NatureServe

VISTA

Decision-Support Software for Land Use and Conservation Planning

User's Manual

from

Vista On-line Help

NatureServe

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About This Help

This help was created by NatureServe (www.natureserve.org) to accompany its Vista decision-support software for land use and conservation planning.

Additional information related to basic mapping functions utilized in conjunction with Vista can be found in help documentation for the specific Environmental Systems Research Institute (ESRI) (www.esri.com) application being used to develop and manage geographic information system (GIS) layers (e.g., ArcGIS 10). Answers to commonly asked questions and other tips on using Vista may be found in the Knowledge Base on NatureServe's online support site at http://support.natureserve.org/Vista/.

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Preface

NatureServe has thirty years of experience collecting and managing biodiversity data through its network of more than 75 state, provincial, and national member Natural Heritage Programs and Conservation Data Centers. We share a common interest with many other organizations in protecting our precious natural heritage and improving our quality of life. As a primary source of biodiversity data across North America, as well as much of Latin America and the Caribbean, the NatureServe network is often the conduit to successful conservation planning efforts. As practitioners, we are challenged by a conservation planning science that is complex and not always integrated with other decision processes. With this in mind, NatureServe Vista was created to provide conservation planning tools to those who are making decisions about our natural resources.

NatureServe Vista was developed by a team of expert conservation planners and software engineers. Our work was primarily funded by a cornerstone grant from the Doris Duke Charitable Foundation and was guided by a panel of expert advisors from all relevant disciplines. The result is a product that we believe has the capability to inform policy decisions and help create outcomes of real conservation significance. As you use this tool, please provide us with regular feedback. Our pledge to you is to support your conservation planning efforts and to continue improving NatureServe Vista in order to provide you with the highest quality conservation planning software available.

ACKNOWLEDGEMENTS

NatureServe gratefully acknowledges the funders, partners, and project team members who helped create the conservation planning methodology and Vista decision support software.

Funders

Providing commercial-quality tools to all those making decisions that affect biodiversity was a tall order and risky venture. We thank our funders for their vision, faith, and willingness to take the risk for biodiversity.

The Doris Duke Charitable Foundation

The NASA ReASON Program

The Surdna Foundation

The Nature Conservancy

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MARXAN Conservation Solution Software

Ball, I. R. and H. P. Possingham, (2000) MARXAN (V1.8.2): Marine Reserve Design Using Spatially Explicit Annealing, a Manual.

Possingham, H. P., I. R. Ball and S. Andelman (2000) Mathematical methods for identifying representative reserve networks. In: S. Ferson and M. Burgman (eds) Quantitative methods for conservation biology. Springer-Verlag, New York, pp. 291-305.

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Data Credit

The biodiversity data shown in illustrations of Vista windows and reports derive from a pilot project carried out with the Land Trust of Napa County, California, which used the following sources for data developed and used in project analyses.

Element data:

California Native Plant Society

California Natural Diversity Database (CNDDB), of the California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch

University of California at Davis, Information Center for the Environment (ICE)

Land status data:

Bureau of Land Management (BLM)

California Spatial Information Library:

http://gio.resources.ca.gov/ "GAP - Managed Areas"

Napa County Agricultural Preserve

Napa County GIS website: http://gis.napa.ca.gov

Napa County website providing information on Title 18 Zoning:
http://www.co.napa.ca.us/code2000/_DATA/TITLE18/index.html

U.S. Geological Survey California GAP program:
http://www.biogeog.ucsb.edu/projects/gap/gap_home.html

Public lands data:

Primary Source - GreenInfo Network

Conservation Biology Institute (CBI) Protected Areas Database:
http://www.consbio.org

Vegetation cover data:

California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program

California Department of Conservation, Office of Mine Reclamation, Abandoned Mined Lands Unit: http://www.consrv.ca.gov

California Department of Forestry and Fire Protection

Counties of Colusa, Glenn, Lake, Marin, Soloano, Sonoma, and Yolo, California

National Water Resources Council

U.S. Fish and Wildlife Service

U.S. Forest Service

U.S. Geological Survey

We gratefully acknowledge these sources for providing data, and for allowing their continued use in the graphics included in this documentation. Further, we gratefully acknowledge CNDDB, a NatureServe Natural Heritage member program, for allowing use of their data on significant natural communities and species as a sample data set provided with the software; the use of these data is subject to the provisions and limitations of the Data Sharing Agreement between NatureServe and CNDDB. For further information about CNDDB, visit http://www.dfg.ca.gov/whdab/html/cnddb.html.

Table of Contents

INTRODUCTION

Welcome to the NatureServe Vista (Vista) planning and assessment software. While Vista is well-suited to support conservation planning experts; Vista was specifically designed to support non-GIS and non-conservation experts to assist integration of conservation with other assessment and planning activities. Vista, however, covers a very broad suite of functions and therefore requires the support of experts to build the database and train end users in the analytical and planning functions. Vista is designed to deliver defensible science-based planning and therefore requires the involvement of subject matter expertise and initially may appear complex to apply. No one likes to read software documentation (user manuals) but spending a little time with the documentation will likely save you hours to days of frustration. From our experience offering technical support, the vast majority of questions are answered by the documentation and many problems can be avoided by following the guidance. Advanced GIS users perhaps have the most difficult time because they tend to access documentation only when they run into a problem and they tend to not use the Vista interfaces since they are used to the ESRI interfaces. Some people have tried to shortcut the system by working in the Microsoft Access back end and have destroyed their project pathways. Vista, like all software is far from perfect and you will likely run into some problems but we believe if you follow the documentation and use the software as advised you'll have a satisfying experience. If you need additional assistance we are proud to offer custom contracts for a variety of support services to ensure your success. This includes assistance in designing workflows for applying Vista and other support tools to *your* planning applications (see the Vista website support section for more information).

A System of Software and Methods

The Vista software is comprised of spatial analytical functions automated through a geographic information system and both spatial and non-spatial databases for managing inputs and Vista outputs. The methods behind Vista are drawn from the systematic conservation planning discipline though Vista can and has been used for a very broad variety of applications. At the heart of the process is the concept of setting quantitative retention goals for elements of interest, assessing how well different scenarios meet those goals, and then using the tool to mitigate problems or create alternative scenarios for implementation. Vista then supports project level implementation, ongoing monitoring, and adaptive planning and management.

Vista is designed to support a two part process that can bring solid science, data, and methods to planners and managers that are not expert either in GIS or in conservation planning. In the first part, the expertise of element experts (biologists, ecologists, and experts in other non-biological conservation features) is utilized to populate the database with the data as well as expert knowledge. In the second part, planners and managers can be readily trained to operate those functions that allow them to assess how well current and future scenarios will meet their goals, where conflicts are, and how to mitigate conflicts or build new alternative scenarios. The best projects will keep the "experts" involved to continue advising and then to build more detailed implementation, management, and monitoring plans.

Virtually all of the functions performed by Vista can be done manually with GIS, so why use Vista? Vista automates functions that would take days to weeks to figure out and then implement in a step-by-step basis manually. Vista also provides significant automated tracking, updating, data integrity testing, and reporting functions. Thus, Vista as a decision support system makes it far easier to build and conduct spatial analyses, track data inputs and outputs, manage databases, and create reports that possible with GIS alone. No software will be able to automate all parts of the broad and complex conservation planning process, therefore, Vista is most often combined with other tools to form "toolkits" suited to different applications. NatureServe and partner organizations also offer a combination of software and services that can be tailored to individual client needs and capabilities. We expect that over time, parts of the process now met through custom services or expert tools will be incorporated into the Vista software to make those functions more accessible to planners.

Vista provides several distinct conservation planning analyses that can provide value on their own or can be integrated in a complete assessment and planning process:

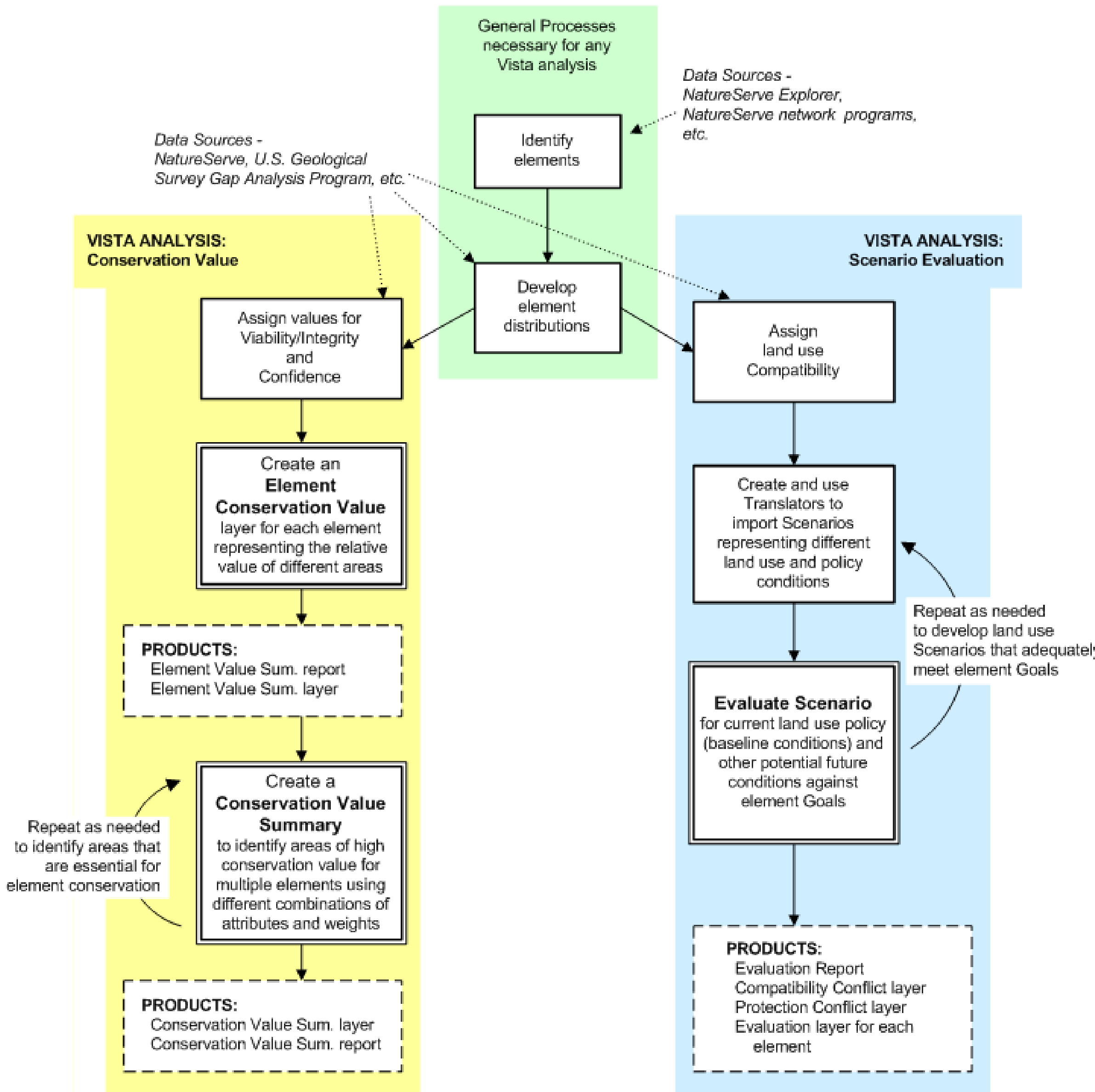
> **Element Conservation Value** layers that indicate the relative value of areas for a single element (species, ecosystem type, cultural feature, desired land use, etc.);
>
> **Landscape Condition Modeling** integrates land and aquatic condition into the element conservation value layers and scenario evaluations. This functionality includes an interface with NOAA's Nonpoint-Source Pollution and Erosion Comparison Tool (N-SPECT) to investigate potential water quality changes and ecological impacts from development, other land uses, and climate change.
>
> **Conservation Value Summaries** that identify areas of high conservation value in the planning region based on combinations of elements and their attributes;
>
> **Scenario Maps** that provide maps and statistics on the distribution of combinations of land uses, management practices, and disturbances and the policy mechanisms behind them;
>
> **Scenario Evaluations** that calculate goal achievement or gaps, identify places where goals are being met and those places causing conflict and goal shortfalls through incompatible land use or unreliable policy mechanisms;
>
> **Site Explorations** that examine the conservation properties of locations based on Vista Conservation Value Summaries and Scenario Evaluations. Using a Conservation Value Summary, Site Explorer displays the inventory of elements mapped for the location and the element attributes of interest.

For a Scenario Evaluation, Site Explorer provides data on the land use and/or policy types for the site selection, along with detailed information on element conservation goals achieved; in addition, Site Explorer enables the user to examine the effects on goals if alternative land uses and or policies are applied.

In addition to these analyses, Vista also includes:

Conservation Solution functionality that facilitates data exchange between Vista and external conservation solution applications, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). Both of these applications generate solutions of sites that can most efficiently meet conservation goals subject to criteria such as amount of area, unit cost or "conservability" dispersion or aggregration of sites, etc. Vista can be used on the front end to generate the input data needed by Marxan and SPOT, via a wizard that makes this process far easier. Vista can also capture solution results generated by these applications and more precisely evaluate their ability to meet goals and then to use the results with Vista Site Explorer to create more resolved spatial plans that specify appropriate land use and implementation mechanisms (e.g., regulations, funding source, education, etc.

Ideally, all of these analyses/functions are utilized for conservation planning, but limited resources and/or data may dictate that fewer or simpler analyses are conducted initially. Vista is thus designed to support the growth of projects as better data are developed and more robust analyses and detailed planning can be conducted. Regardless, the first steps to conservation planning using Vista are designed to prepare the element database. Below is a diagram showing the general processes used for conservation planning in Vista, as well as the processes unique to each analysis. Note that the conservation planning process is not necessarily linear (in fact, it may best be thought of as cyclical), and once the essential database is created (i.e., elements are identified and distribution and attribute data developed), one may enter the process at different points.



General conservation planning processes in Vista.

Below are very general descriptions of steps in the Vista conservation planning process, including whether they are accomplished by the software or through services, and which role(s) are responsible for completing the step (see the topic Roles in the Planning Project for further definitions.) Considerably greater information and guidance are provided in the user manual chapters related to these tasks. One item to keep in mind: roles are best thought of in terms of subject matter expertise rather than institutional or departmental associations.

1. Develop teams or working groups associated with the different data needs and decisions associated with the project (see Roles below). These commonly include a project oversight group, an ecology working group, a

data/GIS working group, and a policy/strategies working group (Service – project leadership)

2. Select conservation elements for inclusion in the Vista conservation database (Service – data development team and end user)
3. Establish the project land use intent classification by modifying the default list provided Vista. This is needed before soliciting expert knowledge about the elements. (Software – data development team and end user)
4. Determine the level of completeness and resolution of data needed to support the project purpose and develop GIS distribution layers and gather expert knowledge on the elements (Service – data development team but see Excel Experts Input spreadsheet tool on NatureServe Vista website)
5. Enter elements and associated information into the Vista conservation database, and point to distribution layers (Software – data development team)
6. Create category systems and filters for selecting elements for analysis and organizing reports (Software – end user)
7. Describe element conservation requirements in terms of the conservation unit utilized in the project (i.e., area or occurrences), minimum required area (if applicable), and response to land use types (the latter, for use in Scenario Evaluation analyses) (Software – data development team)
8. Create weighting systems for use in Conservation Value analyses and/or goal sets to be used in Scenario Evaluation analyses (Software – data development team and end user)
9. Aggregate groups of elements into Conservation Value Summaries, selecting from several variables to be included in the analysis, specifically weights, viability/ecological integrity, and confidence (Software – end user)
10. Import land use and/or policy input layers, using translators to cross-walk them to project land use intent (LUI) categories and/or policy types (PT).Then integrate the layers according to whether they override overlapping features below them or should be combined to represent multiple co-occurring land uses. Process these into scenarios which output separate maps and reports depicting and quantifying the distribution of land uses and policy types (Software – end user)
11. Evaluate the resulting scenarios for their ability to meet conservation goals using Scenario Evaluations by selecting which scenario to evaluation, what group (Filter) of elements to evaluate, what Goal Set to apply, and which policy types you believe are reliable (Software – end user)
12. Explore sites in scenarios to understand the performance of individual or groups of sites relative to conservation goals and their relative ability to contribute to specific element goals with land use and or policy changes. (Software – end user)

13. Modify/mitigate individual sites to increase element goal achievement by changing the conflicting land use to a compatible land use and/or unreliable policies to reliable ones for each selected site (Software – end user)
14. Create entire new alternative scenarios by identifying the set of sites that can most efficiently meet element conservation goals by exporting Vista information to external linked software, importing spatial solutions, and specifying appropriate land use and implementation policies for each site (Linked expert software – conservation experts)
15. Verify that planning units selected for conservation provide viable habitat for conservation elements (Outside software and/or Service – element experts)
16. Integrate all conservation and land-use objectives if you are conducting general land-use planning or management (Partially supported by software. Outside the software – end user, additional experts)
17. Create implementation plans for achieving the conservation goals on selected planning units (Service – conservation experts or end user)
18. Create management plans for conservation areas (Service – conservation experts)
19. Create inventory and monitoring plans to increase confidence in element occurrences, verify viability of elements on conservation lands, or identify need for plan revisions (Service – conservation experts)
20. Maintain currency in knowledge about status of conservation goal achievement and gaps by maintaining an updated database from monitoring activities and other information updates such that element distribution maps and expert knowledge, current actual land use, and current policies. Reanalyze current scenarios to identify gaps and revisit steps above on a routine basis to ensure achievement of goals. (Software and service—all project members).

Other sections will describe in detail steps required to develop and input data for Vista and how to utilize the application to conduct analyses.

Roles in the Planning Process

Because conservation planning (whether using Vista or not) is a data intensive and complex endeavor (as is all planning) we define two types of roles in the process:

Data Development Team – This group of experts (often organized into various specific working groups) provides the following services as needed:

- Identify the conservation elements to be included in the database and obtain or create data on their distribution from a variety of sources
- Obtain data on the current land use, regulations, and management plans that affect future land use and landscape condition (depending on end user skills this may also be an end user role)

- Format all data according to the Vista data model and add additional knowledge on element conservation requirements, for example, goals, weights, and sensitivities
- Create categorizations of elements
- Provide review of analyses as requested by the end user
- Provide additional follow up activities such as developing management and monitoring plans

End User – This individual or team utilizes the software and database to:

- Determine elements that will be used in analyses
- Create alternative weightings for elements reflecting stakeholders' values
- Conduct analyses and evaluations
- Obtain expert reviews as needed
- Create reports and GIS layers
- Create new land use and policy scenarios or site mitigations

In many organizations, all of these roles may be fulfilled internally. In other cases the end user will need to contract or partner with a qualified organization(s) to provide the database development services. In some cases, individuals will play dual roles. Detailed scientific and geographic information system (GIS) methods for developing the database are described in the Element Database section. Many NatureServe Heritage programs and environmental consultants will be qualified to provide these services. NatureServe's Vista support staff can also provide these services (see Vista support website for further information).

Because data development and integration is a costly undertaking and because conservation planning is typically a long-term and dynamic process, we envision Vista being fully integrated into a community's or organization's routine planning and review practices. The benefits to this integration are twofold:

- The Vista database can readily be maintained as decisions are made or new information is gathered
- Dynamic rather than static plans allow the user to always know where they stand in meeting their goals, and threats and opportunities can be readily identified and addressed

Applying Vista to Your Planning Problem

This section provides suggestions for applying Vista to some common planning problems; it is not exhaustive. We believe Vista is appropriate for use by any organization or individual that plans for or manages land or water use, regulates development, or seeks to influence policy NatureServe's Vista support staff can develop custom workflows and integrated toolkits to fully support your planning needs. Details on how to apply Vista to a sample of problems are provided in the Project Types section.

Applications by Conservation Organizations

- Evaluate existing government policies to identify conservation gaps.
- Evaluate your existing plans or land holdings to identify strategic goals.
- Evaluate new scenarios for conservation to see how they meet your goals.
- Provide your plans and database developed with Vista to other implementers to facilitate their adoption of your plan in a flexible decision environment.

Applications by Local or Regional Government Land Use & Infrastructure Planning

- Evaluate current plans, existing land use, and conservation areas to identify gaps in meeting your conservation goals.
- Evaluate the conservation impacts of a large development project and identify mitigation needs onsite or offsite.
- Modify the general plan and zoning to be more compatible with conservation goals and identify areas of low conflict for more intensive land use.
- Evaluate a plan provided by a conservation organization to see how it fits the community's conservation goals.

Applications by Resource Management Agencies or Industry

- Evaluate current management plans to identify gaps in meeting your conservation goals.
- Identify locations for resource use that may be free of biodiversity conflicts.
- Identify areas of likely conservation value but low data confidence that require field inventory.

Vista Conservation Biology and Systematic Planning Approach

Applying the Science of Conservation Biology to Land Use Planning

Conservation biology is an applied discipline, one that uses scientific principles and knowledge of ecology to preserve plant and animal species and communities in the real world. Land use planning that integrates conservation biology will develop and apply more precise information about the location and ecological requirements of biodiversity in the planning area – and can result in better land use decisions.

Central to this approach is the identification of 'conservation elements' of concern in the planning area. These could include threatened and endangered species or local environments, such as wetlands, that fall under environmental regulation. They could also include certain species, habitats, and 'open space' values of high local priority. In some cases, land use planning might be directed at conserving *all of the native biodiversity* in a given area. This more comprehensive approach could allow for better long-term conservation – helping avoid the situation in which new species and habitats would need to be regulated in the future causing endangered species "surprises" and development "train wrecks."

This imprecise concept – *all native biodiversity* – can be effectively addressed through careful selection of the elements of biological diversity to be conserved. Selection criteria would mandate that all characteristic ecological systems be included, complemented by rare and vulnerable communities, species assemblages, and species. These criteria reflect what is known as the "coarse filter/fine filter" hypothesis, which suggests that by conserving multiple, high-quality examples of all ecological systems, we also support the majority of native biodiversity. But since this "coarse filter" on its own might not represent all biodiversity, special attention is also needed for communities and species that are rare or vulnerable – the "fine filter." Experience suggests that this is the most efficient approach to representing all native biodiversity in a network of conservation lands.

With conservation elements clearly defined, we then ask, where are they? Creating maps that accurately describe the location of these elements takes us to a next critical step, enabling us to see where many elements are found together, and where individuals occur in isolation. We can begin to address questions like: Where do our conservation elements co-occur with various land and water uses? Detailed and realistic geographic information system (GIS) layers permit more precise evaluation and planning solutions.

We then ask: What do our conservation elements need to survive and/or function properly? A particular bird species might require several hundred acres of unfragmented and mature forest to successfully raise fledglings. A certain type of wetland might require natural vegetation in most of the surrounding uplands to support natural fluctuations in water levels. A particular grassland type might require controlled fire on a frequent basis to maintain natural diversity in plant and insect species. Each of these examples describes key ecological attributes that define the quality of individual populations or habitat patches. The relative quality of these mapped locations tells us much about our options for their conservation. For example, high quality examples of rare and vulnerable species or communities are of high conservation value because few alternative opportunities exist for their conservation. We might now ask: Are surrounding land uses in conflict with critical ecological processes? Will some locations require costly management and ecological restoration? Which ones?

We are then prepared to ask a central question of land use planning and conservation: How much is enough? Within a planning context, this question might address a *desired level of representation* for each conservation element, based on local interests and values; for example, "our county desires 10% of its lands to be in natural vegetation as open space." It could also embrace a more ecological perspective. One might apply best available knowledge to define the overall amount of each conservation element that is needed to ensure long-term survival and ecological health. This requires additional evaluation of the relative contribution of this planning area to conserving biodiversity (or other conservation values) throughout a larger region.

The science of conservation biology directs us to ask – *and answer* – a number of important questions in the context of any land use planning process. Vista embodies an approach and toolbox that enables the science of conservation biology to inform practical decision making.

REQUIREMENTS

System Requirements

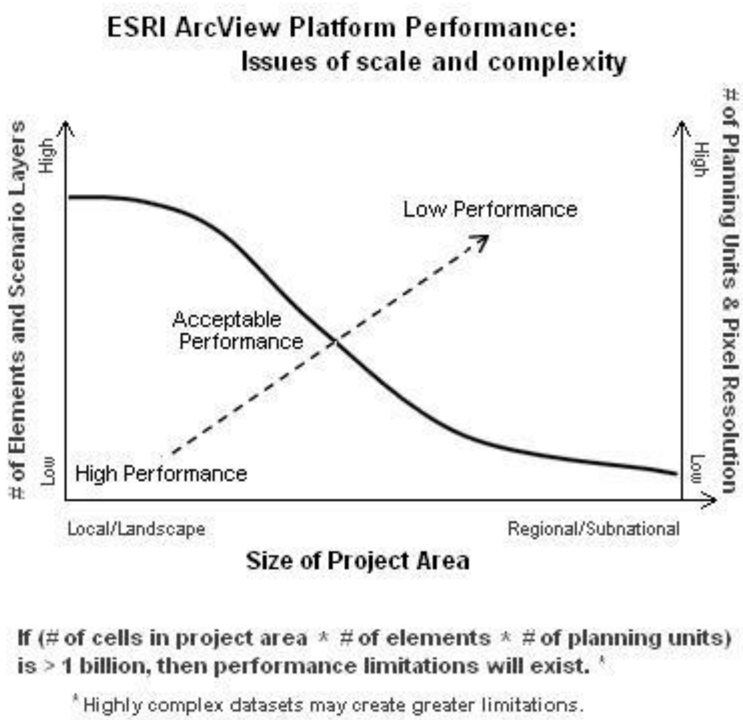
Please see the current requirements in the readme file included with the program or found on our website at: http://www.natureserve.org/prodServices/vista/vista_sys_reqs.jsp

Common Project Requirements

Introduction

Now that you plan to use NatureServe Vista as one of your project tools, you will need to learn how to integrate it into your project or routine planning and assessment activities. However, since Vista has a broad range of applications and can be used by many types of users, we cannot provide prescriptive directions for carrying out every possible project. Instead, we describe a sample of typical planning situations, how Vista and planning methodology can be applied to those problems, types of inputs required, and nature of expertise required. The objective is to help users rapidly initiate projects that will lead directly to the answers required for decision-making. Before you do anything, carefully assess whether Vista, as an ArcView (versus ArcInfo) based tool is able to meet the computational demands of your project. We provide more detailed guidance below but generally the most advanced analyses in Vista cannot process a combination of layers that exceed 1 billion pixels. That means that for projects exceeding approximately 1 million hectares (2.2 million acres) you may need to trade off among the following variables:

- Project extent: if you desire to retain a large project extent (>1 million ha/2.2 million ac) you may need to reduce the number of conservation elements (e.g., by clustering into guilds of elements represented by a single map per guild) and increase the pixel size substantially in your analyses. Keep in mind that if you need to reduce your project extent, you will need to do this before you begin your project because Vista/ArcView will allow you to make project extents larger but not smaller. If in doubt, we recommend starting with a subregion, confirm that Vista can operate satisfactorily, and then enlarge your project accordingly.
- Number of conservation elements: if you desire to have many dozens to hundreds of elements you may need to reduce your project extent (perhaps by breaking your planning region into multiple subregions with separate Vista projects) and or increasing your analytical pixel size.
- Spatial resolution: if you desire to work at fine spatial precision (relative to the size of the planning region e.g., 30 meter to 1 ha) then you may need to reduce project extent and or reduce number of conservation elements.
- Planning sites: if you desire to work with tens of thousands of planning sites you may need to reduce the combination of variables above.



Data Collection

Most projects begin with collecting information. Specific information required for initiating a Vista project is described in the Information Needed for Database Construction section. In addition to geographic information system (GIS) data layers such information must also include the values of project stakeholders. Dealing with appropriate data collection and appropriate inclusion of stakeholder values is the most critical piece of all planning projects with or without Vista. For data, you must ensure that data precision and quality match the planning purposes. For stakeholder values, Vista allows different group values to be expressed in several ways such as varying which conservation elements are selected, how their importance is weighted relative to other elements, what conservation goals are assigned to the elements, and which land-use policies are deemed valid. While Vista allows recording and analyses of different sets of values, it is up to the participants to resolve differences in the outcomes these would generate e.g., whether a scenario evaluation that meets a set of low conservation goals is appropriate to implement.

Data input

All projects will require that data be assembled, formatted, and entered into Vista following the simple Vista data model as described throughout this documentation. The basic types of inputs for Vista include:

- Planning region reference information (boundaries, streams, roads, place names, topography, digital orthophotos, etc.)

- Element distribution maps (NatureServe Heritage network element occurrences, Fish and Game species habitat maps, vegetation cover maps, modeled distribution maps, scenic views, historic sites, etc.)
- Element occurrence attributes (viability, integrity, confidence)
- Element information (name, weight, goal, conservation unit, minimum required area, etc.)
- Existing land use map
- Current land use and management policy maps (zoning, public land management plans, etc).

A more complete summary of the information inputs are described in the Data Inputs and Outputs section, but it should be noted that inputs will vary considerably depending on the project objectives, local environment, etc.

Properly assembling the data usually requires ecological and GIS expertise. While obtaining suitable data and getting it into the system is typically the most time-consuming and resource-intensive part of any project, the same is true for all projects utilizing GIS tools. Vista does provide utilities not typically included in most tools to facilitate collecting information, inputting and documenting data, and conducting thorough data validation functions that run in the background.

Common processes

In the examples that follow, the assumption is that the following steps have already been completed:

- Select a database development team
- Identify the conservation elements of interest in the planning region (e.g., species, ecosystems, scenic viewsheds, etc.)
- Develop the database and import all information into Vista
- Establish expert and stakeholder values for element weights and goals

Required Expertise and Information

Data Development Team Composition

A variety of skills will be needed if the goal is biodiversity conservation. Individuals may possess more than one skill, so the following list should not be interpreted as representing the number of team members required. Needed skills also depend on the analyses to be performed.

- Project coordination and management
- Geographic information services
- Data management
- Metadata documentation
- Terrestrial ecology
- Terrestrial zoology
- Aquatic ecology

- Aquatic zoology
- Non-biological domain expertise (depends on elements of interest to the analytical user, e.g., farmland conservation, archaeological sites, etc.)

Information Required Prior to Database Construction

This section describes the information that the analytical user should provide before the data development team begins work on the conservation database. How Vista will be used can have a great influence on the type of data required, and tailoring the database to user needs will save time and money. However, the user should also try to consider longer-term needs to reduce callbacks for additional information. For example, the analytical user may initially request a database of only legally protected elements, then later discover that the community desires much broader wildlife conservation. Even if the data development team and analytical user work on the same project or in the same organization, they should verify that they all agree on the database requirements. The following are some general questions; a check-off list of more specific information requirements is found in the Information Needed for Database Construction section.

- What will be the primary use of Vista – scenario evaluation, investigation, and education; conservation plan development; integration with general land use planning; resource management, etc.?
- Who will be using Vista and what is their level of knowledge and comfort working with the particular problem, data, and complex software?

Information Needed for Database Construction

The process of beginning a Vista project can be facilitated by identifying the various types of information needed to construct the project database first.

Planning region boundary

Identify the data layer that spatially defines the planning region based on whether:

- It is bounded by a single polygon such as a county, state, ecoregion, or watershed.
- It is bounded by specific tracts of land over which the analytical user has planning authority. These tracts may be disjunct and fall within a larger planning region with the intervening tracts left blank as "no data" regions.
- It is bounded by multiple jurisdictions that will cooperate in the implementation of Vista.

Conservation elements.

Identify the specific elements or categories of elements the client wishes to incorporate after reviewing the Vista default list of biodiversity elements and the types of compatible cultural elements that can incorporated. Decide how weights and goals will be assigned.

Baseline scenario composition.

Identify the planning, management, and regulatory jurisdictions operating within the planning region. List them in order them based on the policy dominance in cases when jurisdictional authority overlaps for the same areas.

Analytical services.

Identify any analytical services (e.g., conservation value summaries, baseline scenario evaluation, scenario generation) that the database development team should conduct prior to database delivery.

Post-delivery services.

Identify any planned post-delivery services for the database development team (e.g., review of analytical results).

Delivery date and budget for database and services.

Identify the desired delivery date and budget for delivery of the database including any analytical services.

Data layers and sources.

Identify any the key data layers and sources known to the analytical user that may be unknown to the data development team.

Data Inputs and Outputs

Introduction

Geographic information system (GIS) layers form the backbone of the Vista database, but additional non-spatial information is also required, including weights indicating social values and goals for element conservation. For use of all Vista functions, an extensive amount of data may be needed. The scale of the data and attribute detail will determine the types of analyses that can be done and the precision of the results. Obtaining and formatting the data for Vista can be a significant task and the most expensive part of the project for several reasons:

- Little-to-no data are developed specifically for conservation planning and must be converted for this use.
- Data come from many different sources and disciplines with different standards for projection, attribution, and documentation.
- Data for any planning region are largely incomplete, at different scales, and of different ages.

The following section is intended to provide a synopsis of the required inputs and outputs of Vista. It is not exhaustive but can serve as a guide for planning and getting started on data and expert knowledge acquisition.

Topics in this document are generally arranged in chronological order, although there is a lot of flexibility available after the Base Data and Conservation Element Data are entered.

Pre-processing for all data

All projections and coordinate systems must be identical, clipped to a manageable size that is larger (preferred but not critical) than the project boundary, ESRI-compatible formats.

INPUTS

Base Data

Project Area

Project boundary file must be a single polygon shapefile

- Typically a political or geophysical boundary like a county or watershed is used
- Add this layer to you ArcMap view before doing anything Vista related. This will set you Data Frame properties to match those of the boundary file.

Data Frame

Set to Layers (this will pull projection information from layers already in the .mxd)

- If you have added your pre-processed boundary file to the view, your Data Frame properties will be correct

Cell Size

A default cell size to be used in the project (can be changed at any time)

Snap Raster

ESRI GRID with cell size evenly divisible by the project cell size

Site layer

Any polygon map e.g., parcels, watersheds, etc., typically used for planning or management decisions at the scale of the project.

- This layer should be selected at the onset of the project, but will not be used until more advanced analyses are built

Land use intent list

A hierarchical list modified from the Vista default which describes physical activity/phenomena.

This list will not actually be used until the (Scenario Data section below, however, if you know that you will be creating Scenarios (most likely) then developing and inputting this list now will save a great deal of time because if it is changed, the element response (see below) must be updated by experts.

Conservation Element Data

Spatial distribution

All conservation elements (EOs, modeled habitat, ecosys, historical sites, etc) – polygon preferably defined as occurrences (can be multiple patches associated with a single ID).

- Common sources include NatureServe member network programs for EO data, land cover rasters (must be dissolved and polygonized), BLM, Fish and Wildlife, and in-house habitat and suitability modeling. The Sources of Element Distribution Data section provides information on where these data may be obtained.

Quality scores

Must have Quality scores stored in polygon attribute table or in float raster. Scores must range from 0.0 – 1.0 values (1.0 is high quality). Vista will import and transform Element Occurrence Ranks directly from NatureServe Member Network Program databases using the Biotics data management system.

- Attributes are typically used for occurrence data, while ecosystems, land cover types and some modeled data typically use a 'Landscape Integrity Raster.' The analysis takes into account negative impacts (point-source pollution, roads, mines, runoff, etc) and runs a weighted straight-line distance, then sums the layers.

Confidence scores

Must also have Confidence scores in same format, or in single value entered into text field.

- Heritage data comes with data confidence data and other datasets can be evaluated by expert opinion. These scores slide on a 0.00 – 1.0 relative scale (1.0 is high confidence).

Quantitative goal

Integer of quantity (e.g., 30 acres, 20 occurrences) or percent 0-100 of area or occurrences.

- Goal sets are a scientific value that should describe the minimum amount of an element needed to allow that element to survive/continue to be viable
- Many goal sets are possible. Sometimes when scientific minimums are uncertain a 'High Risk of Losing Element' and a 'Low Risk of Losing Element' goal sets can be made.

Optional minimum viable occurrence size

Integer value of spatial unit (e.g., 100 acres). Note that this applies to an occurrence not a patch so Vista is not very sensitive currently to fragmentation as long as parts of original occurrences sum to MVO. Recommend secondary analyses with fragmentation tools (e.g., HPP, Fragstats) when details about fragmentation relative to minimum viable patch size are important.

Optional categories of membership

Some default categories provided (e.g., ESA rank) but user can create any desired

- Categories help by organizing goals, weights, results reports, etc.

Optional importance weight

Must be a 0.0-1.0 score but many weight lists possible

- Weights should reflect stakeholder values, wishes

Scenario Data

Land use intent list

This is the *same list* that was referenced in the Land use intent list (above). It is included here because this is the last opportunity you will have to modify this list before using it in a scenario. Hopefully modifications are not necessary, because they will require manual updating of each conservation element.

Policy type list (optional but preferred)

A list of policy types (e.g., "zoning regulation") Modification of Vista default list. Can be readily changed any time (in scenario evaluation user must specify reliable policies).

Land use spatial distribution data

Polygon or integer raster map(s) of current, proposed, or modeled land use intents.

- Usually two or three scenarios will be created. This first shows land use as it currently exists. The second or third show possible future uses based and various growth or development predictions (ie CommunityViz models).
- Current land use data can often be obtained from county or city governments

Policy types spatial distribution data

Polygon or integer raster map(s) of current, proposed, modeled policy types usually inferred from the land use input file.

- This is sometimes the land use file, just translated (displayed) using different attributes.

Element responses to land use intents

Options (all sources are from element experts directly or from literature):

Categorical response

Default is selection of "negative, neutral, or beneficial" response. User can add or delete these responses.

- When you set up your responses you are simply designating how the element will be impacted by a particular land use (kind of like saying 'a lot, a little, not at all'). You will determine if the element can persist through that type of impact later.

Landscape condition response

A condition model for one or a group of elements: the degree of impact on persistence from any land use type on the immediate site and a distance effect in 0.0-1.0 scores. Actual spatial condition map is then automatically built when a scenario is entered and a condition evaluation is requested.

OUTPUTS

Elements

(used for basic understanding of element distribution, requirements, areas of high to low value)

Element conservation value

A floating point raster map with cell values reflecting the combined quality and confidence scores. Defines occurrences falling below minimum viable size.

HTML report summarizing element properties and value map

Conservation Value Summary

(used for generally planning to avoid conflicts with high value areas)

Raster floating point map based on several user-defined parameters indicating relatively low to high value of landscape based on element richness and characteristics.

Scenario

Raster integer map of land use intent distribution

Raster integer map of policy type distribution

HTML scenario report

Acreage of combinations of land use intent and policy types and maps of land use intent and policy type.

Scenario Evaluation

(primary output to identify elements not meeting goals, gap in goal achievement, and where conflicts are occurring and of what type)

Compatibility Conflict map

Raster map shows areas where elements do not meet conservation goals and are in conflict with scenario's land use intent. Visualizes "intensity" of conflict via count of number of elements in conflict per pixel.

Policy Conflict map

Raster map shows areas where elements not meeting goals because of unreliable policy and intensity of conflict per above.

Scenario Evaluation Report

HTML format report with tabular results of element goal achievement based on the evaluated scenario.

Site Explorer

(explore conflict issues at particular sites and use to generate alternative scenarios)

Site Selection Report – Conservation Value Summary exploration

HTML format report that indicates the conservation value of the selected site(s) and element information, including the number and percentage of viable occurrences on the site(s).

Site Selection Report – Scenario Evaluation exploration

HTML format report of land use on the selected site(s), along with element inventory and element response to land uses.

- **Optional:** Can be used to specify alternate land use intent and policy type per site (homogenous over entire site). Generates a shapefile that can be integrated in a new Vista alternative scenario.

GETTING STARTED

Project Types

The following examples describe how Vista may be applied to common land use planning activities. There is considerable variation in the decision processes among the tens of thousands of planning jurisdictions and purposes in the world; therefore, these descriptions are for illustrative purposes only and tend to be written from a North American perspective. Assistance in applying Vista to your specific project may be obtained through your Vista service provider.

Common processes

In the examples below, it is assumed that the following steps have already been completed:

- A database development team has been selected
- The conservation elements of interest in the planning region (e.g., species, ecosystems, scenic viewsheds, etc.) have been identified
- The database has been developed and all information imported into Vista
- Expert and stakeholder values for element weights and goals have been established

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Comprehensive land-use planning

Description: Comprehensive land use planning (also referred to as "general planning" or "long-range planning") tends to be visionary, focusing on creation of comprehensive master plans designed to guide future growth over a long period of time. Long-term planning is often broad in both scope and spatial extent, focusing on development at local to regional spatial scales. Comprehensive plans are often composed of system plans (see table below). These plans are often developed independently and emphasize infrastructure and development, while conservation is often relegated to locations undesirable for any other use rather than being strategically planned through an analytical process. Vista has most typically been used to integrate conservation with general land use planning and transportation planning. Vista is not designed as a general land use planning tool but it can help integrate and bring balance between the development and conservation systems. This integration and balance is brought about through a few optional approaches: first, by identifying areas of high conservation value (using Conservation Value Summaries) so that conservation is put on equal footing with other uses and, second, by facilitating evaluation of the degree of compatibility of other system plans with conservation goals (using Scenario Evaluations). Second, users may also input land uses as conservation elements and goal seek to meet their objectives. As long as land uses are also input as scenario components and element responses are rated for them, Vista can assist in meeting all land use objectives while helping avoid conflicts between incompatible objectives. Suitability analyses on the other hand require other tools. Habitat suitability analyses can be conducted with a variety of other modeling tools. Land use suitability analyses likewise can be conducted with other tools such as CommunityViz. Results from these other tools can then be input to Vista to represent either element distributions or scenario inputs.

Types of Community System Plans
Land Use
Transportation
Utilities and Related Infrastructure
Environmental (air quality, water quality, solid waste)
Recreation, Open Space, Green Infrastructure
Schools
Housing
Historic and Cultural Features
Conservation / Biodiversity

Typical required inputs: Comprehensive planning is the broadest and most complex activity supported by Vista and therefore will require the full breadth of inputs. As important to the data inputs are the value inputs, which should reflect the community's values. Information needed will include the breadth of conservation elements desired (e.g., biodiversity versus only legally protected elements) and the economic trade-offs that the community is willing to make to conserve these elements.

Typical required expertise: The expertise required for developing the conservation database is described in the Vista Requirements section. For true integration of conservation system plans within comprehensive planning, a complete planning team is required. This team would consist of:

- Experts from each plan system (e.g., transportation planner, zoning planners, etc.)
- General planning coordination
- Technical experts in geographic information systems (GIS), databases, and mapping

Vista analytical path: The analyses described here represent the full conservation planning process, some of which is not incorporated into the current version of Vista. If using only Vista, follow steps 1-7; to create a conservation system plan scenario, begin at step 8.

1. Create a Conservation Value Summary (CVS) in Vista that identifies the relative conservation value (low to high) of

different areas in the planning region. Use this initial analysis to guide other system uses away from high value areas and to low value areas.

2. Import resulting system plans into Vista as scenarios to be evaluated.
3. Run a Scenario Evaluation on each scenario (i.e., system plan) as well as alternative scenarios/plans to determine how well they do or do not support conservation goal achievement.
4. Use the output of the Scenario Evaluation and Site Explorer to identify locations most in conflict with the scenarios/system plans and determine the nature of that conflict as well as the potential for the site to contribute to goals if land use or policy changes were made.
5. Modify the scenario/system land use and policy types to be compatible with elements requiring further goal achievement taking into account minimum element occurrence size requirements and opportunities to maximize goal achievement for multiple elements, retain landscape connectivity, and buffer existing conservation areas.
6. To create a conservation system plan that meets all element conservation goals in the most efficient manner, you will need some additional tools and expert help. Begin by enlisting your data development team, NatureServe network program, or Vista support staff. This will include interoperating with linked optimization tools and using results to direct alternatives and mitigations to the most efficient sites.
7. Test resulting alternative plan to ensure conservation goals are met and then evaluate with other software if other system plans are still meeting their objectives or if they need to be revised.
8. Finalize the conservation plan and develop more specific implementation, management, and monitoring plans.
9. Set up a process to ensure frequent updating and reanalysis as actual land use and policies change over time.

Development project review

Description: This activity covers the implementation of various system plans e.g., land development or infrastructure projects and often projects not included in such long range plans. Most plans allow considerable flexibility in project design, which is then assessed against plan goals and criteria and more detailed impact assessments are often required. The application in this case is to evaluate a proposed development project (though it can be any change to land use, management, or policy) against the specific element goals to determine the project's impact on those element goals.

Typical required inputs: In addition to the conservation database including element goals, you will need a vector or raster GIS layer of the project area that indicates different land uses as separate features which are identified in an associated database (or separate layers for each land use). You may also need to refresh your element spatial data with more precise distribution data for the specific project region to downscale your analyses from the larger planning region to the local scale.

Typical required expertise: No specific expertise is required. You will need to crosswalk the different land uses in your planning region to your Vista land use intent (LUI) categories and/or policy types (PT).

Vista analytical path:

1. Create translators to convert land use and policy types in the planning region to Vista project types.
2. Copy an existing scenario and import project GIS layers. Modify existing layers (remove, override, combine with new project layers to create a new proposed scenario using translators to crosswalk LUI and PT.
3. Run Scenario Evaluations. For a shortcut, if a project occupies the majority of an existing site unit(s) in an existing Vista scenario, and has a single land use type, you can use Site Explorer to propose the alternative land use and get instant feedback on potential impacts.
4. Review the evaluation reports and layers generated by Vista.
5. As may be required use Site Explorer to conduct onsite and or offsite mitigation planning to offset impacts.

Conservation planning

Description: This activity is core to Vista functionality. Conservation planning can take many forms, but within the Vista methodology it is the act of allocating areas of land and water to compatible land uses and reliable policies for the maintenance of conservation elements. These elements can be components of biodiversity (e.g., species, ecosystems) or items of cultural value such as scenic viewsheds, historic sites, or farms. Decisions on the areas to allocate for conservation may take into account quantitative goals for preserving elements, the degree of threat posed by expected disturbances, the cost of conservation, the spatial arrangement of the conservation areas (e.g., size of areas and connectivity among them), and methods of implementation (e.g., land-use regulation, acquisition, easements, etc.). Vista does not cover all processes of conservation planning; therefore some evaluations must be conducted using other tools, custom GIS analyses, and professional opinion.

Typical required inputs: In addition to the conservation database including element goals, some of the typically-required inputs listed below are noted as optional, as their absence will not preclude development of a conservation plan.

- A baseline scenario of current land use and a "policy baseline" scenario depicting land use if all polices were carried out to be assessed for needed changes
- An acquisition budget, expressed in terms of land area to be acquired and/or monetary expenditures
- An implementation time frame
- Some reserve design rules such as whether new conservation areas should clump around existing protected areas and whether new areas should be in the most desirable locations, regardless of how dispersed they are, or if they should be aggregated together

Typical required expertise: The required expertise is the same as for Comprehensive Land Use Planning (see previous example), but the other system experts are not absolutely required.

Vista analytical path: The analytical path is the same as for Comprehensive Land-Use Planning, except that compromise with other system plans is not strictly required. In reality, compromise will always be necessary to carry out plans over large areas for many elements, thus a comprehensive approach is preferred over developing a conservation plan in isolation.

Infrastructure planning

Description: This application refers to the selection of sites for infrastructure systems or facilities such as roads, transmission corridors, flood control projects, etc. These systems and facilities often have significant direct impacts on biodiversity and also frequently spur additional development that can extend these impacts over large areas. However, infrastructure projects may generate mitigation funds that can be used to implement conservation priorities outside of their impact envelope. Vista may be used both to direct the location of facilities to less sensitive sites and, when used in conjunction with urban growth models, to mitigate the threats posed by secondary growth if planning can be done collaboratively with land use planning jurisdictions.

Typical required inputs: In addition to the co nservation database, proposed system plan(s) and/or facility location(s) for evaluation of impacts.

Typical required expertise: The required expertise is the same as for Comprehensive Land Use Planning but is limited to the infrastructure system of interest rather than all system plans (except if secondary urban growth modeling for example is desired). Scientific expertise must be capable of determining offsite effects of the infrastructure and element sensitivities to these effects.

Vista analytical path: If an infrastructure plan has not yet been developed, the starting point could be development of a Conservation Value Summary in Vista to guide initial system plans, as in Comprehensive Land Use Planning. However, in this case we assume a proposed plan already exists.

1. Import the infrastructure plan as a scenario, and run Scenario Evaluation to determine conflicts and compatibility of land use intent and/or protection policy types with conservation goals.
2. If using just Vista, use the results of the evaluation to identify affected elements and locations where they occur that should be avoided.
3. As may be required use Site Explorer to conduct onsite and or offsite mitigation planning to offset impacts.

Inventory and monitoring

Description: Creating a reliable conservation plan requires an inventory of the resources to be conserved. Implementing the plan requires monitoring of the condition of those resources to determine if the plan needs adjusting. Vista can assist in these activities, although it currently does not provide any specific functions for inventory and monitoring. NatureServe's Biotics software was designed specifically for managing biological element inventory data and its information can be imported directly into Vista.

Typical required inputs:

For the initial inventory, the processes for selecting elements, obtaining existing spatial distribution information, and creating predicted distributions are covered under the Element Selection and Distribution sections.

For inventory and monitoring purposes, your inputs include:

- The list of elements to be monitored
- The spatial distribution maps with attributes of viability/ecological integrity of occurrences and confidence in their location
- Inventory priorities that may reference locations of low confidence coupled with areas that are known/expected to be threatened in the near future and funding and expertise available for inventory
- For monitoring, the monitoring interval (how often you will monitor each element)
- The monitoring budget and consequent design of the monitoring program

- Optionally, a regularly updated map of threats that can suggest the need for increased frequency and intensity of monitoring where conditions may be changing more rapidly
- Observations of the occurrences over time, gathered through field surveys, aerial photographs, or for large features -- satellite imagery

Typical required expertise: Both inventory and monitoring require similar types of expertise:

- Knowledge of element types to determine which elements occur in the areas of interest and the quality of their occurrences; for biodiversity elements, ecological, botanical, and zoological expertise will be needed
- Expertise in the use of geospatial analysis software and techniques, such as GIS modeling of predicted occurrences
- Sampling design for the elements of interest to determine where monitoring should occur
- Techniques such as aerial photo interpretation and field biology for collecting and interpreting observations

Vista analytical path:

Inventory: The first step is to determine what elements are to be considered in the planning process. The most inclusive approach is to identify all elements known or believed to occur in the planning area and then select the elements to be included in the analysis. The process described here also emphasizes spatially inclusive inventory in order to maximize confidence that element occurrences have been found, especially in threatened areas. As new element observations are made or improved predicted distribution maps are created, they can be imported as updates to the database. In this way, the inventory process is continuous and dynamic. Considerable detail about these processes is provided in the Element Database sections. Also please plan on sharing new or re-confirmed element observations with your state/provincial natural heritage program, conservation data center, natural history museum or other biological data repository. Following their data collection methods and database structure will facilitate incorporation of the data in their systems.

1. Create a Conservation Value Summary (CVS) that can be used to identify areas of low confidence but potential high viability/integrity (that is, areas of high conservation importance but low certainty that the element is actually there).
2. Generate a baseline scenario (or a future growth scenario) and evaluate the scenario against conservation goals for the elements of interest. Identify occurrences of elements as

conservation targets if conservation need is high (conservation falls far short of goals for an element) and land uses are incompatible with occurrences.

3. Prioritize occurrences that are highly threatened by incompatible land use, have high viability/integrity, and/or are low confidence for further inventory work.
4. Determine the appropriate method of inventory (field observation, aerial photo interpretation, etc.).
5. Use the Description field in Vista element properties to identify the element as a target for inventory and monitoring activities and to describe the plan for inventory and monitoring. These notes will be presented in the element report.
6. With new inventory/monitoring data manually or in other tools develop new distribution maps and or update values for viability/integrity and confidence of presence. Refresh the Vista element properties with the new information. Completion of these tasks results in updated Element Conservation Value (ECV) rasters, which have a relative value assigned to each grid cell based on viability/integrity and confidence.

An alternative, simpler process would be to generate an unweighted confidence index type of CVS and target areas of low average confidence for inventory. By concentrating effort at locations where these areas overlap with areas of high element richness, efficiency can be increased by inventorying for several elements at each location.

Monitoring: Once a plan is created that identifies which occurrences of which elements should be conserved, Vista can be used to identify locations where monitoring should be carried out. Monitoring assesses whether occurrences are persisting and if their viability/integrity is changing. A body of literature exists on monitoring procedures, and therefore they are not described here; however, the process is very similar to that of Inventory described above. The focus is on occurrences to be conserved and efficiency.

1. Generate a conservation plan of areas to be conserved.
2. Generate a Conservation Value Summary (CVS) representing element richness (unweighted elements without confidence or viability/integrity attributes) for the elements included in the conservation plan.
3. Overlay the map of areas to be conserved with the CVS to identify areas of richness for monitoring; the areas of overlap will be the cost-efficient locations for monitoring several elements at a time.
4. Work with monitoring specialists to devise a statistical sample of remaining element locations to be monitored.

5. As monitoring work is conducted, update Conservation Value Layers with new information on confidence and viability/integrity, and create an updated CVS as needed.

Limitations

The previous examples present only a sample of the numerous project types to which the NatureServe methodology and Vista are applicable. We also necessarily had to generalize the description of project types and the approach to undertaking them. A project will be affected by many characteristics of the planning region, such as size, biophysical environment, socioeconomics, politics, regulations, etc. Your local data development team should be able to guide you more specifically on the appropriate project path and NatureServe support staff can also assist in developing customized workflows and toolkits for your specific applications.

How to Install NatureServe Vista

Prior to installation:

1. Make sure there is not a previous version of Natureserve Vista on the computer; if another version of the software is present, the installation will fail. If a previous version exists, uninstall using **Start**, **Settings**, **Control Panel**, **Add/Remove Programs**.
2. Make sure that Environmental Systems Research Institute (ESRI) ArcMap 9.0 with the Spatial Analyst extension is already installed on the computer. Note that Vista will not work with earlier releases of ArcView.

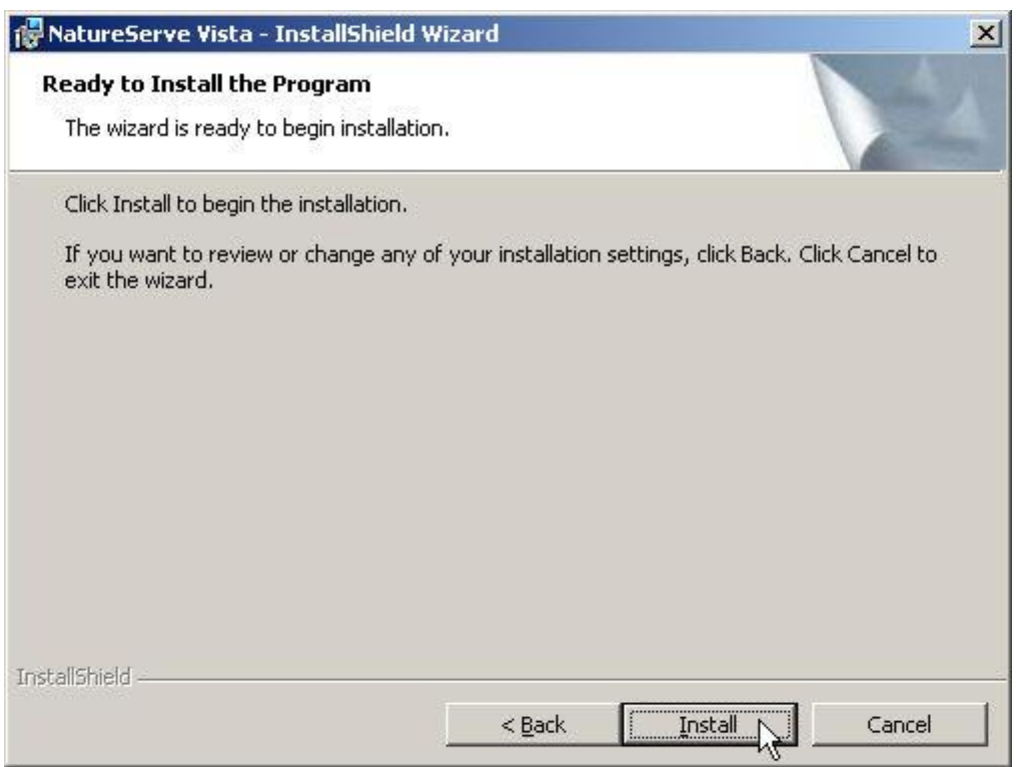
To install the software:

1. Double click on the Vista **setup.exe** and follow the directions in the install wizard.

2. Click **Next** at the Welcome screen.

3. Read and accept the terms of the license agreement. Click **Next** to continue.

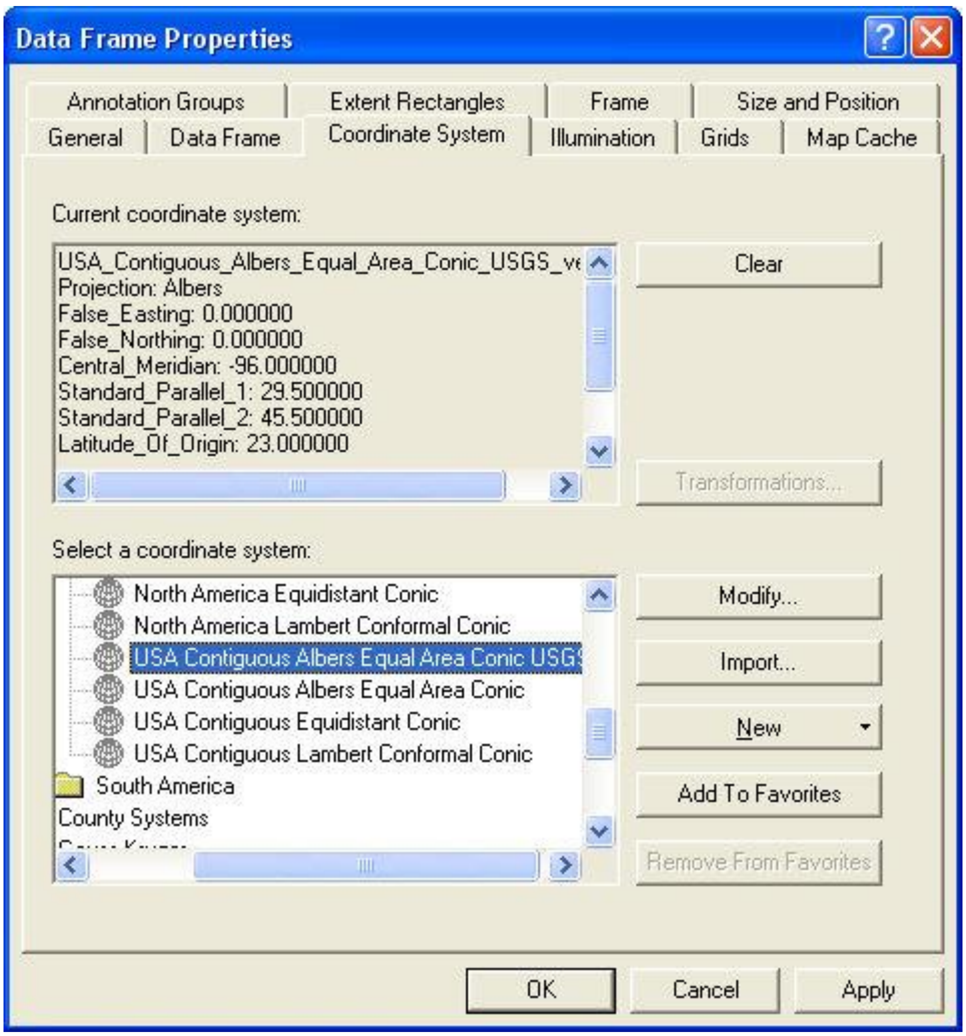
4. Select the Typical setup option. Click **Next** to continue.



5. Click the **Install** button to begin the installation.

How to Begin a New NatureServe Vista Project

1. Open ArcMap, a component of the ArcGIS application developed by the Environmental Systems Research Institute (ESRI).
2. Create a new project document by clicking the New Map File button  on the ArcMap button bar. Note that a new project document can also be created by clicking File - New on the ArcMap toolbar, but a New window will result. If the latter method is used, you will need to name and save the new document before proceeding to the next step.
3. Define a projection for the data frame.
   - Select the data frame in the Table of Contents (TOC), which will have a default name of **Layers**.
   - Right-click, and select **Properties...** from the resulting menu.
   - Select the **Coordinate System** tab on the Data Frame Properties window that is displayed.



   - Navigate through the hierarchy to select the appropriate coordinate system for the project.

- Click **OK** to close the Data Frame Properties window.

4. Open the NatureServe Vista menu.
5. Select **Project▸ New...**
6. Complete data entry on the resulting Project Properties window and save the project to the hard drive.

How to Duplicate a NatureServe Vista Project

In most cases, invoking the 'Save As' menu item in an application will cause a new file to be created using the name specified, and the original file is left unchanged. However, when a map document associated with a NatureServe Vista project is open and ’r;Save As’ is invoked from the ArcMap (a component of the ArcGIS application developed by the Environmental Systems Research Institute) menu, the database and GIS data sources of that existing Vista project will not be duplicated to create a new map document with the specified name. Instead, the new map document only references the original Vista project. Thus, data edits in one of these Vista map documents will be reflected on the other map document as well.

In order to create a separate NatureServe Vista project by duplicating an existing one, the 'File copy' function can be used in either of two ways, depending on whether the map document is collocated with the Vista project, as follows:

> **If the map document is collocated with the NatureServe Vista project** (Vista database, VistaGIS and Templates directory), copy the map document, Vista database, VistaGIS, and Templates directory to a new location.

> **If the map document is not collocated with the NatureServe Vista projec**t, copy the map document, Vista database, VistaGIS, and Templates directory to a new location. Then select **Project▸Attach...** from the NatureServe Vista menu, and attach the copied database to the copied map document.

Note that if the map document to be copied is associated with a Vista database, it must be detached first by selecting **Project▸Detach...** from the NatureServe Vista menu.

VISTA HANDS-ON EXERCISE

Hands on with the Orange County, Florida training dataset

Introduction

This section of the "Getting Started Guide" is designed to 1) familiarize you with the basic functionality of NatureServe Vista, and 2) walk you through the process of entering data and running analyses so you can produce some basic results.

While these results will be relatively easy to generate, they are likely to require refinement prior to their use in informing any actual decisions. The guide, therefore, also includes details on refinements that can be made throughout the process to improve the accuracy of results derived from analyses. In addition, expedient methods for creating customized tools for use in analyses are provided as well.

To get started, we will first walk through the process of creating a new project, and then developing the element database to be used in NatureServe Vista analyses. Following this preparatory section, the guide will walk through each of the three Vista analyses in an expedited fashion in order to provide you with an overall understanding of the inputs and steps involved, and to generate some basic results. Once an analysis has been completed, there will be some recommendations describing ways to refine and customize inputs and analytical tools to improve the accuracy and reliability of the results. Finally, some useful variations on each analysis will be described.

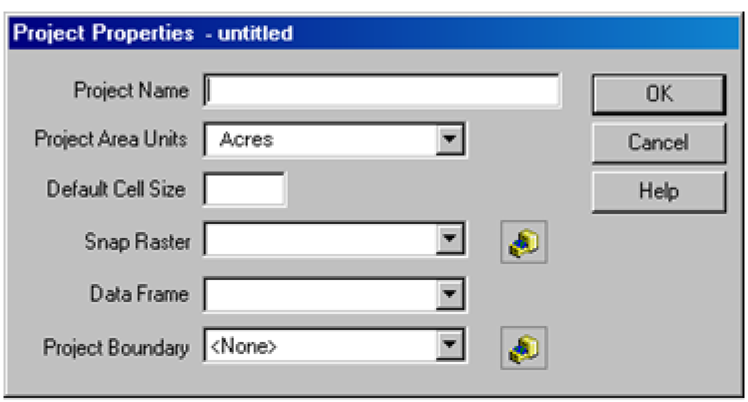
A **sample dataset** is available which can be installed and used for experimenting with NatureServe Vista (see the included readme file for instructions). It is suggested that you view the existing data input windows and analyses for the sample project as you go through this Getting Started Guide the first time. Then, once you are somewhat familiar with NatureServe Vista inputs and functionality, you can use this guide to create your own project using your own data.

Create the project

The first step in beginning a NatureServe Vista project is to create the project and set the project parameters. These data are used to help insure that the project database and associated files are set up properly. Note that all fields in this window must be completed before a Vista project can be created.

Set project properties:

1. Open the **Project Properties-Untitled** window by selecting **Project New...** from the NatureServe Vista menu.



2. Specify a name for the project in the **Project Name** field.
3. Select the units to be used for all areas that are calculated in the database (e.g., cell size units, compatible and protected areas) from the **Project**

Area Units drop-down list. **Note that once a unit has been selected for a project and saved, it cannot be changed.**

4. Enter a value in the **Default Cell Size** field to be displayed as the default cell size in all NatureServe Vista windows used to produce layers. If needed, however, the default value can then be changed in any of those windows to a size more appropriate for a particular analysis. (See Determining Grid Cell Size for more details.)
5. Select a layer from the **Snap Raster** drop-down list, or use the  ArcCatalog button to browse to the layer to be used as the project snap raster. Snap raster is used to maintain relative spatial relationships between layers throughout analyses by having each "snap" to an intersection of grid cells in the designated snap raster. Note that the designated snap raster layer can later be changed, albeit with ramifications which can be addressed by refreshing the existing analysis. (See Snap Rasters for more information)
6. Select the appropriate data frame to be used to load all the layers in NatureServe Vista from the **Data Frame** drop-down list. The default value for an ArcMap data frame in a new project is **Layers**.
7. Select a value from the **Project Boundary** drop-down list, or use the  ArcCatalog button browse to a layer to be used to define the boundary of the project area. Note that the layer designated as the boundary can be changed after the project has been created, but the new layer cannot be smaller or offset from the layer originally chosen. So, it is recommended that this selection be conservative initially since a larger encompassing layer can be utilized later if needed.
8. Click **OK** to save your new NatureServe Vista project.

Develop the element database

Once the project has been created, an element database must be developed for use in NatureServe Vista analyses. This database includes the spatial distributions of elements, as well as attributes associated with occurrences of elements. In order to expedite the process of getting data into NatureServe Vista so that analyses can be run, only essential element data will be developed along with the necessary attributes. Once you become more familiar with the analyses and can determine which will be most effective for addressing planning issues for your project area, the element database can be developed to include only those data that are specifically needed.

Select elements for analyses

The initial step in creating an element database is to select the elements that are to be considered in planning analyses. Typically a suite of different elements are selected, including individual species and ecological communities and systems that represent biodiversity in the planning region, those that are legally-protected, and other culturally-valued elements (e.g., viewsheds, historic sites).

However, for purposes of demonstration, we recommend using a very limited number of elements.

Selecting sample elements:

9. To get you comfortable with entering data as elements, we recommend entering five elements as practice. In the sampledata/ElementBase directory choose:
   a. Red Cockaded Woodpecker, picobore_project.shp
   b. Florida Sandhill Crane, grusprat_project.shp
   c. Celestial Lily, nemaflor_project.shp
   d. Wetlands, Wetlands_clip.shp
   e. Flatwoods, flatwoods_clip.shp

These elements reflect the course filter/fine filter approach to conservation planning: the distributions of certain imperiled species as well as ecosystem types that often harbor other rare or prioritized species. Note that all of these elements have been projected and clipped to the project boundary. While ArcGIS can often display layers of different projections together, for analysis NatureServe Vista requires all data to be in the same projection.

Develop element distributions

We have identified a set of elements and their corresponding distribution data. A NatureServe member heritage program, the Florida Natural Areas Inventory (FNAI) has provided these biological and ecological systems layers. We encourage you to visit FNAI's website http://www.fnai.org/index.cfm for more information on these elements.

10. Open the Element List window by selecting either **Lists▸ Element List** or **Manage Elements** from the NatureServe Vista menu, and then click the **New** button.

The Element Properties window will be displayed.

The General Tab

In the General tab, enter in the name, scientific name (if applicable), a link to the online source and a brief description. Under **Measured by** click on the radio button for **area** for all five elements. **Minimum size for viability** is an important component for many biological features. This information typically comes from scientific literature or can be assigned by consulting with biologists or ecologists. It may reflect the average minimum about of habitat that a species requires to forage or reproduce successfully. For example, the red-cockaded woodpecker needs between 400 and 240 acres as a minimum carrying capacity. Recent studies of the Whooping Cranes suggest that they need between 1623 to 3375 acres for their home ranges. We'll select the small of these values and input them in the **Minimum size for viability**. For the other elements we will disregard this value.

The other inputs we will disregard in this project but for more rigorous analyses these aspects of elements often need to be considered.

The Spatial Tab

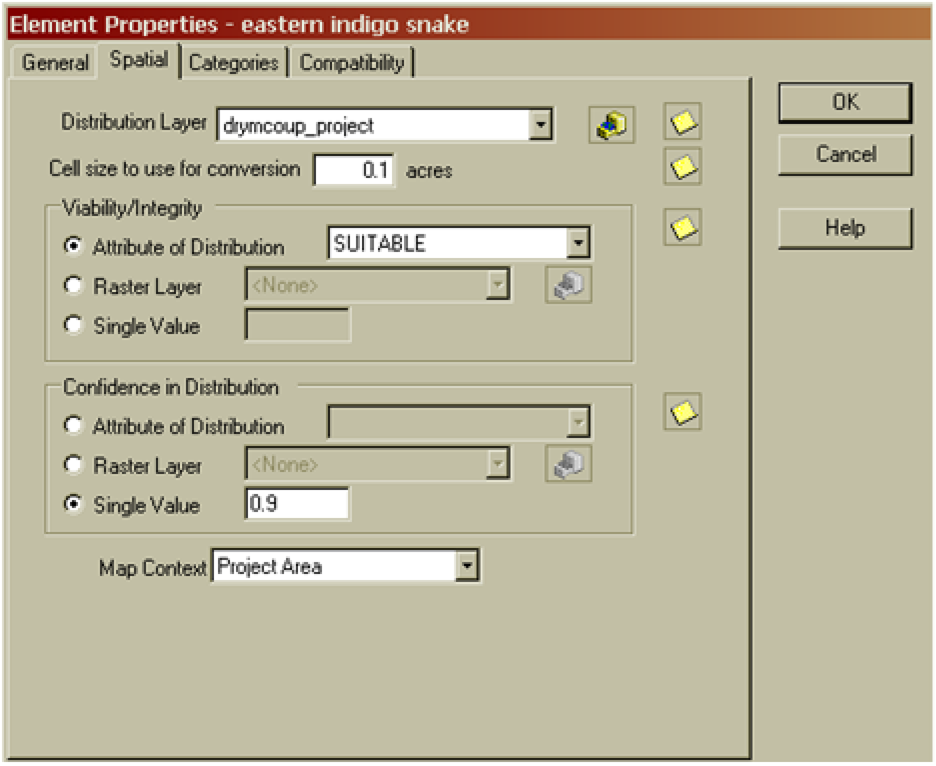
In the Spatial tab, use either the pull down window or the catalog icon to navigate to where the shapefile is stored.

Enter the cell size to be used for area conversions. To get started, choose a cell size that allows for fast processing (e.g., 1/500 of the project boundary) &endash; probably the same value determined for the landscape integrity layer created. Note, however, in an actual analysis to be used for conservation planning, this is a critical value. (See Determining Grid Cell Size for more details.)

Assign viability/integrity values

Viability and ecological integrity values (ranging from 0.0 to 1.0) are assigned and associated with individual occurrences to indicate the likelihood that the occurrence will persist. Higher viability/integrity values represent a greater likelihood of persistence. There are a number of methods that can be used to assign occurrence viability (for species) and ecological integrity (for communities and ecological systems), depending on the available data. The most expedient way to assign viability/integrity values is to convert EO ranks assigned to NatureServe Element Occurrences (EOs). [NatureServe member heritage programs track information on Element Occurrences (EOs) and assign EO ranks to indicate the estimated viability/ecological integrity of the occurrences, both according to a standard methodology.] In cases when EO rank conversions are not an option, landscape integrity or condition layers can be developed and used to assign surrogate viability/integrity values. A single value can also be used to reflect condition. For certain projects when viability/integrity is not important or unknown, a single constant value can be used for all elements.

For simplicity sake, the elements in the sample data have been assigned a viability/integrity value in the element’s attribute table called SUITABLE.



For more information about assigning viability/integrity information see the section Process for Deriving Viability/Integrity Values under the section DATA FOR CONSERVATION VALUE ANALYSES.

Assign confidence values

Confidence values (ranging from 0.0 to 1.0) are assigned and associated with individual element occurrences to indicate the net spatial and/or temporal confidence associated with each occurrence. Higher confidence values represent greater certainty that the element is actually present in and throughout the occurrence.

There are a number of methods that can be used to assign confidence values to occurrences, depending on the available data. The most expedient way to assign confidence is to select a single value to represent all occurrences of a particular element, which is the option we will use for this exercise. Because this value is set in the Element Properties window, we will not add columns to the distribution layers to store confidence values, which would be the method utilized when a single value is not appropriate for all occurrences of an element. For certain projects when confidence is not important or unknown, a single constant value can be used for all elements.

For more detailed information on assigning values to represent confidence, see the section on Confidence for attribute data.

Confidence values for the sample elements:

a. Red Cockaded Woodpecker: 0.9

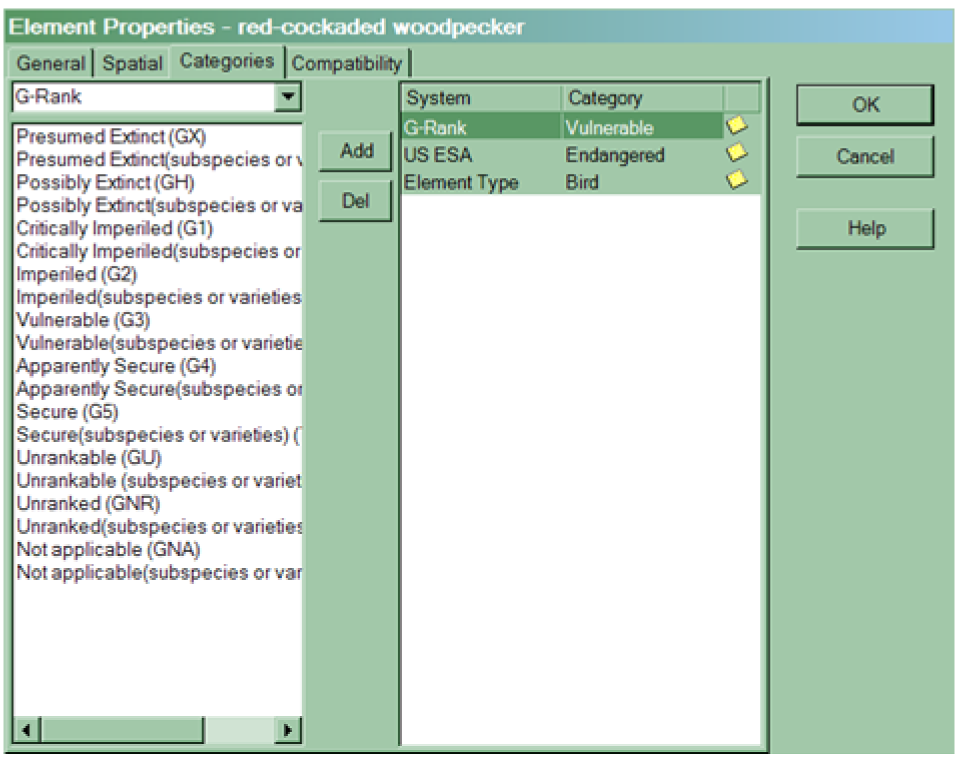
b. Florida Sandhill Crane: 0.9

c. Celestial Lily: 0.9
d. Wetlands: 0.7
e. Flatwoods: 0.7

Categories tab inputs

Category systems provide a means to group elements based on similar characteristics, including those that are of local concern. NatureServe Vista comes with several existing category systems; however as understanding of the potential uses of the database increases, category systems can be developed to group elements for custom uses (e.g., tourism value). (For more complete details, see Category Systems).

Select one of the default category systems from the drop-down menu, then indicate the category to which the element belongs for that system (displayed in the list below the selected system name), and click the Add button. Repeat with other category systems as appropriate. Elements that are not included in a particular category system will not be included in an analysis that is filtered on the basis of this system. Current information about imperilment rankings for species can be found be entering that species name or scientific name into the NatureServe Explorer: http://www.natureserve.org/explorer/



The Compatibility Tab

Compatibility is assigned by evaluating whether a particular land use will permit the element to remain viable (species) or to maintain ecological integrity (ecological elements). Land use categories deemed compatible would permit an acceptable level of viability/integrity for the element, while land uses with lower compatibility would have a negative effect on the element's continued existence at that location. Thus, compatibility is a key part of Scenario Evaluations through its use in identifying areas where land uses are likely to permit the achievement of element conservation goals, as well as areas of incompatible land uses that could be changed to improve goal attainment. Until we create a Scenario and establish our land uses, we will disregard this section and return to it later.

Click on **OK** and click ’r;**Yes**’ when prompted to generate the element conservation value.

To view element results:

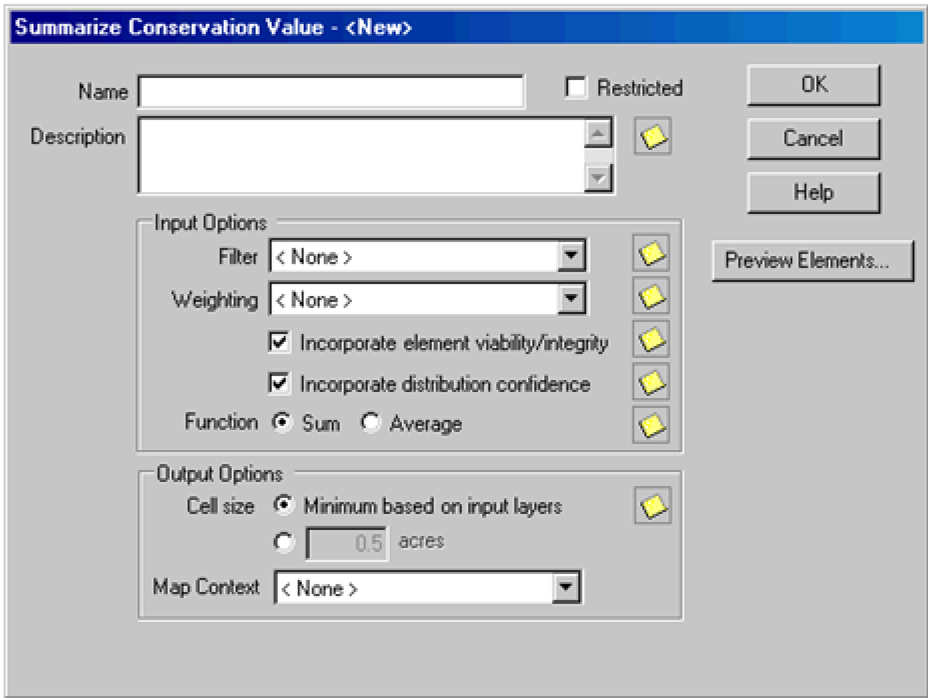
- The report for the Element Conservation Value can be viewed by right-clicking on the element in the NatureServe Vista display tab (far left hand corner), and selecting **Element Report** from the menu.
- The layer for Element Conservation Value can be viewed by checking the box next to the element in the Vista Table of Contents. If the layer is not in the project, Vista will ask if you want to add it. Select **Yes**. To view the legend for the layer as well, find the element on the ArcMap Display tab in the Table of Contents. The elements may be found under the Elements grouping on the Display tab. You may also display the layer from the Display tab by checking the box next to the layer here.

Conservation Value Summaries

A Conservation Value Summary (CVS) identifies areas across the planning region that are most important for conservation through the aggregation of individual element layers with associated viability/integrity and confidence values, weighted according to their relative conservation importance. Creating multiple CVS using different weights and categories provides the user with different 'lenses' in which to examine your data. For example, a weighting system could be created to reflect degree of species imperilment or a filter applied that selects just reptiles and amphibians. Use different CVS to visualize the conservation value of your study area in unique ways.

Expedited walk-through of the analysis:

1. Open the Summarize Conservation Value - <New> window by selecting Summarize Conservation Value... from the NatureServe Vista menu.



2. Enter a name for the Conservation Value Summary.
3. Select a filter to be applied to the data set that defines the set of elements and/or the area to be included in the analysis. (See the Filters topic for more details)
4. Select a weighting system to be applied to the data set that indicates the relative importance of different elements. (See the Weighting Systems topic for more details)
5. Click the **Preview Elements...** button to see a report showing the set of elements to be included in the summary and the weights that have been set for these elements.
6. Place a check in the element viability/integrity checkbox to incorporate these values in the summary.
7. Place a check in the distribution confidence checkbox to incorporate these values in the summary.
8. Select the Sum radio button to indicate that values for the grid cells in the summary are to be derived using a sum.
9. Indicate that the size of grid cells in the summary is to be the minimum possible based on the input layers using the radio button. (See the Determining Grid Cell Size topic for more details)
10. Generate the Conservation Value Summary by clicking **OK**.

To view analysis results:

The **report** for the Conservation Value Summary can be viewed right-clicking on the Conservation Value Summary in the NatureServe Vista Table of Contents, and selecting **Conservation Value Summary Report** from the menu.

The **layer** for the Conservation Value Summary can be viewed by checking the box next to the Conservation Value Summary in the Vista Table of Contents (under the Conservation Value Summaries heading) or, to see the legend as well, view the Conservation Value Summary in the ArcMap Display tab in the Table of Contents where it can be found under the Analyses grouping.

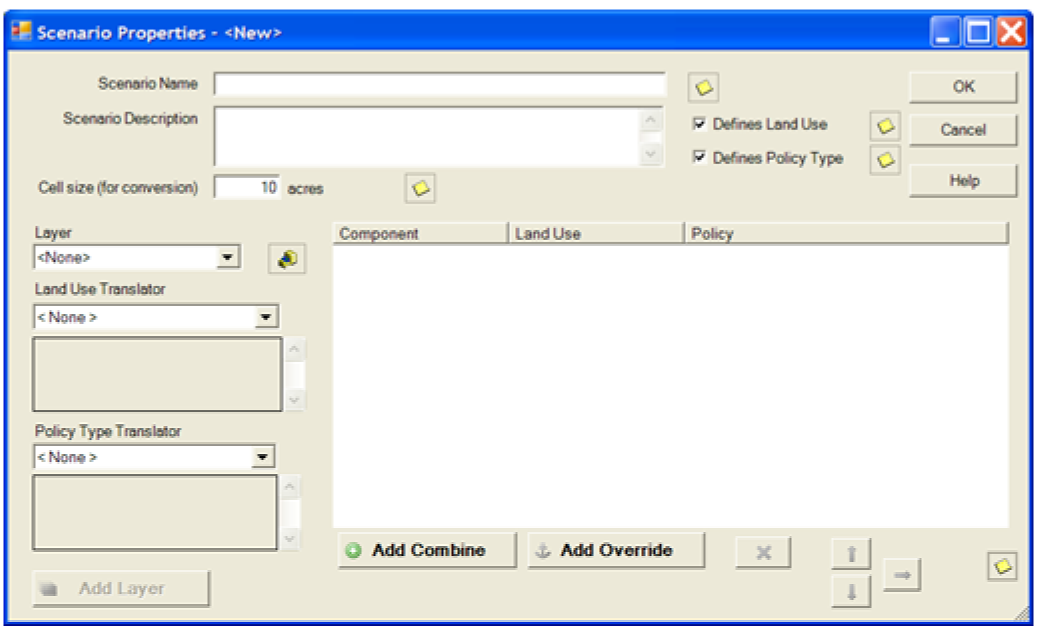
Scenarios and Scenario Evaluations

Scenarios representing both current and potential land uses and protection policies in the planning region are imported into NatureServe Vista using translators that cross-walk the land status categories to common types used in Vista. Scenarios are then evaluated according to element distributions and compatibility with different land uses in order to identify areas in the planning region that support element conservation goals, as well as areas where development or other land uses would have minimal impact on element conservation.

The process of creating translators and defining scenarios is integral before an evaluation can take place. For demonstration purposes, we will create simple translations while importing on land use layer to create a scenario. Input layers for scenarios may come from many sources, including zoning maps, holdings of land trusts, state and federal land managers, and local laws governing land use (e.g., stream setbacks, steep slopes).

Creating a Scenario

1. Go to the vista dropdown menu and select **Define Scenario...**



2. Type orange county baseline in the Name field
3. Type 1.0 into the Cell size (for conversion) field
4. Unclick Defines Policy Type
5. Click the 

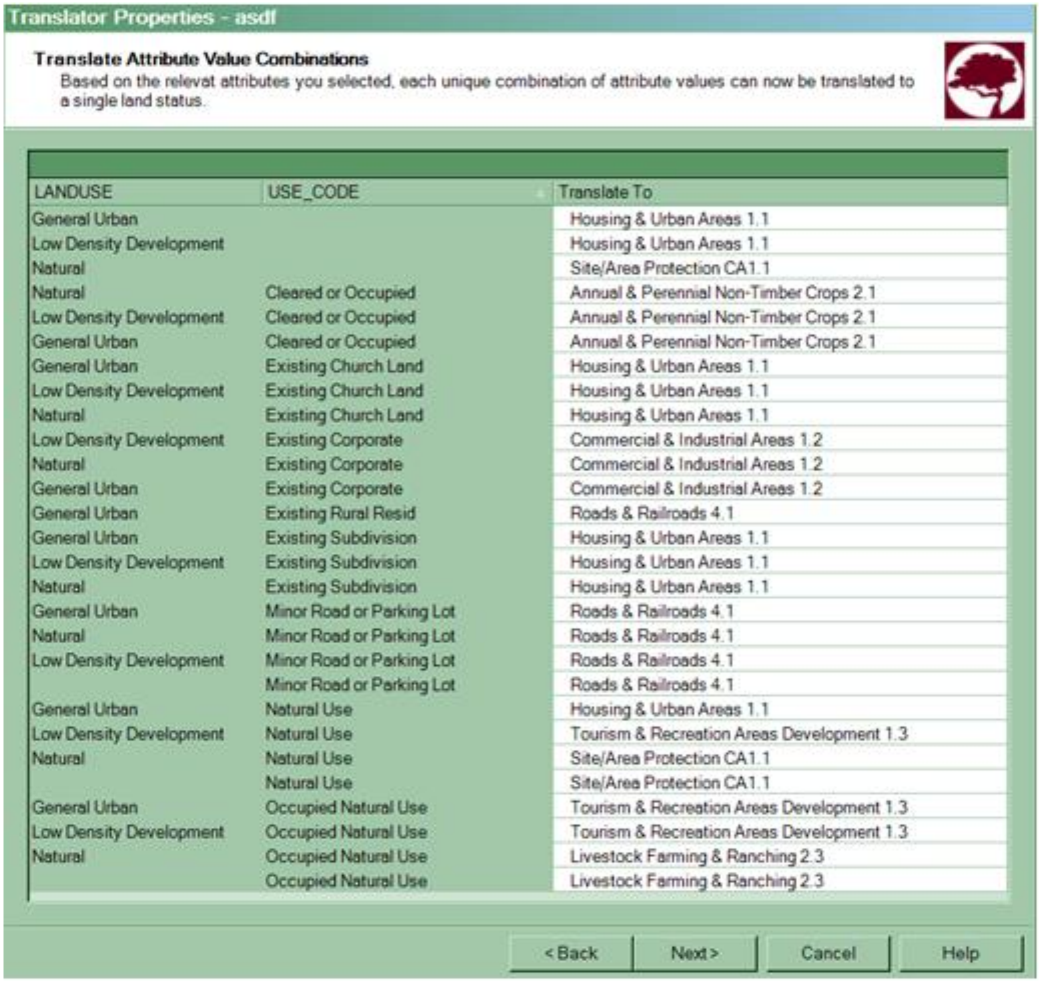
 button.

6. In the Layer dropdown browse to SampleData\Scenario_files and add **alignment_one_impact.shp**
7. In the Land Use Translator dropdown, choose <**Add New…**>
8. Name this translator **alignment one impact**
9. Click <**Next**>
10. Select ’r;**Translate all features to a single land use status**’ and click <**Next**>
11. Click **Finish**
12. Click the 

button

In the Layer dropdown browse to SampleData\Scenario_files and add **ns_statusquo.shp**

13. In the Land Use Translator dropdown, choose <**Add New…**>
14. Name this translator **statusquo**
15. Click <**Next**>
16. Select Translate features based on attribute values and click <**Next**>
17. Select **LANDUSE and USE_CODE** from the drop-down menu and click <**Next**>
18. Use the following table as a guideline for cross-walking the land uses, when you area finished click <Next>



LANDUSE	USE_CODE	Translate To
General Urban		Housing & Urban Areas 1.1
Low Density Development		Housing & Urban Areas 1.1
Natural		Site/Area Protection CA1.1
Natural	Cleared or Occupied	Annual & Perennial Non-Timber Crops 2.1
Low Density Development	Cleared or Occupied	Annual & Perennial Non-Timber Crops 2.1
General Urban	Cleared or Occupied	Annual & Perennial Non-Timber Crops 2.1
General Urban	Existing Church Land	Housing & Urban Areas 1.1
Low Density Development	Existing Church Land	Housing & Urban Areas 1.1
Natural	Existing Church Land	Housing & Urban Areas 1.1
Low Density Development	Existing Corporate	Commercial & Industrial Areas 1.2
Natural	Existing Corporate	Commercial & Industrial Areas 1.2
General Urban	Existing Corporate	Commercial & Industrial Areas 1.2
General Urban	Existing Rural Resid	Roads & Railroads 4.1
General Urban	Existing Subdivision	Housing & Urban Areas 1.1
Low Density Development	Existing Subdivision	Housing & Urban Areas 1.1
Natural	Existing Subdivision	Housing & Urban Areas 1.1
General Urban	Minor Road or Parking Lot	Roads & Railroads 4.1
Natural	Minor Road or Parking Lot	Roads & Railroads 4.1
Low Density Development	Minor Road or Parking Lot	Roads & Railroads 4.1
	Minor Road or Parking Lot	Roads & Railroads 4.1
General Urban	Natural Use	Housing & Urban Areas 1.1
Low Density Development	Natural Use	Tourism & Recreation Areas Development 1.3
Natural	Natural Use	Site/Area Protection CA1.1
	Natural Use	Site/Area Protection CA1.1
General Urban	Occupied Natural Use	Tourism & Recreation Areas Development 1.3
Low Density Development	Occupied Natural Use	Tourism & Recreation Areas Development 1.3
Natural	Occupied Natural Use	Livestock Farming & Ranching 2.3
	Occupied Natural Use	Livestock Farming & Ranching 2.3

19. Click **Finish**
20. Click the 

button
21. 22. Select a component layer in the window and use the arrows in the right hand corner to make adjustments to the hierarchical order of the layers. For example, **alignment one impact** should be above **statusquo**. This is because in Override mode Vista ”r;sees” the top layers first and establishes that land use over the component layers below it.
22. 23. Click **OK**
23. 24. Be patient... depending on your system, sometimes creating a Scenario can take awhile.

Preparing the Elements for a Scenario Evaluation

This process prepares the elements for evaluation with the land use scenario you just created. Return to the element **compatibility tab** (got to Vista dropdown menu > Manage Elements > Properties> click Compatibility). Typically, when creating a project, you would want to populate this tab hen you initially entered the element, however, we have split out this step here to help emphasize which inputs are used for which analyses.

1. Use the following chart to assign compatibilities for each of the five elements. These compatibility assignations are for demonstration only. Perhaps more than any other process step in NatureServe Vista, compatibility should be vetted with an expert (in this case a biologist or ecologist) familiar with the elements and the local land uses.

	Red-Cockaded Woodpecker	Florida Sandhill Crane	Celestial Lily	Wetlands	Flatwoods
Housing & Urban Areas 1.1	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Site/Area Protection CA1.1	Compatible	Compatible	Compatible	Compatible	Compatible
Annual & Perennial Non-Timber Crops 2.1	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Commercial & Industrial Areas 1.2	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Roads & Railroads 4.1	Incompatible	Incompatible	Incompatible	Incompatible	Incompatible
Tourism & Recreation Areas Development 1.3	Incompatible	Compatible	Compatible	Compatible	Compatible
Livestock Farming & Ranching 2.3	Incompatible	Compatible	Incompatible	Compatible	Compatible

2. Click **OK** when finished with each element.

Scenario Evaluation

Scenario Evaluation is the process of taking your elements and comparing them to the scenario you just created, then viewing the results against a set of pre-determined goals. We will establish a very simple retention goal: 100% of elements are to be retained. While unlikely in many scenarios, setting your goal at 100% can help you identify areas where elements are already in conflict with the existing land use. It can also help you critically evaluate your spatial data up to this point: are there errors in my element distributions or in my land use scenario? Have I correctly assigned the compatibility? There are many questions you can ask of a scenario evaluation that can improve the robustness of your analysis.

Defining your Goal Set

1. Open the Vista dropdown menu

2. Go to Lists &endash; Goal Set List...
3. Click on **New**
4. Give your Goal Set a name
5. Set your Default Goal to 100 percent (notice that all your elements are set to the default goal)
6. Click on **OK**.

Defining the Scenario Evaluation

1. Open Vista dropdown menu
2. Select Evaluate Scenario...
3. Click **New**
4. Enter **Baseline Scenario** as the name
5. Select the **Orange County Baseline** from the Scenario drop-down list.
6. Select the goal list you just defined from the Goal Set dropdown.
7. Check Positive and Neutral under Compatible Element Responses
8. By clicking **Positive** and **Neutral** we are telling Vista that both positive and neutral element responses will count towards our goals.
9. Generate the Scenario Evaluation by clicking **OK**.
10. Processing a Scenario Evaluation will take between 10 and 15 minutes depending on your computer. As with many computer programs saving your project after each step can save you a lot of frustration if something should go wrong.

Interpreting Results

1. **Compatibility Conflict Map:** Areas displayed in darker shades are those areas where a high number of elements included in your evaluation coincide with areas of incompatible land use. Lighter areas are locations where fewer elements are incompatible with the land use. This layer is showing us what impact land use is having on our conservation goals. Right click on the evaluation name and select **Scenario Evaluation Repor**t to create a report associated with this evaluation gives us the quantitative details about how many of our element conservation goals have been met based on this scenario evaluation.
2. **Elements:** Expand the list of elements and right click on the element name. Select **Scenario-Element Evaluation Report** to create a report that shows how the element fared under the evaluation in greater detail.

Going further: Using different scenarios and evaluating them (as described above) adds a lot to your vista project. The sample data includes **Alignment_one_mixed_use** and **Alignment_one_residential_use** to reflect two different future land use scenarios reflecting different urban densities. Mixed use assumes a denser, more urban type land use pattern while residential shows a low-density suburban pattern. Try building new scenarios substituting these layers in for the **statusquo** layer following the same steps outlined in that section. When you evaluate these layers the results will be quite different. Compare the **Scenario-Element Evaluation Report** and **Compatibility Conflict Map** to see these results in tabular and spatial format.

THE ELEMENT DATABASE

Element Selection and Editing

Objectives

The purpose of the element selection process is to identify important elements that are to be considered in Vista planning analyses. Editing elements changes the properties used in these analyses.

Products

A list of elements to be included in planning analyses results from both the element selection and editing processes.

Inputs

Required inputs for the element selection process can include

- A list of biological elements known or expected to occur in the planning region. These may be obtained from many sources, including NatureServe network programs, the U.S. Geological Survey (USGS) Gap Analysis Program, university and natural history museums, and state wildlife or natural resource agencies.
- A list of legally-protected elements that occur in the planning region, obtained from the planner and/or regulatory institution(s).
- A list of other culturally-valued elements that occur in the planning region, obtained from the planner.

Other helpful information for the element selection process includes

- An inventory and description of the data available for each element, such as
    - Geographic Information Systems (GIS) layers showing locations of occurrence;
    - Attribute information for occurrences (needed for Conservation Value analyses), specifically viability/ecological integrity and confidence data;
    - Legal status information (e.g., state/provincial and federal endangerment status);
    - Vulnerability status information (e.g., NatureServe conservation status, IUCN ranks).
- The budget available for data development, which can include formatting data for the Vista data model, new mapping or field studies, and predicted distribution modeling

- from the planner and/or regulatory institution(s).

For expedited input of element properties, inputs can include

- A single shapefile containing the required set of attributes for all the elements and formatted to fit Vista specifications;
- Elements with associated attributes (excluding spatial data) selected from a NatureServe Web Service database.

Required inputs for the element editing process are

- Element(s) with assigned properties in the Vista project.

Methods Summary

Select Elements

Elements to be included in planning for the area of interest can be identified using several sets of criteria, along with consideration of the available distribution and attribute data for occurrences of each element. For a typical project three groups of elements will be represented on the list, as follows:

Biodiversity surrogate elements: The subset of all elements occurring in the planning region that, if conserved, is expected to adequately conserve all components of biodiversity.

Legally-protected elements: All elements that must be conserved in the planning region in order to meet legal obligations. There may be considerable overlap of these elements with the biodiversity surrogate group, but the legally protected group may also contain elements not necessary or appropriate for a surrogate role.

Other culturally-valued elements: Any other elements that are desired for conservation in the planning region. The culturally valued group may be comprised of any elements that are compatible with other selected elements. That is, if conserved in the same location as biodiversity surrogate or legally-protected elements, they would not interfere with the viability of those elements. Culturally valued elements need not be biological, and could include such features as scenic views, archaeological sites, prime farmland, etc., provided that the intensity of land use associated with these elements does not increase from current conditions.

Note that before actually beginning the process of selecting elements, the planner and database development team should discuss the values, resources, and time available for developing the element information needed for planning analyses. Ideally, planners will want to evaluate and develop a plan that includes the full suite of biodiversity surrogate elements in their region, but it may be preferable in some cases to select a smaller subset of elements (e.g., legally-protected species). Because developing the element information is likely the most expensive and time-consuming part of implementing Vista for planning analyses, the element selection effort must be scaled to the available time and resources. Vista provides two import functions that can be used to expedite the entry of element properties - importing from shapefiles and from NatureServe Web Services, both of which are described in the final "Input element names into Vista" task listed below.

Edit Elements

The properties of elements that are already included in a Vista project can be modified. The editing process may be used to change the properties for either a single element individually, or for a designated group of elements simultaneously.

Select the appropriate type of edit to see a description of the process.

Edit properties for a single element

Edit properties for a selected group of elements simultaneously

Background

Many conservation methodologies are focused primarily on conserving natural areas, generally designed in the form of core areas and linkages. While the development of natural areas is important to conservation, designing such areas in the planning region without considering the needs of specific elements cannot ensure the conservation of biodiversity or other elements of value. Rather than focusing exclusively on developing patterns of natural areas on the landscape, the methodology utilized in Vista focuses on maintaining the viability of specific elements, which is more of a content approach to conservation. The identification of an adequate number of viable occurrences within the planning region to meet element conservation goals will then result in identification of the most effective areas in the region for conservation.

Biodiversity Surrogate Elements

Biodiversity is a contraction of the term "biological diversity", which refers to the variety of life forms, the ecological roles they perform, and the genetic diversity they contain (Wilson 1988). The complete biodiversity of any specific area is virtually impossible to catalogue due to the multitude of species that are likely to be present. Understanding ecological processes and dependencies among elements in that area adds even greater complexity to the task of fully characterizing biodiversity. Thus, it is impractical, if not impossible, to include all elements within the planning area for use in analyses. It is, therefore, necessary to select a limited set of elements that is representative of all (or nearly all) biological diversity in the region. Through conservation of occurrences of these elements across the planning area, it is hoped that the ecological environments and dynamic interactions that support the vast majority of species are effectively secured.

Biological elements will range in status and distribution from common elements that are widespread throughout the planning region, to rare elements that are restricted to perhaps a single, small occurrence. In addition, the status of elements in the region may be related to their global status. For example, an element having many occurrences in the planning region may appear to be very common and, thus, of little conservation interest; however, if the global status of that element indicates that it is very rare and may perhaps be endemic to the planning region, it would then be considered to have very high conservation value.

The objective for the selection of biodiversity surrogate elements is to ensure that different levels of biological and ecological organization (specifically ecological systems, communities, species assemblages, and individual species) are represented within the set of selected elements. This approach to biodiversity surrogate selection reflects a "coarse filter/fine filter" hypothesis. Specifically, this hypothesis states that by conserving multiple, high-quality occurrences of all representative ecological system types for a given planning area, the majority of native biodiversity is likely to be supported. However, this "coarse filter" alone would not likely encompass the ecological processes that support all biodiversity, particularly those elements that are rare, and thus not reliably found within most examples of ecological systems. Therefore, additional elements, specifically those that are imperiled or vulnerable, are also needed &endash; in the "fine filter." Experience suggests that this is the most efficient and effective approach to capturing biodiversity in a network of reserves (e.g., Jenkins 1976, 1985; Noss and Cooperider 1994, Groves et al. 2002, Kintsch and Urban 2002). The coarse filter/fine filter approach also helps to minimize complexity and cost associated with strict species-based approaches (e.g., Scott et al 1987, Beissinger and Westphal 1998, Willis and Whittaker 2002) while allowing sufficient flexibility to integrate new approaches as technical hurdles are overcome (e.g., Fleishman et al. 2001, Carroll et al. 2001, Scott et al. 2002).

Applying the coarse filter/fine filter approach to the element selection process, *all* natural/semi-natural ecological systems (described below) that are native to the planning region should typically be included.

Ecological systems are comprised of assemblages of biotic communities that occupy similar environments and function under common ecological processes.

Terrestrial ecological systems are defined by NatureServe in a standard classification using vegetation structure and composition and various abiotic components, such as soil features, and natural dynamics, such as riverine flow regime or natural fire dynamics. For example, most recurrent assemblages of vegetation are strongly tied to specific landscape features that influence moisture, nutrient, and often disturbance regimes. These landscape features can also constrain, and therefore define, the typical spatial character of associated vegetation. The integration of these biotic and abiotic components is used to define ecological system types. Examples of terrestrial ecological systems include

- California Central Valley Pine-Oak Woodland and Savanna;
- Atlantic Coastal Plain Tidal Swamp;
- Rocky Mountain Dry-mesic Subalpine Spruce-Fir Forest and Woodland.

Aquatic ecological systems are analogous broad-scale units in the aquatic realm. They are based on environmental or physical features that shape key ecosystem processes (hydrology, water chemistry, sediment transport), and that influence the distribution and composition of biological assemblages. Aquatic ecological systems are defined by unique combinations of 1) general physical features (typically stream size, elevation and hydrologic regime); and 2) the broad geographic area (termed an ecological drainage basin) within which the stream occurs. Examples of freshwater aquatic ecological systems include

- Colorado - San Juan Basin: Headwater/creek, montane elevation, intermittent flow;
- Colorado - San Juan Basin: Montane to Sub-alpine Steep Perennial Headwater and Creek on alluvium, colluvium, and sand.

Along with ecological systems, communities (described below) that are vulnerable or imperiled (i.e., that have a NatureServe global conservation status of G1-G3, or that lack an assigned status but are known by regional experts to be vulnerable) should also be selected using the coarse filter/fine filter approach. Occurrences of these communities typically represent rare environmental settings, and are thus unlikely to be represented solely through conservation of the coarser-scale ecological systems.

Ecological communities are local-scale units that represent assemblages or combinations of species that recur predictably across the landscape in conjunction with relatively local-scale variations in environmental features.

Terrestrial ecological communities (e.g., *associations* from the National Vegetation Classification; see Grossman et al 1998, NatureServe 2002) are defined by similar structural and environmental features, and are nested or grouped into broader ecological systems. Examples of terrestrial communities include

- *Abies lasiocarpa / Juniperus communis* Woodland;
- Foothill Pine-Interior Live Oak/ Wedgeleaf Ceanothus [*Pinus sabiniana-Quercus wislizeni/Ceanothus cuneatus*] Woodland association, which is nested within the more broadly defined California Central Valley Foothill Pine-Oak Woodland and Savanna ecological system.

Aquatic macrohabitats is a term used by NatureServe for units that are analogous to terrestrial plant associations, representing the ecological community scale in the aquatic realm. Aquatic macrohabitats are units of streams, lakes, and coastal marine environments that are relatively homogeneous with respect to size, and thermal, chemical, and hydrologic regimes. Each macrohabitat type represents a recurring physical setting that is thought to contain distinct biotic communities. Aquatic macrohabitats that share similar environmental and hydrologic-process features are nested or grouped into broader aquatic ecological systems. An example of an aquatic macrohabitat is

- Colorado - San Juan Basin: Montane to Sub-alpine Steep Perennial Headwater and Creek on alluvium.

In addition to ecological elements, vulnerable or imperiled species should be included (as the fine filter) when utilizing the coarse filter/fine filter approach for selecting elements to insure that biological diversity is adequately represented in the planning region.

Vulnerable species assemblages are areas that support aggregations of multiple migratory species (which may not be imperiled) during periods in their life cycle or during their annual migrations, and should be considered in the element selection process. These areas are deserving of special conservation attention to ensure that healthy populations of these several species persist. Examples of mixed species animal assemblages include shorebird migratory concentration areas, colonial wading bird colonies, salmonid migratory corridors, and bat hibernacula.

Species (or subspecies) known to occur within the planning area should be evaluated using several criteria in order to determine which of these elements would best add to the representation of biodiversity in the planning region. These criteria also extend to species known or believed to be extirpated from the planning area, but which have a high potential for re-introduction. Existing data in one or more NatureServe network program databases, along with local expert knowledge, are needed in order to rigorously apply these criteria, described below.

Imperiled and Vulnerable species (or subspecies), designated with a NatureServe global conservation status of G1-G3 (T1-T3), are recognized by NatureServe as critically imperiled, imperiled, or vulnerable throughout their range and so are at some risk of extinction. These assigned status ranks are regularly reviewed and updated by experts, and take into account the number of occurrences of the element, the viability or integrity of occurrences, population size, range size, area of occupancy, the trends in each of these preceding factors, threats, protection status, intrinsic vulnerability, and environmental specificity (Master et al. 2003). It is worth noting that the categorization of "vulnerable" as used here is substantially more inclusive than that currently applied by the IUCN Red List of Threatened Species, and typically includes taxa in IUCN's lower risk category of "near-threatened" (Mace et al. 1994).

Special Concern species (or subspecies), designated with a NatureServe global conservation status of G4-G5 (T4-T5), are not considered at risk of extinction, but merit selection if one or more of the following categories is applicable:

Declining species exhibit significant, long- or short-term declines in habitat and/or numbers across their range, and are subject to a high degree of threat such that if the declines continue they would soon be ranked G3 or higher. Determinations of declining G4-G5 species are based on information from sources such as Breeding Bird Survey trends, expert knowledge, and data from NatureServe network programs.

Vulnerable to future decline is used to characterize species that are usually somewhat abundant and may or may not be declining, but have some aspect of their life history that makes them especially vulnerable to future decline. Examples include migratory species that are concentrated in specific areas during their migrations, and species that range, as individuals, over large areas (i.e., regional-scale species) and are vulnerable to habitat fragmentation due to their broad regional landscape requirements.

Endemic species are restricted (either year-round, or in their breeding or nonbreeding season) to a planning area, or nearly restricted (i.e., greater than 90% of the total distribution/range of the element lies within the area), and therefore conservation action within the planning area contributes disproportionately to their persistence.

Widely disjunct is used to characterize species with subpopulations in the planning area that are geographically isolated from other subpopulations (i.e., greater than several hundreds of miles), at distances that are likely to support distinctive genetic character because of the absence, or near absence, of gene flow to other subpopulations.

Keystone species are those whose presence in viable subpopulations have a disproportionate impact on ecological processes, thus affecting habitat requirements for a large proportion of other species. Examples include beaver and prairie dog.

Relationship between Regional Assessments and Sub-Regional Analyses

Actions undertaken to make land use decisions and implement conservation strategies operate at multiple scales (Johnson et al. 1999, Noss 2000). Therefore, regional biodiversity assessments may impact the element selection process at sub-regional scales. For example, several hundred elements may drive a conservation assessment for a given region. Explicit objectives for element representation may then establish a regional vision for conservation that addresses all of those elements. That process may provide appropriate context such that some conservation elements from that regional list influence element selection for a county within that region. To illustrate, a species may not strictly meet the Special Concern criteria for "endemic" or "widely disjunct" in the context of a particular county, but would easily meet those criteria from the context of the ecoregion(s) that include(s) the county. In such cases, it would be appropriate to select the species for inclusion in the conservation planning analyses for the county. In other circumstances, a particular element may indeed occur within a specific county, but there may be better places &endash; from a regional perspective &endash; to meet conservation objectives for that element. For example, a vulnerable species or common ecological system type may have only poor quality occurrences within the county and have many, much better occurrences in adjacent landscapes outside the county. Thus, there may be elements occurring in the county that meet the selection criteria but, given the broader regional context, are best left off of the biodiversity surrogate selection list. However, such elements, if valued for their presence in the county, could still be included on the other culturally-valued elements list. In each of these cases, it is important to solicit expert knowledge and judgment when evaluating elements, and then fully document the resulting decisions.

Limitations

The initial selection of elements for consideration is a complex task that requires scientific knowledge, but must also incorporate the social values of the planning region. It should not be done hastily without education about the role the planning region plays in conserving some elements, especially the "non-glamorous" species that might otherwise be ignored. Scientific knowledge is also very incomplete, especially when it comes to less-conspicuous elements and the classification of some types of communities and ecosystems. New elements or new range extensions of elements will likely be discovered in the planning region periodically. Therefore, the act of element selection should be considered a dynamic activity that should be revisited frequently. The methods described in this section for selecting the subset of elements should be considered guidelines to be modified by local experts.

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PROCESS FOR SELECTING ELEMENTS

Identify biodiversity surrogate elements

Two sets of criteria are used to select elements that will serve as surrogates for biodiversity in planning for the region of interest. Elements should represent multiple levels of ecological organization, varying degrees of rarity, vulnerability, and endemism, as well as multiple geographic scales of habitat/area requirement (see Table 1 criteria below). Elements of biological diversity (i.e., ecological systems, communities, species assemblages, and species) that meet at least one of the criteria in these tables should be placed on the list of selected elements.

Table 1. Core selection criteria for biodiversity surrogate elements

I. **Ecological systems**

A. **All** natural/semi-natural terrestrial ecological systems (as defined by NatureServe* that are known to occur in the planning area, representing local, intermediate, and coarse scaled types †).

B. **All** natural/semi-natural aquatic ecological systems (as defined by NatureServe) that are known to occur in the planning area, representing local, intermediate, and coarse scaled types

II. **Ecological communities**

A. Rare natural/semi-natural terrestrial plant associations with a NatureServe global conservation status of G1-G3‡

B. Rare natural/semi-natural aquatic macrohabitats with a global status of G1-G3

C. Vulnerable species assemblages (e.g., areas where concentrations of migratory species occur)

III. **Species** (including infraspecific taxa)

A. Species with a NatureServe global conservation status of G1-G3; subspecies/varieties with a global status of T1-T3

B. Species (subspecies) with a global status of G4-G5 (T4-T5), that on the whole are "of concern" by virtue of:

1. Experiencing significant **decline** across their range
2. Currently stable, but **vulnerable to future declines**, due for example to their broad regional landscape requirements or to their concentration in particular areas during their migrations
3. Considered **endemic** to the planning area
4. Distributed in **widely disjunct** occurrences in the planning area
5. Considered to be **“keystone”** species

* Available mapped information will be used to depict the standardized ecological system units, minimizing circumstances where nonstandard units are included in Element Value Layers used for Conservation Value analyses

† Geographic scale sensu Poiani et al. 2000, with applications to terrestrial ecological systems is provided in Appendix C.

‡ NatureServe conservation status definitions are provided in Appendix B.

Additional elements that are determined to be important for representing biodiversity in the planning region and for which occurrence information may be available should also be included on the list of selected elements (see Table 2 criteria below). For example, species with a NatureServe conservation status of G4-G5/S1-S3 (i.e., globally secure / subnationally critically imperiled to vulnerable) for which insufficient knowledge exists to determine whether the "declining," "vulnerable," or "disjunct" criteria in Table 1 apply may serve as adequate additional surrogates for biodiversity based on their subnational status.

In some planning regions, community occurrences with a NatureServe conservation status of G4-G5 (i.e., globally secure) may be one of the only sources of community data, including information on attributes of ecological occurrences (e.g., ecological integrity). Because every community can be linked directly to a standard ecological systems classification, occurrences of communities can be linked to comprehensive ecological systems layers for the planning region that utilize such classifications. This may result in high quality occurrence data for a particular community being substituted for that portion of the coverage designated as the corresponding ecological system.

Availability of information on occurrences and the budget for data development can both influence element selection. For example, where detailed maps and ranked occurrences of ecological systems are lacking and the budget is inadequate to produce such information, maps depicting contiguous natural/semi-natural lands may be the only means of depicting ecological diversity. Such maps may be developed through simple means with land use/land cover data, or through more sophisticated methods, for example using the process outlined for landscape integrity layers in the section on creating element distribution layers.

Table 2. Augmented selection criteria for biodiversity surrogate elements

A.	**Species (subspecies)** with a NatureServe global conservation status of G4-G5 (T4-T5),* that on the whole are "of concern" by virtue of their subnational status 1. G4-G5/S1-S3 species
B.	**Communities** with a NatureServe global conservation status of G4-G5 1. G4-G5 community occurrences 2. Contiguous natural/semi-natural lands

* NatureServe conservation status definitions are provided in Appendix B.

Identify legally-protected elements

Legally-protected elements should be identified by the planner and regulating institution(s), such as the U.S. Fish and Wildlife Service, National Marine Fisheries Service, state fish and game agency, etc. Legally-protected elements that meet either of the criteria in Table 3 below should be placed on the list of selected elements. In addition, elements that are not truly protected under the law but are on "priority" or "watch" lists that cause higher scrutiny of conservation plans are typically treated like legally-protected elements.

Table 3. Selection criteria for legally-protected elements

1. Legally listed species, under federal and/or state law
2. Legally designated lands and waters falling under protective status (e.g., designated wetlands, caves, designated steep slopes, designated riparian set-backs, hydrological recharge areas)

The availability and quality of spatial and attribute data for occurrences of legally-protected elements is likely to be better than that of other elements due to the mandated conservation of these elements. Objectives and product requirements for these elements (e.g., documentation and data resulting from planning analyses must be defensible in court) should be established with the end user prior to evaluating the suitability of occurrence data.

Identify other culturally-valued elements

Other elements can be imported into Vista and analyzed along with the biodiversity surrogate and legally-protected elements, provided that they are compatible with such elements if conserved in the same location together. Examples include:

Biological elements

- Non-threatened species of economic and cultural importance
- "Heritage" trees of specimen size and age

Culturally-significant features

- Archaeological sites
- Historic farms

Other socially-desired features

- Scenic view areas or features
- Prime agricultural areas
- Characteristic natural areas lacking conservation quality for biodiversity or legal protection.

In order for a culturally-valued element to be considered for inclusion on the list of elements evaluated in planning for the region, the element must meet a set of criteria (see Table 4 below). These criteria are designed to ensure that the element has the necessary attributes for conservation planning analyses, and that it is compatible with other biological elements conserved at the same location (i.e., its conservation will not adversely affect any other elements, considering both present conditions as well as future effects of conservation in terms of, for example, site development or visitation of historic features).

Examples of elements that are typically lumped into open or green space conservation, but which may be incompatible with other conservation elements include

- Recreation parks or trail corridors;
- Agricultural lands where intensity of practices may increase in the future (e.g., clearing hedgerows, drainage, pesticide application);
- Intensely managed forestland, shrubland, or grassland;
- Streams or lakes that may be managed in ways that change habitat structure, temperature, chemistry, or that may be stocked with exotic species.

The emphasis for all elements should be conservation of the compatible features themselves. Associated human activities such as recreation, resource extraction, alteration of the natural land cover, etc. should be described as land-uses in scenario evaluation to determine their compatibility with the conservation elements. In this way ”high quality farmland" can be a conservation element but associated agricultural management practices would be land-uses in a scenario to be evaluated for their potential threat to other elements.

Table 4. Selection criteria for other culturally-valued elements

1. Element can be mapped with distinct spatial boundaries
2. Element can be attributed like other biological elements in terms of viability/integrity of occurrences and confidence in presence (not required, but useful for Conservation Value analyses)
3. Element can be weighted in conservation importance relative to other elements
4. Element can have quantitative representation goals
5. Element is compatible with the other biological elements conserved at the same location

Inventory and assess available data for selected elements

The selection of elements can be limited by the adequacy of existing data, and the time and budget available to format available data according to the Vista data model, or to develop new data through mapping, field survey, and modeling. Spatial data requirements for elements are described in the Element Distributions section and, for the Conservation Value analyses, required viability/integrity and confidence attribute data are described in detail in their respective sections. The requisite requirements for different analyses may be useful in evaluating whether a particular element should, on the basis of available data and/or data needed, be included on the selected elements list.

The following information is required in order for an element to be included in planning analyses using Vista:

- A geographic information system (GIS) layer of the spatial distribution of the element, in vector format; the resolution and precision of the layer must be appropriate for the planning analyses (e.g., very coarse field guide range maps will not be suitable for identifying areas to be conserved in a planning project)

If Conservation Value analyses are to be performed, then the following additional attribute information may be needed:

- Information that can be used to determine a value representing the viability/ecological integrity of each occurrence in the distribution layers
- Information that can be used to determine a value representing the confidence of each occurrence in the distribution layers

If Land Use and Conservation Scenario Evaluations are to be performed, no additional attribute information is required. However, the evaluations will be more informative if a minimum required area (if applicable) and conservation goal for the element (e.g., occurrences, or total area of occurrence, in compatible lands) are established.

Input element names into Vista

Elements can be entered into Vista immediately following creation of the selected elements list, or entry can be deferred until distribution layers have been developed and attribute values have been assigned (if appropriate) so that all element information can be entered into the system at once (see the Process for Creating Element Distribution Layers). However, it may be helpful to input the list of elements before obtaining and developing element data, essentially creating the element records to which distributions and other information can later be added.

If the decision is made to create element records before obtaining/developing additional element data, see the Vista Element Properties window, specifically the initial data entry steps on the General tab, and optionally the Categories tab, for a description of the process for entering selected elements into Vista.

Expediting the input of element properties

Entry of elements and some of their associated attributes into the Vista Element Properties window can be expedited through use of a function for importing element data directly from:

- A shapefile, or
- NatureServe Web Services.

Import element properties from a shapefile

This function provides the ability for Vista users to import properties for multiple elements from a single shapefile, and is accessed by selecting **Project▸ Import Element Properties from File…** from the Vista menu. In order to utilize this import function, first a shapefile containing attributes for all the elements to be imported must be created. The shapefile must be formatted to fit Vista specifications, which were designed to be easily compatible with Biotics data exports.

Shapefile Specifications

The following fields are mandatory in order to utilize the Vista functionality for importing element properties from a file:

FID
Shape
FEATURE_ID
EO_ID
ELCODE
EO_NUMBER
SNAME
SCOMNAME
DATASENS
EORANK
GRANK
SRANK
FEDERAL
SPROT
LASTOBS
DESCRIPTIO
EODATA
BESTSOURCE
MANAME
COUNTY
EOSIZE_AC
REP_ACC
LOC_UNCERT
QC_STAT
SYMB
MAPLABELDS
MAPLABEL

Note that the values contained in these fields cannot contain # < > / \ | : + * ? and that entries with unique scientific names must also have unique common names.

Once the shapefile containing these attributes for the elements of interest has been created, from the Vista menu select **Project ▸ Import Element Properties from File…** to import the shapefile, and complete data entry on the resulting Element Import Form.

Import element properties from NatureServe Web Services

Entry of elements into the Vista Element Properties window can also be expedited through the use of NatureServe Web Services, which provides data on over 70,000 of the plant and animal species of the U.S. and Canada. The import from web services function allows Vista users to search the NatureServe Web Services database, select desired elements, and then import the properties for those elements to the Vista project. Note, however, that spatial files will not be imported because of data sensitivity issues.

The import process populates the Vista Element Properties window with following fields for each element created:

Name
Default Name
URL
Element Type category
G-Rank category

To access the function select **Project▸ Import Element Properties from Web Service...** from the Vista menu, and then complete data entry on the resulting Vista Element Import window.

Steps in the Element Editing Process

ELEMENT PROPERTIES WINDOW

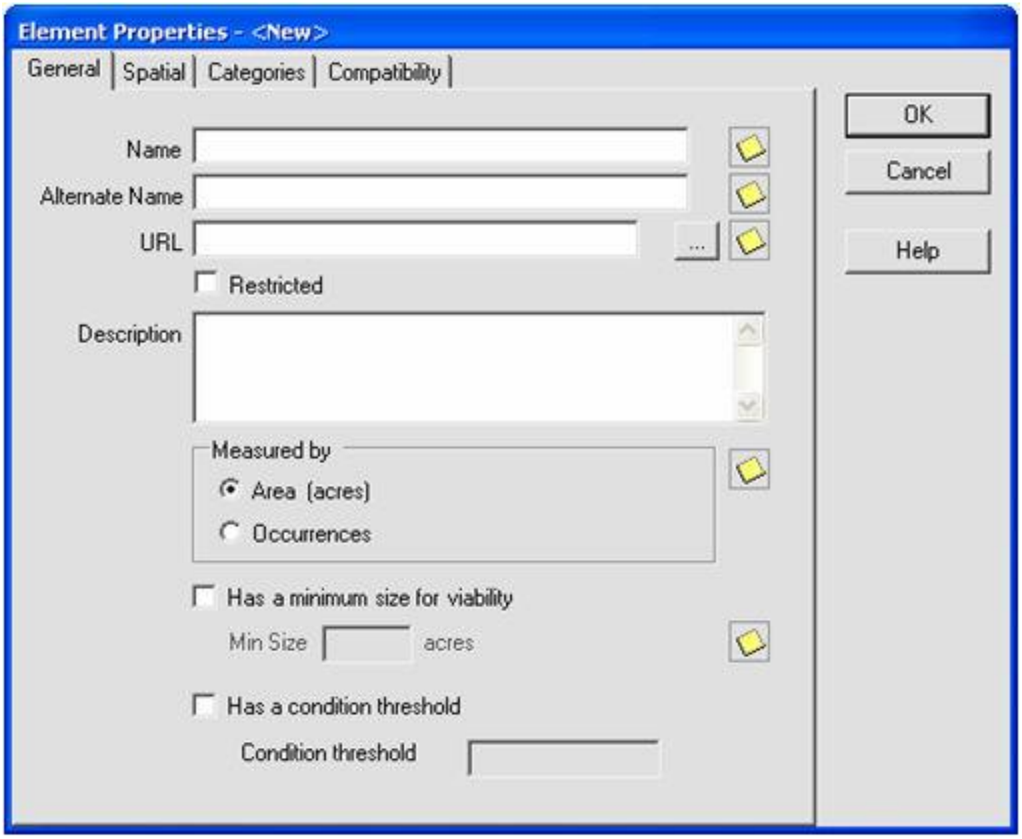
The **Element Properties - <New>** window is displayed by either clicking the **New...** button on the Element List window or choosing **Selection ▸New Element** from the NatureServe Vista menu while an element is highlighted in the Vista Table of Contents. The new properties window is used to add a new element, along with associated distribution layers and attribute data, to the project for use in analyses.

The Element Properties window consists of four tabs for recording specific types information on elements General, Spatial, Categories, and Compatibility. Depending on the analyses to be performed, different fields may be used, and data input may occur at different times. Specifically, some of the items on the General and Spatial tabs are completed for Conservation Value analyses only, while the Compatibility tab is used strictly for Land Use and Conservation Scenario Evaluations.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

Add an element:

GENERAL TAB INPUT



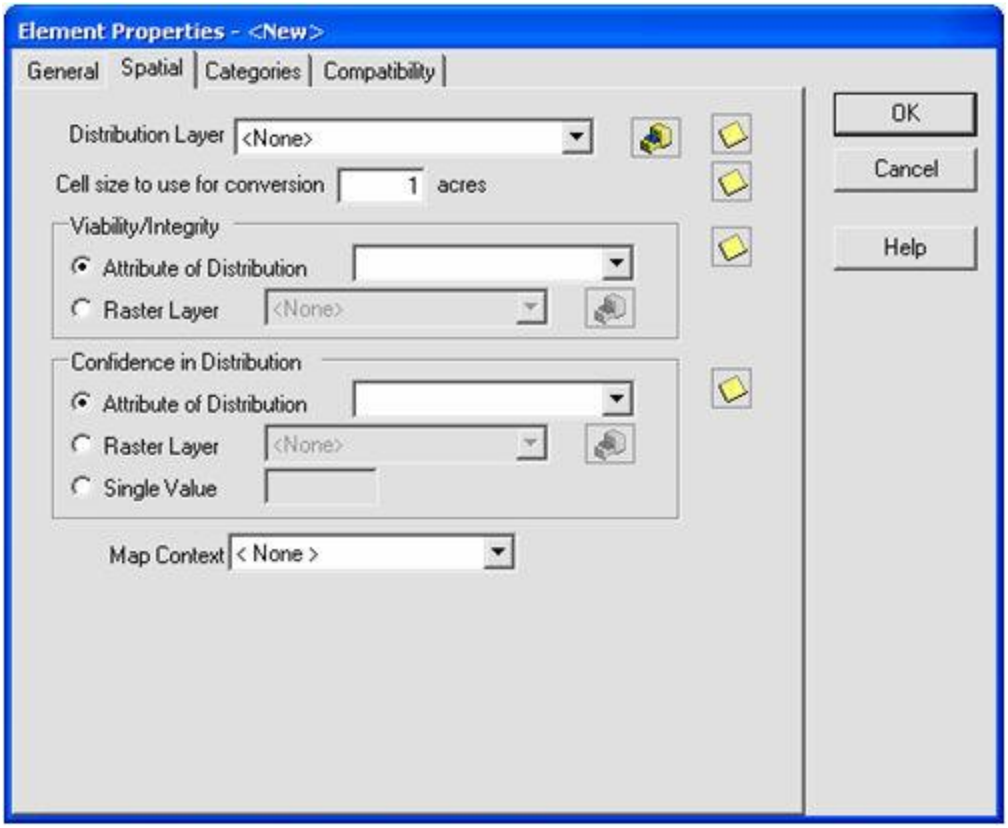
1. Specify a name for the element in the **Name** field. Typically this will be the common name used for the element. The **<New>** on the window title will change to the name of the new element as the entry is typed in.
2. Specify another name for the element in the **Alternate Name** field. Provided that the previous Name field contains the common name for the element, this field is generally used for its scientific name.
3. Enter a web address in the **URL** (Uniform Resource Locator) field that provides information related to the element (e.g., NatureServe Explorer). The  button can be used to open an explorer window that goes directly to the URL entered in the field, or if there is no address specified, the explorer default window will open.
4. If the ability to edit the element data should be limited to members of the data development team, place a check in the **Restricted** checkbox.
5. Enter a brief description of the element in the Description field, if desired.

Note: If records are being created for selected elements before additional data has been obtained/developed, data entry for the remaining fields on this tab, as well as for the Spatial tab and Compatibility tab (if needed), can be deferred until distribution layers have been developed for elements (see the process for developing distribution layers), and any attributes have been assigned (see processes for assigning viability/integrity values and confidence values). It may be a more effective use of data entry time to open each element record only once

to enter all of this information at the same time, rather than repeating the process several times to enter each of these items separately.

6. Indicate whether the distribution of the element is represented by area or by distinct occurrences using the appropriate **Area** or **Occurrences** radio button.
7. Indicate whether there is a minimum size required for viability of the element in the checkbox, and if so, enter the **Minimum Size**. This minimum size value is used to exclude occurrences (i.e., 1 occurrence = 1 record in a distribution shapefile) that do not overlap with both a "compatible" land use and a "reliable" policy in Scenario Evaluation analyses, AND that fail to meet the element's condition threshold, from the total to be compared with the minimum size. If the area of the occurrence is less than the designated minimum size, the entire occurrence is not considered to be viable and is excluded from analyses.
8. Indicate whether there is a threshold for condition of the element in the checkbox, and if so, enter a value (ranging from 0.0 to 1.0, low to high threshold, respectively) for **Condition Threshold**. The condition threshold value is used to exclude data to be included in analyses on the basis of failing to meet minimum condition requirements to be considered viable. Condition threshold values specified in this field should result from running models in the system, rather than from element quality data.
9. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

SPATIAL TAB INPUT



1. Select the distribution layer for the element from the drop-down menu of the **Distribution Layer** field, or by using the  ArcCatalog button to browse to the layer. (Layers will be displayed in the drop-down menu only if the layer is the correct feature type and is included on the Display Type tab of the Table of Contents [TOC].) See the Element Distributions section for more details on distribution layers.
2. Enter a value indicating the cell size to be used for conversion. For a discussion of optimal cell size to be used for a planning project, see the Determining Grid Cell Size topic.

   Note: If Land Use and Conservation Scenario Evaluations are to be performed, the grid cell size used to create the visualization layers generated by a Scenario Evaluation is set in this field. If this cell size differs greatly from the cell size specified for the scenario used in the evaluation (set in the Scenario Properties window), the visualization layers may not overlay the scenario correctly.

If Conservation Value analyses are to be performed, data entry for the fields contained in the *Viability/Integrity* and *Confidence in Distribution* group boxes (described in the following steps 3 and 4) can be deferred until values for these attributes have been assigned (see the sections on Viability/Integrity and Confidence for details on these attributes).

3. **If Conservation Value analyses are to be performed**, indicate whether the viability/integrity value is an **attribute of the distribution**

layer for the element, or is represented by a **raster layer** using the appropriate radio button.

If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

See the Viability/Integrity section for more details on this attribute.

4. I**f Conservation Value analyses are to be performed**, indicate whether the confidence value is an **attribute of the distribution** layer for the element, is represented by a **raster layer**, or will consist of a single assigned value for all occurrences of the element, using the appropriate radio button.

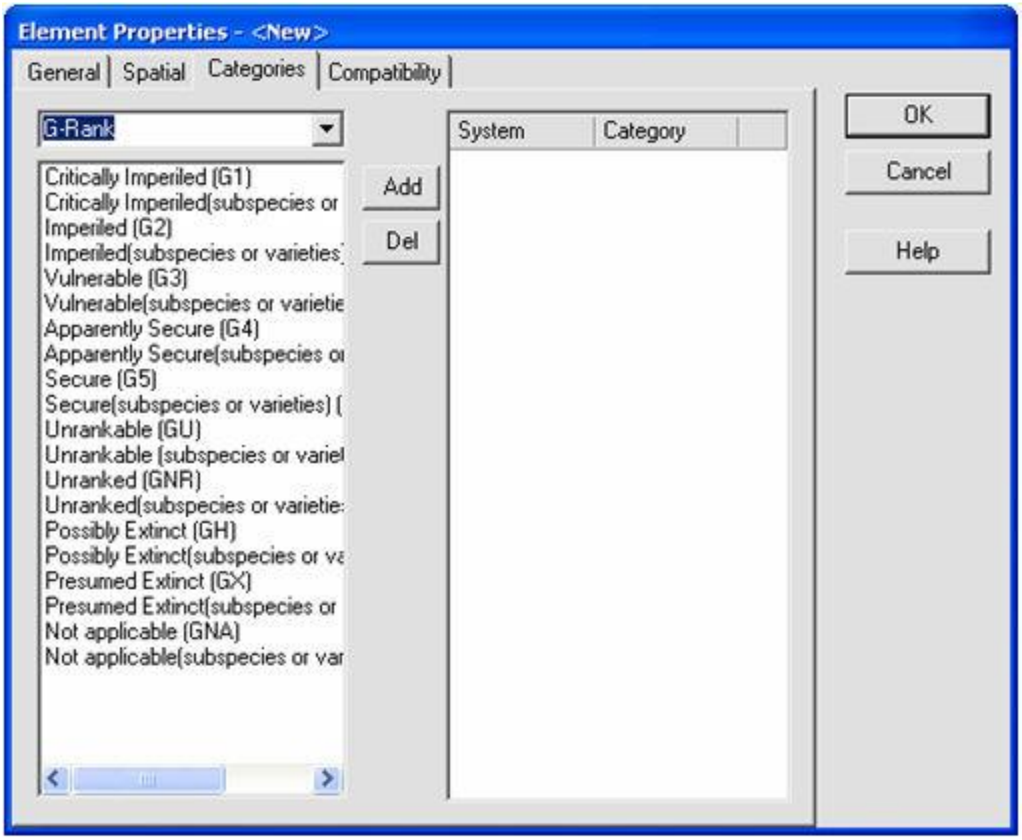
   If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

   If a single value for confidence is to be used, record that value in the field next to the **Single Value** radio button.

   See the Confidence section for more details on this attribute.

5. Select from the **Map Context** drop-down menu an existing context to be used in creating reports for the element, if any. If a map context needs to be created for the element, see the topic entitled Map Context Properties Window.
6. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

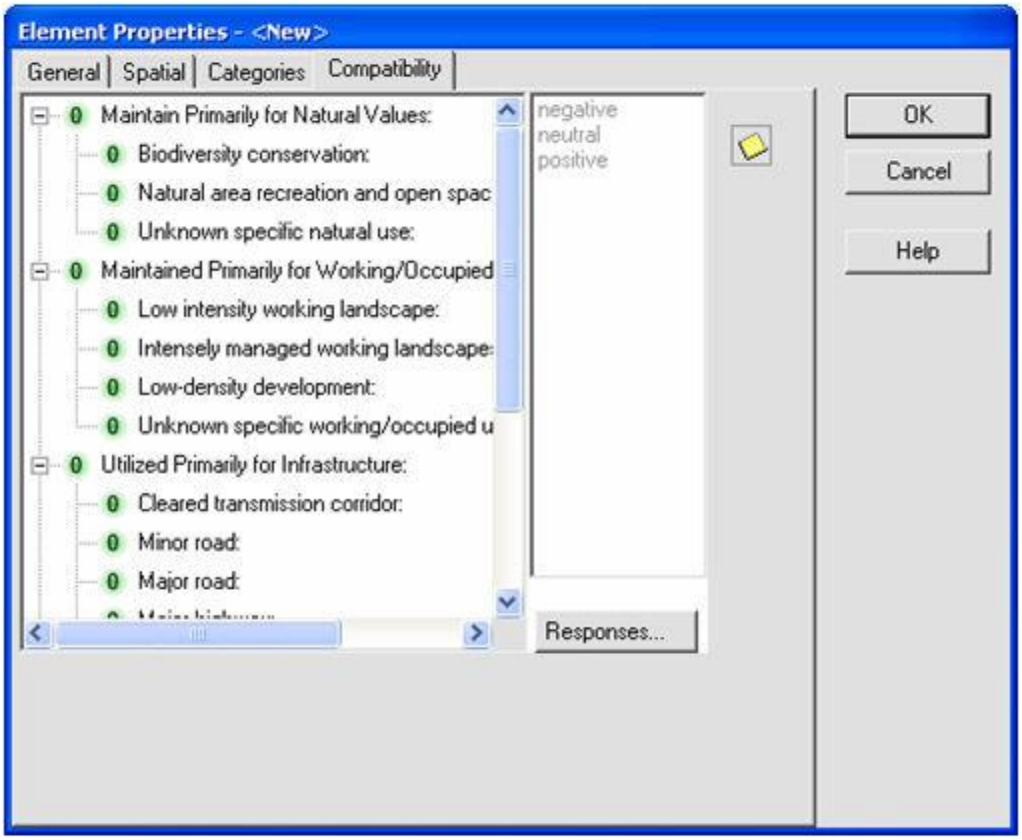
Categories Tab Input



Information on Category Systems to which an element belongs can be entered at any time once the element record has been created. Several default categories are provided in Vista, so it may be useful to indicate any of the default categories that apply initially, and then create additional categories and assign elements later as needed for developing Filters, conservation Goal Sets, and Weighting Systems, and performing analyses. To create a new category system, see the Category System Properties window section for details.

1. To specify a category system to which the element belongs, select the Category System from the drop-down list in the upper left of the window. A list of the categories within that system will be displayed below the system name.
2. Select the category to which the element belongs, and then click the **Add** button. The name of the system and category to which the element belongs will be displayed in the right pane of the window.
3. Repeat the system/category selection and add process to specify additional categories as needed.
4. To delete an element from a category system, select the system and category in the right pane and click the **Del** button.
5. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel.**

COMPATIBILITY TAB INPUT



An indication of the degree to which implementation of a specific Land-use Intent (LUI) category (described in Appendix F) is compatible with an element - that is, will permit the element to persist - is recorded using this window. More specifically, implementation of compatible LUIs will permit a species to remain viable or an ecological element to maintain ecological integrity. Scenario Evaluations, used to assess element compatibility with various land use scenarios in terms of meeting conservation goals, are dependent upon these compatibility assignments for accurate results, so it is strongly recommended that only experts on the element assign compatibility. Any decisions related to compatibility should be recorded (using the button to access the associated Documentation Window) to allow peer review and/ or legal review.

For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.

1. **If Land Use and Conservation Scenario Evaluations are to be performed**, indicate the degree to which the element is compatible with each of the NatureServe Vista LUI categories by clicking on the LUI to be assigned, and selecting the appropriate compatibility response from the list in the column to the right.

Assigning a response value to a major LUI category (e.g., "Maintain Primarily for Natural Values") will cause the system to automatically assign the entire category the same value (i.e., both the major category name and all of its associated child [minor] categories). However, assigning a compatibility response for a minor category LUI (e.g., "Biodiversity conservation") will not cause any other items in the category to be automatically designated.

2. To edit or add a new value to the list of compatibility responses, click the **Responses...** button to open the Compatibility List window.
3. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

Edit Element Information:

Element properties can be edited either individually, or for multiple elements simultaneously, as described below.

Edit an individual element:

1. Navigate to the Element Properties window populated with existing data for the element by either right-clicking the element name in the NatureServe Vista table of contents and selecting **Element Properties...** from the resulting menu, or by clicking **Manage Elements...** from the Vista menu, selecting the element in the Element List window that opens, and clicking the **Properties...** button. The resulting properties window displays data for the element.
2. Edit element properties data using the processes described above for adding an element as guidelines. More detailed descriptions of elements and related data can be found in the Element Selection, Element Distributions, Viability/Integrity Attributes, and Confidence Attributes sections.
3. To close the window and save any changes made to the element record click **OK**; otherwise, click **Cancel**.

Edit multiple elements:

1. Click **Manage Elements...** from the Vista menu to open the Element List window, and click the **Edit Multiple...** button to set property values for a designated set of elements simultaneously. See the Multi-Element Property Edit window for details on the process for editing properties for a group of elements.

Developing Distributions

ELEMENT DISTRIBUTIONS

Objectives

The purpose of the element distribution process is to create a Geographic Information Systems (GIS) layer for each selected element that depicts its spatial distribution within the planning region.

Products

Vector GIS layers that indicate the distribution of each selected element result from the element distribution process.

Inputs

The element distribution process requires the input of vector layers that show occurrences of elements. The Sources of Element Distribution Data section provides information on where these data may be obtained.

Methods Summary

The distribution for a selected element in Vista can be indicated by pointing to a distribution layer obtained and/or developed for that element. Note that, depending on the data available for the selected elements, some of the tasks listed as components of the process for developing distribution layers may not be necessary or appropriate. Note also that this section describes the primary tasks of evaluating existing data and developing new distribution data. There are disciplines and literature focused on the various techniques used to collect, record, map, and model distribution information; therefore, the process described for developing distribution layers does not attempt to address that level of detail. When such knowledge is required, the database development team should be able to provide or access such expertise.

Select a task below to see a detailed description of the process.

Background

An element distribution depicts the individual or multiple incidences of elements that are of conservation interest in a specific planning area. The distribution is made up of mapping units that form the basis for the conservation plan. These may include selected elements of biodiversity, such as populations, communities, or ecological systems. They may also include other elements or features of local interest.

NatureServe and the network of natural heritage programs utilize standard methodology for recording the occurrence of biodiversity elements (Stein and Davis 2000). Element occurrence records delineate the boundaries of a population, habitat, or ecological classification unit as they have been observed in the field. Representing an element occurrence on a map facilitates the evaluation of associations between the occurrence and other mapped features (e.g., habitat, watershed, counties, observations, or other occurrences). Four key characteristics of NatureServe element occurrence representations are 1) they are polygons (rather than points); 2) they incorporate locational uncertainty; 3) they are developed from source features, each of which corresponds to a discrete observed area based on survey information (i.e., an observation); and 4) they can be comprised of multiple source features.

NatureServe methodology facilitates the development of occurrences that reflect the diverse, often complex ways that elements of biodiversity actually occur on the landscape. For example, occurrences of different elements generally overlap and frequently share boundaries (such as the shoreline of a lake). An occurrence of a single element can contain voids (i.e., holes indicating areas that are not part of the occurrence), be comprised of multiple separate areas/patches, and include different types of contiguous areas (e.g., an occurrence that includes both a stream and pond).

The boundaries of an occurrence are delineated to reflect only what has been actually observed during field surveys, confirmed from remotely sensed data, or derived from historical accounts. Despite the possibilities presented by detailed topographic base maps, occurrences are generally not mapped to include appropriate but un-surveyed nearby areas. Many factors may affect the quality and reliability of locational data for an occurrence, including survey techniques and any equipment used (e.g., GPS unit, U.S. Geological Survey topographic quadrangle map). Therefore, in some cases it may not be possible to pinpoint the actual location at which an observation was seen on a map. In other words, some uncertainty is associated with the mapped representation of that location.

In most planning efforts, NatureServe element occurrence data will be augmented by other mapped information to fully represent features of interest. Mapped features might be represented as discrete points, lines, or polygons. In many instances, a comprehensive land cover map will be integral to representing communities, ecological systems, and other land cover. Planners should evaluate each of these ’r;non-standard’ forms of distribution information in light of the standards established by NatureServe for representing elements of biodiversity.

Limitations

Note that element distribution data will rarely satisfy all criteria for completeness, accuracy, currency, and/or precision. Therefore, the user must evaluate which criteria need to be met in order for distribution data to be categorized as acceptable for use in the analysis. (See the Confidence section for further details on confirmation types and levels of confidence associated with Conservation Value analyses).

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APPENDIX D: Sources of Element Distribution Data

There are many sources of data that provide information on the distribution of different elements. The lists of sources below (grouped by categories of elements discussed in the Element Selection section) are by no means exhaustive. The database development team should be familiar with the best sources of data available for the planning region.

Biodiversity Surrogate Elements

Ecological systems and communities data sources:

Note that in many cases, ecological data from different sources can be combined to form a hybrid map, such as using a more recent coarse land cover map to mask out recently converted areas of natural systems.

- NatureServe, which is actively mapping terrestrial ecological systems across the United States and adjacent regions
- The Nature Conservancy
- National Land Cover Database
- USGS Gap Analysis Program
- USDA Forest Service Landfire Program

- NOAA coastal change mapping program
- State mapping programs
- Local government or watershed programs
- Academic mapping projects

Rare elements data sources:

- NatureServe network program Element Occurrence data

  Element Occurrence (EO) records developed by NatureServe network programs found in each U.S. state, Canadian province, and in several Latin American countries, are a primary source for information on rare elements. NatureServe programs utilize a standard methodology for recording data on occurrences that includes a number of quality control steps to ensure accuracy of the information. Over the last several years, this methodology has been updated and thoroughly reviewed, with programs moving to a new software that utilizes the revised methodology and includes a Geographic Information Systems (GIS) component for recording EO locational information. See http://whiteoak.natureserve.org/eodraft/index.htm for details on the revised EO Data Standard. Other nations and their subnational divisions also maintain databases on rare elements.
- Natural history museum records
- Observations recorded by taxon-specific societies, such as the Native Plant Society
- Academia

Sources for data on other species:

- State agencies such as fish and game, natural resources, wildlife and parks
- Breeding Bird Survey
- USGS Gap Analysis Program predicted distribution maps
- Academia

Legally-protected Elements

- U.S. Fish and Wildlife Service
- Areas or features of natural hazard that are of conservation interest (e.g., flood plains, steep slopes), often regulated and mapped by state/provincial or federal agencies
- Many of the sources listed in the Biodiversity Surrogate section above are also sources of data for legally-protected biological elements

Other Culturally-valued Elements

Note that data sources for other culturally-valued elements will be primarily state/provincial and local in origin.

- Areas or features of natural hazard that are of conservation interest (e.g., flood plains, steep slopes) that are not already regulated as legally-protected elements are often mapped by state/provincial or federal agencies

- Prime farmland, often mapped by divisions of the U.S. Department of Agriculture, state agriculture agencies, local governments or land trusts, and academia
- Archaeological sites on private or state/provincial and local public lands, mapped by state/provincial agencies or academia
- Historic sites, mapped by local government and academia
- Scenic views, although often not mapped, are sometimes inventoried by local governments; these scenic areas can be mapped using GIS tools

Steps in the Distribution Development Process

PROCESS FOR DEVELOPING ELEMENT DISTRIBUTIONS

Obtain spatial data for selected elements

Using the list of selected elements, obtain and evaluate existing spatial data on distributions of the elements. Distribution layers that identify occurrences of elements must be in vector format. If point data has been used to represent occurrences in the layers, the points will need to be buffered to polygons using a distance that represents associated locational uncertainty, precision, or for some animal species, minimum spatial requirements (i.e., Inferred Extent [IE]). See the Develop distribution layers needed task for details on creating polygon distributions from existing point occurrences.

Likely types of distribution data (grouped by type of selected element) follow. For a more complete list of potential sources of this data, see Appendix D. The Sources of Element Distribution Data section provides more complete information on where these data may be obtained.

Biodiversity surrogate elements:

Rare elements distribution sources: Point observations (vector), field-mapped habitat features (vector), or aerial photograph mapped habitat features (vector).

Ecological systems and communities distribution sources: Land cover maps, usually derived from interpreted satellite imagery (raster), or aerial photographs (vector).

Other species: predicted distribution maps created from GIS modeling procedures (raster).

Legally-protected elements: These usually overlap with "rare elements" (described above) but, because of their status are somewhat more likely to have recent, more detailed maps of their known distribution.

Other culturally-valued elements: This is a broad category, so the distribution information will vary and tend to be local in origin. Thus, the data may be more current than that of other element types, and is likely to be mapped from detailed aerial photographs or field-mapped.

Reproject data if necessary

In order to process existing element distribution data, all of the GIS layers must be in the same projection.

Reprojecting data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Merge data into one layer

In order to permit a number of element distributions to be processed together (instead of repeating the same processes for each layer separately), distribution data for all elements can be merged into a single layer.

Merging data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Filter out any elements that are not on the selected elements list

Existing distribution data may contain data on both selected elements as well as other elements that were not determined to be of interest for the analyses.

Before continuing the process of developing distributions, these additional elements should be removed.

Applying filters to data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Evaluate data and update if needed

Before using existing element distribution data, it must be evaluated for completeness, currency, accuracy, and precision, as described below. Note that no distribution data is likely to satisfy all of these criteria. Further, evaluation of data using these criteria is subjective, and can be influenced by both its intended use and the data quality requirements of the end user.

Completeness is the degree to which distribution data represents all of the occurrences believed to exist by local experts; most existing databases of observed or mapped distributions are considered to be very incomplete and biased. Predictive distribution modeling by experts is frequently used to overcome these problems, but often over-predict element distributions at the expense of precision.

Completeness can be assessed by comparing a distribution layer developed from remotely sensed data or modeling with field observation records, and calculating the proportion of known observations not found in the distribution layer.

Currency indicates how recently the distribution data was created or updated. If the data is routinely updated, it is important to know how much of it is updated each cycle. The relative importance of data currency is a direct result of the pace at which land use and land cover in the planning region are changing.

Currency can be assessed using the date of the field survey or, if mapped or modeled, the date of any remotely-sensed imagery (satellite or aerial photos), or the date of any other data used in modeling.

Accuracy represents both locational accuracy (i.e., whether the mapped location of an element occurrence reflects the actual location where it was observed on the ground), as well as presence - whether the element truly occurs at the mapped location.

See the Confidence section for more detailed information on accuracy.

Precision is the degree to which a distribution is complete without depicting the element in locations where it does not actually occur.

True measures of precision are nearly impossible to obtain because they would require perfect information. Often, expert review of distribution layers can provide a qualitative sense of the precision of the data.

The task of evaluating distribution data can be best approached by striking a balance between the set of elements and quality of the data to be included in an analysis. For example, if robust representation of biodiversity surrogate elements is deemed important for planning in the region, data quality must frequently be compromised somewhat in order to retain a sufficient number and variety of such elements. Further, different criteria for evaluating each characteristic can be set for each type of selected element. For example, the criteria for legally protected elements may be much more stringent than that for culturally-valued elements.

Following the evaluation process, records for selected elements that have acceptable data can be pointed to the appropriate distribution layers without further processing (see Point to Distribution Layers from the Vista Application for details on this procedure). Unacceptable layers should be characterized by the nature of the problem, along with a description of the required action(s) that would result in acceptable data for the element. For example:

- Distribution lacking. *Action:* Create a new distribution using predictive modeling.
- Distribution not current. *Action:* Update using current layers of converted areas.
- Distribution incomplete. *Action:* Update with supplemental field mapping or aerial photo interpretation.
- Distribution imprecise. *Action:* Mask out areas believed to be unsuitable with current layers of converted areas, filter using minimum size, etc.

Remove unacceptable data

Based on evaluation of element distribution data according to completeness, currency, accuracy, and precision, any that are determined to be unacceptable should be removed (e.g., historical distributions, extinct elements).

Removing distribution data involves basic GIS tasks that are performed outside of the Vista application. For guidance on performing these tasks, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.

- The Contents tab shows a list of topics that can be browsed through.
- The Index tab provides the ability to search an index of help topics.
- The Find tab provides the ability to search for a particular word in all of the help topics.

Develop distribution layers needed, given time and budget constraints

In cases when existing distribution layers are deemed unacceptable for use in analyses, there are a number of different methods available for either updating or creating completely new distribution layers for elements.

The process of developing distribution layers is necessarily an iterative process associated with element selection, balancing the cost of updating or creating new layers with the needs of the project. Having the planner indicate the importance of each selected element may be a useful means for initially determining the distribution layers needed for analysis (i.e., layers for the highest priority elements), as well as the resources to be allocated for updating/creating the layers. However, whether an update or new creation is more appropriate for a particular distribution layer (based on the existing data), and the methods to be used to generate that layer, are decisions best made by experts.

Brief descriptions of some of the methods for updating and creating distributions are provided below.

Update existing distribution layers

- Intersect new layers of converted land (e.g., agriculture, development) with the existing distribution layer and mask out areas that are unsuitable for the element.
- Use satellite imagery to detect conversion and/or succession of habitat/landscape to different types; areas of change can be used to update the existing distribution layer.
- Add new field observations or revisit areas to obtain more current data, and update the existing distribution layer(s) accordingly.
- Revise an existing modeled distribution by applying a minimum required area filter, which removes occurrences that are too small to be viable.
- Buffer NatureServe point EOs, typically created using heritage methodology that preceded the methodology currently in use, by applying custom uncertainty distance buffers based on associated precision values (shown below).

NatureServe Precision value (legacy data)	Buffer distance for Precision (in meters)
S = seconds (location mappable within a three-second radius)	100
M = minutes (location mappable with ~2 km or 1.5 mi. radius)	2400
G = general (location mappable with ~8 km or 5 mi. radius)	8000

The resulting circular polygons should be processed into 'standard' NatureServe EOs following NatureServe's current heritage methodology (see the Element Occurrence Data Standard, found at http://whiteoak.natureserve.org/eodraft/index.htm) by applying separation criteria found in the EO specifications for the element. The primary intent of EO specifications is to ensure, through the provision of standard guidance for a species or community type, that occurrences are delineated so that they reflect populations or communities of populations, and that they are consistently defined and mapped. This is accomplished by 1) providing criteria that describe barriers restricting movement and/or dispersal of species elements, or limiting expansion and/or altering function for ecological communities; and 2) specifying practical separation distances across suitable and unsuitable habitat for species, or across intervening areas of different natural/semi-natural communities and cultural vegetation for communities.

Create new distribution layers

- Field map Element Occurrences (EOs) following NatureServe's heritage methodology (described above), which is well developed and has been peer-reviewed. This is the most direct method for creating a distribution, but it can also be the most expensive, depending on the area of distribution and how easily the element is detected (e.g., some species may require repeated site visits and trapping to confirm presence). Elements most suited to this approach are those having a very limited distribution with known geographic limits, but for which specific locations for occurrences need to be confirmed, and for which presence can be easily detected by direct observation.
- Process nonstandard occurrence information into 'standard' NatureServe EOs, if possible, by applying separation criteria found in the EO specifications for the element. Using this approach to developing distribution layers may be particularly useful if viability/integrity and confidence attributes for occurrences are to be assigned for use in Conservation Value analyses.
- Interpret data from remote sensing techniques (e.g., satellite imagery, aerial photography) to create an element distribution; these techniques are well developed, and often combined with Geographic Information Systems (GIS) modeling. The potential complexity and expense of this

approach are affected by the size of the distribution area, the number of elements, and the difficulty in detecting the elements in the remotely sensed data.

Typically, this process involves initially obtaining sample field observations, using them to train an interpreter to consistently identify or classify these features in remotely sensed data, and then verifying the work through follow-up field visits. The field surveys - collecting the initial field observations and verifying the interpretation through additional field visits - are frequently the most expensive aspects of this approach.

- Model the predicted distribution using GIS and statistical techniques. While very rare elements have traditionally been difficult to model, this technique is well suited for types of elements that have associations to specific biogeophysical characteristics, and/or which are difficult to detect or map directly. Such types of elements include
  - Elements that have very strong associations to one or more environmental variables for which good distribution data exist (e.g., climate, elevation, aspect, land cover types, aquatic features); distributions of the biogeophysical features can be used as surrogates for the elements' distributions.
  - Elements that have broad distributions, but known limiting factors that can be mapped. Such element distributions may be broad because either the element is dominant in the planning area (e.g., grasslands in the Great Plains), or the element is associated with a broad group of variables (e.g., occupies both forest and grasslands; both streams and lakes). Known and mappable limiting factors can include elevation limits, specific land cover types, and soil types.

Split data into separate layers by element

Any distribution data that was merged into a single layer to facilitate processing must now be divided into separate layers by element so that the record for each element can be pointed to a single layer containing the distribution for that element alone.

Separating distribution layers involves basic GIS tasks that are performed outside of the Vista application. For guidance on performing these tasks, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Reconcile overlapping features in distribution layers

Evaluate each element distribution layer to identify any features that overlap. Edit these features as needed to ensure that overlapping areas will 'belong' to only a single occurrence. If overlap is not reconciled, Element Conservation Value (ECV) rasters developed for use in Conservation Value analyses will include only one feature out of each group that overlaps.

Divide distributions comprised of a single area

Element distributions should not be represented in NatureServe Vista by a single attribute table record. In cases when an element distribution layer consists of a single area, that sole "occurrence" must be divided into separate "occurrence" units. Dividing such an area into smaller sections insures that analyses utilize just that portion of the element's distribution defined by spatial filters and/or conservation goal sets.

Document products with metadata

The final products of this process are vector element distribution layers. Metadata should document source data used to develop the distributions, methods used to reproject the data, filters applied to the data, and the rationale used for assessing whether the source data was acceptable.

Vista automates the process of producing metadata that is compliant with the Federal Geographic Data Committee (FGDC) metadata standards. See http://www.fgdc.gov for more details on metadata standards.

Point Vista to the distribution layers

If elements have not yet been entered into the Vista application, see the Input Element Names process for guidance on how to do this.

Once an element exists in Vista (i.e., a record has been created by using the Element Properties - <New> window), bring up the properties window for that element by selecting it from the **Element List** window and clicking the **Properties...** button. Use the resulting Vista Element Properties window (specifically portions of the Spatial tab) to associate the distribution layer with the element.

Data for the element can also be entered on the Categories tab of the window during this process, and if Land Use and Conservation Scenario Evaluations are to be performed, it may be most efficient to enter data on the Compatibility tab during this process as well.

VIABILITY/INTEGRITY ATTRIBUTES

Objectives

The purpose of the viability/ecological integrity process is to assign a specific value (ranging from 0.0 to 1.0) for each occurrence of an element that suggests the likelihood that, if current conditions prevail, the occurrence will persist. These values can be used in Conservation Value analyses to identify areas with high conservation value that can support elements with occurrences of high viability/integrity, and areas of impaired condition that cannot.

Products

The viability/ecological integrity attribute can be expressed in either of two products, as follows:

- Values stored in a column in a vector distribution theme that indicate the likelihood of persistence for each associated occurrence.
- Values assigned to occurrences of elements based on separate raster themes having cell values that denote the viability/ecological integrity of occurrences in corresponding locations of the vector distribution layer. Examples of raster themes include landscape integrity layers and/or modeled distributions.

Inputs

Viability/ecological integrity values can be input two ways:

- As an attribute of a vector distribution theme, used when a viability/integrity value is assigned for each individual occurrence polygon. Viability/integrity values range between 0.0 and 1.0, and can be based on several indicators of an element's likelihood of persisting at a particular location over time, such as NatureServe Element Occurrence (EO) ranks.
- As a raster layer with a 0.0 to 1.0 viability/integrity value assigned to each individual grid cell, as in a modeled distribution of an element.

Methods Summary

Relevant viability/ecological integrity data or surrogate landscape integrity raster themes (combined, in some cases, with values for minimum required area) are used to assign values between 0-1.0 that suggest the likelihood that, if current conditions prevail, occurrences will persist. Depending on the data available for elements, some of the tasks listed as components of the process for assigning these values may not be necessary or appropriate. Note that viability/integrity values associated with distribution maps are currently used only in Conservation Value analyses.

While element viability/integrity values provide for a more robust analysis, they may be very difficult and/or time consuming to determine. In the case of some elements, they may be unnecessary to apply. For example, viability/integrity values wouldn't likely have meaning in the case of designated priority zones (priority conservation or wildlife areas), cultural features, protected areas, etc. In the case where viability/integrity in not applicable or difficult to ascertain, constant values (0.5 for example) can be applied equally to elements to fulfill this requirement.

Background

The viability or ecological integrity of an occurrence is based on assumptions about the key ecological attributes that are thought to support the element on-site, and the degree to which these factors occur within expected ranges of natural variation. For example, a particular fire-adapted montane grassland type may naturally occur in patches that range from 500-2,500 acres. It may be assumed to experience patchy natural wildfires as frequently as every 5-25 years, with burned patches that encompass as much as 40-80% of the occurrences. When fire frequency and spatial character fall outside of these ranges there may be correlated signs of degradation visible, such as changes in native species composition and vegetation structure.

Viability or ecological integrity at an occurrence level addresses ecological resilience, that is, the ability and/or likelihood for the species, community, or ecological system to persist in a particular location. Resilience also includes the presence of resources required by the element in sufficient quantity and quality for populations to persist, but also within acceptable levels (e.g., nutrient concentrations not reaching toxic levels). Occurrences with high viability or ecological integrity may retain ecological attributes that can be difficult or impossible to restore through management, so the viability/integrity of the occurrence adds a significant dimension to gauging the relative irreplaceability of the occurrence.

Two principle types of information can be used to indicate the relative viability or ecological integrity of occurrences. If element data consists of NatureServe network Element Occurrences (EOs) and viability/ integrity criteria have been developed and applied according to standard EO rank specifications, the resulting EO ranks can be relied upon to reflect the likelihood of occurrences persisting. The criteria provided in rank specifications integrate ecological factors in subcategories of size, condition, and landscape context, as appropriate for the element type, to derive an occurrence rank.

In most instances where EO ranks are unavailable, occurrences can be processed in combination with ecological integrity layers, and in some instances, occurrence size ranks, to provide an indirect measure of occurrence viability or ecological integrity.

Limitations

The methods described here for attributing viability or ecological integrity are meant to provide a measure that indicates whether occurrences have relatively high or low viability/integrity to be used in Conservation Value analyses. This process is not a substitute for population viability analysis (PVA) or field surveys to determine probabilities of population persistence or actual ecological quality of occurrences. The user should establish criteria that define 0.0-1.0 viability/integrity values; they may be used as relative values (as suggested in this section), or defined as probabilities of persistence calculated from a PVA.

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Steps in the Viability/Integrity Assignment Process

PROCESS FOR DERIVING VIABILITY/INTEGRITY VALUES

Evaluate available attribute data for element occurrences

Data on occurrences of elements must be evaluated to determine which have attributes that can be considered indicative of viability (species) or ecological integrity (ecological communities/systems), and which occurrences will need additional work to determine appropriate viability/integrity values.

Attribute information for occurrence viability and ecological integrity may be obtained directly from NatureServe heritage program databases. Using NatureServe heritage methodology, network programs track data for 'standard' Element Occurrences (EOs), including assessments of the viability/integrity of occurrences as EO ranks, which are assigned by applying EO rank specifications to field data. In such cases, the EO ranks can be evaluated and possibly updated by the data development team, and then numeric values assigned for A, B, C, or D ranks for use in Vista Conservation Value analyses.

Determining viability/integrity values for 'nonstandard' occurrence data (e.g., 'modeled' habitat, mapped polygons from remotely sensed data, contiguous landscape areas), as well as for 'standard' NatureServe occurrences with an assigned EO rank other than A, B, C, or D (e.g., E, H, F, X) can involve developing landscape integrity values and, as appropriate, size ranks which can be utilized for such occurrences.

PROCESS FOR DERIVING VIABILITY/INTEGRITY VALUES

Create columns for viability/ecological integrity attributes

Assigned and calculated values for viability/ecological integrity - that is, values for EO rank equivalent values, landscape integrity values, and size values, as well as the finalized viability/integrity confidence value - must be stored in columns associated with the element distribution layers (in vector format). Four columns should be created for each element distribution layer for recording these attributes.

Creating columns for storing associated attribute data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.

- The Find tab provides the ability to search for a particular word in all of the help topics.

Transform attribute values for 'standard' NatureServe EOs into viability/integrity values

Element data in the form of 'standard' NatureServe network Element Occurrences (EOs) typically have assigned EO ranks that indicate the estimated viability or ecological integrity of these occurrences.

Convert EO rank values

In cases when the assigned EO rank is an A, B, C, or D, then standard conversions can be applied that translate these ranks into the appropriate viability/ecological integrity values. The recommended EO rank conversions to viability/integrity values (ranging between 0.0 and 0.9) are as follows:

EO Rank	Equivalent Viability/Integrity Value
A	0.9
B	0.8
C	0.6
D	0.3

Recommended EO rank viability/integrity conversion values.

Record values in column of element distribution layers

If viability/integrity values have been determined on the basis of EO rank for occurrences of the element, populate the appropriate column in the associated distribution layer.

Determining viability/integrity values for NatureServe EOs with assigned ranks other than A, B, C, or D (including E, F, H, and X-ranked EOs), or those without an assigned EO rank can involve developing landscape integrity values and, as appropriate, size ranks; these can then be used to assign surrogate viability/integrity values. The process for assigning size values and landscape integrity maps/values is described in the steps that follow.

Process 'nonstandard' occurrence data to assign viability/integrity values

'Nonstandard' element data (i.e., occurrences developed using processes other than those embodied in NatureServe heritage methodology) can result from such processes as habitat modeling, mapping from remotely sensed data, and contiguous landscape areas. These 'nonstandard' data may be utilized in Conservation Value analyses.

Process into 'standard' EOs

For some 'nonstandard' data it may be possible to apply criteria found in the EO specifications for the element to that data (see the Develop Distribution Layers task for details). In such cases, the data is essentially processed into 'standard' NatureServe Element Occurrences (EOs) by applying separation criteria, and EO ranks could then be assigned using EO rank specifications developed for the element. Any occurrence with an A, B, C, or D rank can then be translated to a viability/integrity value as described in the preceding process step.

Record values in column of element distribution layers

If viability/integrity values have been determined on the basis of EO rank for occurrences, populate the appropriate column in the associated distribution layer.

New 'standard' occurrences that cannot be assigned an A, B, C, or D EO rank should, if possible, be evaluated in terms of size (generally used for ecological elements) and/or landscape integrity, as described in the following process steps.

Determine size values for occurrences if needed to assign viability/integrity values

Occurrences of ecological elements that cannot be assigned an A, B, C, or D Element Occurrence (EO) rank should, if possible, be evaluated in terms of size. The size factor is based on the area of surrounding suitable habitat needed for the survival of sensitive species populations within the community or ecosystem EO (e.g., the need for undisturbed area surrounding a nest site), and/or the area needed to allow for continuation of the natural dynamic processes essential for supporting that community or ecosystem occurrence (e.g., disturbance by fire or wind). When relevant for an ecological element, the EO rank specifications provide a range of sizes (in the A through D criteria) that can be used to assign a size value.

Calculate the area of occurrences and compare with size in EO rank specs

To assign a size value, calculations must be made to determine the area of an occurrence of an ecological element, which can then be evaluated using the criteria in the EO rank specifications for the element. Any occurrences that meet the criteria for an A, B, C, or D size can be assigned a size value.

Convert size values to numeric equivalents

Standard conversions to be used for converting assigned size values of A, B, C, or D to numeric equivalents (ranging between 0.0 and 0.9) are as follows:

Size Rank	Numerical Value
A	0.9
B	0.8
C	0.6
D	0.3

Recommended size conversion values.

Record values in column of element distribution layers

If numeric equivalent values have been determined on the basis of size for ecological occurrences, populate the appropriate column in the associated distribution layer.

The numeric equivalents for size can be used along with landscape integrity values to determine a surrogate ecological integrity value for community occurrence data, either 'nonstandard' data that cannot be translated into 'standard' NatureServe EOs or 'standard' EOs lacking an A, B, C, or D EO rank. Note that 'nonstandard' data that cannot be developed into 'standard' occurrences is primarily the case for ecological elements. The processes for developing landscape integrity maps/values are described in the four tasks that follow.

Determine the stratification for landscape integrity raster(s)

'Nonstandard' occurrence data that cannot be translated into 'standard' NatureServe Element Occurrences (EOs), or 'standard' EOs that lack an A, B, C, or D EO rank, require an assessment of landscape integrity in order to assign surrogate viability/integrity values.

The process of developing raster maps used to characterize landscape integrity involves two major considerations:

- What uses of land or water are known to significantly impact the viability/ecological integrity of these elements?
- What data are available that provide specific locations of those land and/or water uses in the planning region?

Generally, if the planning problem involves terrestrial ecosystems (uplands and wetlands) and aquatic ecosystems (either freshwater or coastal marine), creation of at least two landscape integrity rasters, one for each ecosystem (terrestrial and aquatic) should be considered. Additional landscape integrity rasters may be developed for certain subsets of elements, as appropriate (e.g., ’forest interior' birds, animals, wetlands, nonvascular plants, terrestrial species) or for individual elements alone.

Determine the area(s) to be mapped for landscape integrity

When developing landscape integrity rasters for the planning region, it is important to include a buffer zone surrounding the region in each raster. Each grid cell in the raster landscape integrity layer will be assigned a value based on the land/water use(s) in that cell, taking into account any effects from land uses in the surrounding area/cells. And so, buffering the planning region ensures that information on land/water uses that are adjacent to cells at the edge of the planning region will be included so that these uses can be considered when developing the landscape integrity values for these edge cells.

The size and configuration of the buffer surrounding the area will depend on the overall size of the planning region, and on the elements of interest. For example, if freshwater aquatic ecosystems are a focus, watershed area upstream of the planning landscape should be evaluated for inclusion in the aquatic landscape integrity raster. For efforts limited to terrestrial elements, a 5-20 mile buffer should adequately address most patterns of adjacent land use for planning efforts that range from local to regional scales.

Create landscape integrity raster(s)

The data development team will use a Geographic Information System (GIS) (e.g., ESRI ArcGIS and the Spatial Analyst extension) to create one or more landscape integrity rasters from source data. The process for developing these rasters is described below.

Obtain potential source data

Most spatial data needed for assessing landscape integrity can be accessed from government agencies. Examples of source data for both terrestrial and aquatic use classes are shown in the Land/Water Use Classes and Weights table below. In many cases, two landscape integrity rasters should be developed &endash; one comprised of source data that would influence the terrestrial landscape, and the other from data that would affect the aquatic environment.

Determine grid cell size

The optimal size of the grid cells to be used for the rasters must be determined. (See the Determining Grid Cell Size topic for detailed information on how to select the best raster cell size for different layers created and utilized in Vista.)

Evaluate potential source data for spatial resolution and accuracy

While it will be a rare circumstance when all available data depict features at the same spatial resolution, combining data layers of highly disparate resolutions should be avoided; the higher the disparity between layers, the greater the amount of error. For example, 1:24,000 stream layer should not be combined with a 1:2,000,000 roads layer, but using a 1:100,000 stream layer with a 1:250,000 roads layer may result in an acceptable level of error in the landscape integrity layer produced. Note that map accuracy information should be included in metadata.

Establish weights for land/water use classes

Each land and water use class depicted in the source data must be assigned a weight that will be used to describe its effect on aquatic and/or terrestrial landscape integrity. These weights reflect expert judgments about the relative severity of impact that each use class could have on the elements of interest in the planning region. Depending on the number and range of values, a scale between 0 and 1000 is generally adequate. For example, land and water use classes may be categorized in terms of "high severity," "moderate severity," and "low severity," with the associated weights initially set at 1000, 500, and 100, respectively. Again, this is an expert judgment; there is no way to fully test the assumptions behind these weights, so it may take some trial and error to determine acceptable values. Examples of assigned weights for different land and water use classes are shown below.

Layer #	Description of Data (Land / Water Use)	Source Raster	Weight
4	Land/Use Urban	DOC/Farmlandmapping	1000
5	Interstate	CASIL	1000
11	Dams	Base data	1000
15	Hazardious Waste Sites	USEPA	1000
16	Toxic Release Inventory	USEPA	1000
12	Mines	DOC/OMR	850
6	State Highways	CASIL	800
18	303D bays	SWRCB	800
18	303D Lakes	SWRCB	800
18	303D Estuaries	SWRCB	800
18	303D streams	SWRCB	800
3	Land/Use Intensive Agricuture	DOC/Farmlandmapping	500
7	Local Roads	CASIL	500
8	Rail Roads	CASIL	500
13	Industrial Discharge Facilities	USEPA	500
9	4 wheel Drive Road	CASIL	250
10	Power Lines	CASIL	250
2	Land/Use Extensive Agricuture	DOC/Farmlandmapping	100
17	Underground Pipelines	CASIL	50
0	water	DOC/Farmlandmapping	0
1	Land/Use Natural	DOC/Farmlandmapping	0
Null	Napa County Boundary	CASIL	
Null	Ten Mile Buffer	Created from Napa County Boundary	
Null	Watershed Boundary	CASIL	

Example showing land/water use classes and weights assigned for a

conservation planning project for Napa County, California, to be used to describe aquatic and terrestrial landscape integrity.

Develop distance interval values representing the impact of each use class

A set of values for distance intervals must be developed for each land and water use class that will be used to indicate their effects on elements of interest at different distances. The intervals are based on the resolution of the grid cells in the use class raster, and are essentially the units of the cells. For example, if a raster has grid cells that have a resolution of 90 x 90 meters, then the distance intervals could be: 1 = <90 meters distance (i.e., within 1 grid cell away from an area of a particular use class is represented by a distance of less than 90 meters), 2 = 90-180 m. distance (i.e., located up to 2 grid cells away), 3 = 181-270 m. distance, etc. Each grid cell in a land use raster should be assigned a distance value based on the distance of the cell from areas of land use.

Calculate grid cell values based on use class weight and distance effects

Calculate a value for each cell (CV) in a particular land or water use raster using assigned distance values (D) from the previous step, where Weight (W) is a constant, using the formula

$$(1/D) * W = CV$$

where:

D = Distance value for cell based on distance from use class

W = Weight assigned to component use class

CV = Cell value

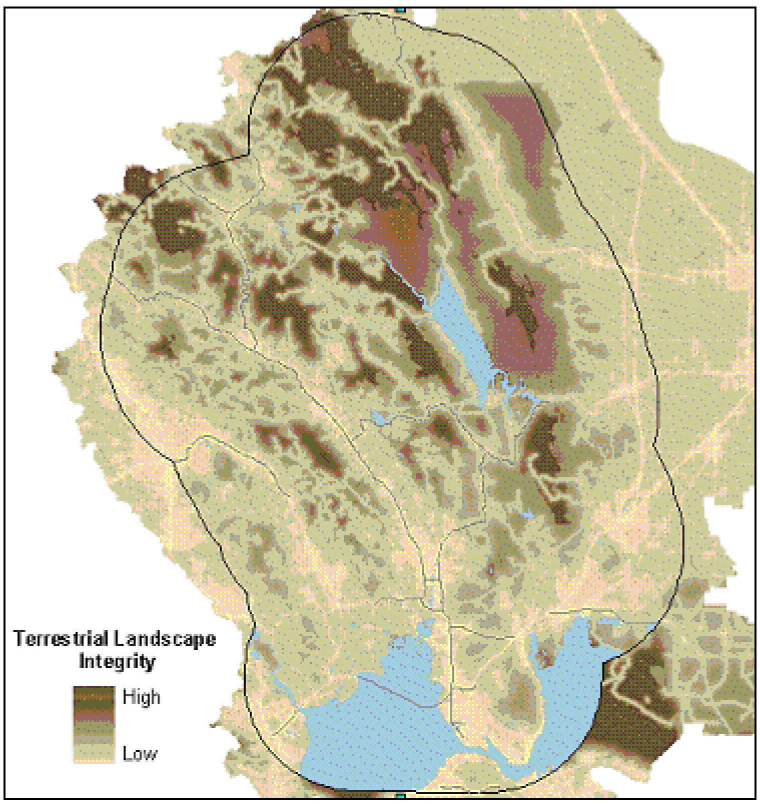
The values (CV) that are calculated for the grid cells in each use class raster reflect the decreasing impact of the use class with increasing distance from the grid cell (and, thus, from any element occurrences present in the cell).

Combine calculated grid values

Sum the CVs calculated in the preceding step for the use class rasters into a single value for each cell in one composite raster. Thus, every grid cell in this summary raster (SCV) has a value that was obtained by adding the CVs assigned in each of the different use class rasters for that cell 'location.' The summary raster represents the combined effects of different use classes in the planning region.

Normalize each summary cell value to produce a relative landscape integrity value

Take the inverse of the value for each cell (SCV) in the summary use raster (1/SCV) to create a new 'inverse' layer. Normalize the grid cell values of this inverse layer to values ranging from 0.0 to 1.0 by, first, identifying the maximum value assigned to cells in the layer, and then dividing each inverse cell value by that maximum. Each grid cell value in the normalized inverse summary raster represents the relative landscape integrity value for that cell. A value close to 1.0 indicates that the grid cell has relatively high landscape integrity (i.e., is minimally affected by land/water uses); whereas, a value approaching 0.0 indicates relatively low landscape integrity (i.e., significantly impacted by land/water uses). As cells (and the occurrences within) are located closer to a land or water use, the landscape integrity decreases and the resulting impact of the use class increases. The figure below is a graphic representation of the terrestrial landscape integrity within Napa County, California, and the surrounding buffer zone.



Map indicating the range of terrestrial landscape integrity values for Napa County, CA.

Finalize the viability/integrity value associated with each occurrence

The final calculation to develop viability/ecological integrity values for 'nonstandard' occurrences and 'standard' NatureServe Element Occurrences (EOs) for which an A, B, C, or D EO rank cannot be assigned involves two factors:

- Landscape integrity value(s) associated with the occurrence, and
- Size of the occurrence, used only for ecological elements (in some cases).

Intersect integrity and distribution layers to assign landscape integrity values

Assign landscape integrity values for each occurrence by intersecting the appropriate landscape integrity raster, developed in previous steps, with one or more element distribution layers. The resulting landscape integrity values should be recorded in the appropriate column in the associated distribution layers. For occurrences of elements lacking size values, this value serves as the finalized viability/integrity value.

When an occurrence overlaps more than one grid cell, the unique landscape integrity value for each overlapping cell should be combined to establish a single value for the occurrence. An average integrity value calculated from overlapping cells should be adequate for most occurrences, but expert opinion may determine that an alternate method for combining landscape integrity values should be utilized (e.g., minimum integrity value, geometric mean, etc.).

Note: Because many aspects of species viability cannot be ascertained from maps and models of landscape integrity (e.g., population size, population condition), viability values assigned to species occurrences should be limited to B-C (i.e., should be valued 0.8 or less) when based on landscape integrity values alone.

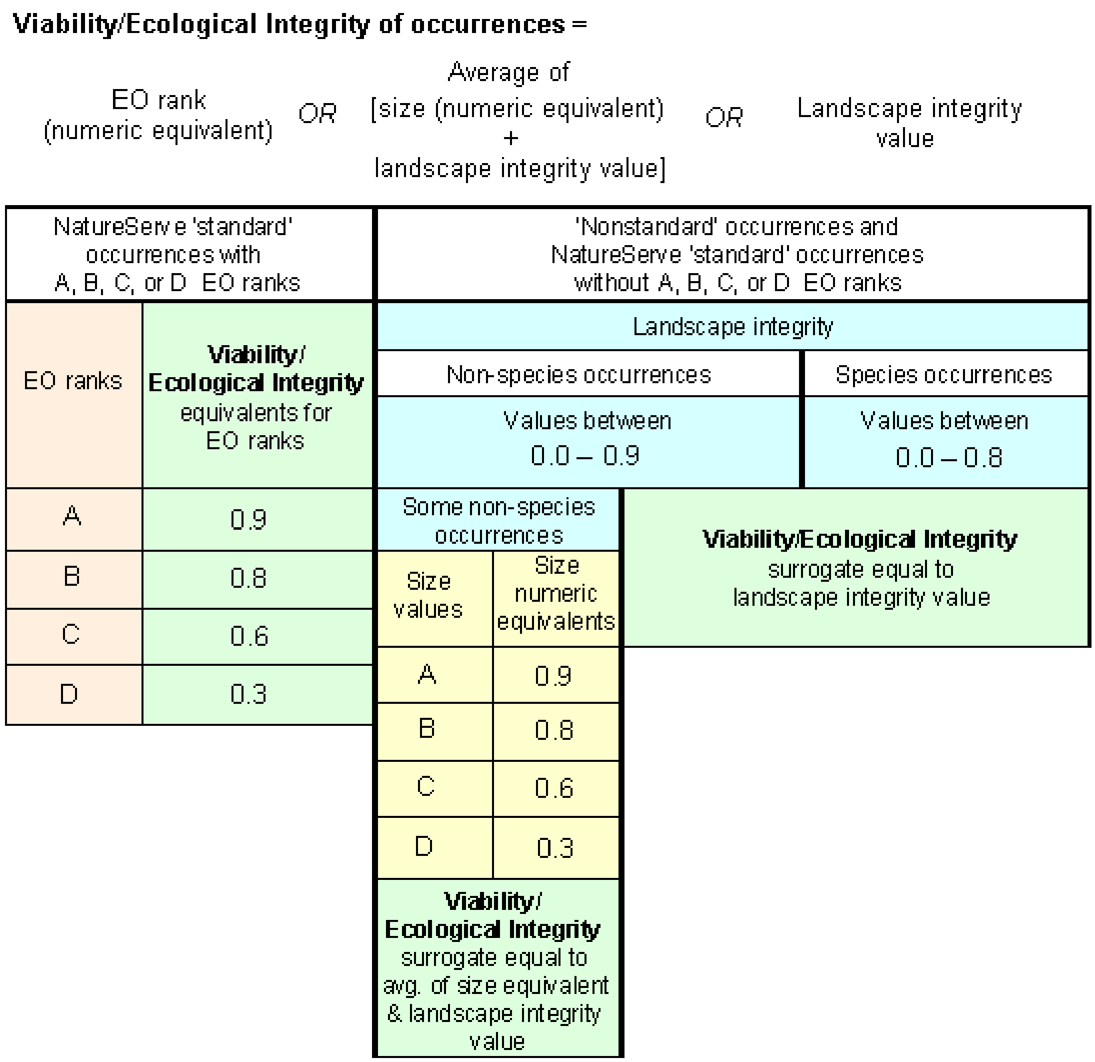
Calculate final integrity values for community occurrences with size values

Determine the finalized ecological integrity value for each ecological occurrence having an assigned size value by calculating the mean of the associated landscape integrity value and the size value. For example, an occurrence with a landscape integrity value of 0.5 and a size value of 0.9 should be assigned an ecological integrity value as follows: (0.5 + 0.9) / 2 = 0.7.

Record finalized Viability/Integrity values for occurrences

Record finalized viability/ecological integrity values in the appropriate column of the associated distribution layers.

The table below shows the viability/integrity values based directly on the assigned EO rank, or determined using other inputs (i.e., size and/or landscape integrity).



Add viability/integrity values to Vista

The addition of finalized viability/integrity values to Vista can be deferred until confidence attribute values have been assigned to distribution layers (if appropriate) so that all element information can be entered into the system at once. However, if it is desirable to input viability/integrity values at this point in the process and distribution layers have not yet been associated with elements, the task of pointing to distribution layers must first be completed (see the task Point to Distribution Layers from Vista). Once a distribution has been associated with an element, attributes can be added using the Vista Element Properties window, specifically in the *Viability/Integrity* group box on the Spatial tab.

Document products with metadata

The final products of the process are numerical values for viability/ecological integrity (ranging from 0.0 to 1.0) assigned to each element occurrence, and supporting landscape integrity rasters used to develop surrogate viability/integrity values.

Metadata should include documentation on the following:

- Source data used to define landscape integrity
- Rationale for making each landscape integrity map (e.g., terrestrial vs. aquatic, etc.)
- Rationale for the surrounding buffer area included with the planning region
- Decisions made for calculating weight and distance values
- Decisions related to the methods used for averaging raster grid cell values for each occurrence

Vista automates the process of producing metadata that is compliant with the Federal Geographic Data Committee (FGDC) metadata standards. See http://www.fgdc.gov for more details on metadata standards.

CONFIDENCE ATTRIBUTES

Objectives

The purpose of the confidence process is to assign a specific value (ranging from 0.0 to 1.0, low to high confidence, respectively) that describes the spatial and temporal confidence associated with each occurrence of an element. These values may represent either a statistically-derived assessment of data accuracy or qualitatively-derived, categorical values of confidence in the data, as specified and documented by the user. Confidence values can be used in Conservation Value analyses to indicate the degree of certainty that the element is actually present in and throughout each location (polygon) indicated in the distribution layer for that element.

Products

The confidence attribute can be expressed in two products, as follows:

- Values stored in a column associated with a vector distribution theme that indicate confidence in presence of the element for each associated occurrence.
- Values assigned to occurrences of an element based on raster themes having cell values that indicate confidence that the element is present

in corresponding locations of the vector distribution layer. Raster themes can include land cover layers and modeled distributions.

In addition to these products, a single value that represents confidence for all occurrences of a particular element can be assigned based on knowledge of data quality without being expressed as either an attribute of a vector theme or as a cell value in a raster theme.

Inputs

Confidence values can be input three ways:

- As an attribute of a vector distribution theme, used when a confidence value is assigned for each individual occurrence polygon. The confidence values range between 0.0-1.0, and are generally derived through calculations based on different measures of confidence for each occurrence, as in NatureServe Heritage Element Occurrences (EOs).
- As a raster layer with a 0.0-1.0 confidence value assigned to each individual grid cell, as in a modeled distribution of an element.
- As a single value representing confidence for all occurrences of a particular element (in either raster or vector format), as in common thematic accuracy assessments of land cover maps.

Values associated with occurrences in vector themes result from any occurrence-specific attributes that can be translated to confidence values. For EOs developed according to NatureServe heritage methodology, such attributes could include associated Representation Accuracy (RA), the date that an occurrence was last observed, assigned EO ranks, and information on the digitizing base used to create the occurrence.

Confidence values assigned to cells in a raster theme can be derived from different source data. For example, probability maps that result from predictive distribution modeling can be used to indicate the confidence that an element occurs at the location represented by a cell.

A single value representing confidence for all occurrences of an element can be associated with either vector or raster themes. There are two primary sources used to determine a single confidence value:

- The results of an accuracy assessment performed on an element distribution, a source that typically applies to land cover-type elements (e.g., ecological systems, vegetative communities) with distributions created from remotely sensed data.
- An educated or expert opinion about the confidence associated with an element distribution based on comparisons to known locations where the element occurs, personal experience with the element in the field, etc.

Methods Summary

The methods described here are a fairly robust approach to assigning and documenting confidence in element presence. While the methodology assumes that a large amount of information can be used to derive confidence scores, it is flexible enough to allow the use of whatever information is available, including simple expert opinion about data quality. The data development team and decision makers must decide on the definition of confidence attributes to be used for the project, specifically whether confidence will represent the relative value (from low to high) of data quality, or will represent an actual probability of element occurrence. To make that decision, available data must be reviewed to determine whether it supports the definition of confidence to be used, and available time and resources must be evaluated to assess whether they are sufficient to implement that definition.

While element confidence values provide for a more robust analysis, they may be very difficult and/or time consuming to determine. In the case of some elements, they may be unnecessary to apply. For example, confidence values wouldn't likely have meaning in the case of designated priority zones (priority conservation or wildlife areas), cultural features, protected areas, etc. In the case where confidence in not applicable or difficult to ascertain, constant values (0.5 for example) can be applied equally to elements to fulfill this requirement.

A confidence value is a measure of certainty that the element is actually present in a location designated in its distribution layer. Confidence values may be derived from a single input, such as a probability raster, or can be determined from a combination of several inputs that affect confidence. These input types represent spatial and/or temporal characteristics of confidence that can then be used to calculate a net confidence value for an occurrence. Four confidence types can be considered in assessing net confidence, listed below.

Locational Precision - Confidence that the boundary of an occurrence reflects the true location and extent of the element at that location, based on actual field observation rather than on the limitations inherent in portraying occurrences on a map (see Map Resolution confidence below)

Presence - Indication of whether the element is extant at a location (versus extirpated, extinct, or historical) based on field observation, the date of observation, or on the date of the base information used to map or model the element's distribution

Map Resolution - Based on the scale of maps used to represent the occurrence, or to create a distribution through a modeling process

Modeled - Indication that the distribution was developed using modeled or remotely sensed data as surrogates for direct observation of the element

Each type can be assigned a value ranging between 0.0 and 1.0 according to its representation of confidence for the occurrence. The net confidence associated with an occurrence is then derived by multiplying together each of the values assigned for these components, weighted as needed to allow for different confidence types to be more significant in the output (e.g., Map Resolution may be only half as important as Presence, and so would be assigned a lesser weight). The general formula used to calculate a net confidence value to be used for Conservation Value analyses is

Net Confidence = (Locational Precision * w1) * (Presence * w2) * (Map Resolution * w3) * (Modeled * w4)

where:

Locational Precision = Locational Precision confidence, based on the accuracy of occurrences mapped on the basis of field observations, including any uncertainty buffers

Presence = Presence confidence, based on the status of the element as extant, extirpated, or historical determined through observation, or on the date that observations were made, or on the date of input maps used to model distributions, or on any other uncertainty associated with its presence

Map Resolution = Map Resolution confidence, based on the scale of maps used to create distributions

Modeled = Modeled confidence, based on whether the occurrence was derived from a distribution model or remotely sensed data

w1 = weight of Locational Precision component

w2 = weight of Presence component

w3 = weight of Map Resolution

w4 = weight of the Modeled confidence

Note that generally all four of the confidence types are not applicable and/or utilized in determining the net confidence for occurrences, although using all confidence types would result in more realistic representation of the certainty of the occurrence data. The net confidence value is significantly affected by the number of types used in its calculation. The greater the number of confidence types used for occurrences in the analyses (i.e., Locational Precision, Presence, Map Resolution, and Modeled), the greater will be their influence on lowering net conservation values. An important consideration, therefore, is to ensure that elements with more information about confidence attributes not have their net confidence score reduced more than other elements with less information. Care should be taken to appropriately weight confidence factors to achieve equitable treatment. In addition to effects on net confidence values, utilizing a greater number of confidence types to assess confidence can increase both the complexity and cost of data preparation substantially. The user of the information should determine the relative value of confidence information to their application of the data and budget accordingly.

If a particular confidence type is irrelevant or has been excluded uniformly due to project constraints and is not to be included in calculating net confidence, a 1.0 value should be used for that type in the calculation, causing no effect. One way to think about assessing values for the different confidence types associated with an occurrence is to assume an initial value of 1.0; then, based on the amount of uncertainty indicated through evaluation of pertinent data, the value for that confidence type would be down-ranked accordingly. In cases when data is insufficient to assess certainty for a confidence type to be included in net confidence calculations, a confidence value that is appropriate for unknown should be assigned. For example, if the current status of an observation is unknown, the value assigned for the Presence confidence might be 0.5. There should be consistency in determining the confidence values to be used to indicate the same degree of uncertainty.

A number of methods can be used to determine values for the confidence types to be used to calculate net confidence; potential methods are described in the separate process sections for each type of confidence. Depending on the data available for elements, some of the tasks listed as components of the process for assigning confidence values may not be necessary or appropriate.

Although they are very useful for informing data users about the likelihood that an element is actually present in each mapped polygon, confidence values associated with distribution maps are currently used only in Conservation Value analyses.

Select a task below to see a detailed description of the process for assigning confidence.

Background

Uncertainty is inherent in all data and models, and data on elements of biodiversity and their locations are typically subject to greater uncertainty than much other data used in planning, such as topography, hydrography, and infrastructure. The type of uncertainty associated with occurrences of elements in a planning region, and the magnitude of such uncertainty can, and should, affect the planning process for that region. Uncertainty exists in every aspect of the planning process, including

- Input data, based on such factors as data collection techniques and timing, data format (i.e., points, lines, polygons, or rasters), human error, map scale, and natural variability
- Calibration and categorization of the data (e.g., whether the mapped location of an occurrence reflects its actual location,

whether the element present at that location has been correctly identified)

- Data processing (e.g., assumptions incorporated in the model, aggregation and classification of the data, spatial data processing)

While it is recognized that uncertainty associated with data cannot be eliminated, Vista provides both a process and tools to evaluate and document this uncertainty by assigning values that reflect data confidence. There are five separate types of confidence that can potentially be used to determine the overall confidence (uncertainty) associated with data, described in detail below.

***Locational Precision**,* a type of spatial confidence, is indicated through the boundary of the feature used to represent an occurrence. High confidence indicates that the occurrence boundary precisely reflects the true location, size, and shape of the element occurrence (to the extent that it has been surveyed in the field). However, when confidence is low, the boundary of the occurrence may not reflect the actual location and/or extent of the element, insofar as it has been surveyed. The primary concerns with locational precision confidence are that the map may falsely indicate that an element is located in a unit, fail to indicate an actual occurrence, misrepresent the known size of the occurrence, or misrepresent the known shape of the occurrence. Any of these errors could lead to either conservation of areas where goals for the element cannot be achieved, or to failure to conserve important occurrences or portions of occurrences that were not precisely mapped.

***Presence**,* a type of temporal confidence, indicates whether an element is actually extant at the location indicated by an occurrence, or whether the location may represent an extirpated, extinct, or historical occurrence. Presence can be assessed on the basis of two differing sources of data: 1) direct observation of an element, and 2) the date of an observation combined with information on landscape changes over time. In the first instance, actual observation records resulting from field surveys that indicate whether an element can still be found at the location are used to establish presence. In the second case Presence confidence is based on the date of an observation, with the assumption that older observations will have lower confidence because changes on the landscape or in land use since observations were made may have either eliminated the element, or led to changes in the size and/or shape of its distribution. Other data that may be evaluated in terms of date include remotely sensed data or modeled distributions, with the date of the most dynamic input used in the mapping/modeling used to assess presence; this will typically be the date of the imagery used to produce a land cover layer from which an element distribution is mapped or modeled.

When Presence confidence information is available for an individual occurrence, it can be used in determining the net confidence of that occurrence. However, when presence status is applicable to an element (e.g., a species extirpated in a given jurisdiction), the value for confidence would be applied to each of the occurrences in its distribution (located within that jurisdiction). For example, a historical record could indicate quite precise locations of nests for a bird species that is now known to be extinct or extirpated from a given planning area. All of these extirpated occurrences would uniformly receive a zero percent Presence confidence that the bird would be found if the sites were revisited. The Presence confidence measure is particularly important for restoration, however, since high confidence that an element was once actually extant at a location could suggest some probability for its restoration to that site.

Map Resolution, a type of spatial confidence, is based on either the scale of the maps used to represent occurrences of the element, or the scale of the maps used to create a modeled predicted distribution. This type of confidence is closely related to Locational Precision, but rather than assessing confidence in the mapped occurrence, Map Resolution is concerned with how Locational Precision is affected by mapping unit representation. For example, if an observation of a rare plant occurrence measuring four square feet is represented in a raster cell of one square mile, the confidence value for Map Resolution would be quite low compared to the use of that same mapping to depict the distribution of extensive forest types. In vector maps, the use of very small-scale national range maps to depict the distribution of an element within a county would also be assigned very low Map Resolution confidence.

Modeled confidence, a spatial component, is used to indicate that an element distribution is inferred from surrogates of its presence rather than actual observation. Modeled occurrences are developed partly or entirely from one or more predicted distribution models and/or remotely sensed data (depending on the type of platform, e.g., satellite imagery versus low altitude aerial photography). Because most distributions developed from remotely sensed data include some degree of modeling, this confidence attribute is referred to as simply "Modeled." There is inherent uncertainty in distributions developed from such data since the occurrence of elements was not directly observed and/or measured in the field. These models may be assessed for accuracy in the same way a thematic land cover map is assessed if, in fact, the feature to be modeled could be observed on the ground. In other instances, some initial confidence value might be derived from quantitative accuracy scores for a major model component (e.g., vegetation type), while others might require a qualitative valuation of the model quality to derive a relative score.

Using the recommendations provided in the Vista documentation for data preparation and assessing confidence, different confidence types can be used to determine net confidence values. A net confidence value can be associated with either an individual occurrence or distribution polygon representing an element, or with a grid cell of a raster confidence layer. Alternatively, a single value representing net confidence can be associated with all occurrences of an element, depending on which confidence types are available to determine that value. Knowledge of uncertainty in the data may help to determine the suitability of the data for addressing particular questions in the planning region, providing an indication on whether additional data should be collected or acquired.

Limitations

Vista currently uses only a single net attribute of confidence per occurrence polygon or raster grid cell. Retaining all of the attributes used to calculate a net confidence value may be valuable; the confidence attributes can be accessed directly through the Environmental Systems Research Institute (ESRI) ArcView application when decisions need to be made on issues that may be sensitive to confidence type (e.g., locational precision versus assumed extirpated versus age of observation, etc.).

When the confidence attributes of elements are included in Conservation Value analyses, they have the effect of lowering the conservation values of grid cells in proportion to the confidence scores of all elements selected and occurring at any particular location. However, low confidence does not necessarily mean that the elements observed or predicted for that location are not present, but rather that characteristics of the data (e.g., age of the observation, scale of the input maps) and/or changes that have occurred at the location reduce certainty that the element is present. It is recommended that different types of Conservation Value Summaries be developed - both with and without confidence in order to evaluate its effect of lowering the value of areas that are otherwise indicated by the data to be of conservation importance. It is important to prioritize areas for near-term conservation action based on confidence in the data, however, the optimal solution for low certainty is to increase the confidence of element observations/predictions (e.g., by obtaining more current data, by using finer resolution maps).

There is inherent uncertainty based on the size of the grid cell used for mapping element occurrences (observed or modeled) in a raster format. This uncertainty is also present in the processing of raster maps for Conservation Value analyses. The larger the cell size used for mapping and processing, the less confidence there is in making decisions for management units at a finer resolution (e.g., parcels from a legal town map). Vista uses the original confidence attributes of the elements and does not recalculate confidence when analytical cell sizes are changed. See the topic Determining Grid Cell Size for further information on the effects of cell size on analyses.

Confidence values are based on locations where elements have been observed or predicted; there are no confidence values assigned to locations where elements are not known or predicted to occur. In other words, Vista currently does not utilize a value for confidence that a location does *not* contain an occurrence of a particular element. While such knowledge would be very useful, the guiding assumption is that predictive distributions should be employed where existing occurrence information is known to be incomplete (most cases); using only existing data would lead to large errors of omission in element distribution. Errors of commission, that is, mapping elements as present where they are not, is a common result of predictive distribution modeling, which is designed to utilize precautionary principles in predicting element presence. Therefore, when employing predictive distribution maps, there may be higher confidence that areas depicted as lacking elements are truly lacking conservation value, than the opposite and more dangerous case (i.e., low confidence that areas that show the presence of elements have conservation value).

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Steps in the Confidence Assignment Process

PROCESS FOR ASSIGNING CONFIDENCE VALUES

Evaluate available attribute data for element occurrences

Data on occurrences of elements must be evaluated to determine which have attributes that can be considered indicative of the certainty, or confidence, in that data, and which occurrences will need additional work to determine confidence values. The confidence information available may directly influence which attributes should be included for calculating net confidence values for occurrences, which can then be used in Conservation Value analyses.

Information on the different types of confidence associated with occurrences of elements may be obtained directly from NatureServe Natural Heritage member program databases. NatureServe programs track data for Element Occurrences (EOs), which are developed using standard NatureServe heritage methodology and typically include attributes that can be used to indicate several types of confidence. Representation Accuracy (RA) values, information on the digitizing base used to develop occurrences, associated locational uncertainty, Inferred Extent (IE), and/or, in some cases mapping precision can be used to determine values for spatial confidence. Data including the last date of observation and the assigned EO rank can be used to develop values for temporal confidence. (For additional details on EO methodology, see the *Element Occurrence Data Standard,* found at http://whiteoak.natureserve.org/eodraft/index.htm).

'Nonstandard' occurrence data for elements (e.g., 'modeled' habitat, mapped polygons from remotely sensed data, contiguous landscape areas) may also be utilized in Conservation Value analyses. However, assigning confidence values to 'nonstandard' element data will require some additional processing, depending on the type of confidence to be evaluated.

PROCESS FOR ASSIGNING CONFIDENCE VALUES

Create columns for confidence attributes

Assigned and calculated values for confidence - that is, the four different types of confidence and the net confidence - must be stored in columns associated with the element distribution layers (in vector format). Five columns should be created for each element distribution layer for recording these attributes.

Creating columns for storing associated attribute data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Determine Locational Precision confidence values for occurrences

Locational Precision, a type of spatial confidence, is generally indicated through the boundary of the feature used to represent an occurrence. High confidence indicates that the occurrence boundary precisely reflects the true location, size, and shape of the element occurrence, to the extent that it has been surveyed in the field. However, when confidence is low, the boundary of the occurrence may not reflect the actual surveyed location and/or extent of the element. In addition, spatial data consisting solely of point locations cannot represent the extent of elements and so will always have associated locational uncertainty and, thus, a decreased Locational Precision confidence.

There are a number of ways that values for Locational Precision confidence (ranging from 0.0 to 1.0) can be derived for use in Conservation Value analyses, depending on the feature type(s) of available spatial data (e.g., points, polygons), the methodology used to develop the data, and the resources and needs of the user. Some of these potential methods are described below, categorized as follows: '*standard*' spatial data (i.e., occurrences developed using NatureServe heritage methodology), which may require different processes for assigning confidence depending on currency and associated locational uncertainty, and other '*nonstandard*" data.

'STANDARD' NATURESERVE EO DATA

Because the spatial model and methodology for developing mapped representations Element Occurrence (EO) has been revised in the last decade, 'standard' EOs may have somewhat different spatial characteristics. The best method for assigning Locational Precision confidence will vary depending on the type of EO (e.g., point, circular polygon, polygon).

If the current NatureServe heritage methodology was used to develop EO representations, the resulting polygons have several associated attributes that can be used to assess Locational Precision confidence: Representation Accuracy (RA), locational uncertainty, and/or Inferred Extent (IE). Because the boundaries of such EOs are developed to include locational uncertainty (i.e., uncertainty that the true location of an element on the ground is accurately represented by the location of the element on the map), there may be area incorporated in an EO that is not actually occupied by the element, but was included to ensure that the location of each underlying element observation was captured within the boundary of that occurrence. (For additional details on EO spatial methodology, see the Element Occurrence Data Standard, found at http://whiteoak.natureserve.org/eodraft/index.htm) Note that the methods for assigning Locational Precision confidence to 'standard' EOs appear in order, with the preferred method listed first, the second next, etc.

Utilize Representation Accuracy values

Representation Accuracy (RA) values are assigned to EOs to indicate their accuracy, that is, the relative amount of the polygon that is comprised of the actual element observation(s), as opposed to area included in the occurrence due to locational uncertainty. Provided that RA values have been assigned (or if they can be assigned), a mapped EO with significant area incorporated for locational uncertainty (i.e., having low RA) should generally be down-weighted in Locational Precision confidence relative to another EO in which the boundary is thought to accurately represent the element location (i.e., having high RA).

Assign high confidence if locational uncertainty type is 'negligible'

Lacking RA values (and the means to assign RA values), an assigned locational uncertainty type of 'negligible' indicates that EOs have been created on the basis of very precise locational information for the element. Such EOs have no additional area included in their boundaries for locational uncertainty, but may result from application of a procedural buffer in order bring a point or line feature up to the size that equals the minimum mapping unit for the scale map being used (e.g., for a 1:24,000 U.S. Geological Survey topographic map, the minimum mapping unit is 12.5 meters, or approximately 40 feet). The Locational Precision confidence assigned to EOs with associated negligible locational uncertainty should be high - typically, a value of 1.0.

Utilize Inferred Extent features as appropriate for selected animal EOs

EOs for some animal elements that have a locational uncertainty type other than 'negligible' (i.e., 'linear,' 'areal delimited,' or 'areal estimated') and lack RA values can be utilized to develop Inferred Extent (IE) features that may be useful in assigning Locational Precision confidence. Note that in many instances, IE features may have already been created by the NatureServe member program. In order for IE to be an option for determining confidence, the feature created by buffering the underlying source data for the EO by the IE distance provided in EO specifications for the element must be larger than that EO. If so, then the IE distance can be applied to the Source Feature to create a new IE feature associated with the EO. Note that IE features should be edited to remove any areas known not to be occupied by the element (e.g., for a terrestrial animal, the portion that extends into a body of water should be removed). Because IE distances are based on home range and/or dispersal distances for the element, the Locational Precision confidence value assigned to IE features should be relatively high (0.95) since the areal extent of such features should be generally equivalent to the minimum needed to meet spatial requirements of the animal.

Compare EO area with the average occurrence size for the element

Lacking RA values and associated IE features, Locational Precision confidence for EOs with 'linear,' 'areal delimited,' or 'areal estimated' locational uncertainty can be determined using area. More specifically, dividing the average area for an occurrence of the element in that geographic area by the area of the EO will result in a calculated value for Locational Precision confidence, but only if the EO area is greater than the average. In such cases, it could then be surmised that a significant amount of locational uncertainty had been included in the occurrence; thus, Locational Precision confidence would be diminished. Expressed as a formula:

$$LPC = A_A \div A_{EO}$$

where:

LPC = Locational Precision confidence

A_A = Area of average occurrence

A_{EO} = Area of occurrence

and:

$$A_{EO} > A_A$$

In cases when EOs are circular features with a locational uncertainty type of 'areal estimated,' they have been developed by applying a buffer for the uncertainty distance assigned to the occurrence to the underlying point location. Uncertainty distances can be selected from a set of recommended uncertainty distance classes (with the larger value in each range used as the buffer), or a custom distance can be specified. In cases when point EOs developed using the previous methodology have been converted to the current methodology, custom distances equivalent to the legacy mapping Precision values associated with the EO points are used as buffers. Note that if EOs are in the form of points, buffer distances appropriate for assigned Precision values (if available) should be applied to create circular polygons. The table below shows the set of NatureServe uncertainty distance classes and the custom buffer distances used for Precision, along with the resulting area of EOs produced by buffering points with these distances (i.e., the area resulting from added locational uncertainty).

	Buffer distance applied to point EO (in meters)	Area of EO (i.e., area of added uncertainty) (in acres)
NatureServe Uncertainty Distance classes	>6.25 – 25	0.5
	>25 – 50	2
	>50 – 100	8
	>100 – 200	31
	>200 – 400	125
	>400 – 800	500
	>800 – 1,500	1,750
	>1,500 – 4,000	12,400
NatureServe Precision values (legacy data)	Seconds = 100	8
	Minutes = 2,400	4,500
	General = 8,000	50,000

Areas of circular polygons created using uncertainty distance class or Precision buffers.

Example:

An occurrence of California Black Rail with 'areal estimated' locational uncertainty has an assigned uncertainty distance class of >100-200 meters, and has thus been mapped using a 200-meter buffer. The resulting feature has an area of 31 acres (see table above). If the average occurrence of this species is known to be 20 acres, the Locational Precision confidence of the EO is 20 ÷ 31 = 0.65.

The average area for occurrences of a particular element may be obtained from an expert, or may be determined by calculating the average size of occurrences for the element, using those in the distribution layer developed for the project as well as occurrence data from other sources to ensure a more reliable result.

In the absence of sufficient data to calculate the average occurrence size for an element, values developed for groups of species, described below, could be utilized.

Using 1995 data from NatureServe heritage Element Occurrence (EO) records, the average occurrence size was calculated for species in each of the following groups: mammals, birds, reptiles, amphibians, fishes, invertebrates, and vascular plants. The average amount of habitat (in acres) occupied by a species was calculated using values in the Size of EO field of those occurrences records where size was recorded. Extreme values (approximately the upper and lower 5%) were excluded from the calculation. The resulting averages, by group, are: mammals - 989 acres; birds - 525 acres; reptiles - 219 acres; amphibians - 183 acres; fishes - 501 acres; invertebrates - 185 acres; vascular plants - 10 acres. These values were then rounded and combined, resulting in the following average amounts of habitat occupied for each occurrence of a species, by group:

- Mammals -- 1,000 acres
- Birds & fishes -- 500 acres
- Reptiles, amphibians, & invertebrates -- 200 acres
- Vascular plants -- 10 acres

'NONSTANDARD' OCCURRENCE DATA

Spatial data developed using processes other than those embodied in NatureServe heritage methodology are referred to as 'nonstandard.' Such data can result from a number of different processes, including modeled habitat, polygons mapped from remotely sensed data, and contiguous landscape areas.

Process into 'standard' EOs

For some 'nonstandard' spatial data it may be possible to apply criteria found in the EO specifications for the element to the data (see the Develop Distribution Layers task for details). In such cases, the data is essentially processed into 'standard' NatureServe Element Occurrences (EOs) by applying separation criteria, and Locational Precision confidence could then be assigned as described in the preceding section.

Utilize EO area with the average occurrence size for the element

'Nonstandard' polygon data that cannot be processed into 'standard' EOs may be evaluated using the average area of occurrences for the element and the actual area of the feature, as described in the 'standard' EO section above.

Assign appropriate value if confidence cannot be determined

If data (both 'standard' and 'nonstandard' types) for occurrences are insufficient to assign a Locational Precision confidence value but this type will be used to calculate net confidence for occurrences in the project, a value appropriate for unknown (e.g., 0.5, 0.2) should be assigned instead of 0.0. This will insure that the net confidence will not equal 0.0 in cases when there is a lack of data to assign values for all confidence types to be included in the analysis.

Data that may be difficult to assess in terms of Locational Precision confidence include NatureServe network program EOs that lack assigned Representation Accuracy (RA) values, that have a locational uncertainty type other than 'negligible,' that cannot be represented by Inferred Extent (IE) features, and that lack uncertainty distance buffers (e.g., a plant EO with 'areal delimited locational' uncertainty lacking RA). 'Nonstandard' occurrence data that cannot be processed into 'standard' EOs may also be difficult to assess for Locational Precision confidence.

Record values in column of element distribution layers

Populate the appropriate column in the associated distribution layers with Locational Precision confidence values.

Record a value of 1.0 in the column if Locational Precision confidence is not to be used in assessing net confidence for occurrences in the project. Using 1.0 to represent this confidence will ensure that there will be no effect on net confidence calculations by excluding this type.

Determine Presence confidence values for occurrences

Temporal confidence indicating whether an element is actually present, i.e., is extant, at the location indicated by an occurrence is represented by Presence confidence. This confidence can be based on actual field survey data for the element, or on the age of associated element information, with the assumption that older data will generally indicate less confidence that the element is still present at a particular location. If the necessary attribute data are available for occurrences, then a value representing Presence confidence can be assigned to each occurrence; alternatively, a single confidence value may be appropriate to assign to all occurrences of a specific ecological element.

There are a number of ways that values for Presence confidence (ranging from 0.0 to 1.0) can be derived for use in Conservation Value analyses, depending on attributes associated with occurrences, the methodology used to develop the data, and the resources and needs of the user. Some of these potential methods are described below, categorized as follows: 'standard' occurrence data (i.e., data for Element Occurrences [EOs] developed using NatureServe heritage methodology), and other 'nonstandard' data.

'STANDARD' NATURESERVE EO DATA

NatureServe Element Occurrences (EOs) have been developed with attributes that can, in most cases, be used to assess Presence confidence. Specific data that can be used to indicate confidence include the last observation date for the occurrence and EO ranks.

Utilize last observation date

The Last Observation Date field in an EO record contains the most recent date that the element was actually observed at that location. It is generally assumed that older dates indicate lower Presence confidence, but this can be adjusted based on expert opinion, or on the basis of data indicating the land use and/or management policy at an EO location has changed, which may then affect the likelihood of its continued presence.

If date is to be used to assign Presence confidence, there are a number of ways that dates can be translated into a numerical value ranging from 0.0 to 1.0 to represent confidence. In some cases, a straight linear decrease in confidence value from the present day to the date of observation could be used, while in other situations, some nonlinear decreasing function from the present day to the date of observation might be more appropriate.

In areas where data indicating land use and/or management policies that could affect the continued presence of occurrences are available, it may be useful to obtain or develop layers that identify these different areas within the planning region and/or indicate areas where the land use/policy has changed within a specified time frame (e.g., 1 year, 5 years). Intersecting these layers with element distributions would identify occurrences that are more likely to have persisted as well as those that have probably been extirpated, thus facilitating refinement of Presence confidence values assigned on the basis of date. For example, an occurrence last observed fifteen years ago would have an assigned confidence value based on the date of that last observation; however, if the occurrence is in a national park where little change has occurred in the last 50 years, the confidence value could be increased to reflect greater confidence that the occurrence is still present at that location. Another example would be an occurrence observed two years ago at a site that is now a shopping mall; in this case, the confidence value assigned for a very recent last observation date would be decreased since there would be virtually no confidence that the occurrence remains.

Utilize EO rank

'Standard' NatureServe EOs typically have assigned EO ranks, determined through the application of EO rank specifications. Ranks of A, B, C, and D indicate the estimated viability of species occurrences, or the ecological integrity of community occurrences, and thus the likelihood of persistence. Other EO ranks are used for locations representing extirpated or extinct occurrences (E rank), or historical occurrences (H rank). (For additional details on EO ranks and rank specifications, see the Element Occurrence Data Standard, found at http://whiteoak.natureserve.org/eodraft/index.htm)

Occurrences that have assigned EO ranks should be evaluated in terms of how current the ranks are, and updated as needed using EO rank specifications developed for the element. For occurrences without ranks, it may be possible to assign EO ranks using rank specifications criteria. EO ranks can then be converted into Presence confidence values (ranging between 0.0 and 1.0), for example:

EO Rank	Presence Confidence Value
A = excellent viability/integrity	**1.0**
B = good viability/integrity	**1.0**
C = fair viability/Integrity	**1.0**
D = poor viability/integrity	**1.0**
E = extant	**1.0**
U = unrankable	**0.75**
H = historical	**0.50**
F = failed to find	**0.50**
X = extirpated	**0**

Example of values that could be used to convert EO ranks to Presence confidence.

'NONSTANDARD' OCCURRENCE DATA

Data developed using processes other than those embodied in NatureServe heritage methodology are referred to as 'nonstandard.' Such data can result from a number of different processes, including modeled habitat, polygons mapped from remotely sensed data, and contiguous landscape areas.

Determine date of source data used to develop 'nonstandard' occurrences

Presence confidence for 'nonstandard' occurrences can be assessed using the age of the most dynamic input data that was used in mapping and/or modeling the occurrences. Typically this will be the date of the imagery (e.g., aerial/satellite views) used to produce a land cover map, from which an element distribution is then mapped or modeled. In some cases, the age of the underlying data can be evaluated in terms of EO rank specifications for the associated element, and an appropriate EO rank assigned (e.g., H = historical, E = extant). This rank could then be translated to a value indicating Presence confidence using the conversion table above.

Assign presence/absence values to raster source data

Presence confidence for 'nonstandard' occurrence data in raster format can be indicated through the use of a non-zero value up to 1.0 (i.e., >0.0 to 1.0) for grid cells in which an element is located, and an assigned value of 0.0 to indicate its absence.

Down-rank Presence confidence values for modeled occurrences

Presence confidence values assigned to modeled habitat areas need to be down-ranked to indicate the uncertainty associated with distributions that are modeled rather than actually observed in the field. (See also, the Modeled confidence section.) Considering the confidence equivalents for EO ranks shown in the conversion table in the previous section, modeled occurrences could be assigned a Presence confidence value of 0.25 to indicate the associated uncertainty with the data.

Assign appropriate value if confidence cannot be determined

If data (both 'standard' and 'nonstandard' types) for occurrences are insufficient to assign a Presence confidence value but this type will be used to calculate net confidence for occurrences in the project, a value appropriate for unknown (e.g., 0.5, 0.2) should be assigned instead of 0.0. This will insure that the net confidence will not equal 0.0 in cases when there is a lack of data to assign values for all confidence types to be included in the analysis.

Record values in column of element distribution layers

Populate the appropriate column in the associated distribution layers with Presence confidence values.

Record a value of 1.0 in the column if Presence confidence is not to be used in assessing net confidence for occurrences in the project. Using 1.0 to represent this confidence will ensure that there will be no effect on net confidence calculations by excluding this type.

Determine Map Resolution confidence values for occurrences

Map Resolution, a type of spatial confidence, is indicated through the map scale used to create element distribution layers. Generally, the coarser the scale of the map, the less detail that can be depicted on the map, and the lower the Map Resolution confidence value for occurrences.

There are a couple of ways that values for Map Resolution confidence (ranging from 0.0 to 1.0) can be derived for use in Conservation Value analyses, depending on attributes associated with spatial data for occurrences.

Utilize digitizing base information for NatureServe 'standard' EOs

For NatureServe Element Occurrences (EOs) developed from one or more observations (i.e., Source Features) according to the current NatureServe heritage spatial methodology, data recorded in the Digitizing Base field in each component Source Feature record (specifically, the digitizing base that was used to develop that feature), can be used to determine the Map Resolution confidence for individual EOs.

Evaluate map scale for layers used to develop 'nonstandard' occurrences

The Map Resolution confidence for occurrence data developed using processes other than those embodied in NatureServe heritage methodology (e.g., element distributions based on remotely sensed data or modeling) should be adjusted on the basis of the map resolution of the coarsest input layer. For example, if a model utilizes a land use layer at a scale of 1:24,000 and a vegetation layer at a scale of 1:500,000, the vegetation data represents the greatest uncertainty incorporated in the distribution. Map Resolution confidence for the modeled occurrences should be adjusted accordingly.

Assign appropriate value if confidence cannot be determined

If data for occurrences are insufficient to assign a Map Resolution confidence value but this type will be used to calculate net confidence for occurrences in the project, a value appropriate for unknown (e.g., 0.5, 0.2) should be assigned instead of 0.0. This will insure that the net confidence will not equal 0.0 in cases when there is a lack of data to assign values for all confidence types to be included in the analysis.

Record values in column of element distribution layers

Populate the appropriate column in the associated distribution layers with Map Resolution confidence values.

Record a value of 1.0 in the column if Map Resolution confidence is not to be used in assessing net confidence for occurrences in the project. Using 1.0 to represent this confidence will ensure that there will be no effect on net confidence calculations by excluding this type.

Determine Modeled confidence values for occurrences

Modeled confidence, a component of spatial confidence, is used to indicate that an element distribution has been developed partly or entirely from a spatial distribution model and/or remotely sensed data. There is inherent uncertainty in distributions developed from such data since the underlying information was not directly observed and/or measured in the field. Note that some mapping projects (e.g., land cover layers) may include a thematic accuracy assessment that can be used to develop a value for this confidence attribute. There are several ways that values for Modeled confidence (ranging from 0.0 to 1.0) can be derived for use in Conservation Value analyses, depending on attributes associated with spatial data for occurrences.

Assign a constant value

Modeled confidence can be a constant value determined on the basis of expert opinion, or using the results of an accuracy assessment of the model output.

Assign a value based on a probability surface

In cases when the model used to develop a distribution also results in a probability surface, this can be used to assign a Modeled confidence value.

Assign appropriate value if confidence cannot be determined

If data for occurrences are insufficient to assign a Modeled confidence value but this type will be used to calculate net confidence for occurrences in the project, a value appropriate for unknown (e.g., 0.5, 0.2) should be assigned instead of 0.0. This will insure that the net confidence will not equal 0.0 in cases when there is a lack of data to assign values for all confidence types to be included in the analysis.

Record values in column of element distribution layers

Populate the appropriate column in the associated distribution layers with Modeled confidence values.

Record a value of 1.0 in the column if Modeled confidence is not to be used in assessing net confidence for occurrences in the project. Using 1.0 to represent this confidence will ensure that there will be no effect on net confidence calculations by excluding this type.

Calculate net confidence value for each occurrence

The net confidence associated with an occurrence is derived by multiplying together each of the values assigned for the different component confidence types, weighted as desired.

Determine how component confidence types should be weighted

Determine any weights to be used for indicating greater or lesser significance of the individual component types (i.e., Locational Precision, Presence, Map Resolution, and Modeled confidence) in confidence calculations.

Calculate net confidence values

Calculate the net confidence value for each element occurrence using the formula

Net Confidence = (Locational Precision*w1) * (Presence * w2) * (Map Resolution * w3) * (Modeled * w4)

where:

Locational Precision = Assigned value for Locational Precision confidence

Presence = Assigned value for Presence confidence

Map Resolution = Assigned value for Map Resolution confidence

Modeled = Assigned value for Modeled confidence

w1 = weight of Locational Precision confidence

w2 = weight of Presence confidence

w3 = weight of Map Resolution confidence

w4 = weight of Modeled confidence

Note that a 1.0 value should be used in this formula for any component confidence types determined to be not applicable and/or that are not to be utilized in assessing net confidence.

If there is no value, or a value of 0.0 assigned for any component confidence type to be used in the net confidence calculation, a value appropriate for unknown (e.g., 0.5, 0.2) should be used instead to insure that net confidence will not equal 0.0.

Record values in column of element distribution layers

Populate the appropriate column in the associated distribution layers with net confidence values.

Add net confidence values to Vista

The addition of net confidence values to Vista can be deferred until viability/integrity attribute values have been assigned to distribution layers (if appropriate) so that all element information can be entered into the system at once. However, if it is desirable to input confidence values at this point in the process and distribution layers have not yet been associated with elements, the task of pointing to distribution layers must first be completed (see the task Point to Distribution Layers from Vista). Once a distribution has been associated with an element, attributes can be added using the Vista Element Properties window, specifically in the *Confidence in Distribution* group box on the Spatial tab.

Document products with metadata

The final products of the process are numerical values for net confidence ranging from 0.0 to 1.0 assigned for each occurrence.

Metadata should include documentation on the following:

- Source data used to define Locational Precision confidence (if applicable)
- Source data used to define Presence confidence (if applicable)
- Source data used to define Map Resolution confidence (if applicable)
- Source data used to define confidence values for Modeled occurrences (if applicable)
- Rationale for assigning the values for each type of confidence
- Decisions made for calculating net confidence values

Vista automates the process of producing metadata that is compliant with the Federal Geographic Data Committee (FGDC) metadata standards. See http://www.fgdc.gov for more details on metadata standards.

Data for Scenario Evaluations

LAND USE COMPATIBILITY

Objectives

The purpose of indicating element compatibility with different Land Use Intent (LUI) categories (described in Appendix F) is to permit the identification of areas within the planning region where responses to specific land uses will permit elements to remain viable or maintain ecological integrity. Element land use compatibility is evaluated using Land Use and Conservation Scenario analyses, with the user designating which responses should count toward the achievement of conservation goals and which should not.

Products

Element compatibility is stored as an attribute associated with the LUI categories used in the project.

Inputs

Element experts assess LUI compatibility on the basis of information that can be derived from a number of sources, including academic and government studies evaluating element viability (for that specific element or related elements) in the presence of different land uses, recent surveys that have found viable populations in the presence of certain land uses, or expert opinion.

Methods Summary

Compatibility is assigned by indicating whether particular land uses will permit the element to remain viable (species) or to maintain ecological integrity (ecological elements). The customized list of LUI compatibilities can reflect a gradation of impacts for each element. LUI categories deemed compatible would permit an acceptable level of viability/integrity for the element, while land uses with decreasing compatibility would have an increasingly negative effect on the element's continued existence. For example, transmission corridors would not be compatible with most elements that comprise a forest ecosystem, but may be generally compatible with the elements of a grassland ecosystem.

Select the task below to see a detailed description of the process.

Indicate land use compatibility using Vista

Background

Compatibility indicates whether acceptable levels of viability/integrity for the element are likely to occur in the presence of various land uses that may affect key ecological attributes that support the element. Scenario Evaluations are used to identify areas where compatible land uses are likely to permit the achievement of conservation goals for the element through acceptable viability/integrity, as well as areas of incompatible land uses that could be changed to improve goal attainment.

Steps in the Compatibility Assignment Process

PROCESS FOR ASSIGNING COMPATIBILITY

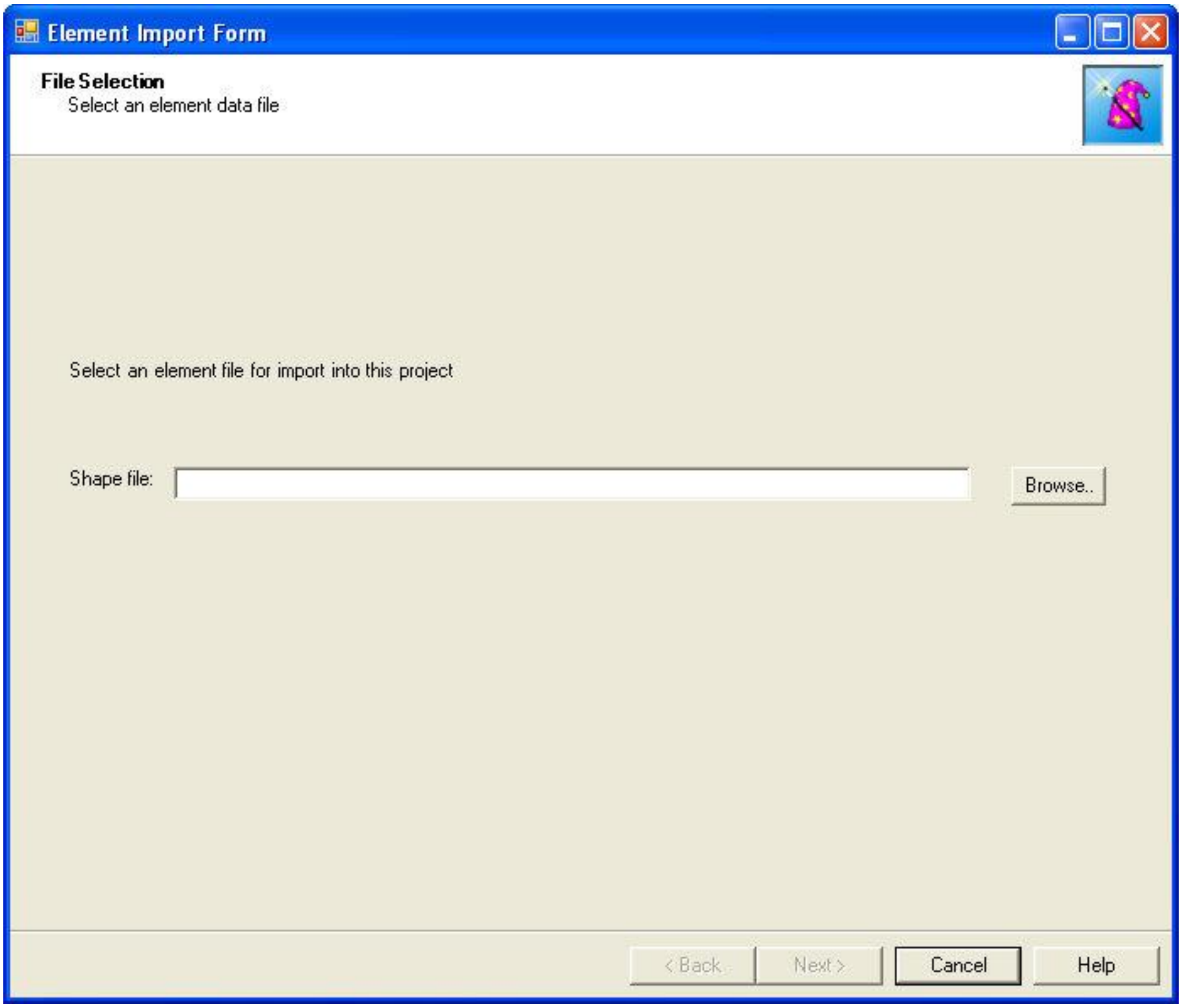
Indicate land use compatibility using Vista

Using the Compatibility tab on the Element Properties window, indicate whether each land use intent category used in the project is compatible with continued viability/integrity of the element.

Windows for Element Data

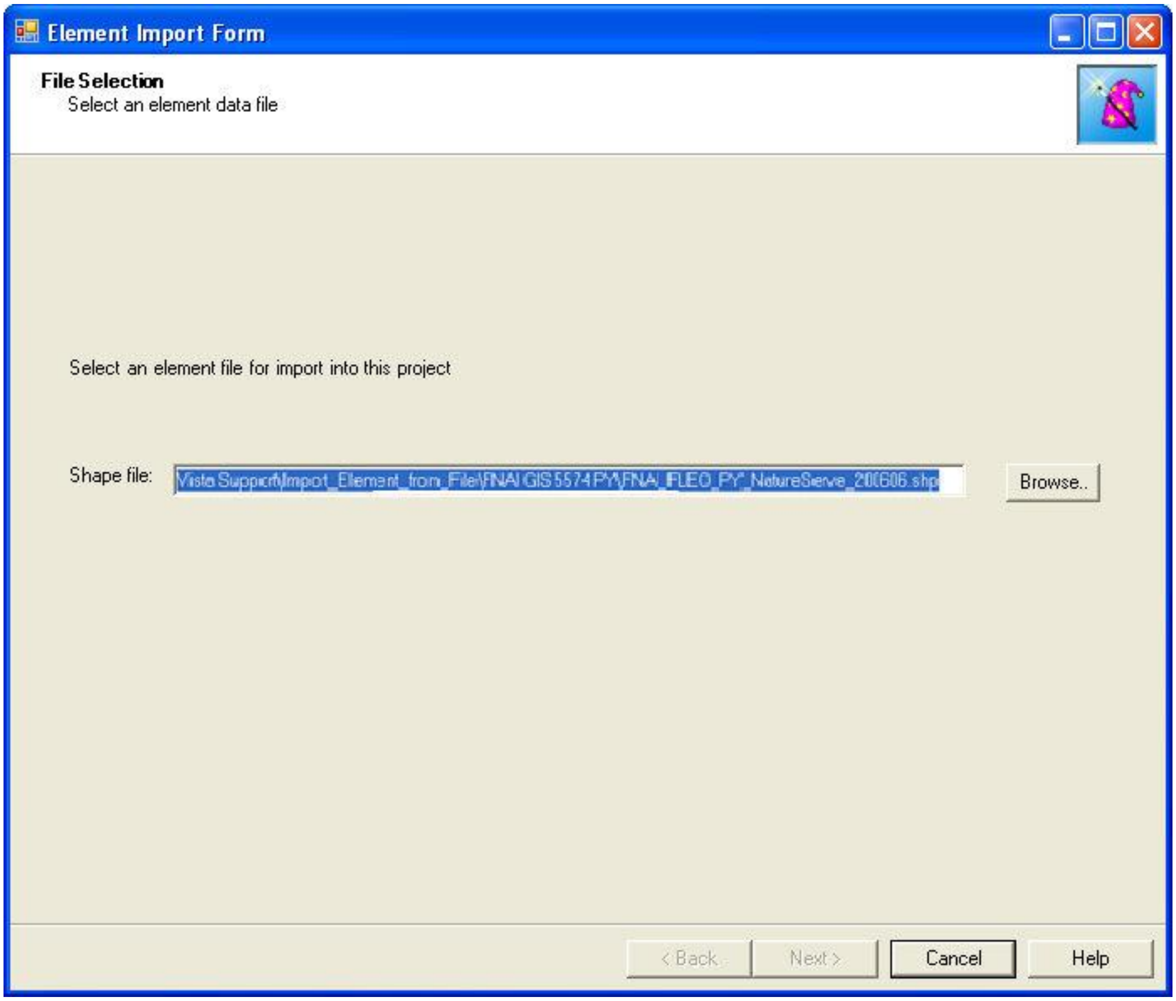
ELEMENT IMPORT FORM

The **Element Import Form** is displayed by clicking **Project ▸ Import Element Properties from File...** from the Vista menu. The form is used to import properties from multiple elements using a shapefile containing their attributes.

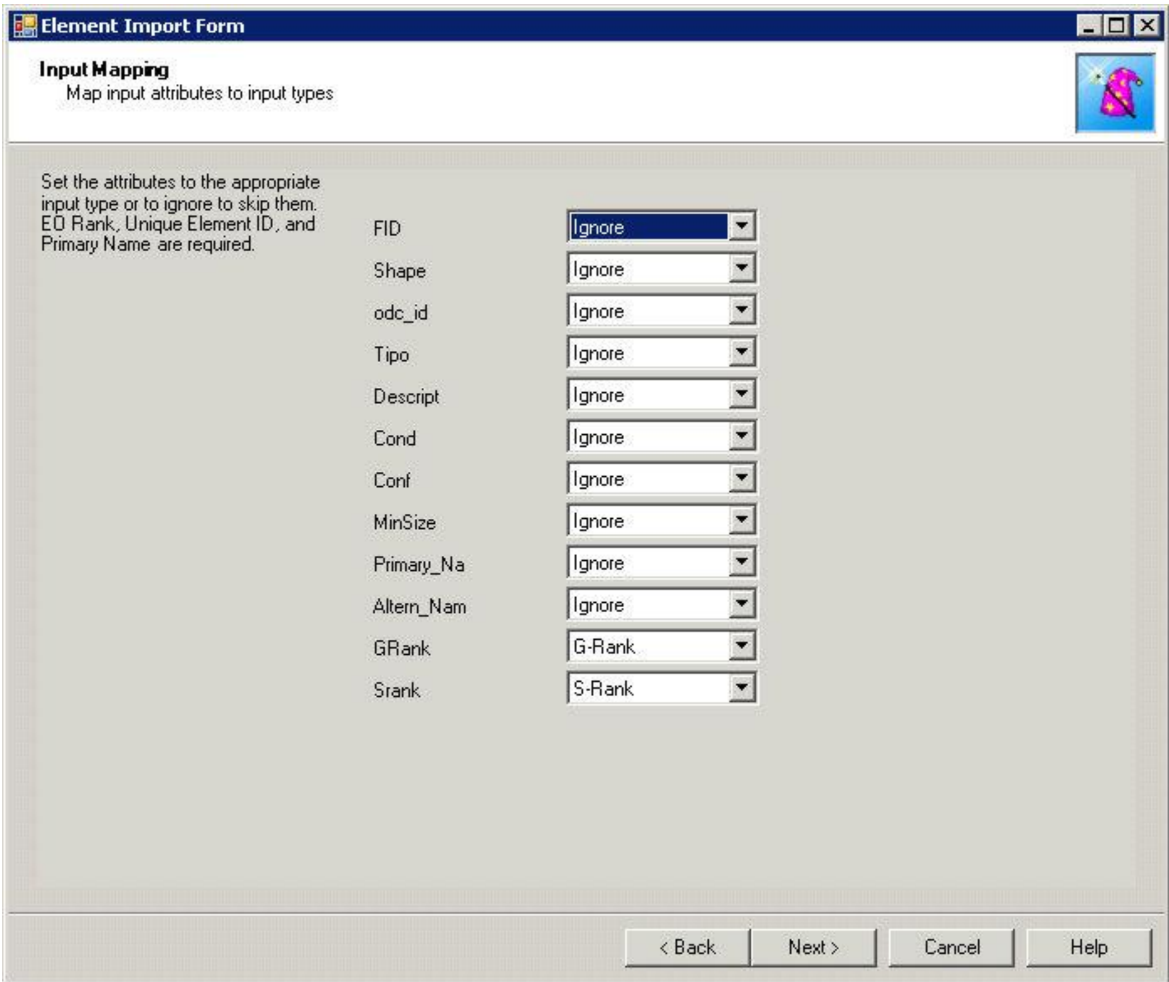


Import element properties:

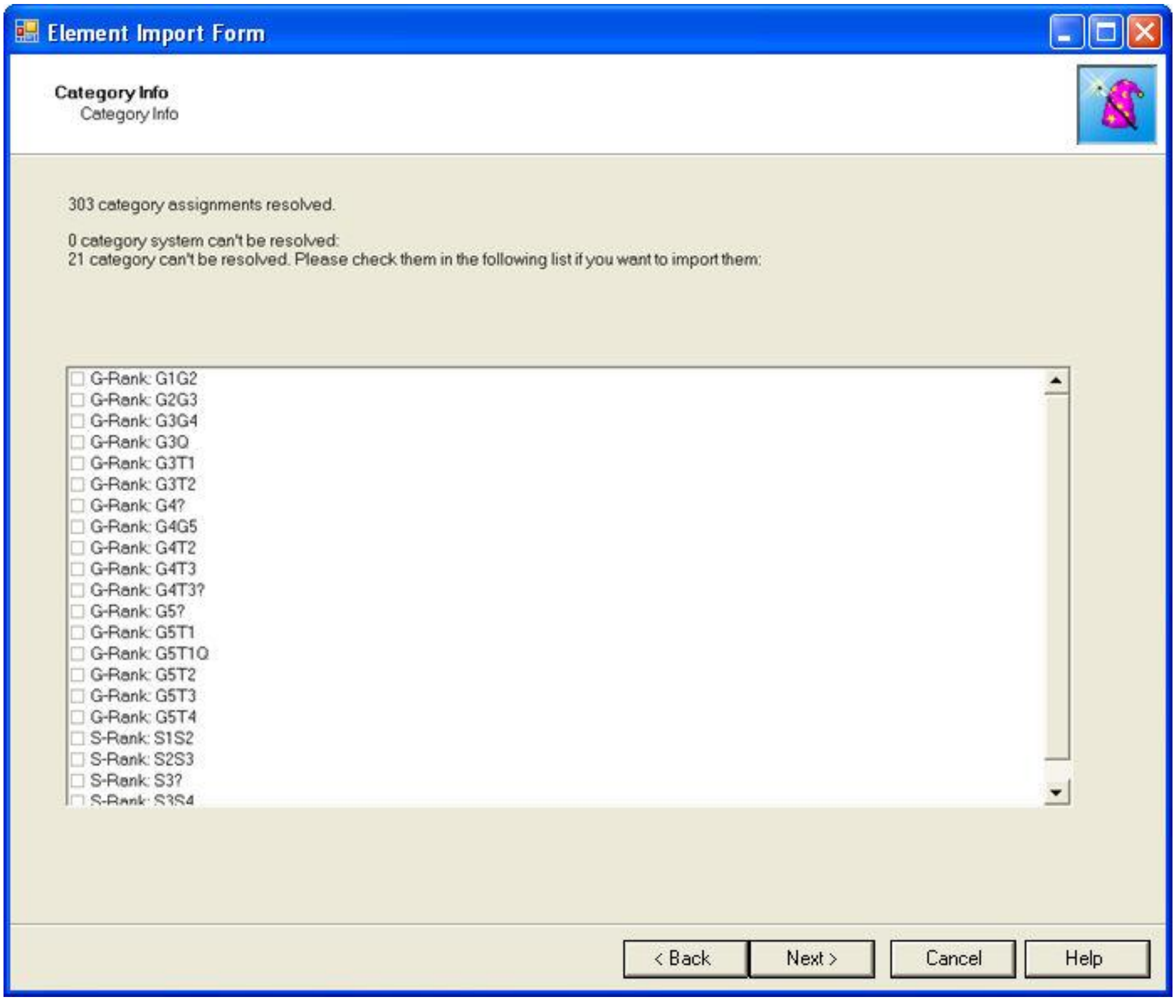
1. Click the **Browse...** button to navigate to a shapefile containing one or more element distributions, select the file, and click **Open,** or alternatively, enter the name of a shapefile directly into the **Shape File** field. Click **Next>**.



2. Edit EO rank to quality/integrity score conversions. Click **Next>**. CAM THIS IS AS FAR AS I GOT



3. Review the attributes that Vista cannot parse, and designate which to import manually. Click **Next>**.

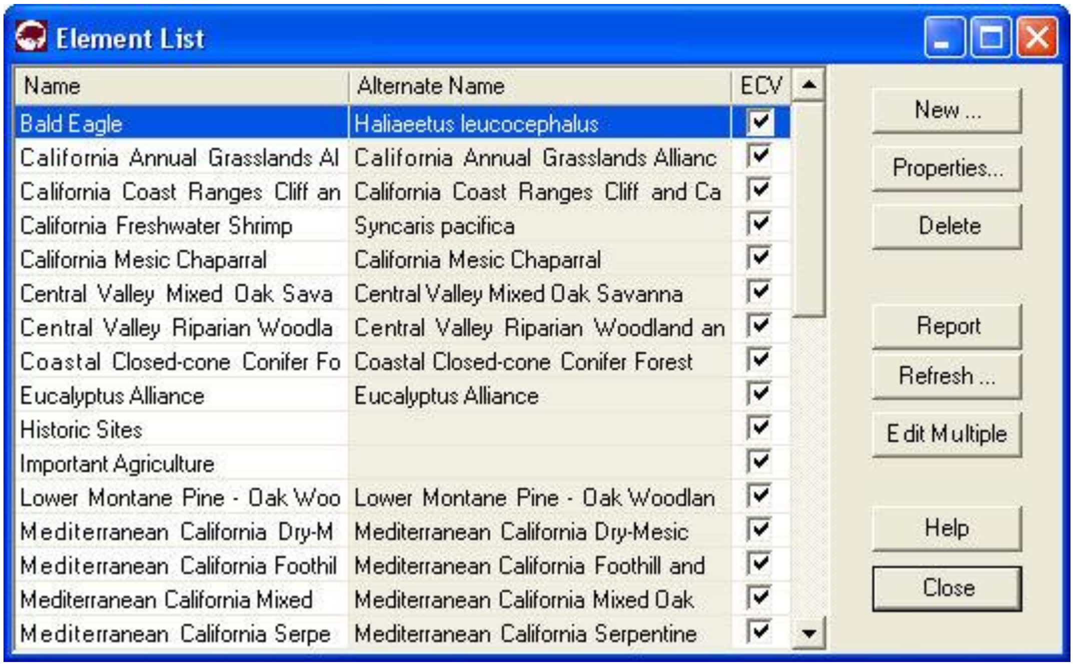


4. After the import process, separate element records will be created for each element in the shapefile. A spatial distribution layer must be specified for each element record before the element can be used in any Vista analyses. By opening the Element Properties window for each element, or by using the **Edit Multiple...** button on the Element List window, additional information can be added or edited.
5. Once the import process has completed and any related data have been entered, all of the elements must be processed by clicking the **Refresh...** button on the Element List window. See Refresh Selected Results for additional information on refreshing elements in Vista.

Element List Window

The **Element List** window is displayed by selecting either **Lists ▸Element List...** or **Manage Elements...** from the NatureServe Vista menu. This window lists all of the elements that have been entered into Vista for use in the project. See the

Element Selection section for more detailed information on elements to be included in a project.



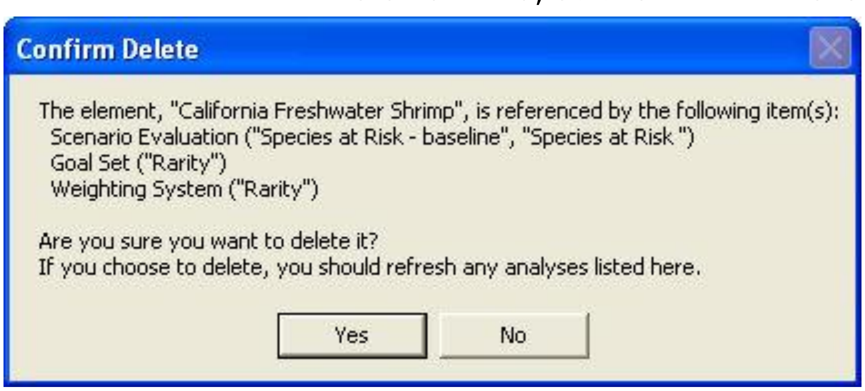
Button functions:

New... displays a new Element Properties window that can be used to add a new element to the project.

Properties... displays the Element Properties window showing details and allowing edits to the element selected in the list.

Delete deletes the element selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented, which includes information on any analytical tools and/or analyses that reference the element to be deleted, as shown in the following example.



Report displays a report for the selected element that provides data related to the element, including its spatial attributes and distribution, as well as its inclusion in category systems used in analyses. See the Reports section for more details on Element Details reports.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for selected elements.

Edit Multiple displays the Multi-Element Property Edit window that can be used to set the value for a selected property across a specified group of elements at the same time.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of an element that will be used in Vista input windows; this is typically the common name for the element.

Alternate Name - secondary name of the element, frequently the scientific name for the element.

ECV - checkbox that indicates that an Element Conservation Value layer has been created for the element.

Element Properties Window

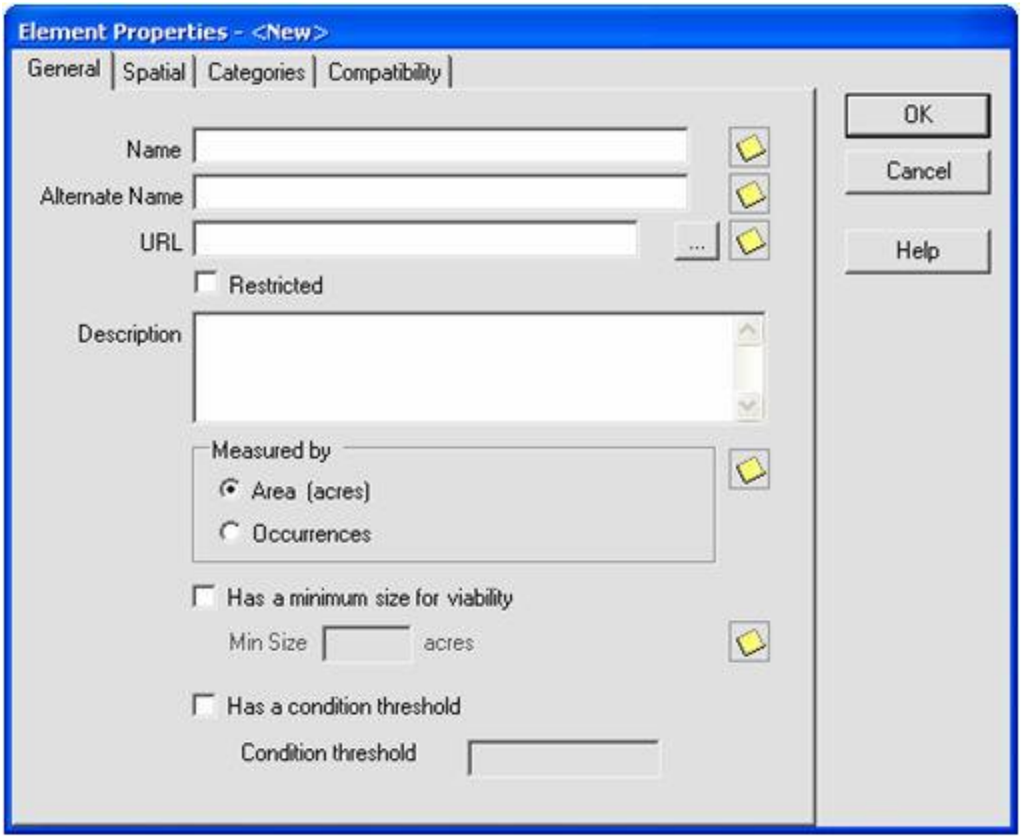
The **Element Properties - <New>** window is displayed by either clicking the **New...** button on the Element List window or choosing **Selection ▸New Element** from the NatureServe Vista menu while an element is highlighted in the Vista Table of Contents. The new properties window is used to add a new element, along with associated distribution layers and attribute data, to the project for use in analyses.

The Element Properties window consists of four tabs for recording specific types information on elements General, Spatial, Categories, and Compatibility. Depending on the analyses to be performed, different fields may be used, and data input may occur at different times. Specifically, some of the items on the General and Spatial tabs are completed for Conservation Value analyses only, while the Compatibility tab is used strictly for Land Use and Conservation Scenario Evaluations.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

Add an element:

General tab input



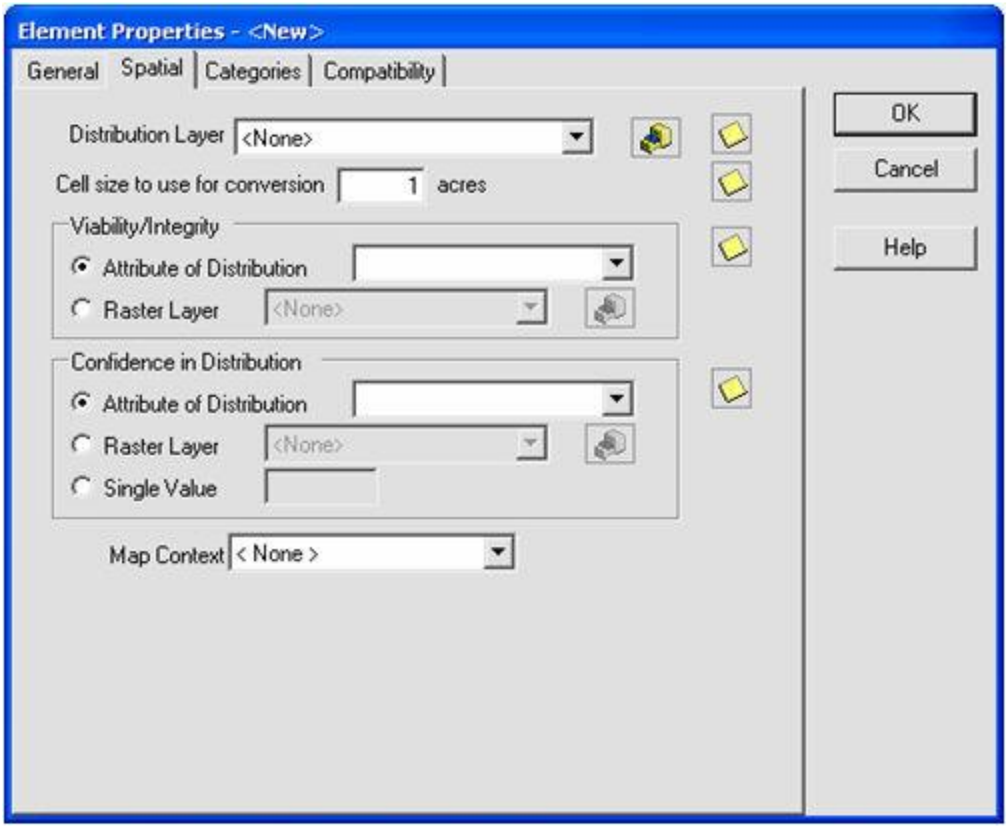
1. Specify a name for the element in the **Name** field. Typically this will be the common name used for the element. The **<New>** on the window title will change to the name of the new element as the entry is typed in.
2. Specify another name for the element in the **Alternate Name** field. Provided that the previous Name field contains the common name for the element, this field is generally used for its scientific name.
3. Enter a web address in the **URL** (Uniform Resource Locator) field that provides information related to the element (e.g., NatureServe Explorer). The  button can be used to open an explorer window that goes directly to the URL entered in the field, or if there is no address specified, the explorer default window will open.
4. If the ability to edit the element data should be limited to members of the data development team, place a check in the **Restricted** checkbox.
5. Enter a brief description of the element in the Description field, if desired.

Note: If records are being created for selected elements before additional data has been obtained/developed, data entry for the remaining fields on this tab, as well as for the Spatial tab and Compatibility tab (if needed), can be deferred until distribution layers have been developed for elements (see the process for developing distribution layers), and any attributes have been assigned (see processes for assigning viability/integrity values and confidence values). It may be a more effective use of data entry time to open each element record only once

to enter all of this information at the same time, rather than repeating the process several times to enter each of these items separately.

6. Indicate whether the distribution of the element is represented by area or by distinct occurrences using the appropriate **Area** or **Occurrences** radio button.
7. Indicate whether there is a minimum size required for viability of the element in the checkbox, and if so, enter the **Minimum Size**. This minimum size value is used to exclude occurrences (i.e., 1 occurrence = 1 record in a distribution shapefile) that do not overlap with both a "compatible" land use and a "reliable" policy in Scenario Evaluation analyses, AND that fail to meet the element's condition threshold, from the total to be compared with the minimum size. If the area of the occurrence is less than the designated minimum size, the entire occurrence is not considered to be viable and is excluded from analyses.
8. Indicate whether there is a threshold for condition of the element in the checkbox, and if so, enter a value (ranging from 0.0 to 1.0, low to high threshold, respectively) for **Condition Threshold**. The condition threshold value is used to exclude data to be included in analyses on the basis of failing to meet minimum condition requirements to be considered viable. Condition threshold values specified in this field should result from running models in the system, rather than from element quality data.
9. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

SPATIAL TAB INPUT



1. Select the distribution layer for the element from the drop-down menu of the **Distribution Layer** field, or by using the ArcCatalog button to browse to the layer. (Layers will be displayed in the drop-down menu only if the layer is the correct feature type and is included on the Display Type tab of the Table of Contents [TOC].) See the Element Distributions section for more details on distribution layers.
2. Enter a value indicating the cell size to be used for conversion. For a discussion of optimal cell size to be used for a planning project, see the Determining Grid Cell Size topic.

   Note: If Land Use and Conservation Scenario Evaluations are to be performed, the grid cell size used to create the visualization layers generated by a Scenario Evaluation is set in this field. If this cell size differs greatly from the cell size specified for the scenario used in the evaluation (set in the Scenario Properties window), the visualization layers may not overlay the scenario correctly.

If Conservation Value analyses are to be performed, data entry for the fields contained in the *Viability/Integrity* and *Confidence in Distribution* group boxes (described in the following steps 3 and 4) can be deferred until values for these attributes have been assigned (see the sections on Viability/Integrity and Confidence for details on these attributes).

3. **If Conservation Value analyses are to be performed**, indicate whether the viability/integrity value is an **attribute of the distribution**

layer for the element, or is represented by a **raster layer** using the appropriate radio button.

If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

See the Viability/Integrity section for more details on this attribute.

4. I**f Conservation Value analyses are to be performed**, indicate whether the confidence value is an **attribute of the distribution** layer for the element, is represented by a **raster layer**, or will consist of a single assigned value for all occurrences of the element, using the appropriate radio button.

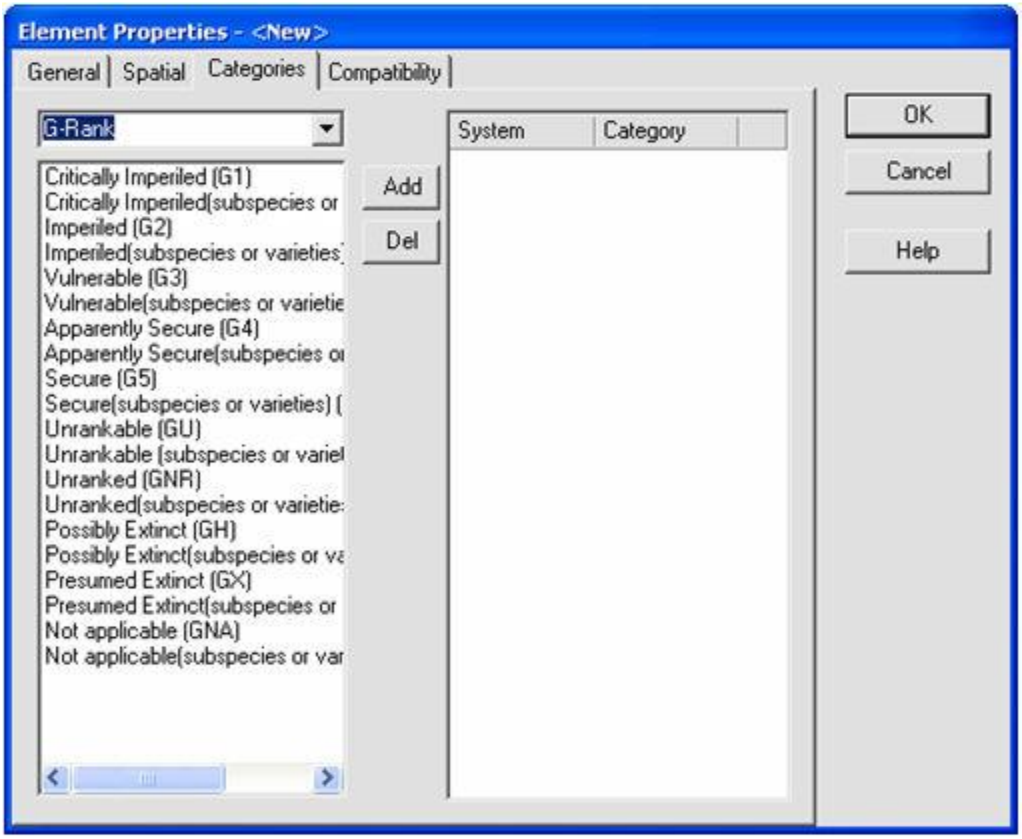
   If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

   If a single value for confidence is to be used, record that value in the field next to the **Single Value** radio button.

   See the Confidence section for more details on this attribute.

5. Select from the **Map Context** drop-down menu an existing context to be used in creating reports for the element, if any. If a map context needs to be created for the element, see the topic entitled Map Context Properties Window.
6. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

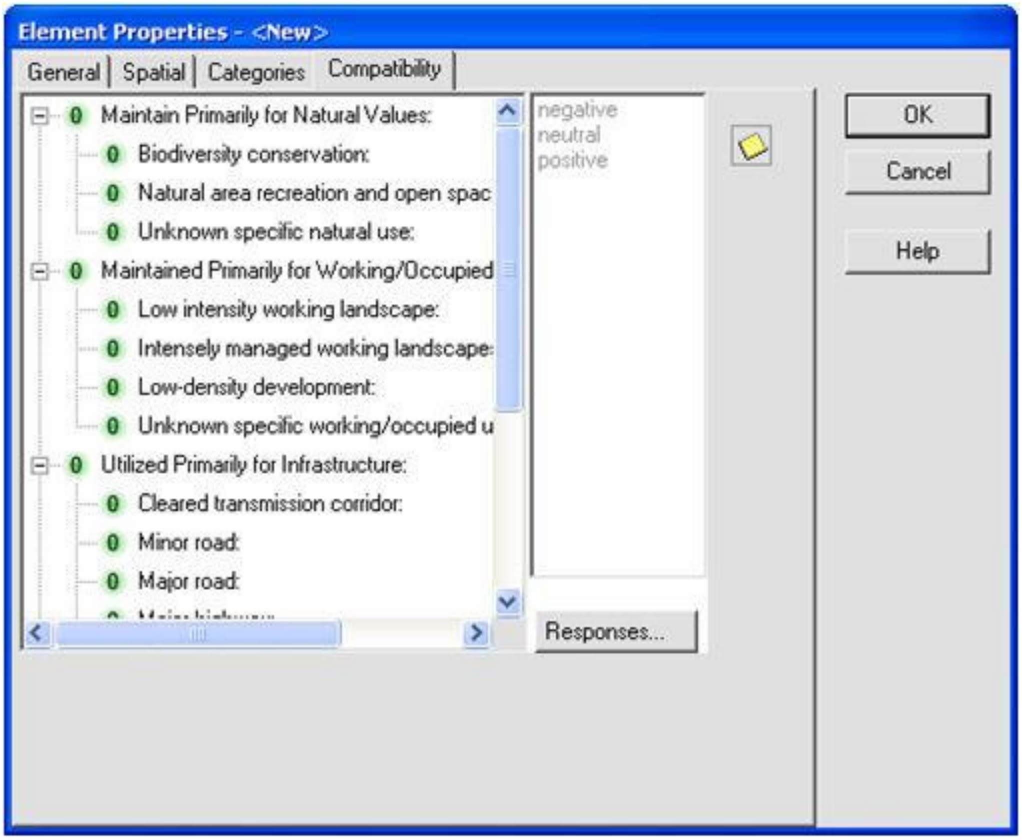
CATEGORIES TAB INPUT



Information on Category Systems to which an element belongs can be entered at any time once the element record has been created. Several default categories are provided in Vista, so it may be useful to indicate any of the default categories that apply initially, and then create additional categories and assign elements later as needed for developing Filters, conservation Goal Sets, and Weighting Systems, and performing analyses. To create a new category system, see the Category System Properties window section for details.

1. To specify a category system to which the element belongs, select the Category System from the drop-down list in the upper left of the window. A list of the categories within that system will be displayed below the system name.
2. Select the category to which the element belongs, and then click the **Add** button. The name of the system and category to which the element belongs will be displayed in the right pane of the window.
3. Repeat the system/category selection and add process to specify additional categories as needed.
4. To delete an element from a category system, select the system and category in the right pane and click the **Del** button.
5. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel.**

COMPATIBILITY TAB INPUT



An indication of the degree to which implementation of a specific Land-use Intent (LUI) category (described in Appendix F) is compatible with an element - that is, will permit the element to persist - is recorded using this window. More specifically, implementation of compatible LUIs will permit a species to remain viable or an ecological element to maintain ecological integrity. Scenario Evaluations, used to assess element compatibility with various land use scenarios in terms of meeting conservation goals, are dependent upon these compatibility assignments for accurate results, so it is strongly recommended that only experts on the element assign compatibility. Any decisions related to compatibility should be recorded (using the  button to access the associated Documentation Window) to allow peer review and/ or legal review.

For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.

1. **If Land Use and Conservation Scenario Evaluations are to be performed**, indicate the degree to which the element is compatible with each of the NatureServe Vista LUI categories by clicking on the LUI to be assigned, and selecting the appropriate compatibility response from the list in the column to the right.

   Assigning a response value to a major LUI category (e.g., "Maintain Primarily for Natural Values") will cause the system to automatically assign the entire category the same value (i.e., both the major category name and all of its associated child [minor] categories). However, assigning a compatibility response for a minor category LUI (e.g., "Biodiversity conservation") will not cause any other items in the category to be automatically designated.

2. To edit or add a new value to the list of compatibility responses, click the **Responses...** button to open the Compatibility List window.
3. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

Edit Element Information:

Element properties can be edited either individually, or for multiple elements simultaneously, as described below.

Edit an individual element:

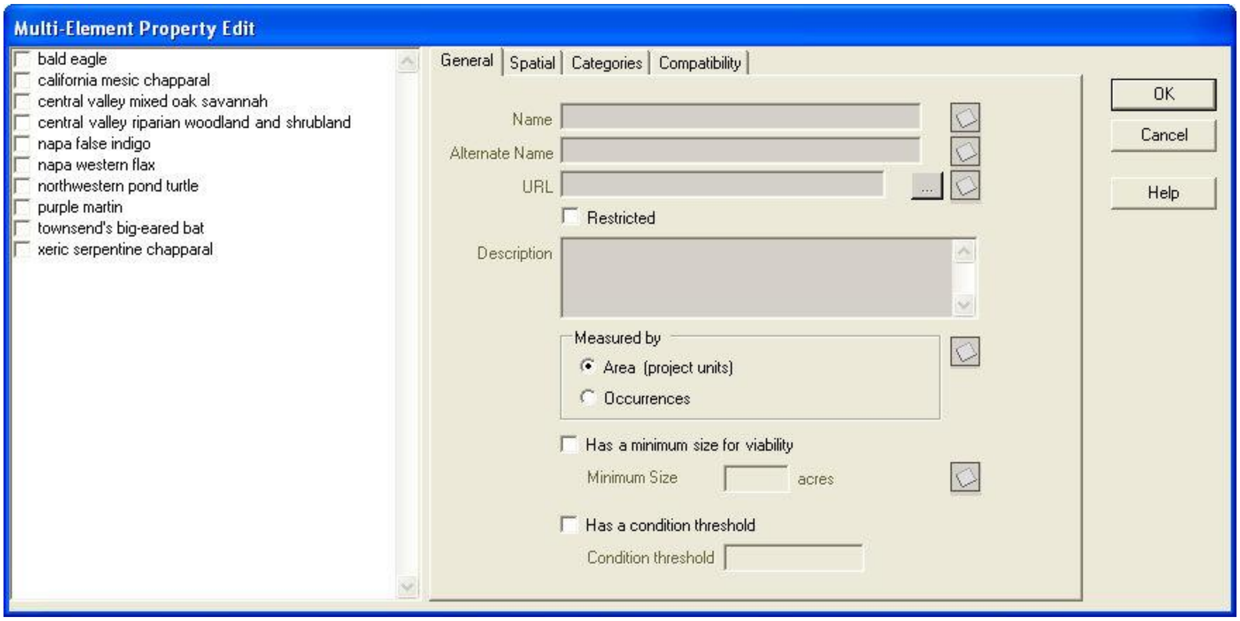
1. Navigate to the Element Properties window populated with existing data for the element by either right-clicking the element name in the NatureServe Vista table of contents and selecting **Element Properties..**. from the resulting menu, or by clicking **Manage Elements...** from the Vista menu, selecting the element in the Element List window that opens, and clicking the **Properties...** button. The resulting properties window displays data for the element.
2. Edit element properties data using the processes described above for adding an element as guidelines. More detailed descriptions of elements and related data can be found in the Element Selection, Element Distributions, Viability/Integrity Attributes, and Confidence Attributes sections.
3. To close the window and save any changes made to the element record click **OK**; otherwise, click **Cancel**.

Edit multiple elements:

1. Click **Manage Elements...** from the Vista menu to open the Element List window, and click the **Edit Multiple...** button to set property values for a designated set of elements simultaneously. See the Multi-Element Property Edit window for details on the process for editing properties for a group of elements.

Multi-Element Property Edit Window

The **Multi-Element Property Edit** window, displayed by clicking the **Edit Multiple...** button on the Element List window, is used to set values for a selected group of elements simultaneously.



<u>Edit properties for multiple elements</u>:

1. Select the set of elements that is to be assigned the same values for specific properties by clicking either on each element to be included or on the checkbox for each of these elements.
2. Choose the appropriate tab(s) that contain properties to be changed for the designated group of elements. You will notice that the attributes that can be edited are limited, with many "grayed out" and unavailable. In addition, there are no values displayed in any of the fields that can be edited, even if the existing values for the selected elements are the same to begin with. Properties that can be edited for the designated set of elements simultaneously are as follows:

On the **GENERAL** tab, can edit:

Measured by Area or Occurrences

Has a minimum size for viability

Minimum Size

Has a condition threshold

Condition threshold

On the **SPATIAL** tab, can edit:

Viability/Integrity - Attribute of Distribution or Raster Layer

Map Context

On the **CATEGORIES** tab all Category Systems can be edited

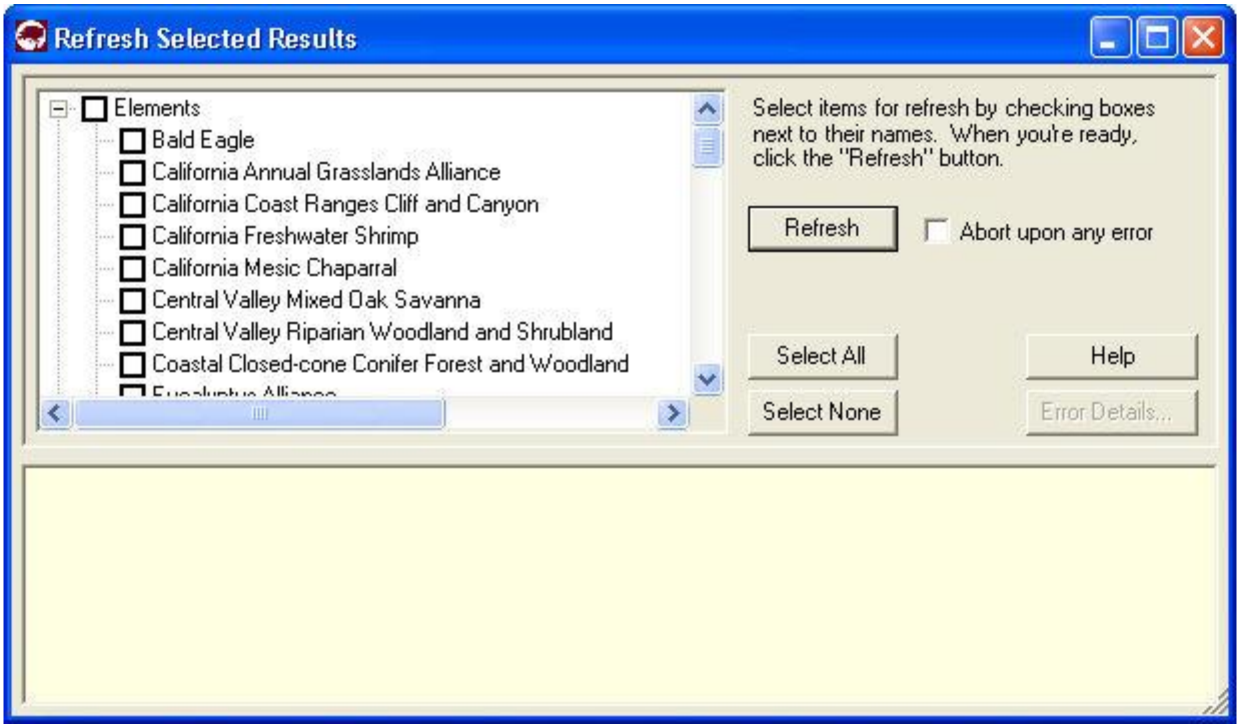
On the **COMPATIBILITY** tab element compatibility can be edited

3. Edit properties in the records of the selected elements simultaneously by clicking the appropriate radio buttons or checkboxes, entering values, and/or choosing values from drop-down menus for any properties that are to be set to a single value for these elements. Guidance for editing elements is provided in the processes described for adding new elements using the Element Properties window.
4. To close the window and save the edits made in the records of each of the selected elements simultaneously, click **OK**; otherwise, click **Cancel**.

REFRESH SELECTED RESULTS WINDOW

The **Refresh Selected Results** window can be opened several ways, depending on the item(s) to be refreshed.

- To display the Refresh Selected Results window listing all items that can be refreshed in the project (that is, elements, Conservation Value Summaries (CVS), and Scenario Evaluations, seen by scrolling down the list), click **Refresh Results...** from the NatureServe Vista menu.
- To display the Refresh Selected Results window listing only elements in the project to be refreshed, click the **Refresh...** button on the Element List window, or right-click on the major heading "Elements" on the NatureServe Vista tab in the Table of Contents (TOC) and choose **Refresh Results...** from the context window.
- To display the Refresh Selected Results window listing only CVS in the project to be refreshed, click the **Refresh...** button on the Conservation Value Summary List window.
- To display the Refresh Selected Results window listing only scenarios and Scenario Evaluations in the project to be refreshed, click the **Refresh...** button on the Scenario List window or the Scenario Evaluation List window, or right-click on the major heading "Evaluations" on the NatureServe Vista tab in the TOC and choose **Refresh Results...** from the context window.



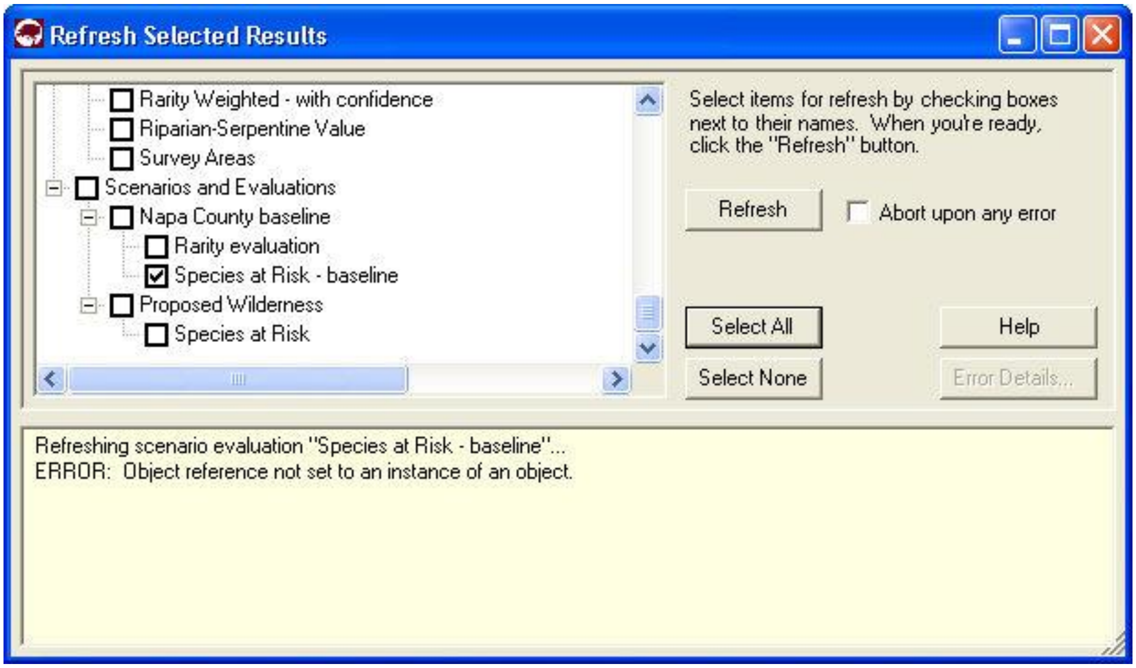
<u>Refresh data</u>:

1. Indicate which data are to be refreshed by using the check-box(es) associated with the element(s) and/or project analyses. The **Select All** button can be used to select the entire list of items; using the **Select None** button will de-select any items that have been selected.
2. Indicate whether the refresh process should be cancelled if an error should occur using the **Abort upon any error** checkbox.
3. Click the **Refresh** button to begin the data refresh process.

If the refresh process completes without errors, the following message is displayed:

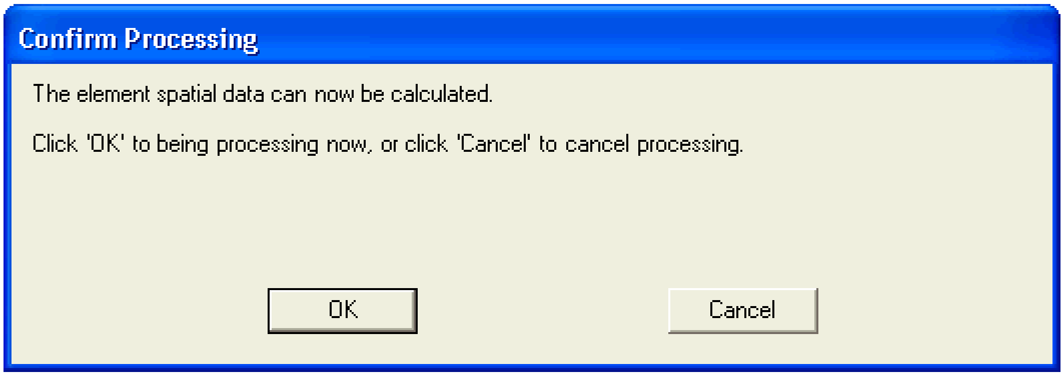
If an error occurs during the refresh, the following message will be displayed

and an error log will be displayed in the lower half of the Refresh Selected Results window.



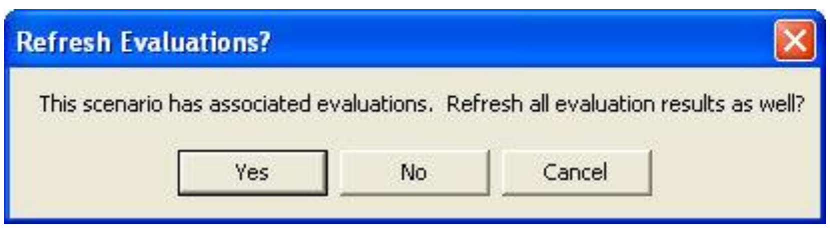
If more detailed information on the error(s) encountered is desired, click on the error log and then click the **Error Details...** button to display an Error Detail window.

Note that elements, CVS, and Scenario Evaluations in the project can be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single element or analysis on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Confirm Processing window will be displayed.



Click **OK** to continue with the refresh process; otherwise, click **Cancel**.

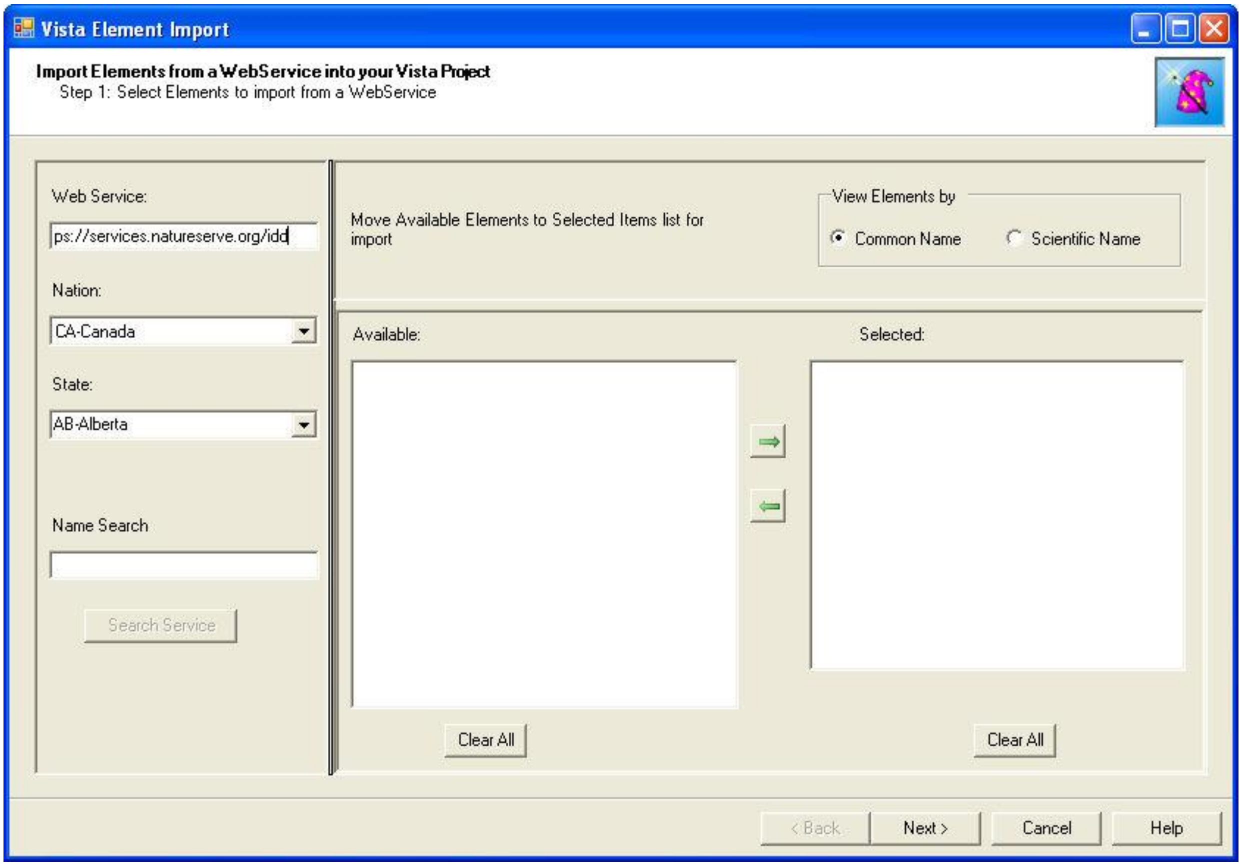
Scenarios in the project can also be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single scenario on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Refresh Evaluations? window will be displayed.



Click **Yes** to refresh both the scenario as well as any Scenario Evaluations that utilize the scenario; click **No** to refresh only the scenario; otherwise, click **Cancel**.

VISTA ELEMENT IMPORT WINDOW

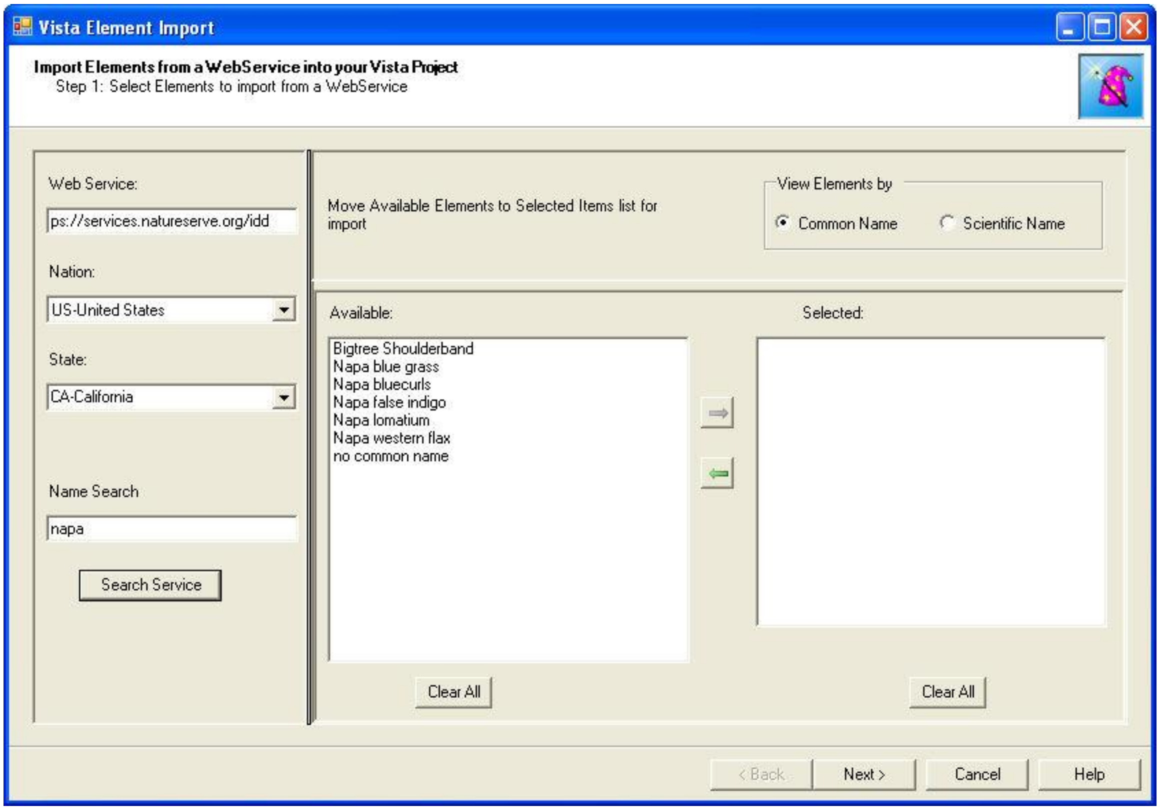
The **Vista Element Import** window is displayed by clicking **Project ▸ Import Element Properties from Web Service...** from the Vista menu, and is used to import properties from multiple elements using NatureServe Web Services.



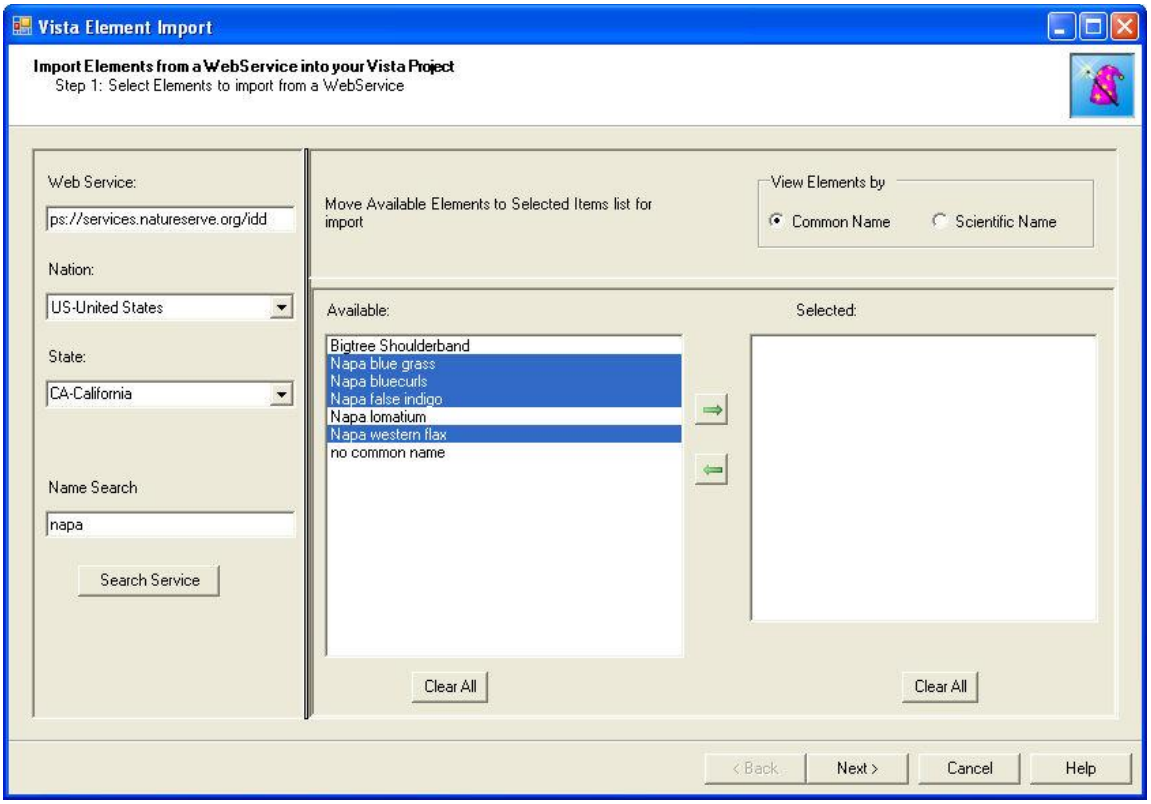
<u>Import element properties using a web service</u>:

1. If the web service location is not populated automatically, enter: https://services.natureserve.org/idd
2. Select the desired values from the Nation and State drop-down menus.
3. Using the Name Search field, enter the name or part of the name of an element whose properties are to be imported, and click **Search Service**. Note that either common or scientific names can be used in the search. Note also that the wildcard ”r;*” is permitted for searches, but caution is recommended as its use may result in a longer search time before results are returned.

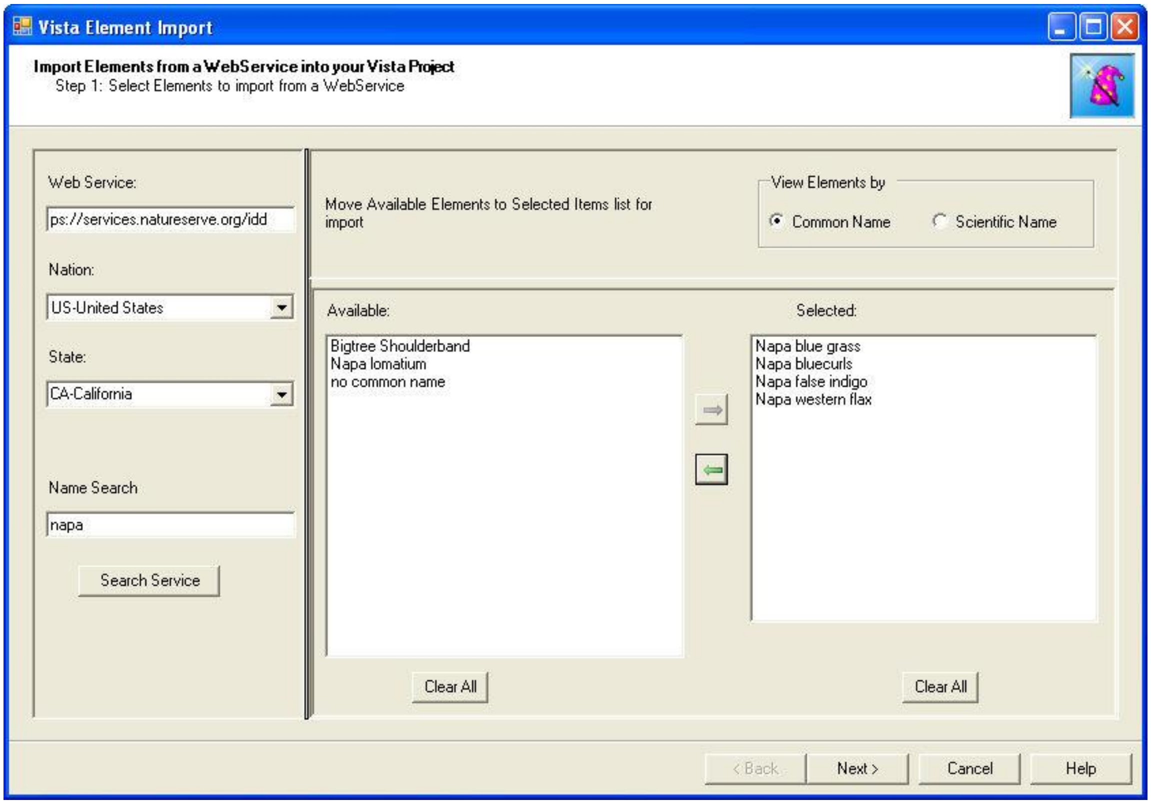
When the search has completed, the results will be displayed as a list of species in the **Available:** field. The listed species can be displayed by using **Common Name** or by **Scientific Name** by selecting the appropriate radio button in the **View Elements By** area.



4. Select one or more elements to be imported, and click the  button. Multiple elements can be selected together using <Control>-Click, and a range by using <Shift>-Click.



Elements selected for import will be displayed in the **Selected:** list.

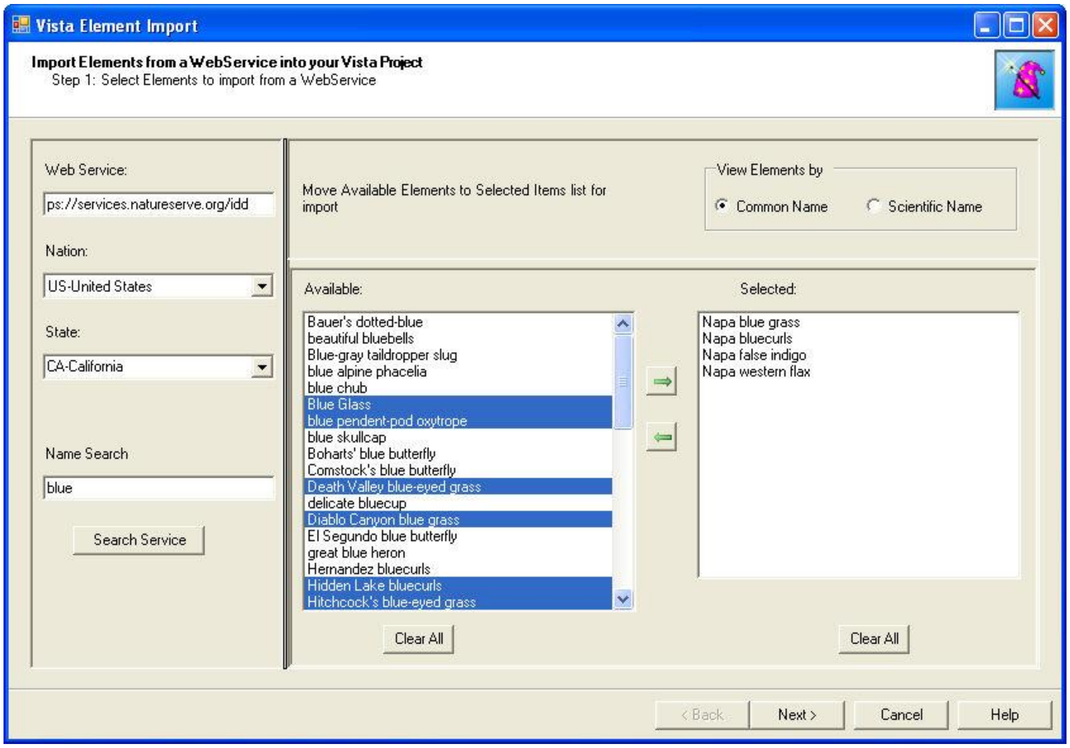


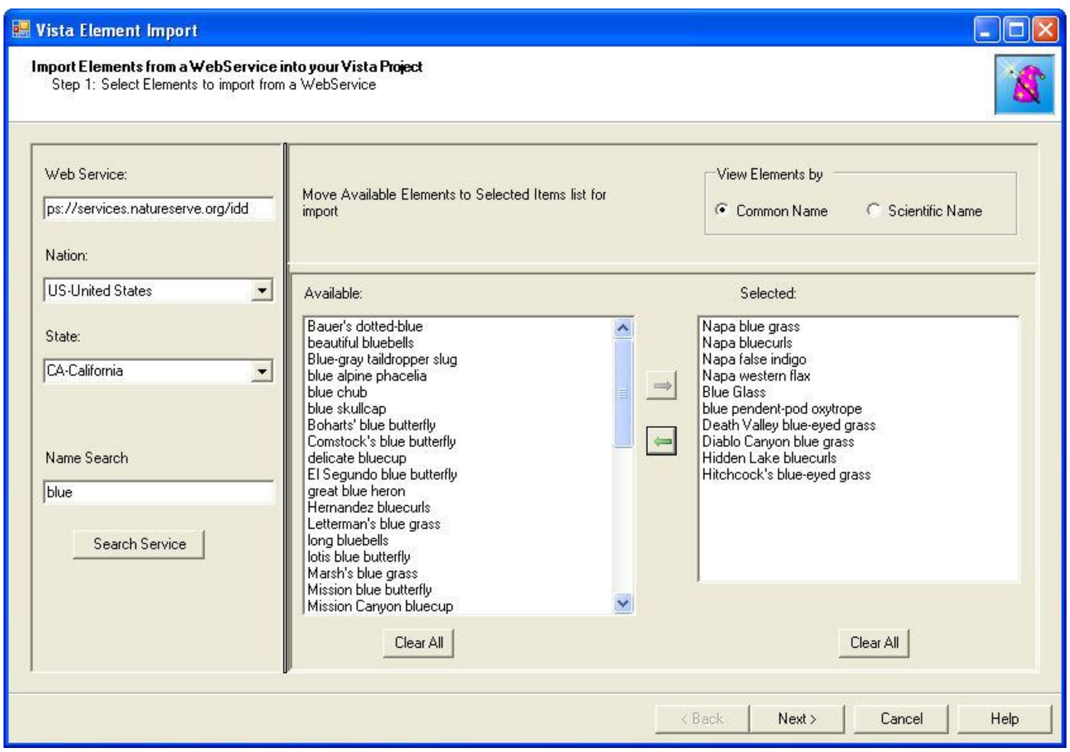
5. Repeat the process from step 4 until all the elements in the **Available:** list that are to be imported have been moved to the **Selected:** list.

   To de-select an element from the list to be imported, click on the element in the **Selected:** list and use the  button to move the element back to the **Available:** list.

   To re-start the selection process over at any point, click the **Clear All** button under the **Selected:** list.

6. To begin a new search for available elements, click the **Clear All** button under the **Available:** list. Repeat the search process from step 3 and then the selection process in step 4.

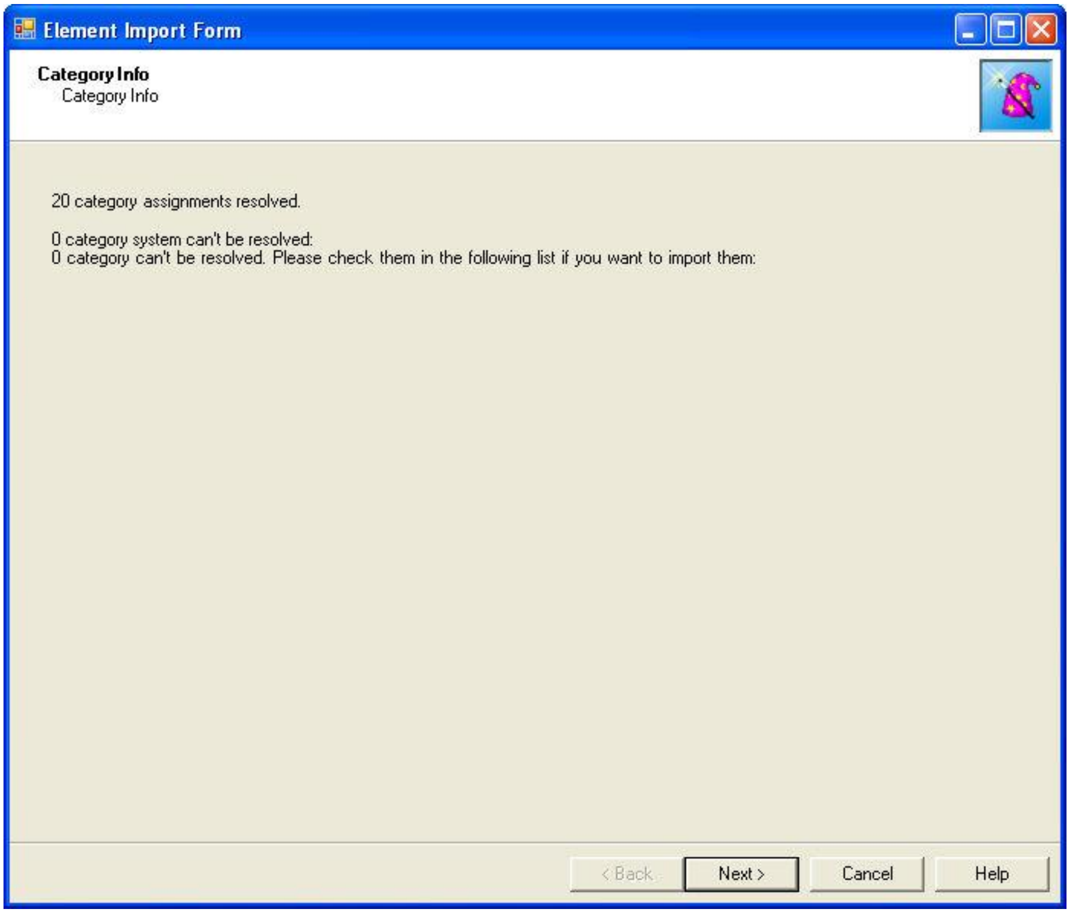




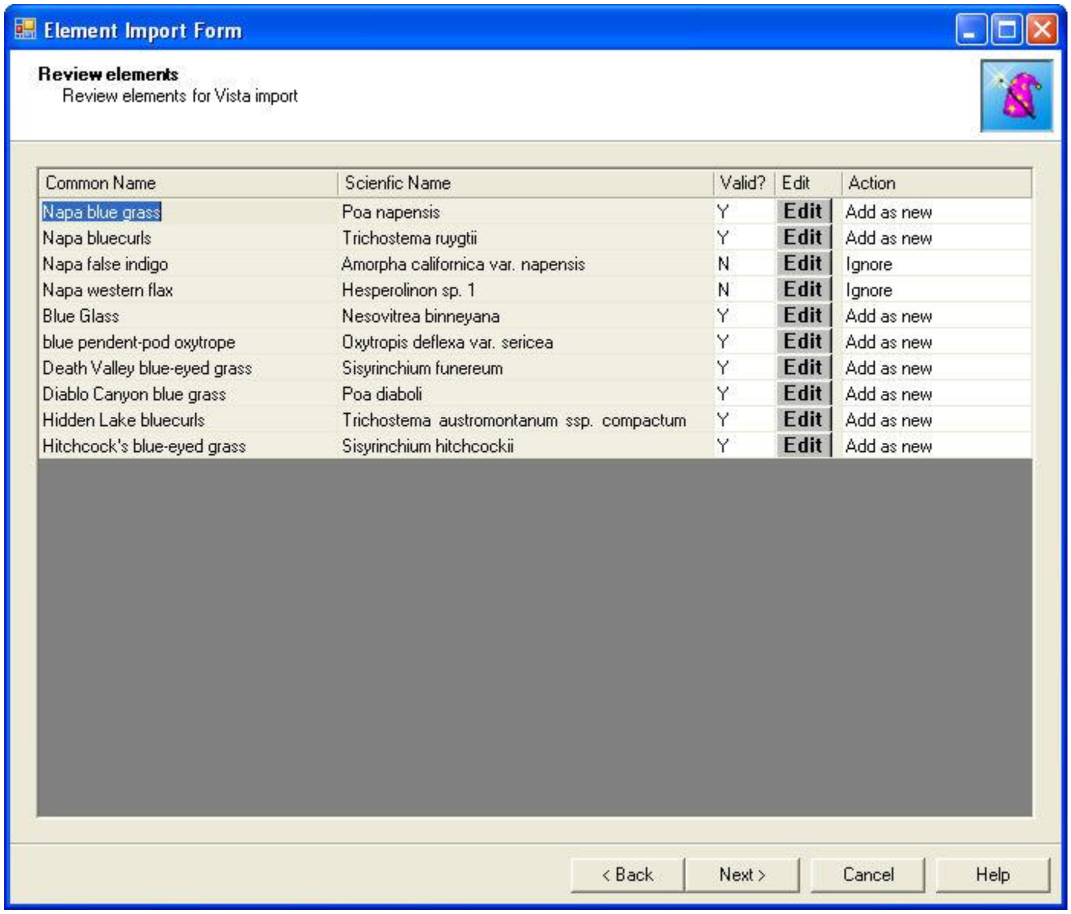
7. When the **Selected:** list contains all of the elements to be included for the properties import, click **Next>**. The data for these elements will be transferred from the web service, and a Category Info report

displayed in an Element Import Form, which provides the status of assignments to Category Systems, specifically whether both the Element Type category and G-Rank category systems have been resolved and assigned for each of the elements.

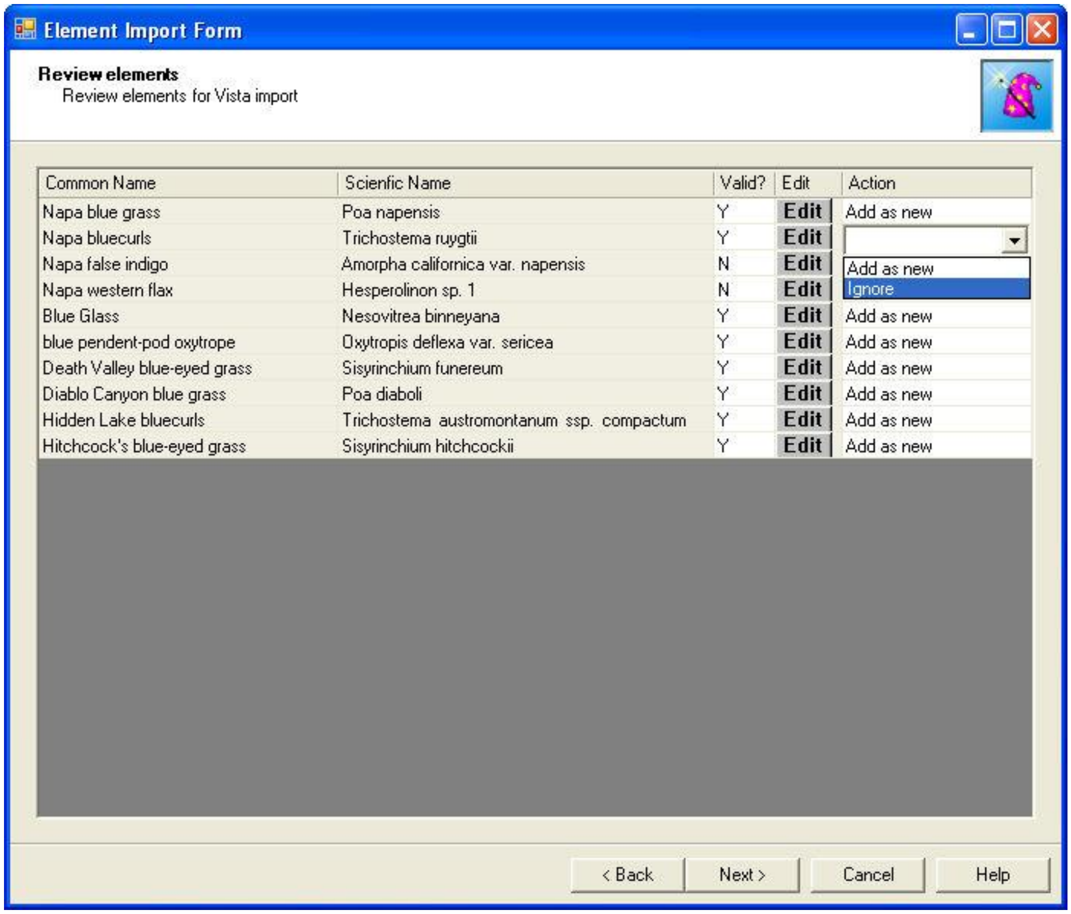
Note: This Vista Element Import window has changed at this point in the process to one labeled with the same name as the Element Import Form utilized in Vista to import element properties using a shapefile rather than a web service.



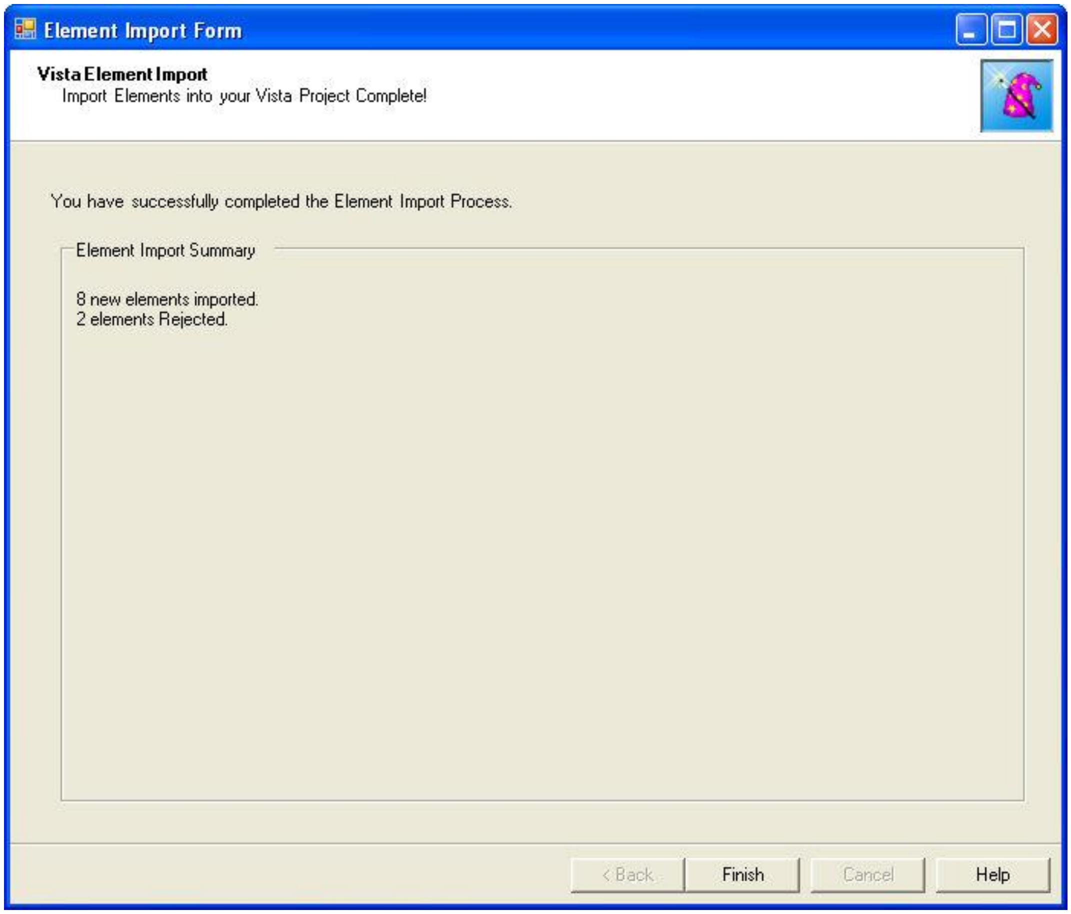
8. Click **Next >**. The system will display a list of the elements transferred.



9. Review the elements and attributes that were transferred, and, if desired, perform either or both of the following:
    - For any element transferred that lacks an associated valid category, specify or modify a category system by clicking **Edit** and making changes on the Categories tab of the Element Properties window that opens;
    - Change the displayed value in the **Action** column using the drop-down menu property in the element list, if appropriate, as follows:
        - **Add as new** will import the element (not previously existing) and associated properties as a new element in the project;
        - **Ignore** will cause the element and associated properties to not be imported into the project;
        - Only in cases when the Action initially displayed is **Ignore**, selecting the additional option to **Overwrite existing element** will result in replacement of that element and associated attributes already existing in the project with the imported element and properties data.



10. Once all desired changes to the elements have been made, click **Next>** to complete the element properties import process. The designated elements and associated properties will be imported into the [Element Properties window](#) and a final status report of the import will be shown. (In the example below, 2 of the 10 elements selected for properties import had an Action value of **Ignore**, and the remaining 8 were labeled with the **Add as new a**ction.)

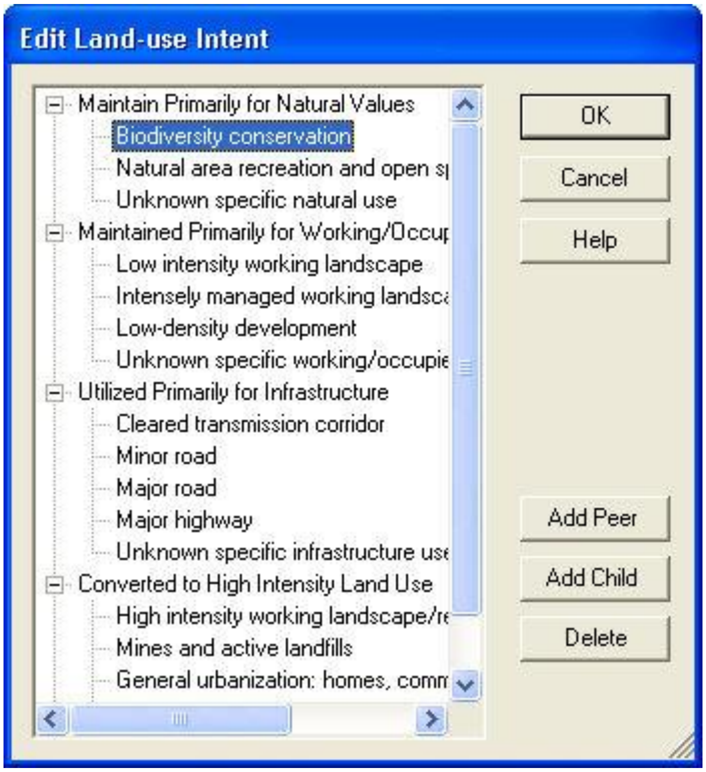


11. Click **Finish** to close the import window.

Edit Land-use Intent Window

The **Edit Land-use Intent** window is displayed by selecting **Lists ▸Land Uses List...** from the NatureServe Vista menu. This window displays the default Vista land use intent (LUI) categories (described in Appendix F), which are utilized in land use and conservation Scenario Evaluations.

This window is used to customize the LUI categories in order to better capture the important conservation impacts of specific land uses and/or management practices in the planning region. LUI categories are used specifically in assigning land use compatibility for elements (described under the Compatibility tab section of the Element Properties window), and for developing translators that are used to define land use scenarios (described in the Translators section, with details on creating translators found in the Translator Properties window topic).



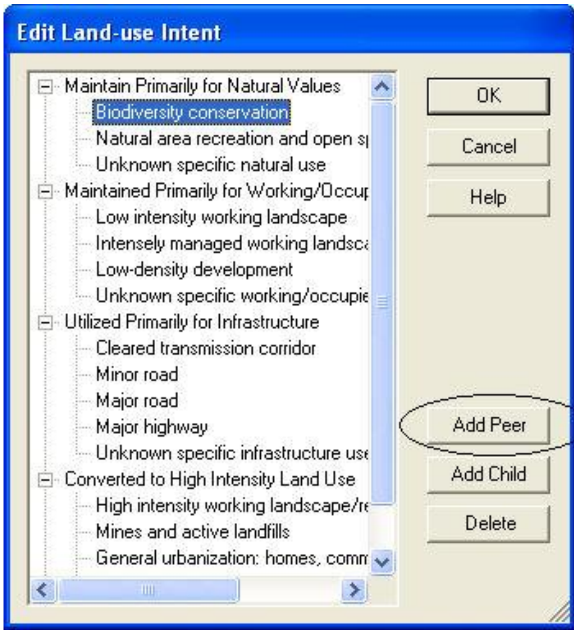
<u>Button functions</u>:

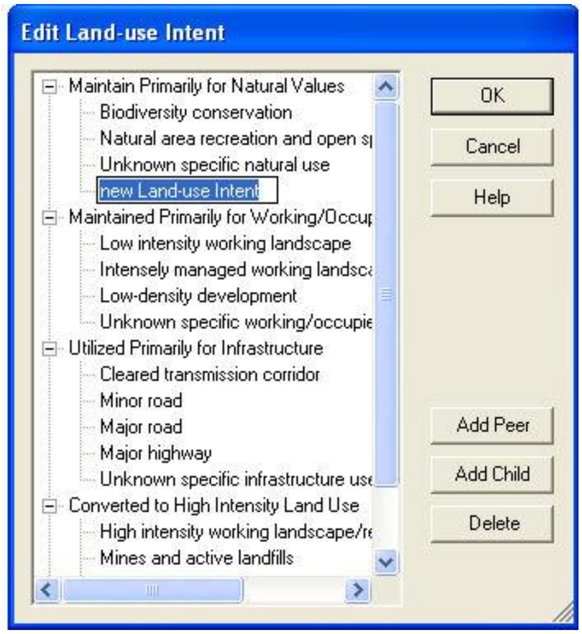
OK saves changes made to the LUI categories and closes the window.

Cancel closes the window without saving any changes made to the LUI categories.

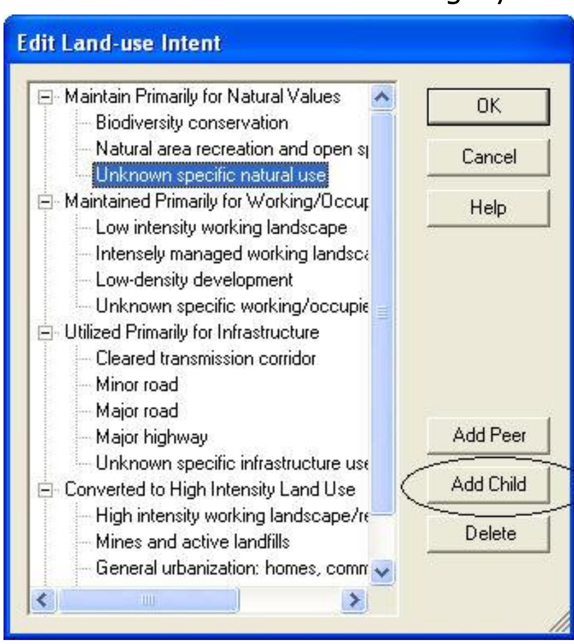
Help opens the on-line documentation.

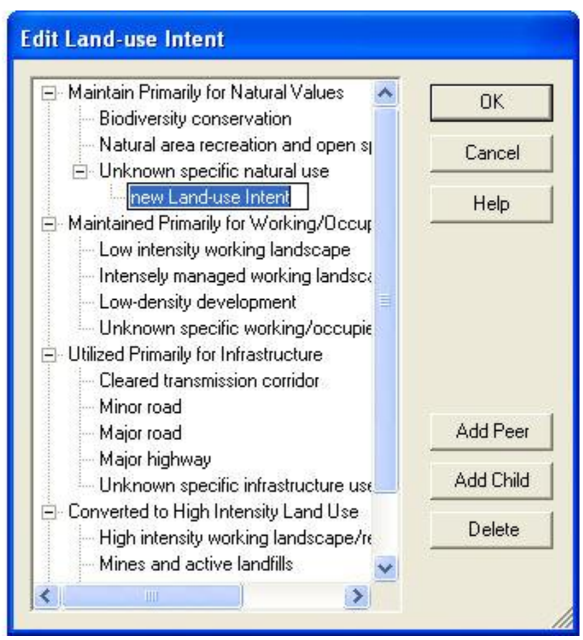
Add Peer adds a new LUI category at the same hierarchical level as that of the selected land use. The new category will appear as a new entry at the end of existing LUI categories at that level, and can then be labeled as desired. In the following example, selecting the minor category "Biodiversity conservation" and clicking the **Add Peer** button will result in a new LUI category at the same level, added after those already existing beneath the "Maintain Primarily for Natural Values" major category to which it belongs.





Add Child adds a new LUI category within, or under, the hierarchical level of the selected land use. The new category will appear as a new entry at the end of any existing child categories beneath the selected category, and can then be labeled as desired. In the following example, selecting the LUI category "Unknown specific natural use" and clicking the **Add Child** button will result in a new child land use category within/under that selected LUI.





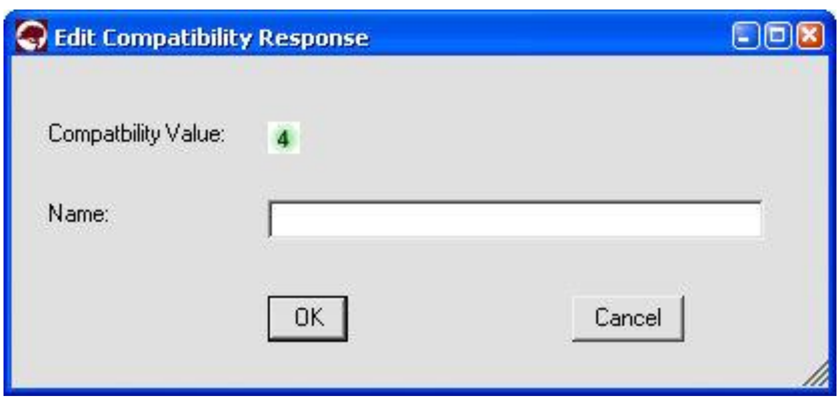
Delete deletes the land use category selected in the LUI hierarchy.

A **Confirm Delete** window is displayed before the deletion is implemented. In cases when the LUI selected for deletion contains child (minor) categories, the **Confirm Delete** window informs the user so that inadvertent deletion of these subcategories can be avoided.

A **Cannot Delete** window is displayed in cases when the LUI category is referenced by one or more items, as shown in the following example.

EDIT COMPATIBILITY RESPONSE WINDOW

The **Edit Compatibility Response** window is displayed by clicking the **New...** or **Properties...** buttons on the Compatibility List window, and is used to create and edit Land Use Intent (LUI) compatibility responses used for Scenario Evaluations. For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.



Create a compatibility response:

1. When the Edit Compatibility Response window opens to create a new response, the next numeric compatibility value to be associated with a compatibility response is automatically displayed. Enter the label for the new response in the **Name** field.
2. To close the window and save the new compatibility response, click **OK**; otherwise, click **Cancel**.

Edit a compatibility response:

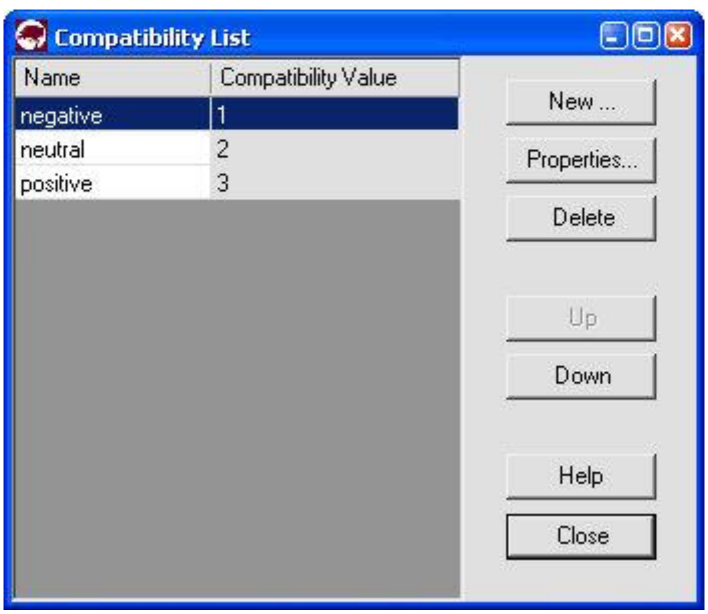
1. Select the compatibility response to be changed on the Compatibility List window and click the **Properties...** button. The resulting edit window displays the response name and sequential numeric value.
2. Edit the label for the response as desired in the Name field.

Note: The numeric compatibility value cannot be edited in this window. However, this sequential value will automatically change for a particular compatibility response by changing the order of the responses using the **Up** and **Down** buttons on the Compatibility List window.

3. To close the window and save any changes made to the compatibility response click **OK**; otherwise, click **Cancel**.

Compatibility List Window

The **Compatibility List** window is displayed by clicking the **Responses...** button on the Compatibility tab of the Element Properties window, and is used to create and edit the set of Land Use Intent (LUI) compatibility responses used for Scenario Evaluations. For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.



Button functions:

New... displays an Edit Compatibility Response window that can be used to develop a new compatibility response to be used in the project analyses.

Properties... displays the Edit Compatibility Response window showing details of existing compatibility responses and allowing edits to the response selected in the list.

Delete deletes the compatibility response selected in the list.

A window is displayed in cases when the compatibility response is assigned to one or more LUI categories in the Element Properties window and cannot be removed.

Up Moves the selected compatibility response higher in the list of responses, and changes the associated sequential number accordingly. The resulting order of responses is displayed on the Compatibility tab of the Element Properties window.

Down Moves the selected compatibility response lower in the list of responses, and changes the associated sequential number accordingly. The resulting order of responses is displayed on the Compatibility tab of the Element Properties window.

Help opens the on-line documentation.

Close closes the window.

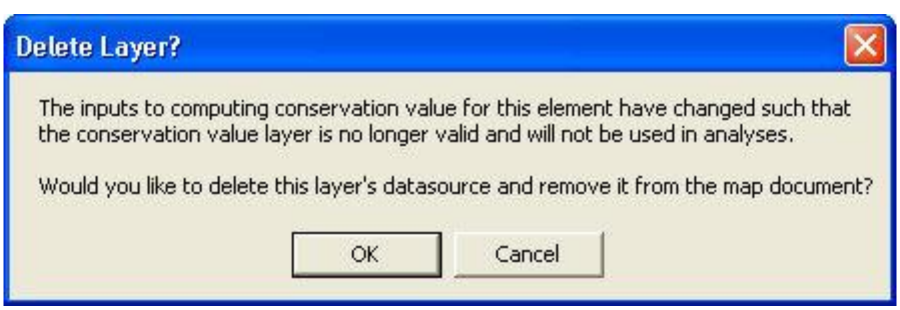
Columns displayed:

Name - name of the compatibility response.

Compatibility Value - sequential number associated with a particular compatibility response.

Delete Layer?

Message displayed by Vista when the layer used to represent an element's distribution, specified on the Spatial tab of the Element Properties window, has been changed to one that is invalid for use in calculating an Element Conservation Value layer.



<u>Button functions</u>:

OK &endash; deletes the distribution layer associated with the element and remove it from the map document.

Cancel &endash; closes the window without retaining any changes.

Analytical Tools

Category Systems

Category Systems

Objectives

The purpose of a category system is to provide a means to group elements based on similar characteristics, including those that are of local concern. For example, elements can be categorized by their taxonomy (e.g., birds, vascular plants), legal status (e.g., Endangered according to the U.S. Endangered Species Act), vulnerability (e.g., NatureServe global conservation status [G2]), or social value (e.g., high economic value). Category systems can be used to develop filters, weighting systems, and conservation goal sets, making the process of selecting and evaluating subsets of elements for analyses more efficient.

Products

A named category system that groups elements on the basis of official designations or other descriptive characteristics, along with the assignment of elements to various category types within the system. The Vista application contains several pre-defined category systems, including those defined by the U.S. Endangered Species Act and NatureServe's global conservation status system.

Inputs

Inputs for developing a category system include a list of all elements of interest in the planning region and any desired criteria for grouping the elements.

Methods Summary

See the section on the Category Systems Properties window for a detailed description of how to create and edit a category system.

Limitations

To make category systems useful, it is important that they be updated routinely to reflect systems that are the most useful for grouping elements. The system update process should include review and any needed revisions to both the description of each category within a system (in case any categories have changed), and the assignment of elements to those categories. While most category systems tend to be very stable, element assignments may be dynamic. For example, the legal status of an element may change over time; failure to review and adjust the category assigned to such an element could have serious ramifications to results of analyses if the legal status assignment is obsolete.

Steps in the Category System Creation Process

PROCESS FOR CREATING A CATEGORY SYSTEM

▸Identify sets of characteristics that can be used to create a category system

Identify sets of characteristics that can be used as the basis for one or more category systems. For example, elements could be grouped by taxonomy (e.g., birds, vascular plants), legal status (e.g., Endangered according to the U.S. Endangered Species Act), vulnerability (e.g., NatureServe global conservation status), or social value (e.g., high economic value, historical value).

▸Create a category system using Vista

Identify any interests that can be used as the basis for one or more filters. For example, meeting legal obligations, or ensuring adequate representation of elements that are most critical to conservation in the planning region.

Windows for Category Systems

CATEGORY SYSTEM LIST WINDOW

The **Category System List** window is displayed by selecting **Lists ▸Category System List...** from the NatureServe Vista menu. This window lists all the category systems that have been created for the project. See the Category Systems section for more detailed information on the development and use of category systems in analyses.

<u>Button functions</u>:

New... displays a new <u>Category System Properties window</u> that can be used to develop a new category system to be used in the project.

Properties... displays the Category System Properties window showing details and allowing edits to the category system selected in the list.

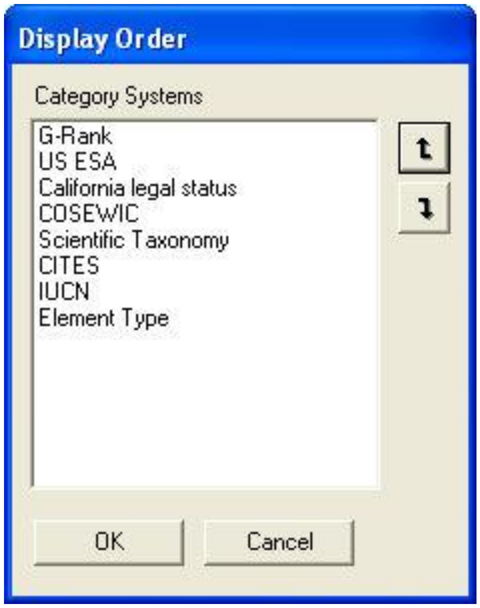
Delete... deletes the category system selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the category system is referenced by another item used in project analyses, as shown in the following example.

Report... displays a report for the selected category system that lists the categories within that system. See the <u>Reports</u> section for more details on Category System reports.

Display Order... results in a Display Order window, which can be used to edit the order that the category systems are listed in the Category System List window. Category systems are moved up or down in the order using the appropriate arrow button.



Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of the category system.

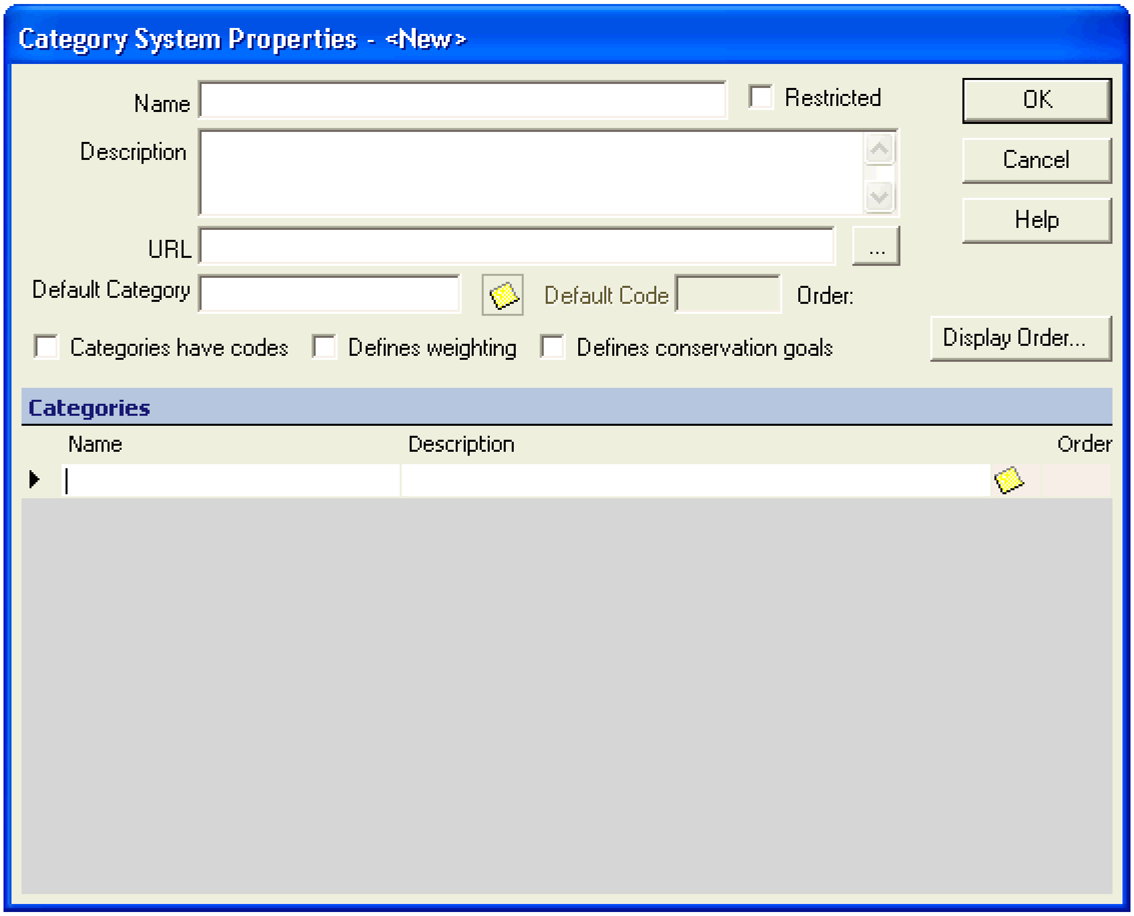
Description - description of the category system, if any.

Order - number indicating the display order sequence assigned to the category system.

Category System Properties Window

The **Category System Properties - <New>** window is displayed by clicking the **New...** button on the Category System List window. The new properties window is used to create a category system for use in the project. See the Category Systems section for more detailed information on the use of category systems in developing filters, goal sets, and weighting systems.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



<u>Create a category system</u>:

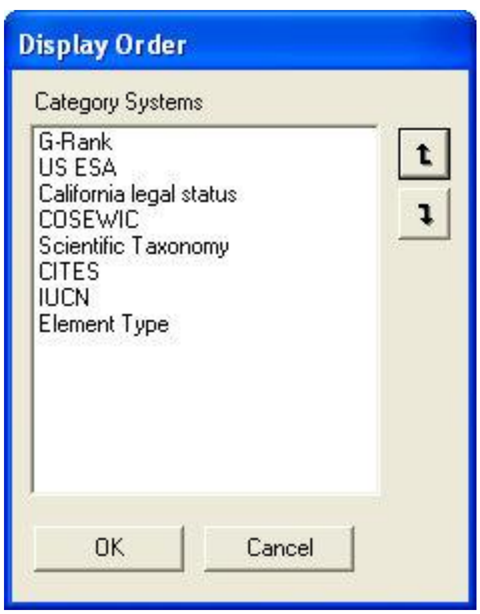
1. Specify a name for the new category system in the **Name** field. The **<New>** on the window title will change to the name of the new category system as the entry is typed in.
2. If the ability to edit the category system should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the category system in the **Description** field, if desired.
4. Enter a web address in the **URL** (Uniform Resource Locator) field. The

button can be used to open an explorer window that goes directly to the URL entered in the field, or if there is no address specified, the explorer default window will open.
5. Enter the category to be used as the default for elements not explicitly categorized in this system in the **Default Category** field. For example, if an element does not have an assigned global NatureServe conservation status, in the category system G-Rank that element would have an assigned category of Unknown (which would be the value entered in this Default Category field for the G-Rank category system). Most category systems utilize "Unknown" or "Unranked" as the default category.

6. If codes will be assigned to categories in this category system, place a check in the **Categories have codes** checkbox. Checking this item will result in the addition of a Code column to the Categories table, shown in the window below. Note that this box can be checked at any time if it is later determined that codes should be assigned for categories in the category system.
7. If codes are to be assigned for categories within the system (indicated using the checkbox described in item 6 above), then enter a code in the **Default Code** field to be used for elements not explicitly categorized in this system. The default code indicated in this field is based on the entry in the Default Category field (described in step 5 above). For example, if the default category is "Unknown", the default code entered could be "UK", as shown below.
8. If the category system will be used to define a weighting scheme, place a check in the **Defines weighting** checkbox. (See the Weighting Systems section for detailed information on weighting.) Checking this item will result in the addition of a Weighting column to the Categories table in the lower half of the window. However, this will not automatically cause weights to be added to elements during the process of creating a Conservation Value Summary, but will aid in the creation of weighting schemes later. Note that this box can be checked at any time if it is later determined that the category system will be used to define a weighting scheme.
9. If the category system will be used to define conservation goals, place a check in the **Conservation goals** checkbox. (See the Goal Sets section for detailed information on goals.) Checking this item will result in the addition of a Goal column to the Categories table in the lower half of the window. However, this will not automatically cause goals to be added to elements during the process of creating scenarios for use in Scenario Evaluations, but will aid in the creation of goal sets later. Note that this box can be checked at any time if it is later determined that the category system will be used to define conservation goals.
10. Using the Categories table in the lower half of the window, enter the name of each category in the new category system, along with a brief description, if desired. In addition, entries should be made as appropriate in any columns added for defining codes, goals, and/or weightings associated with each category. Note that if a value for code is not assigned for a particular category, Vista will use the default code specified in step 7 above. The value in the Order column of the Categories table is automatically generated as each new category is entered.
11. If it is necessary to delete a category, move the cursor to the column to the left of the Name column in the Categories table and click next to the entry to be deleted; the entire line for the category should be highlighted. Click the **Delete** button on your keyboard to delete the category. A **Cannot Delete** window is displayed in cases when the category is

referenced by another item used in project analyses, as shown in the following example.

12. If the order that the different categories within the category system are listed needs to be changed, use the **Display Order...** button to invoke the Display Order window. Although an order column is shown in the Categories table on the Category System Properties window, changes to the order of listed categories can only be made using the Display Order window. Categories are moved up or down in the order using the appropriate arrow button.
13. The value displayed for Order (located to the right of the Default Code field) indicates the position of the default code in the list of categories for the system. For example, if the category system is G-Rank, the default category is "Unknown," and the display order for categories was set by the user to be G1, G2, Unknown, G3, G4, then the value would be "Order: 3" indicating that the default category and code are in the third position in the display order. If there is no order specified for the default category, then the value for Order is automatically set to the last position in the category sequence.



14. To close the window and save the data entered for the category system click **OK**; otherwise, click **Cancel**.

15. To review details on the new (saved) category system, select the system on the Category System List window and click the **Report** button. Settings for the category system, as well as goals and/or weights assigned to specific categories will be displayed. See the Reports section for more details on Category System reports.

Edit a category system:

1. Select the category system from the list on the **Category System List** window (e.g., Element Type) and click the **Properties…** button. The resulting properties window displays data for each category in the category system.
2. Data for the existing category system displayed in this window can be edited using the processes described above for creating a new category system as guidelines.
3. To close the window and save any changes made to the category system click **OK**; otherwise, click **Cancel**.

Filters

Objectives

The purpose of a filter is to provide a means to more easily select a subset of elements, either on the basis of element attributes or within a specified location, for analyses and to consistently use the same selection of elements for different analyses at different times. An unlimited number of filters may be created on the basis of different interests, such as meeting legal obligations or representing elements that are most critical to conservation in the planning region.

Products

A named filter developed using a filter expression that includes any of the following, either singly or in combination:

- Element categories
- Individual elements
- Spatial filters
- Other filters (e.g., US ESA categories)

Inputs

Inputs for developing a filter include a list of all elements of interest in the planning region, all layers developed for the planning region, and any interests that can be used to define a subset of elements.

Methods Summary

Filters can be created by selecting a category system, and then choosing groups of elements from within and among different categories and/or individual elements to be combined into a single filter representing the elements of interest. For example, the categories NatureServe global conservation status Critically Imperiled and Imperiled [G1G2] categories (from the G-Rank category system) and U.S. Endangered Species Act federally listed Endangered and Threatened categories (from the US ESA system) could be used to create a filter called 'highest priority elements.' If this filter was then applied in the process of creating a Conservation Value Summary, it would have the effect of limiting the Element Conservation Value (ECV) layers that are utilized to those of elements that belonged to these categories.

Limitations

A current limitation of this version of Vista is that a spatial filter can only be developed based on the default project boundaries or on a sub-region derived from a layer that contains a single feature (e.g., the county shape). In addition, spatial filters cannot be nested or included in sub-expressions. Another limitation is that the expressions used to create a filter are limited to the operands AND and OR; however, ANDs and ORs cannot be mixed in the same sub-expression. More complex queries that would utilize other operands such as IF, BUT NOT, etc. are not supported by this version.

Steps in the Filter Creation Process

PROCESS FOR CREATING A FILTER

Identify any interests that can be used to create a filter

Identify any interests that can be used as the basis for one or more filters. For example, the set of elements needed to meet legal obligations (e.g., Endangered according to the U.S. Endangered Species Act), or needed to insure adequate representation of those that are most critical to conservation (e.g., NatureServe global conservation status of Critically Imperiled and Imperiled) in the planning region.

PROCESS FOR CREATING A FILTER

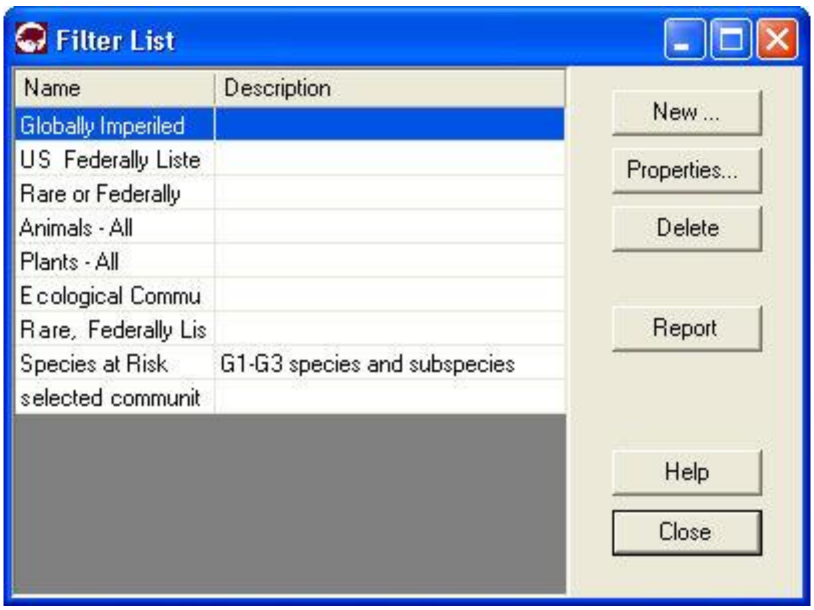
Create a filter using Vista

Use the Vista Filter Properties window to create a new filter.

Windows for Filters

FILTER LIST WINDOW

The **Filter List** window is displayed by selecting **Lists ▸Filter List...** from the NatureServe Vista menu. This window lists all the filters that have been created for the project. See the Filters section for more detailed information on the development and use of filters in analyses.



Button functions:

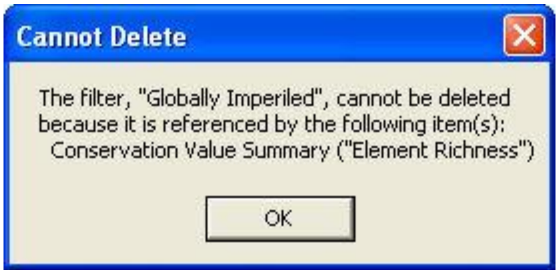
New... displays a new Filter Properties window that can be used to develop a new filter to be used in the project.

Properties... displays the Filter Properties window showing details and allowing edits to the filter selected in the list.

Delete deletes the filter selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the filter is referenced by another item used in project analyses, as shown in the following example.



Report displays a report that describes the selected filter and lists the elements that are included for analysis when the filter is applied. See the Reports section for more details on Filter reports.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

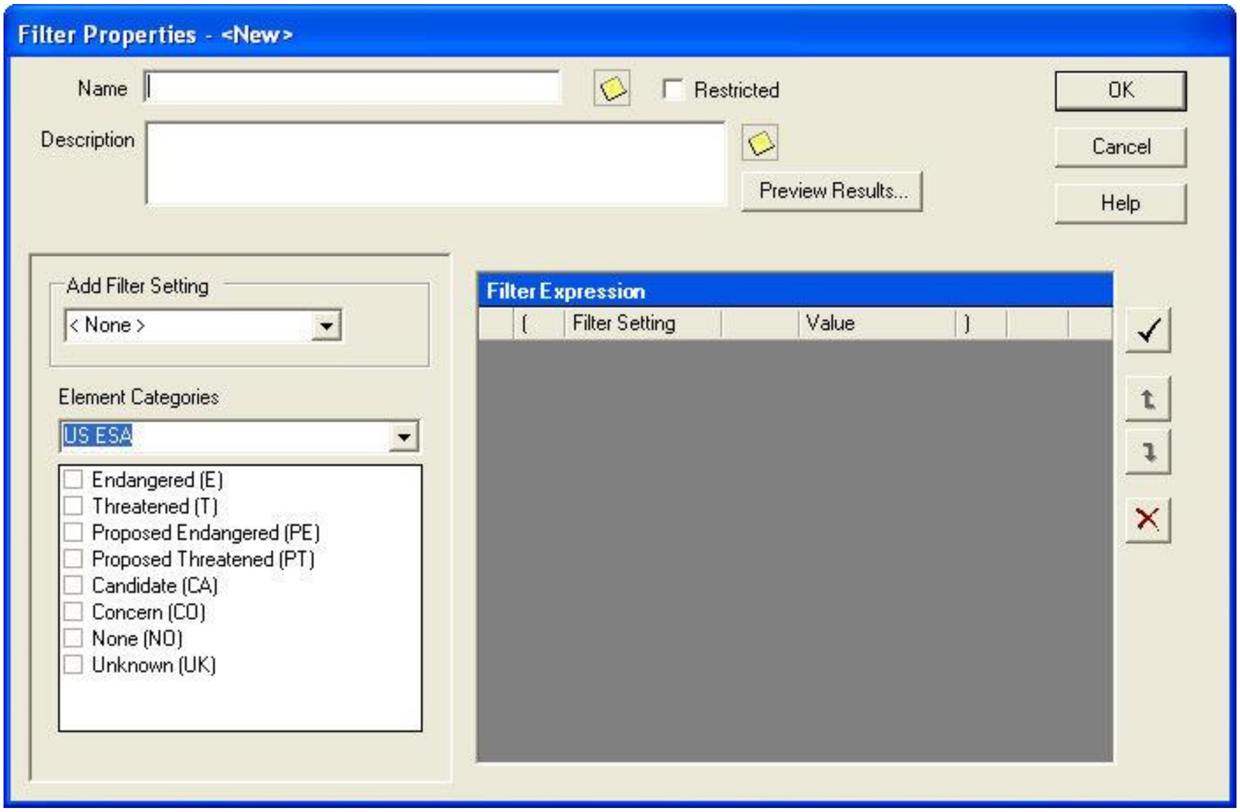
Name - name of the filter.

Description - description of the filter, if any.

FILTER PROPERTIES WINDOW

The **Filter Properties - <New>** window is displayed by clicking the **New...** button on the Filter List window. The new properties window is used to create a filter that can be used to define the set of elements to be included in analyses. See the Filters section for more detailed information on the development and use of filters in analyses.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



<u>Create a filter</u>:

1. Specify a name for the filter in the **Name** field. The **<New>** on the window title will change to the name of the new filter.
2. If the ability to edit the filter should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the filter in the **Description** field, if desired.
4. Choose the expression to be used to define the new filter by selecting the appropriate type from the **Add Filter Setting** drop-down menu. The setting selected will restrict the values that can be used to create that expression to those permitted by that filter. Available settings are as follows:
    - **Element Categories** - used to select categories of elements
    - **Individual Elements** - used to select specific elements
    - **Spatial Filter** - used to designate a specific area within which elements must be located
    - **Existing Filter** - used to select an existing filter
5. Select the appropriate value(s) to be used to define the elements and/or area to be included in an analysis. This process may differ based on the setting identified in the previous step, as follows:

Element Categories setting will cause a drop-down menu to be displayed containing all of the category systems defined in Vista. Select the category system to be used, and the categories within that system will be displayed with checkboxes. Check the box(es) for the category(ies) to be used in the expression. The categories selected will be automatically added as a row in the **Filter Expression** table. If desired, select another category system from the drop-down list and select categories from that system; another row will be added to the table.

Individual Elements setting will cause the list of elements in the Vista database to be displayed with checkboxes. Check the box(es) for the element(s) to be used in the expression, and the elements selected will be automatically added as a row in the Filter Expression table.

Spatial Filter setting will result in radio buttons that indicate the area to be used in the filter expression. The Project Boundary, or Default Boundary, is automatically included in all analyses and does not need to be selected from the spatial filter menu. To designate an area smaller than the project boundary, use the **Sub-Region** radio button to select a layer from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. Note that if a sub-region is to be specified, the layer used must contain only a single feature (e.g., the county shape), and that only one layer can be used in the filter expression. Selecting another layer will result in its substitution for the layer originally chosen for the expression. In addition, spatial filters cannot be nested or included in sub-expressions, and can only be related to other rows in the **Filter Expression** table using the **AND** operand (see step 7 for information about operands).

Existing Filter setting will cause a drop-down menu to be displayed containing all of the filters already defined in Vista. Select the filter to be used and the expressions within that filter system will be displayed, and the filter automatically added as a row in the Filter Expression table. If desired, select another filter from the drop-down list and another row will be added to the table.

6. Repeat steps 4 and 5 as needed to create additional rows in the **Filter Expression** table. In some cases, different values from the same filter setting need to be represented by separate rows in the filter expression (e.g., when different operands need to be applied). In such cases, after selecting the values to be included in a row, reset by selecting a different filter setting and then select the desired setting again. Check off the desired values, and these will be displayed in a separate row in the **Filter Expression** table.
7. Once there is more than one row in the table, relationships between criteria in the different rows should be indicated. Click on the last column to the right in the table (before the column displaying the documentation icons) and select the appropriate operand, if any, to be used for different

rows, with **AND** indicating that all criteria defined in that row and following one must be met and **OR** indicating that criteria in at least one of the two rows must be met. Note, however, that **AND**s and **OR**s cannot be mixed in the same sub-expression. Click in the appropriate **(** and **)** columns to add brackets where needed in the expression. Entire rows can be moved up and down using the arrow buttons. A selected row can be deleted using the X button.

Moving the cursor from row to row in the **Filter Expression** table will cause the categories, elements, or other filters in the row to be automatically displayed in the lower left portion of the window for editing purposes, but the setting in the Add Filter Setting box will not change from the last one used to select values.

8. Once you have completed the entries and defined relationships in the **Filter Expressions** table, validate the expression by clicking the validate button. If the expression cannot be validated, a window will be displayed indicating that the expression is not valid. Click **OK** and point to any column indicators in order to display a brief statement describing the issue with the expression that prevents its validation. Correct the expression and recheck the validation.

   If the filter expression is valid, a window will be displayed indicating that the expression is valid. Click **OK**.

9. To review the elements and/or area that will be included in analyses when the filter is applied, click the **Preview Results...** button. The resulting report will display the entire expression including brackets and operands, as well as any spatial filter used. See the Reports section for more details on Filter reports.
10. To close the window and save the expression developed for the filter click **OK**; otherwise, click **Cancel**.

Edit a filter:

1. Select the filter from the list on the **Filter List** window (e.g., Element Type) and click the **Properties...** button. The resulting properties window displays the criteria defined for the filter.
2. Edit the filter using the processes described above for creating a new filter as guidelines.
3. To close the window and save any changes made to the filter click **OK**; otherwise, click **Cancel**.

Weighting Systems

Objectives

The purpose of a weighting system is to provide a means to weight elements relative to others of lesser importance in the planning region. Specifically, a weighting system can be used in Conservation Value analyses to assign greater significance to elements that are more important from a conservation perspective. A weighting system can be based on an established value system (e.g., NatureServe global conservation status reflecting element vulnerability), or on local priorities, such as an element's value to the local economy. Applying different weighting systems to the same set of elements in analyses will provide a comparison of priority conservation sites for different stakeholders.

Products

A named weighting system that assigns a weight between 0.0 to 1.0 to categories of elements and/or individual elements based on their relative importance in the planning region. A set of weights reflecting NatureServe's global conservation status is provided as a default in Vista, with weights defined for specific categories within the "G-Rank" category system.

Inputs

Inputs for developing a weighting system include a list of all elements of interest in the planning region and any value systems that can be used to define the relative importance of different elements, along with any assigned ranking that indicates rarity (e.g., NatureServe global conservation status, IUCN Red List system).

Methods Summary

Select a task below to see a detailed description of the process for creating a weighting system.

Identify any value systems that can be used to create a weighting system

Create a weighting system using Vista

Background

The relative rarity of an element is approximated by the NatureServe conservation status of an element, which is assigned on the basis of a number of factors, including the number of occurrences, number of occurrences with good viability (species) or ecological integrity (communities or systems), area of occupancy, geographic extent of occurrences, and environmental specificity. The rarer the element, the fewer occurrences exist and the fewer the options for element representation in the planning region; the fewer the options, the greater the contribution of each occurrence to representation of the element (and the greater the need to conserve the occurrences to ensure element representation). For elements with a conservation status of Critically Imperiled or Imperiled, all or nearly all occurrences are needed to adequately represent these elements, and each occurrence typically contributes significantly (often 95-100%) to the total number of options for element representation. For elements globally ranked as Vulnerable, most occurrences are needed for element representation, but each occurrence typically contributes a smaller relative proportion to the total number of options for element representation than occurrences of Critically Imperiled/Imperiled elements. For elements assessed as Apparently Secure or Secure, each occurrence contributes a relatively minor portion to the total number of options or proportional area needed for element representation.

The default category system "G-Rank" provided with Vista consists of weights (i.e., numeric conversions) for the different NatureServe conservation statuses (see table below), with the rarest elements having the greatest weight (1.0) indicating their importance from a conservation perspective, and the most secure elements with a weight of 0.4.

Designated weights for the default "G-Rank" category system.

NatureServe Global Conservation Status		
Category	**Rank**	**Weight**
Critically Imperiled	G1	1.00
Critically Imperiled (subspecies or variety)	T1	1.00
Imperiled	G2	0.90
Imperiled (subspecies or variety)	T2	0.90
Vulnerable	G3	0.80
Vulnerable (subspecies or variety)	T3	0.80
Apparently Secure	G4	0.60
Apparently Secure (subspecies or variety)	T4	0.60
Secure	G5	0.40
Secure (subspecies or variety)	T5	0.40
Unranked		0.30

Unranked (subspecies or variety)		0.50
Not applicable		0.20
Not applicable (subspecies or variety)		0.50
Possibly extinct		0.50
Presumed Extinct		0.70
Presumed Extinct (subspecies or variety)		0.50
Unrankable		0.50

The rarity of an element, represented by its conservation status rank, may be used to characterize the relative irreplaceability of occurrences for that element. Irreplaceability can be defined by

1. The likelihood that a given area is needed to achieve an explicit conservation objective, and
2. The extent to which the options for achieving an explicit conservation goal are diminished if an area is not conserved.

If one could appropriately scale the irreplaceability of a given area between 0.0 and 1.0, an area with a score of 1.0 includes targeted element occurrences that are essential to achieving their respective conservation objectives. If the area is not conserved, there is no chance that those objectives can be met. Conversely, an area scored 0 includes no occurrences that are needed to meet explicit conservation objectives, and if the area is not conserved, it will have no effect on the chances of conservation objectives being achieved for any targeted conservation element.

The relative irreplaceability of a given area will vary, in part, depending upon the relative rarity of targeted conservation elements present. The relative rarity of a given element directly influences the number of options available for element representation. Additionally, the relative viability/ecological integrity of the ecosystem/community/species occurrence addresses aspects of ecological resilience, and the likelihood of conservation success in any given locale. "High quality" occurrences may retain ecological attributes that can be difficult to restore through management, so the quality of the occurrence adds a significant additional dimension to occurrence irreplaceability (see the Viability/ Ecological Integrity section for details). A third factor for assessing relative irreplaceability involves the degree of confidence one has that the conservation elements are indeed present at a given location (see the Confidence section for details).

Limitations

To ensure the most accurate results in Conservation Value analyses, it is important that weighting systems be updated routinely to reflect any changes in the importance of particular elements relative to others. Policies and priorities for conservation in the planning region may change for various stakeholders over time, and so assigned element weights may be dynamic. The process for updating a weighting system should include review and any needed revisions to the weightings assigned for groups of elements and/or individual elements.

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Steps in the Weighting System Creation Process

PROCESS FOR CREATING A WEIGHTING SYSTEM

▸Identify any value systems that can be used to create a weighting system

Identify any value systems that can be used as the basis for one or more weighting systems. For example, NatureServe global conservation status and IUCN Red List values indicate element vulnerability, while values created to reflect local priorities for various stakeholders might include the economic value of elements, their contribution to local character, or to historical integrity.

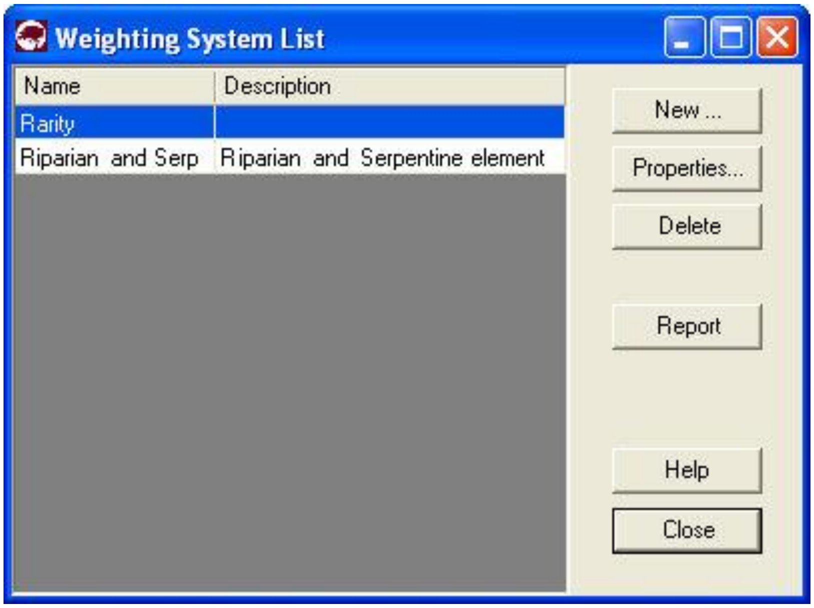
▸Create a weighting system using Vista

Use the Vista Weighting System Properties window to create a new weighting system.

Windows for Weighting Systems

WEIGHTING SYSTEM LIST WINDOW

The **Weighting System List** window is displayed by selecting **Lists ▸Weighting System List...** from the NatureServe Vista menu. This window lists all the weighting systems that have been created for the project. See the Weighting Systems section for more detailed information on the development and use of weighting systems in analyses.



Button functions:

New… displays a new Weighting System Properties window that can be used to develop a new weighting system to be used in the project.

Properties… displays the Weighting System Properties window showing details and allowing edits to the weighting selected in the list.

Delete deletes the weighting system selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the weighting system is referenced by another item used in project analyses, as shown in the following example.

Report displays a report that describes the selected weighting system and its settings. See the Reports section for more details on Weighting System reports.

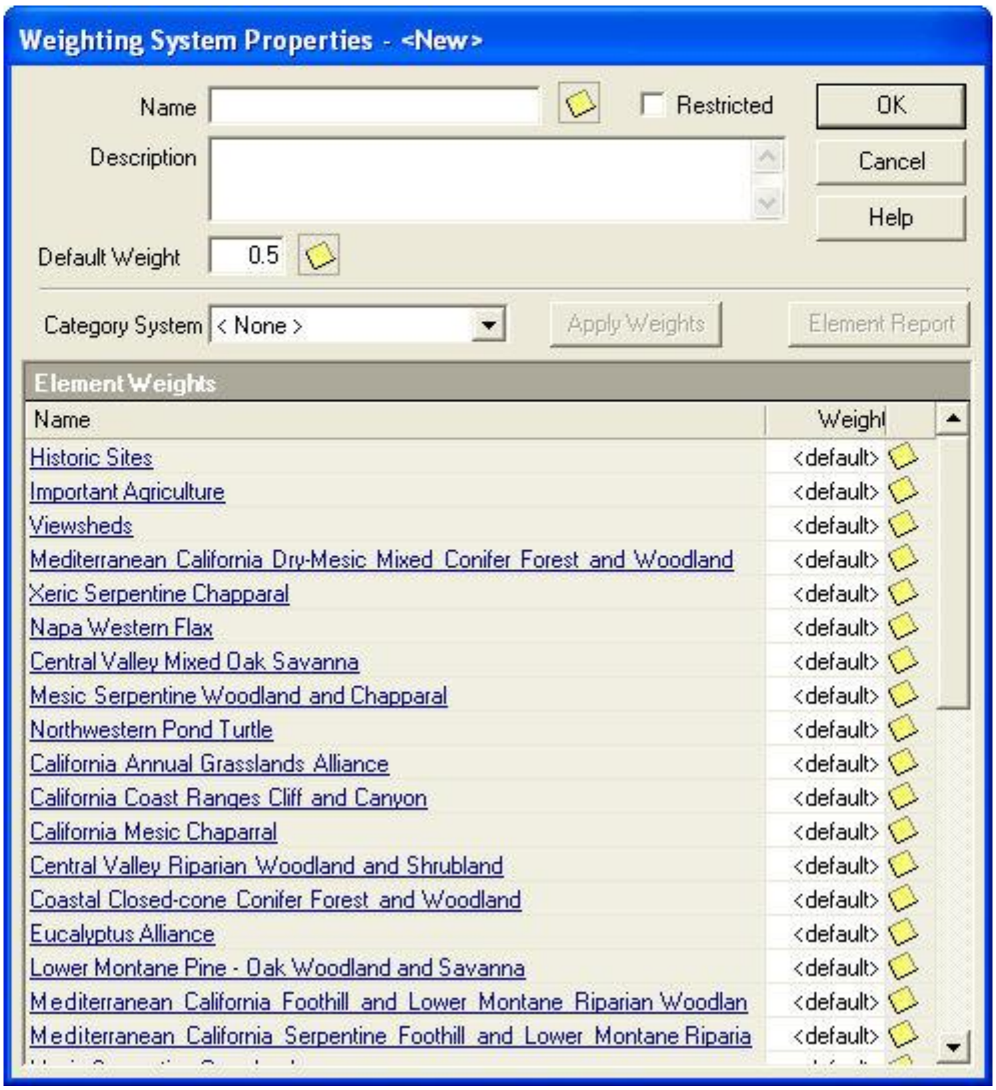
Help opens the on-line documentation.

Close closes the window.

Weighting System Properties Window

The **Weighting System Properties - <New>** window is displayed by clicking the **New...** button on the Weighting System List window. The new properties window is used to create a new weighting system that can be utilized for prioritizing elements in Conservation Value analyses. See the Weighting Systems section for more detailed information on the development and use of weightings in analyses.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

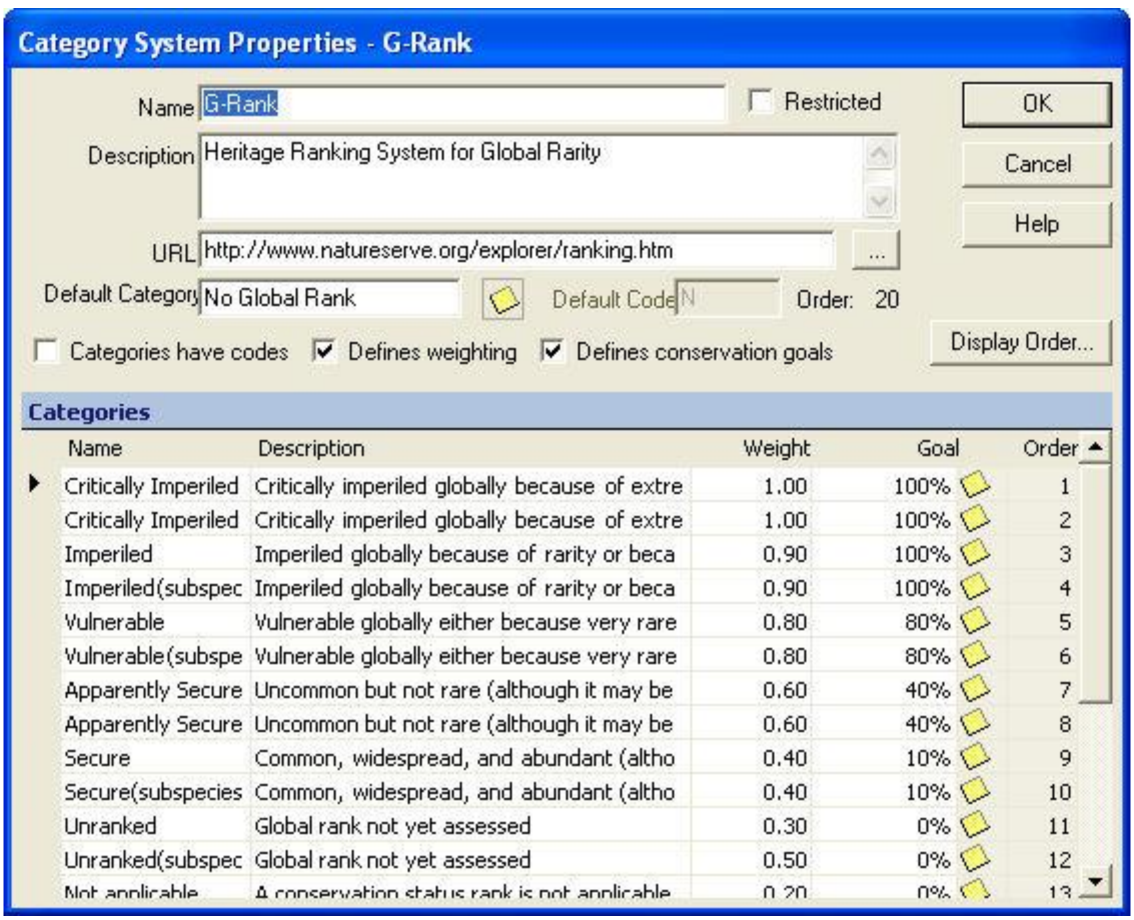


Create a weighting system:

1. Specify a name for the weighting system in the **Name** field. The **<New>** on the window title will change to the name of the new weighting system as the entry is typed in.
2. If the ability to edit the weighting system should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the weighting system in the **Description** field, if desired.
4. Enter a value in the **Default Weight** field to be used in cases when a specific weight is not assigned to an element. The default value in this field is 0.5.

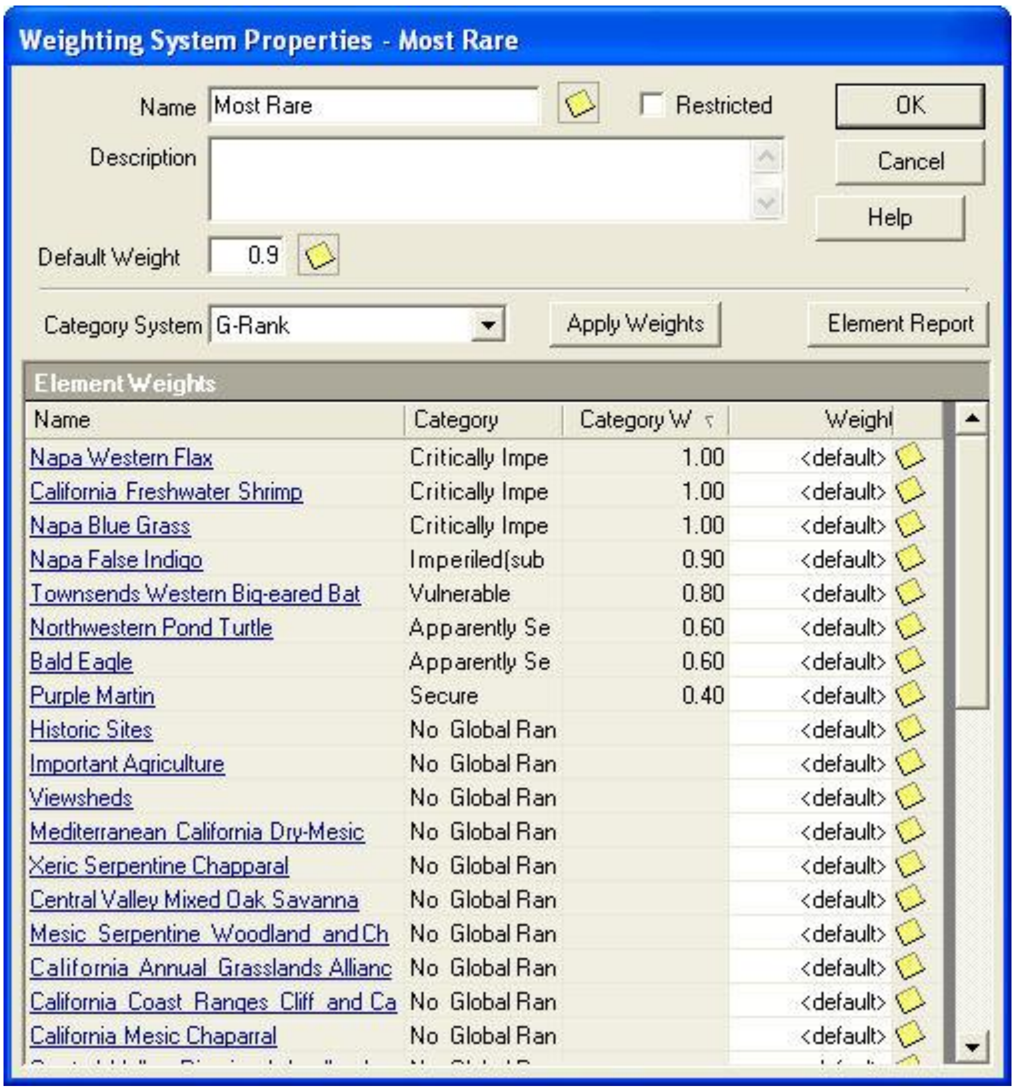
If a category system is to be used to create the weighting system, continue with step 5; if not, skip to step 8.

5. From the **Category System** drop-down menu of existing systems, select a category system to be used in developing the weighting system. Only category systems that define weights are shown in the drop-down list, such as the default "G-Rank" system displayed in the Category System Properties window below, although the option to create a new category system (**<Add New...>**) or to display all existing systems (**<Show List...>** in order to select and modify an existing system by adding weights) are included in the drop-down list.



The advantage of using a category system is that weights can be assigned for groups of elements (e.g., all elements that are Critically Imperiled will have an assigned weight of 1.0) instead of element by element individually (e.g., weight assigned for Burrowing Owl is 0.5, weight assigned for California Black Rail is 1.0, etc.). Note, however, that regardless of whether weights are assigned to categories of elements or to individual elements, Vista applies the weightings to each element individually during analyses.

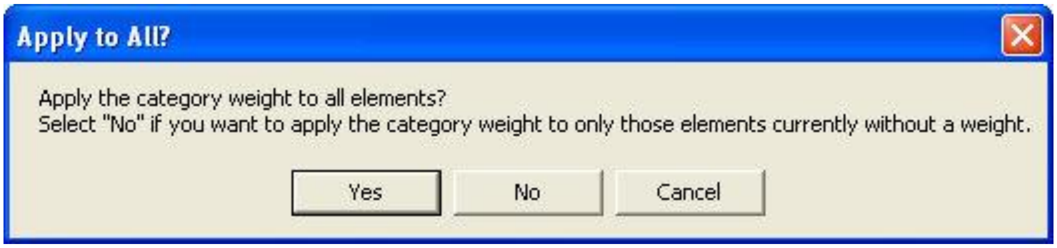
Once a category system has been selected, Category and Category Wt. columns are displayed for elements listed in the Weighting System Properties window, and the name and weight associated with the category to which each element belongs are displayed in these columns, respectively.



6. Determine if the weight assigned for the category system is appropriate for each element. If an alternate weight is preferred for an element, assign a specific value from 0.0 to 1.0 in the Weight column, replacing the

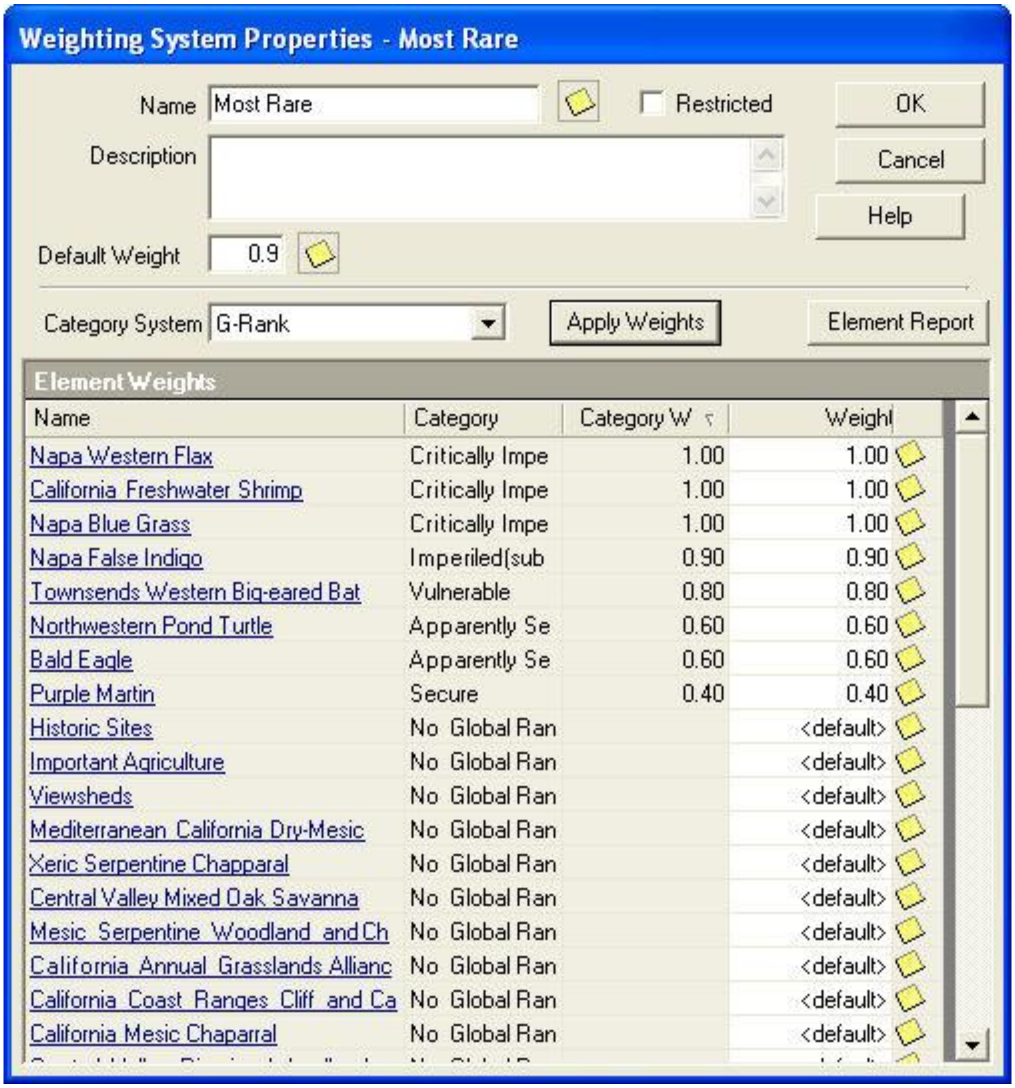
< default>. Clicking on an element name opens its element report, which can aid in setting weights. It may be useful to record the reason(s) for specifying a certain weight by using the associated button to access the Documentation window.

7. After any specific weights have been entered for elements, click the **Apply Weights** button.



The resulting "Apply to All?" window prompts the user to decide whether to replace newly entered values in the Weights column with the pre-existing weight values previously assigned to the category (**Yes**), or retain the new weight values and use existing category weights only for <default> values in the Weight column (**No**).

Skip to step 9.



To create the weighting system without using a category system:

8. Replace the <default> value in the Weight column with a value from 0.0 to 1.0 for any element that should be weighted differently than the value specified in the **Default Weight** field (in step 4 above). Clicking on an element name and clicking the **Element Report** button opens its Element Details Report, which can aid in setting weights. It may be useful to record the reason(s) for specifying a certain weight by using the associated  button to access the Documentation window.
9. If needed, reset to <default> any weight values for elements that should be weighted using the entry in the **Default Value** field (see step 4 above) instead by selecting the value to be changed in the Weight column and clicking either the **Delete** or **Backspace** button to remove the value. Moving to another row (using either **Enter** or the arrow buttons) will cause the now missing value to be replaced with <default>.

10. To save the data entered for the weighting system click **OK**; otherwise, click **Cancel**. Any elements with a <default> weight value will be automatically weighted according to the value entered in the **Default Weight** field (in step 4 above) in any analyses.
11. To review details on the new weighting system, select the system on the Weighting System List window and click the **Report** button. Settings for the weighting system, as well as weights assigned to specific elements will be displayed. See the Reports section for more details on Weighting System reports.

Edit a weighting system:

1. Select the weighting system from the list on the Weighting System List window and click the **Properties...** button. The resulting properties window displays the weights defined for elements in the weighting system.
2. Edit the weighting system using the processes described above for creating a new weighting system as guidelines.
3. To close the window and save any changes made to the weighting system click **OK**; otherwise, click **Cancel**.

Goal Sets

Objectives

The purpose of a goal set is to provide explicit, numerical objectives for targeted conservation elements based on a value system (e.g., legal protection, economic value). Setting goals helps to address a central question of land use planning and conservation: How much is enough? When quantitative goals for each conservation element are stated, they can be used in Scenario Evaluations to help identify which areas are essential to conserve or manage for compatible uses in order to support targeted conservation elements, and which areas can be designated for development or other less compatible land uses. Further, evaluations that use quantitative objectives permit conservation efforts to be evaluated in terms of progress over time and/or under different conditions (e.g., baseline scenario, future scenario).

Products

A named goal set that assigns numerical objectives to be met in order to effectively conserve elements of interest in the planning region. The goal assigned to an element can be defined in terms of occurrences or area to be conserved, with the numerical value expressed as either the number of viable occurrences or viable area needed, or the percentage of viable occurrences or viable area needed in order to adequately conserve the element.

Inputs

Inputs for developing a goal set include a list of all elements of interest in the planning region and any explicit representation objectives already established for each element (e.g., existing habitat plans to be adopted as-is; objectives established through political mandate, etc.), along with any assigned ranking that indicates rarity (e.g., NatureServe global conservation status, IUCN Red List system).

Methods Summary

Select a task below to see a detailed description of the process for creating a goal set.

- Identify and evaluate any existing objectives for elements
- Identify any assigned values that represent element vulnerability
- Develop overall conservation goals
- Identify subregional and regional spatial stratification for setting objectives
- Establish historical extent for any ecosystem elements
- Establish quantitative objectives for achieving element conservation goals
- Create a goal set using Vista

Background

It is useful to describe the approach for developing goal sets in terms of conservation *goals* and conservation *objectives*. Conservation goals represent the desired future condition for targeted species, communities, ecosystems, or other conservation elements. These overarching goals differ among targeted elements. Some of these differences reflect the "coarse filter/fine filter" strategy for biodiversity conservation and the purposes for which different groups of elements are targeted. For example, a suite of imperiled, rare, and vulnerable species, and vulnerable species assemblages are often targeted as "fine filter" conservation elements. They are targeted individually because it is the only way to ensure that their individual needs can be addressed. The conservation goal focuses on the viability of these species within the planning area, and might be stated as: "targeted species remain viable within the planning area due to efforts that address vulnerabilities." Importantly, this statement suggests that not only is the intent to maintain "minimally viable" populations, but to specifically address the vulnerabilities these species face due to habitat loss, habitat conversion, or direct exploitation.

Rare vegetation, aquatic communities, and all native ecological system types might be targeted as "coarse filter" elements. A "coarse filter" strategy is aimed at maintaining the ecological processes that support the vast majority of species, thus helping to avoid targeting numerous species individually. In addition to maintaining non-target species, "coarse filter" strategies emphasize the conservation of ecosystem services (e.g., air, water, nutrient cycling, etc.). While conservation goals for species correctly emphasize the health and viability of their populations, "coarse filter" goals focus on representation of ecological variability and environmental gradients. So the conservation goal for communities and ecological systems might be stated: "essential ecosystem services are secure and non-target species remain viable due to efforts that address vulnerabilities."

Conservation objectives are the explicit - and hopefully quantifiable - expressions of broader conservation goals. Objectives express the "How much?" "How many?" and "In what spatial distribution?" questions underlying element conservation. Building conservation scenarios is appropriately dictated by these explicit, numerical objectives for each targeted species, community type, ecological system type, or other conservation element. By identifying areas that contribute to these objectives, a conservation vision at a region-wide scale is created.

Some primary considerations in creating a conservation goal set include:

- An *adaptive approach* to setting conservation objectives is essential, since there is frequently a lack of knowledge and/or data existing while establishing objectives, and the ecosystems supporting targeted elements will continue to change. All conservation objectives should be based on the best available knowledge, but should also be viewed as working hypotheses. This requires careful documentation and a long-term commitment to monitoring.
- Both *uncertainty* and *risk* will always need to be addressed, and this should be clearly acknowledged. Uncertainty results from incomplete knowledge and the inability to predict future events. Risk reflects the fact that conservation objectives are, in the end, social decisions, based upon societal willingness to accept the risk of biodiversity loss.
- *The spatial context of selected conservation lands is important*. That is, in setting objectives, it should not be presumed that the lands and waters forming the "matrix" around selected conservation lands contribute no conservation value. In fact, land and water management throughout a given region will continue within a policy framework established by existing regulation, so considerable contribution to conservation value can be expected from surrounding lands.
- *Objectives for the planning region should be placed in the context of existing range-wide objectives* for all targeted elements. In other words, any existing range-wide recovery plans or regional conservation plans

should be evaluated to determine if specific priorities have been established for occurrences within the planning area.

- *Use history as a guide to the future.* Wherever possible, use knowledge of element distribution and abundance over recent centuries to guide establishment of conservation objectives.
- Develop useful *element groupings* and establish *initial objectives* to apply to the group when lacking specialized knowledge, then *refine objectives* as possible with element-specific information.

"Fine Filter" Objectives

The table below provides a summary of initial objectives for targeted species and rare communities in any given planning area. Here, elements are grouped according to their assigned NatureServe global conservation status. Goals are expressed as a percentage of known occurrences in the area. This provides a simple and practical mechanism for establishing initial objectives when other specialized plans do not exist, or where time and expertise is limited for researching other plans.

Initial Conservation Objectives for Targeted Species and Rare Communities

NatureServe Global Conservation Status	Goal (% of current distribution)
Imperiled - Rare (G1-G3)	100%
Declining/vulnerable (G4)	50%

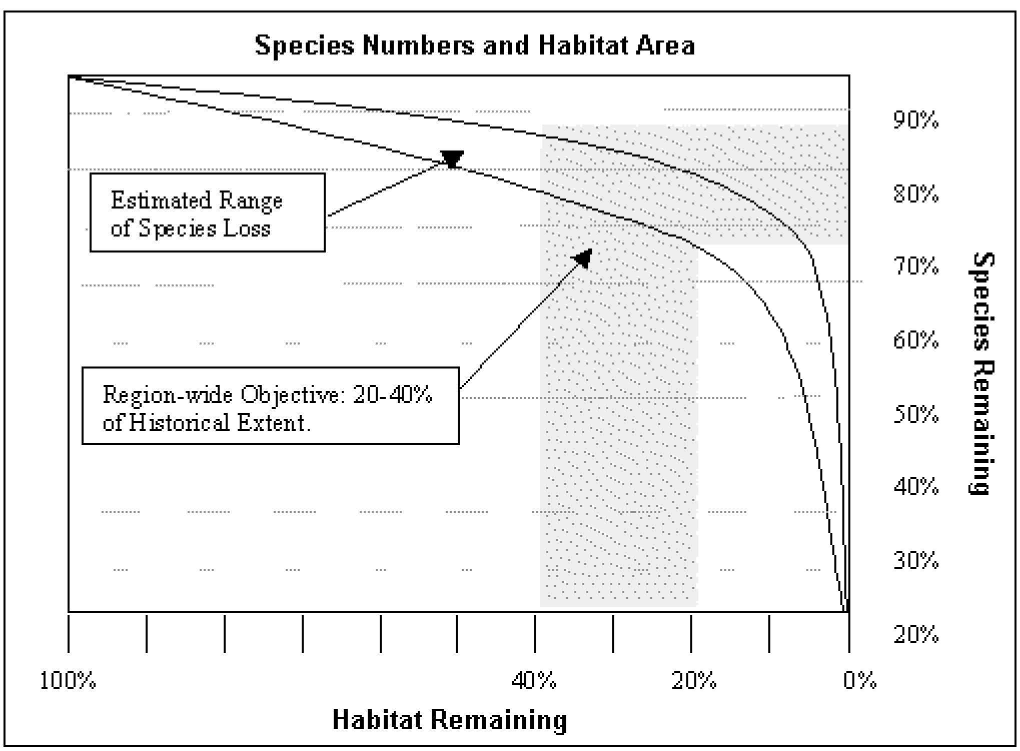
Experience suggests that, for imperiled and rare species, nearly all extant occurrences are needed for recovery and continued viability. For at-risk and declining/vulnerable species, there are typically more occurrences to choose from, and the range-wide proportion of occurrences found within a given area is larger than for imperiled and at-risk species. This greater degree of conservation options is reflected in lower proportional objectives.

"Coarse Filter" Objectives

"Coarse filter" objectives are commonly expressed as areal extent. Areal measures have been commonly applied to the process of setting conservation objectives at national scales using theory from island biogeography (MacArthur and Wilson 1967, Wilcox 1992). A well-established (albeit quite general) relationship exists between habitat area and the number of species that an area can support (e.g., Wilcox 1992). Loss of habitat tends, over time, to result in the loss of species within an approximate range. This relationship formed the basis for international objectives (10% of country area) set by the IUCN for member countries (WCED 1987). This idea is graphically represented in the figure below, and was adapted from Dobson (1996).

Conservation objectives should be stated for each targeted element, and establish some historic context wherever possible, by expressing the desired extent as a percentage of estimated area *circa* e.g. 1850, or the time period immediately prior to widespread European-American settlement of the planning region. The historical time period should mark the beginning of rapid and transforming, human/technology-driven changes to ecosystems, but should be recent enough to reflect vegetation patterns under modern climatic conditions. It, therefore, provides a useful and important reference point, and provides some indication of what the total area and distribution of native ecosystems would be like today if major land use alteration had not occurred in recent centuries.

Establishing an estimate of historical extent for ecological systems is no simple task; in some highly altered places, it is nearly impossible. However, for purposes of establishing numerical conservation objectives, a reasonable approximation will suffice. For most other terrestrial ecological systems, percent change for each system type can be estimated within 10% intervals using current land use/land cover data as well as specific studies. Area can then be added (or subtracted) from the current mapped extent to approximate the historical extent. Where change is estimated to be less than 10%, the current extent can be used.



Estimated species loss with percent area of habitat loss over time.

In order to establish an initial goal representing a percentage of area, the species/area relationship (shown in the figure above) should be considered. In addition, consideration should be given to whether or not most vulnerable and sensitive species are targeted, either individually or in rare communities. In many regional assessments, an initial objective is set for each ecosystem type ranging between 20 and 40% of historical extent. Theory would suggest that this percentage of "coarse filter" representation alone could result in the eventual loss of between 15% and 35% of native species. However, if objectives target "fine filter" elements individually, this range of "coarse filter" objectives could provide an adequate starting point.

Limitations

To ensure the most accurate results in analyses (e.g., Scenario Evaluations), it is important that goal sets be updated routinely to reflect any changes in conservation goals for the planning region. Since specific objectives for target elements are frequently defined on the basis of incomplete knowledge and/or data, and ecosystems that support targeted elements change over time, careful documentation and long-term monitoring are necessary to ensure that goals remain current.

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Steps in the Goal Set Creation Process

PROCESS FOR CREATING A GOAL SET

Identify and evaluate any existing objectives for elements

Identify any explicit representation objectives already established for any of the target elements (e.g., existing habitat plans, objectives established through political mandate, etc.). Using the discussion and default objectives in the Background section, evaluate the existing objectives and determine whether to accept them as-is, or establish project-specific objectives.

PROCESS FOR CREATING A GOAL SET

Identify any assigned values that represent element vulnerability

Identify species and community elements that have assigned values representing global rarity (e.g., NatureServe global conservation status, IUCN Red List system). For any elements lacking such values, evaluate them in terms of global rarity and assign a representative value, approximated using NatureServe conservation status or IUCN Red List ranking.

Develop overall conservation goals

Articulate overall conservation goals for each conservation element, or for groups of conservation elements where a common overarching goal statement applies. These goals represent the initial phases of a "goal-based" approach to generating scenarios for the planning region that support element conservation. For many individual land use decisions, a broader perspective is needed that puts a particular area into context and clarifies alternative options. Using this approach, overall conservation goals for the planning region are established in this process step, and then explicit, numerical objectives are developed for specific conservation elements later in the process.

Note that in cases when an element in the Vista database has not been included in any goal sets, its conservation goal will default to 0.0 in analyses. Thus, Scenario Evaluations that include the element will falsely indicate that its goals have been met.

Identify subregional and regional spatial stratifications for setting objectives

Identify any *subregional* spatial stratifications (e.g., U.S. Department of Agriculture Forest Service [USDA] subsections, major watershed units) that are appropriate to use in developing conservation objectives for all or certain groups of elements. For example, objectives for terrestrial ecosystems might be expressed using USDA Forest Service subsections. After determining stratifications at the subregional level, then determine the appropriate *regional* stratification for each element. Using the previous example, objectives for terrestrial ecosystems might be expressed as percentages of historical extent within each of two USDA Forest Service subsections that describe their range within the planning region.

Establish historical extent for any ecosystem elements

Where ecosystem representation is a part of the conservation plan for the region of interest, review available information to establish rough approximations of the historical extent of major ecological system types throughout the region. The appropriate historical time period is generally considered to be between 1600 and 1850 throughout North America. These approximations may be derived from various sources, and approximation within 10-20% of the actual historical extent of an ecosystem is desired.

Establish quantitative objectives for achieving element conservation goals

Establish appropriate measurements representing conservation objectives for target elements (e.g., *numbers* of discrete, local viable occurrences; *linear miles* of stream; *percentages of total area* for major ecosystem types, etc.). Utilize any subregional or regional spatial stratifications (identified in a previous step) that are appropriate for setting objectives. For ecosystems, objectives should represent an approximation within 10-20% of their actual historical extent (established in a previous step).

Create a goal set using Vista

Using the Vista Goal Set Properties window, create a goal set composed of the individual objectives established in the preceding step.

Windows for Goal Sets

EDIT SUB-REGIONAL GOAL SET WINDOW

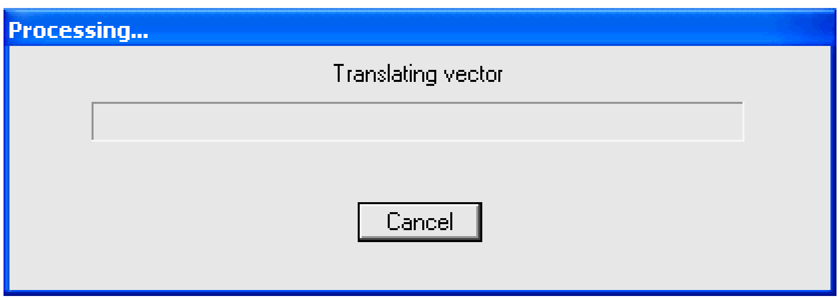
The **Edit Sub-Regional Goal Set** window, displayed by clicking the **Sub-goals...** button on the Goal Set List window, is used to create a new set of conservation goals for a defined group of elements in a specific area of interest within the planning region. Goal sets can be utilized in Land Use and Conservation Scenario Evaluations for comparing existing land use statuses and scenarios for future land uses, and tracking conservation progress over time. See the Goal Sets section for more detailed information on the development and use of goals in analyses.

Create a sub-goal set:

1. The value in the **Source Goal Set Name** field will default to the goal set selected in the Goal Set List window, but can be changed using the drop-down menu, which includes the option to use **< None >**, create a new goal set (**<Add New...>**), or to open the Goal Set List window displaying all existing goal sets (**<Show List...>**) in order to select and modify an existing set of goals.
2. Choose the filter to be used, if any, to define the new sub-regional goal set by changing the default value of **<Unfiltered>** to the appropriate choice from the **Source Filter** drop-down menu. The setting selected will

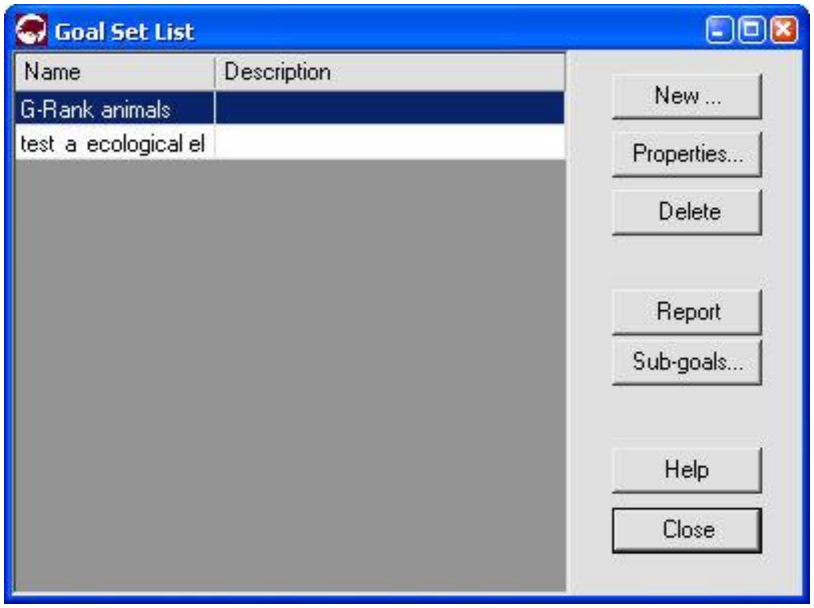
restrict the elements that will be included in the sub-regional goal set to those permitted by that filter. The menu includes the option to create a new filter (**<Add New...>**), or to open the Filter List window displaying all existing filters (**<Show List...>**) in order to select and modify an existing filter.

3. Use the **Sub-Regional Layer** field to indicate the spatial layer to be used to define specific areas within the planning region for use in sub-regional goal sets. Although the default value in the field is **<None>**, a layer is required to create a sub-regional goal set. Select a layer from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. To add additional values to the drop-down menu, add a layer to the table of contents. Note that the layer used must contain more than one polygon feature (e.g., parcels) in order to be used to define a sub-regional goal set.
4. To close the window, saving the sub-regional goal set click **OK** to begin processing; otherwise, click **Cancel**.



Goal Set List Window

The **Goal Set List** window is displayed by selecting **Lists ▸Goal Set List...** from the NatureServe Vista menu. This window lists all the goal sets that have been created for the project. See the Goal Sets section for more detailed information on the development and use of goal sets in analyses.



Button functions:

New... displays a new Goal Set Properties window that can be used to develop a new goal set to be used in the project.

Properties... displays the Goal Set Properties window showing details and allowing edits to the goal set selected in the list.

Delete deletes the goal set selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the goal set is referenced by another item used in project analyses, as shown in the following example.

Report displays a report that describes the selected goal set and its settings, as well as any elements with explicit goals to be included in analysis when the goal set is utilized. See the Reports section for more details on Goal Set reports.

Sub-goals... displays the Edit Sub-Regional Goal Set window that can be used to develop a new goal set to be used for a specific sub-region defined in the project.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

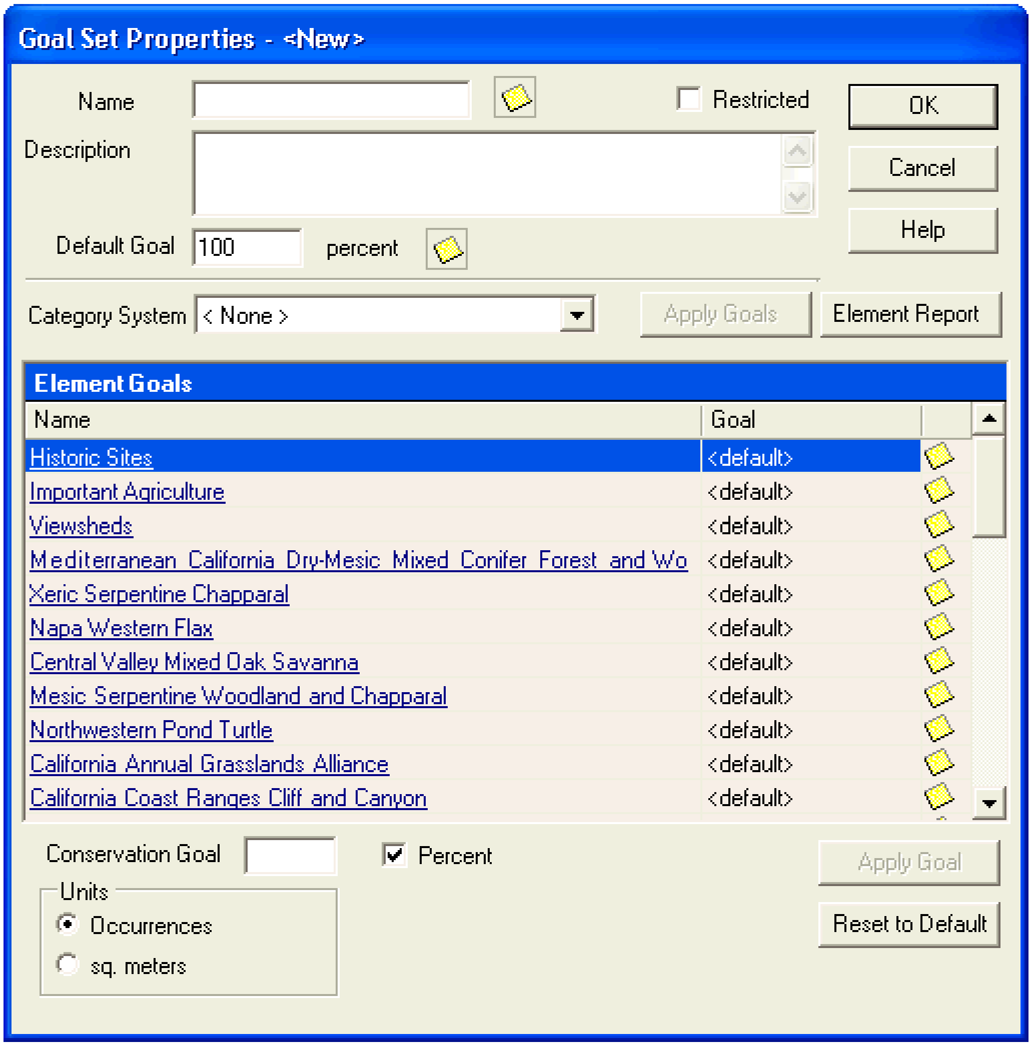
Name - name of the goal set.

Description - description of the goal set, if any.

GOAL SET PROPERTIES WINDOW

The **Goal Set Properties - <New>** window is displayed by clicking the **New...** button on the Goal Set List window. The new properties window is used to create a new set of conservation goals for elements of interest in the planning region. The goal set can be utilized in Land Use and Conservation Scenario evaluations for establishing a baseline against which both the existing land use status and scenarios for future land use can be compared, and conservation progress tracked over time. See the Goal Sets section for more detailed information on the development and use of goals in analyses.

Note that the button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



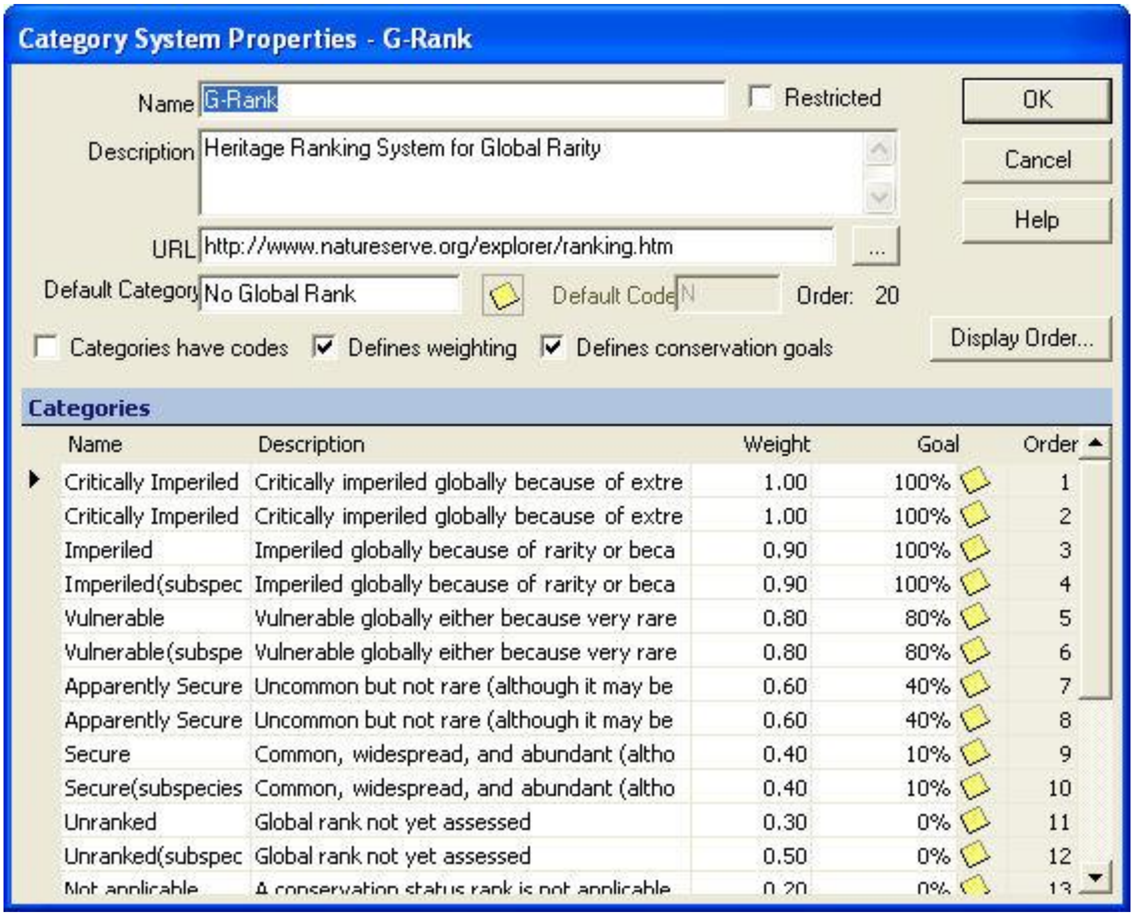
Create a goal set:

1. Specify a name for the goal set in the **Name** field. The **<New>** on the window title will change to the name of the new goal set as the entry is typed in.
2. If the ability to edit the goal set should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the goal set in the **Description** field, if desired.
4. Enter a value in the **Default Goal** field to be used in cases when a specific goal is not assigned to an element. The default value in this field is 100 percent.

If a category system is to be used to create the goal set, continue with step 5; if not, skip to step 7.

5. From the **Category System** drop-down menu select a category system to be used to define conservation objectives for the goal set. Only category

systems that define goals are shown in the drop-down list, such as the default "G-Rank" system displayed in the Category System Properties window below, although the option to create a new category system (**<Add New...>**) or to display all existing systems (**<Show List...>** in order to select and modify an existing system by adding goals) are included in the drop-down list.

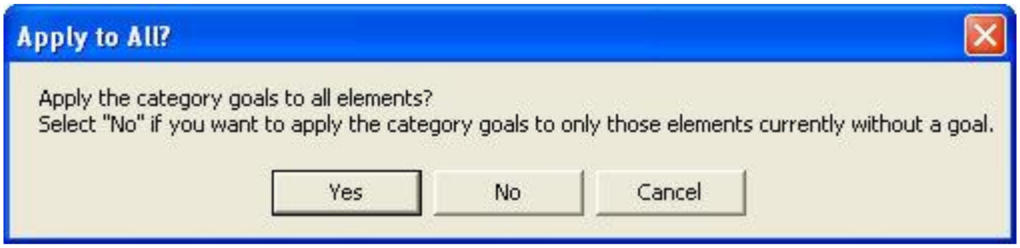


The advantage of using a category system is that goals can be assigned for groups of elements (e.g., all elements that are Critically Imperiled will have a conservation goal of 100%) instead of element by element individually (e.g., goal assigned for Burrowing Owl is 80% of viable occurrences, goal assigned for California Black Rail is 90%, etc.).

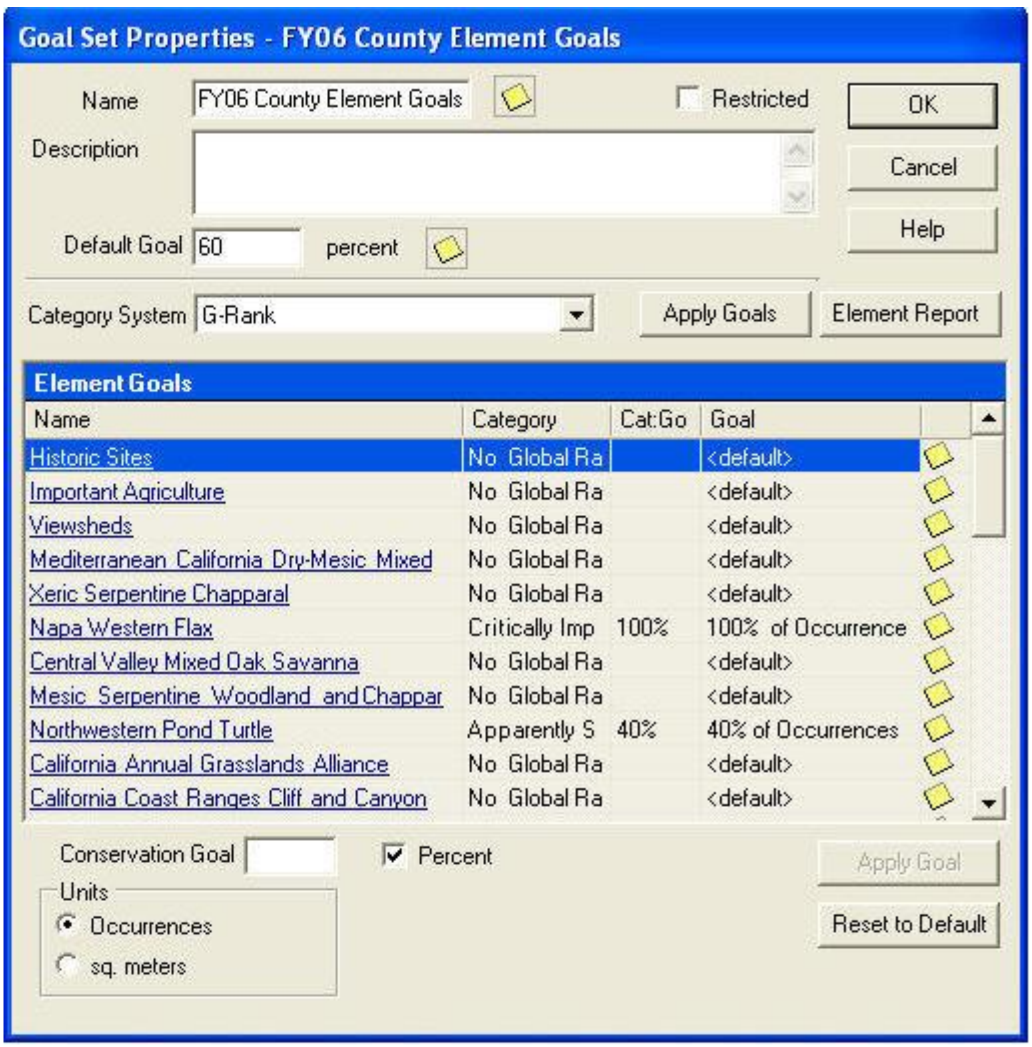
Once a category system has been selected, Category and Cat:Goal columns are displayed for elements listed in the Goal Set Properties window, and the name and conservation goal associated with the category to which each element belongs are displayed in these columns, respectively.

6. If it is preferable to begin using goals set for elements in the category system instead of just <default> values, use the **Apply Goals** button to the right of the **Category System** field to replace values in the Goal column with those displayed in the Cat.Goal column. Note that this action will result in an "Apply to All?" window that prompts the use to decide

whether to replace any new values entered in the Goal column with the pre-existing goals assigned to the category (Yes), or retain any newly-defined values for the goal set being defined (No).



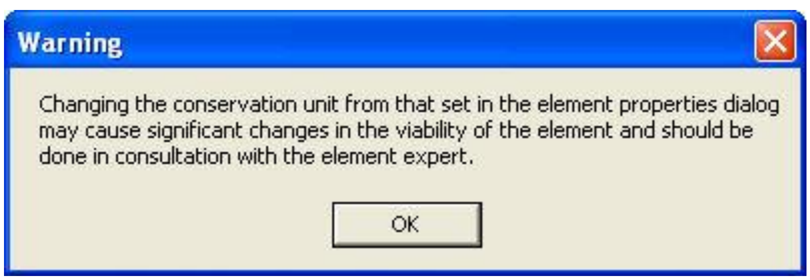
If the **Apply Goals** button is used before any specific element goals have been defined, it makes no difference whether the user chooses **Yes** or **No** since there are no new goals to be overwritten. (If specific goals have been defined, however, see step 7.) Category goal values will be displayed in the Goal column.



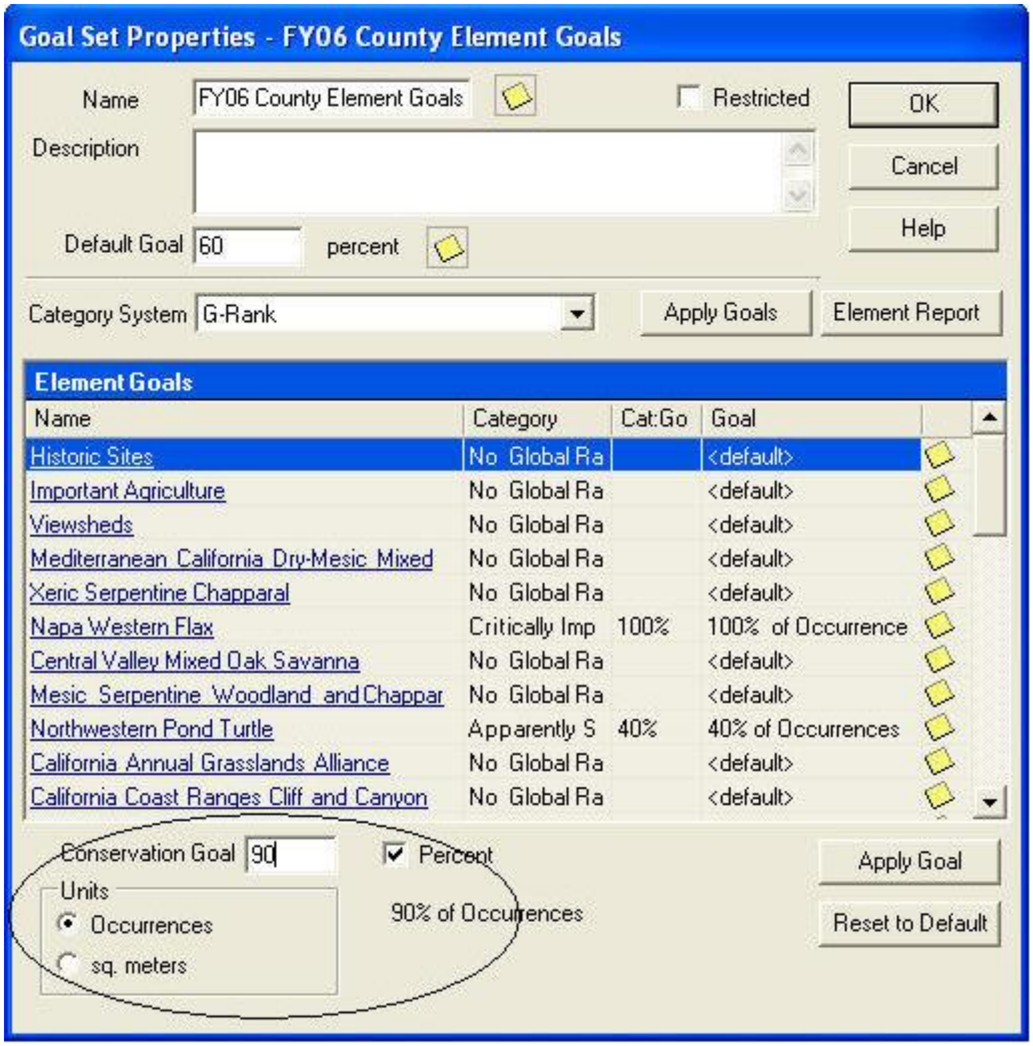
7. To assign a specific conservation goal to an element for this goal set:

- Highlight the element
- Enter (or change) the value in the **Conservation Goal** field in the lower left corner of the window. The value will be changed in cases when the Goal has been previously populated with the category value using the **Apply Goals** button, or when a value has been previously specified for the element.
- Indicate whether the goal represents viable occurrences or viable area to be conserved for the element by selecting either the **occurrences** or **area** radio button, respectively, in the Units group box in the lower left corner of the window.

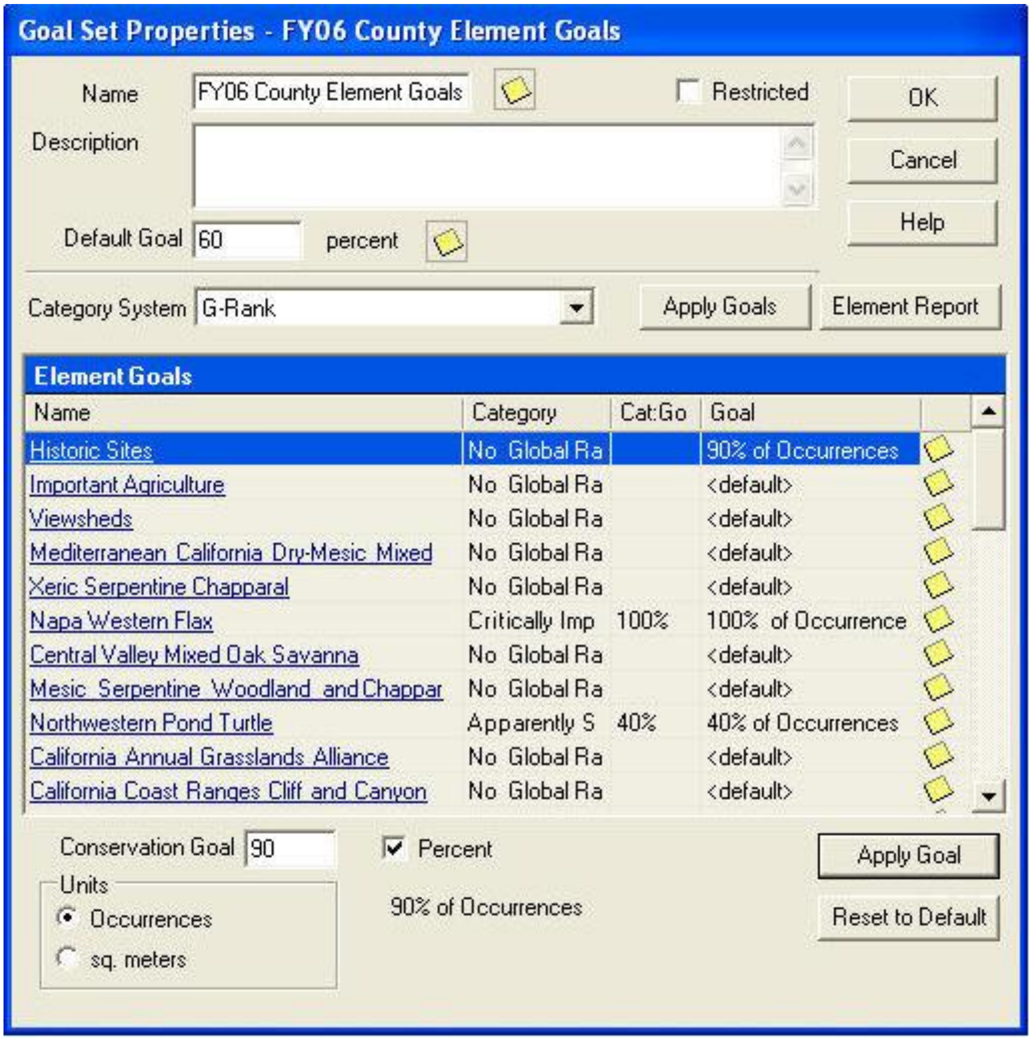
  If a category system is being used to create goals, the appropriate **occurrences** or **area** radio button in the *Units* group box will be automatically selected based on the goal in the category system. Changing this default setting may significantly impact the actual viability (or integrity, for ecological communities and systems) of an element to be conserved in the region of interest if the goal is not appropriate for the type of data associated with that element. The first time such a change is made during the process of defining the conservation goal for a specific element, the following warning message is displayed:



- If the goal is to be applied as a *percentage* of viable occurrences or viable area to be conserved rather than the *number* of viable occurrences or viable area, place a check in the **Percent** checkbox. Note that if the element has an assigned category goal, the **Percent** checkbox will be checked by default since category goals always represent a percentage, rather than a number, of occurrences or area.

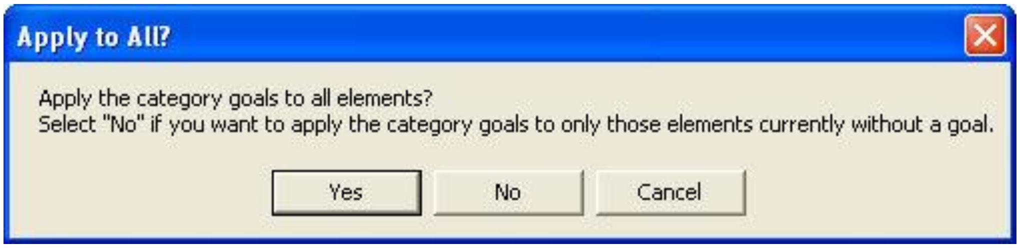


- Once these items have been completed, click the **Apply Goal** button in the lower right corner of the window to assign the conservation goal to the element. Note that a specified conservation goal for a particular element can be changed back to the original <default> value by highlighting the element and clicking the **Reset to Default** button in the lower right corner of the window.



If a category system is <u>not</u> being used to create goals, skip to [step 9](#).

8. If, after specific element goals have been defined, there are <default> values remaining in the Goal column that need to be replaced with the goal values defined for the category system instead of simply using the value in the **Default Goal** field, use the **Apply Goals** button to the right of the **Category System** field. This will replace the <default> values in the Goal column with those displayed in the Cat.Goal column. Note that this action will result in an "Apply to All?" window that prompts the user to decide whether to replace any new values entered in the Goal column with the pre-existing goals assigned to the category (**Yes**), or retain any newly-defined values for the goal set being defined (**No**).



Unless specifically defined goals should be overwritten, the user should choose **No** to replace only <default> values in the Goal column.

9. To view a report on a specific element, highlight the element and the **Element Report** button. See the Element Details Report for more detailed information.
10. To close the window and save the goal set click **OK**; otherwise, click **Cancel**.
11. To review details on the new (saved) goal set, open the Goal Set List window, select the set, and click the **Report** button. Settings for the goal set, as well as goals assigned to specific elements will be displayed. See the Reports section for more details on Goal Set reports.

Edit a goal set:

1. Select the goal set from the list on the Goal Set List window and click the **Properties...** button. The resulting properties window displays the goals defined for elements in the goal set.
2. Edit the goal set using the processes described above for creating a new goal set as guidelines.
3. To close the window and save any changes made to the goal set click **OK**; otherwise, click **Cancel**.

CONSERVATION VALUE ANALYSIS

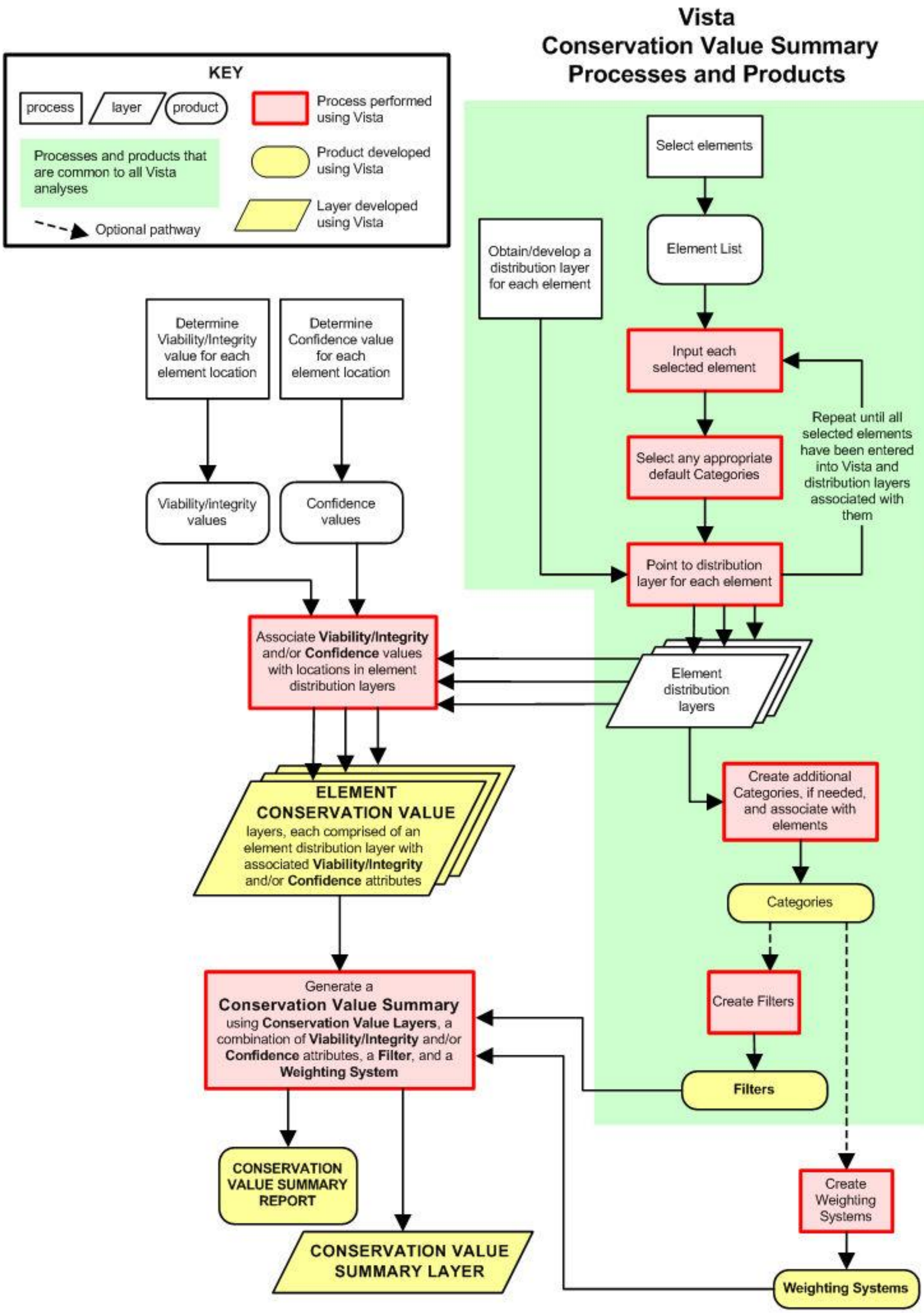
INTRODUCTION TO CONSERVATION VALUE SUMMARIES

The conservation value of individual elements, captured in Element Conservation Value (ECV) layers, can be combined to produce an overall summary of conservation value across the planning region. The summary aggregates all of the individual raster ECVs, including their associated viability/ecological integrity and confidence attributes, and weights them according to their relative conservation importance as defined by a selected weighting system. Viability/integrity values (ranging from 0.0-1.0) are used to indicate the likelihood that an element occurrence will persist, while confidence values (also ranging from 0.0-1.0) suggest the spatial and temporal confidence associated with each occurrence. The result of this aggregation is a raster layer of biodiversity "hotspots" highlighting the most important places for conservation in the region - a Conservation Value Summary.

Conservation value summaries (CVS) can be customized in several ways. Filters can be defined which constrain the set of elements incorporated in the analysis (e.g., ”r;Legally protected only”; ”r;Legally protected or globally imperiled”). A custom weighting system can also be applied in order to weight individual elements according to local priorities. The same set of elements can be aggregated according to different weighting systems to compare the priority conservation sites for different constituent groups. Finally, the analysis itself can be customized to understand element richness (unweighted elements without confidence or viability/integrity attributes), or concentrations of high viability/integrity or low confidence.

The products of a CVS are a report and a summary raster layer that can be used to set conservation priorities in the planning region. The CVS identifies which areas are most important for conservation, and which may be more suitable for development.

Once a CVS has been generated, the conservation value of selected land units (e.g., parcels) within the planning region can be examined using the Site Explorer tool. Provided that the data support such resolution, a CVS exploration can calculate the conservation value of the site selected along with element attribute data, including the number of occurrences and number of viable occurrences present on the site.


Vista
Conservation Value Summary
Processes and Products
KEY
process
layer
product
Process performed using Vista
Processes and products that are common to all Vista analyses
Product developed using Vista
Layer developed using Vista
Optional pathway
Select elements
Element List
Obtain/develop a distribution layer for each element
Input each selected element
Repeat until all selected elements have been entered into Vista and distribution layers associated with them
Select any appropriate default Categories
Point to distribution layer for each element
Determine Viability/Integrity value for each element location
Determine Confidence value for each element location
Viability/integrity values
Confidence values
Associate Viability/Integrity and/or Confidence values with locations in element distribution layers
Element distribution layers
Create additional Categories, if needed, and associate with elements
ELEMENT CONSERVATION VALUE layers, each comprised of an element distribution layer with associated Viability/Integrity and/or Confidence attributes
Categories
Create Filters
Generate a Conservation Value Summary using Conservation Value Layers, a combination of Viability/Integrity and/or Confidence attributes, a Filter, and a Weighting System
Filters
CONSERVATION VALUE SUMMARY REPORT
CONSERVATION VALUE SUMMARY LAYER
Create Weighting Systems
Weighting Systems

Element Conservation Value

ELEMENT CONSERVATION VALUE

Objectives

The purpose of this process is to create a geographic information system (GIS) Element Conservation Value raster for each selected element that depicts its spatial distribution within the planning region, along with associated values that reflect the viability/ecological integrity and/or the confidence of each occurrence. Thus, an Element Conservation Value (ECV) layer reflects the element's conservation value across the planning area. ECV layers are currently used only in Conservation Value analyses.

Products

This process results in an ECV layer, developed by rasterizing the distribution layer for an element and assigning a single conservation value to each grid cell based on the values for viability/integrity and confidence in that cell.

Inputs

Vector distribution layers comprised of occurrences of elements of interest in the planning region, which may have associated values for viability/integrity and/or confidence, serve as inputs to the ECV creation process. In cases when viability/integrity values are determined using raster landscape integrity layers, these layers are also utilized in creating ECVs.

Methods Summary

Vista will automatically create a raster ECV layer for an element when each of the following tasks has been completed:

- The name of the selected element has been entered into Vista
- A distribution layer in vector format has been associated with the elements
- Any assigned viability/ecological integrity attributes have been associated with occurrences of the element
- Any assigned confidence attributes have been associated with occurrences of the element

Note that some of these tasks may have been completed during the process of creating the element database in Vista. Methods for each of the tasks are described in the separate process sections.

Background

The most basic analysis of a single element is to determine its conservation value across the planning area. Once distribution, viability/integrity and confidence information has been entered in Vista, the system creates a raster layer of conservation value for the element. Conservation value is defined as **viability/integrity *x* confidence**, applied across the element's distribution. Areas of highest conservation value for the element, then, are those with the highest viability/integrity and confidence scores and, conversely, those with the lowest conservation value are those with the lowest viability/integrity and confidence scores.

An Element report showing details on attributes of the element (as described in the Element Properties window), as well as distribution statistics (number of occurrences and total area) and a map depicting conservation value for the element can be generated using the **Report** button on the Element List window. See the Element Report for more detailed information.

Limitations

ECV layers are created by rasterizing vector element distribution layers. This process results in a loss of precision.

References

Margules, C.R., and R.L. Pressey. 2000. Systematic conservation planning. Nature 405:243-253.

Pressey, R.L., C.J. Humphries, C.R. Margules, R.I. Van-Wright, and P.H. Williams. 1993. Beyond opportunism: key principles for systematic reserve selection. Trends in Ecology and Evolution 8: 124-128.

Pressey, R.L., and R.M. Cowling. 2001. Reserve selection algorithms and the real world. Conservation Biology 15:275-277.

CONSERVATION VALUE SUMMARIES

Objectives

The purpose of this function is to create a Conservation Value Summary (CVS), which can be used to indicate the conservation value of specific locations in the planning region based on attributes of elements and/or their occurrences.

Products

A Conservation Value Summary - a raster theme that represents an index of element conservation values derived for each grid cell, based on attributes of elements and/or their occurrences - results from the Summarize Conservation Value process.

Uses for the CVS

The CVS is primarily a visualization tool that indicates areas of relatively high and low conservation importance. Thus, a CVS can be used in the conservation planning process to identify areas where incompatible land uses could negatively impact important elements of biodiversity. In addition, the CVS can be used with the Vista Site Explorer tool to examine details on the conservation value for a specific site or set of sites, along with information on the contributing biodiversity elements present on the selection. A CVS may also be overlaid with other geographic information system (GIS) layers for additional analyses, including

- Existing protected areas, to identify places of high conservation value that are not currently protected;
- Ownership, to identify the stewards of high conservation value areas;
- Proposed plans for zoning, infrastructure, or major developments, to identify likely conflicts.

Individual Element Conservation Value (ECV) layers can be overlaid with both the CVS and development plans to identify specific element occurrences that are in conflict with the plans, as well as to view the viability/integrity and confidence values of those occurrences.

Inputs

Depending on the elements and attributes selected to create a CVS, inputs include

- Element Conservation Value (ECV) rasters for designated elements, which are comprised of distribution data along with attributes of occurrences
- A Vista filter, used to select the elements, and thus the ECV layers to be included in the summary
- A Vista weighting system, used to indicate the relative importance of specific elements and/or groups of elements

Methods Summary

A filter, attributes, and/or a weighting system are selected and applied to element distribution data, resulting in a Conservation Value Summary. Vista provides great flexibility in selecting both the elements and the attributes to be used in this process. Attributes that can be included in a CVS calculation are

Viability/Integrity - finalized viability or ecological integrity value for each element occurrence

Confidence - net confidence value for each element occurrence

Weight - weights that indicate the relative importance of elements, and thus, their occurrences (for those elements assigned values in the designated weighting system)

The conservation value for each grid cell in a CVS is then derived by multiplying together attribute values (ranging from 0-1.0) for every occurrence of the designated set of elements that intersects the grid cell, along with any weights to be applied to occurrences of these elements based on the designated weighting system, and then adding the results, as illustrated in the following formula:

$$CVS_{[x,y]} = \sum_{e=1}^{n} ((VI_e * C_e)_{[x,y]} * W_e)$$

where:

e = element
[x, y] = coordinates for a grid cell
VI = occurrence viability/integrity value
C = occurrence confidence value
W = element weight

A CVS cell value can range from 0 (indicating that no elements are known to be present) to the total number of elements occurring at that location. For example, a cell would have a value of 15.0 if fifteen elements occur at that location and either 1) the richness option without confidence is used to calculate the CVS, or 2) all attributes for all elements have a perfect 1.0 value. However, because perfection in data is rare, values for cells in a CVS will generally be much lower than the value for total species richness (i.e., number of elements).

Creating summaries based on different combinations of element and occurrence attributes can be useful in identifying reasons that specific locations within a planning region are important for conservation (e.g., presence of highly-weighted rare species; presence of many elements; very high viability of species populations or ecological integrity of ecosystems; very high confidence of element presence). Nine basic combinations of attributes can be used to create a CVS, specifically

- ***Weighted Viability/Integrity (with and without Confidence)***

- ***Unweighted Viability/Integrity (with and without Confidence)***
- ***Weighted Richness (with and without Confidence)***
- ***Richness (with and without Confidence)***
- ***Unweighted Confidence Index***

For information on these different summary options, including a list of variables used for each, the type of calculations to be performed, interpretation of the resulting CVS, and any limitations, see the Different Types of Conservation Value Summaries section.

Limitations

The CVS is an index and should be used as such - a general indicator of areas with relatively high and low conservation value based on user inputs and options. A large amount of data about individual elements and their occurrences is aggregated to a single value in this process, which necessarily results in a loss of precision and information to achieve the summary or averaged value. In addition, precision is lost as the data is re-sampled during the process of creating a CVS. Re-sampling occurs when the Element Conservation Value (ECV) layers used to create the CVS are overlaid on top of one another; their cell boundaries may not line up so their values are ”re-sampled" into the grid cells in the CVS which closely correspond with (but are not always identical to) the cell locations they came from. Note that the results of a CVS display all occurrences of elements included in the analysis coded according to conservation value; the analysis does not exclude any occurrences from the results on the basis of minimum viable size.

It is also important to realize that the CVS does not automatically incorporate other important considerations of conservation planning, such as the degree to which elements are already protected at a location, how irreplaceable any one occurrence is in terms of meeting conservation goals, or the degree to which any particular occurrence is threatened. Such information can, however, be obtained using Scenario Evaluation analyses.

Steps in the ECV Raster Creation Process

PROCESS FOR CREATING ELEMENT CONSERVATION VALUE LAYERS

Enter the names of selected elements into Vista

Elements that are important to consider in planning analyses are identified and then added to Vista for use in project analyses. If this process has already been completed, then disregard this step.

For details on elements to be included in the project, see the Element Selection section. If elements have not yet been selected for the project, a description of the process for selecting elements can be found under the Methods Summary heading in that section. If elements have been selected but not yet entered into Vista, see the Input Element Names into Vista step of the element selection process.

PROCESS FOR CREATING ELEMENT CONSERVATION VALUE LAYERS

Associate distribution layers with elements

Distribution layers are developed and then associated with elements in Vista in order to represent the spatial distributions of these elements within the planning region. If this process has already been completed, then disregard this step.

For details on distributions, see the Element Distributions section. If distribution layers have not yet been developed for the project, a description of the process for creating distributions can be found under the Methods Summary heading in that section. If distributions have been developed but not yet associated with elements in Vista, see the Point Vista to the Distribution Layers step of the distribution process.

Associate viability/integrity values with element distributions

Viability/ecological integrity values represent the likelihood that, if current conditions prevail, an occurrence will persist. A viability/integrity value (ranging from 0.0 -1.0) is assigned to each occurrence of an element and then added to Vista. If this process has already been completed, then disregard this step.

For details on viability/integrity, see the Viability/Integrity Attributes section. If these attributes have not yet been assigned to occurrences of elements, a description of the process for assigning viability/integrity can be found under the Methods Summary heading in that section. If viability/integrity values have been developed for occurrences but not yet recorded in Vista, see the Add Viability/Integrity Values to Vista step of the viability/integrity process.

Associate confidence values with element distributions

Confidence values suggest the spatial and temporal confidence associated with an occurrence. A confidence value (ranging from 0.0 to 1.0, low to high confidence, respectively) is assigned to each occurrence of an element and then added to Vista. If this process has already been completed, then disregard this step.

For details on confidence, see the Confidence Attributes section. If these attributes have not yet been assigned to occurrences of elements, a description of the process for assigning confidence can be found under the Methods Summary heading in that section. If confidence values have been developed for occurrences but not yet recorded in Vista, see the Add Net Confidence Values to Vista step of the confidence process.

Document products with metadata

The final products of this process are Element Conservation Value (ECV) rasters that represent the conservation value of individual elements in the planning region. Metadata should document the data source, the data standards, and the confidence measure associated with each ECV layer.

Vista automates the process of producing metadata that is compliant with the Federal Geographic Data Committee (FGDC) metadata standards. See http://www.fgdc.gov for more details on metadata standards.

Conservation Value Summaries

CONSERVATION VALUE SUMMARIES

Objectives

The purpose of this function is to create a Conservation Value Summary (CVS), which can be used to indicate the conservation value of specific locations in the planning region based on attributes of elements and/or their occurrences.

Products

A Conservation Value Summary - a raster theme that represents an index of element conservation values derived for each grid cell, based on attributes of elements and/or their occurrences - results from the Summarize Conservation Value process.

Uses for the CVS

The CVS is primarily a visualization tool that indicates areas of relatively high and low conservation importance. Thus, a CVS can be used in the conservation planning process to identify areas where incompatible land uses could negatively impact important elements of biodiversity. In addition, the CVS can be used with the Vista Site Explorer tool to examine details on the conservation value for a specific site or set of sites, along with information on the contributing biodiversity elements present on the selection. A CVS may also be overlaid with other geographic information system (GIS) layers for additional analyses, including

- Existing protected areas, to identify places of high conservation value that are not currently protected;
- Ownership, to identify the stewards of high conservation value areas;
- Proposed plans for zoning, infrastructure, or major developments, to identify likely conflicts.

Individual Element Conservation Value (ECV) layers can be overlaid with both the CVS and development plans to identify specific element occurrences that are in conflict with the plans, as well as to view the viability/integrity and confidence values of those occurrences.

Inputs

Depending on the elements and attributes selected to create a CVS, inputs include

- Element Conservation Value (ECV) rasters for designated elements, which are comprised of distribution data along with attributes of occurrences
- A Vista filter, used to select the elements, and thus the ECV layers to be included in the summary
- A Vista weighting system, used to indicate the relative importance of specific elements and/or groups of elements

Methods Summary

A filter, attributes, and/or a weighting system are selected and applied to element distribution data, resulting in a Conservation Value Summary. Vista provides great flexibility in selecting both the elements and the attributes to be used in this process. Attributes that can be included in a CVS calculation are

Viability/Integrity - finalized viability or ecological integrity value for each element occurrence

Confidence - net confidence value for each element occurrence

Weight - weights that indicate the relative importance of elements, and thus, their occurrences (for those elements assigned values in the designated weighting system)

The conservation value for each grid cell in a CVS is then derived by multiplying together attribute values (ranging from 0-1.0) for every occurrence of the designated set of elements that intersects the grid cell, along with any weights to be applied to occurrences of these elements based on the designated weighting system, and then adding the results, as illustrated in the following formula:

$$CVS_{[x,y]} = \sum_{e=1}^{n}((VI_e * C_e)_{[x,y]} * W_e)$$

where:

e = element
[x, y] = coordinates for a grid cell
VI = occurrence viability/integrity value
C = occurrence confidence value
W = element weight

A CVS cell value can range from 0 (indicating that no elements are known to be present) to the total number of elements occurring at that location. For example, a cell would have a value of 15.0 if fifteen elements occur at that location and either 1) the richness option without confidence is used to calculate the CVS, or 2) all attributes for all elements have a perfect 1.0 value. However, because perfection in data is rare, values for cells in a CVS will generally be much lower than the value for total species richness (i.e., number of elements).

Creating summaries based on different combinations of element and occurrence attributes can be useful in identifying reasons that specific locations within a planning region are important for conservation (e.g., presence of highly-weighted rare species; presence of many elements; very high viability of species populations or ecological integrity of ecosystems; very high confidence of element presence). Nine basic combinations of attributes can be used to create a CVS, specifically

- ***Weighted Viability/Integrity (with and without Confidence)***
- ***Unweighted Viability/Integrity (with and without Confidence)***
- ***Weighted Richness (with and without Confidence)***
- ***Richness (with and without Confidence)***
- ***Unweighted Confidence Index***

For information on these different summary options, including a list of variables used for each, the type of calculations to be performed, interpretation of the resulting CVS, and any limitations, see the Different Types of Conservation Value Summaries section.

Limitations

The CVS is an index and should be used as such - a general indicator of areas with relatively high and low conservation value based on user inputs and options. A large amount of data about individual elements and their occurrences is aggregated to a single value in this process, which necessarily results in a loss of precision and information to achieve the summary or averaged value. In addition, precision is lost as the data is re-sampled during the process of creating a CVS. Re-sampling occurs when the Element Conservation Value (ECV) layers used to create the CVS are overlaid on top of one another; their cell boundaries may not line up so their values are ”re-sampled” into the grid cells in the CVS which closely correspond with (but are not always identical to) the cell locations they came from. Note that the results of a CVS display all occurrences of elements included in the analysis coded according to conservation value; the analysis does not exclude any occurrences from the results on the basis of minimum viable size.

It is also important to realize that the CVS does not automatically incorporate other important considerations of conservation planning, such as the degree to which elements are already protected at a location, how irreplaceable any one occurrence is in terms of meeting conservation goals, or the degree to which any particular occurrence is threatened. Such information can, however, be obtained using Scenario Evaluation analyses.

Different Types of Conservation Value Summaries

The conservation value for a grid cell in a Conservation Value Summary (CVS) is derived by multiplying together selected attribute values (ranging from 0.0-1.0), and then combining the results, as illustrated in the following basic CVS formula:

$$CVS_{[x,y]} = \sum_{e=1}^{n} ((VI_e * C_e)_{[x,y]} * W_e)$$

where:

e = element
[x, y] = coordinates for a grid cell
VI = occurrence viability/integrity value
C = occurrence confidence value
W = element weight

Using different combinations of elements and attributes in summaries enables the user to identify different reasons for the conservation importance of a particular location. Nine basic combinations of attributes can be used to create a CVS, specifically

- ***Weighted Viability/Integrity, with and without Confidence***
- ***Unweighted Viability/Integrity, with and without Confidence***
- ***Weighted Richness, with and without Confidence***
- ***Richness, with and without Confidence***
- ***Unweighted Confidence Index***

Note that the number of elements present (i.e., the richness) in a cell will always be calculated for a CVS unless an average confidence is calculated (specifically, an unweighted confidence index).

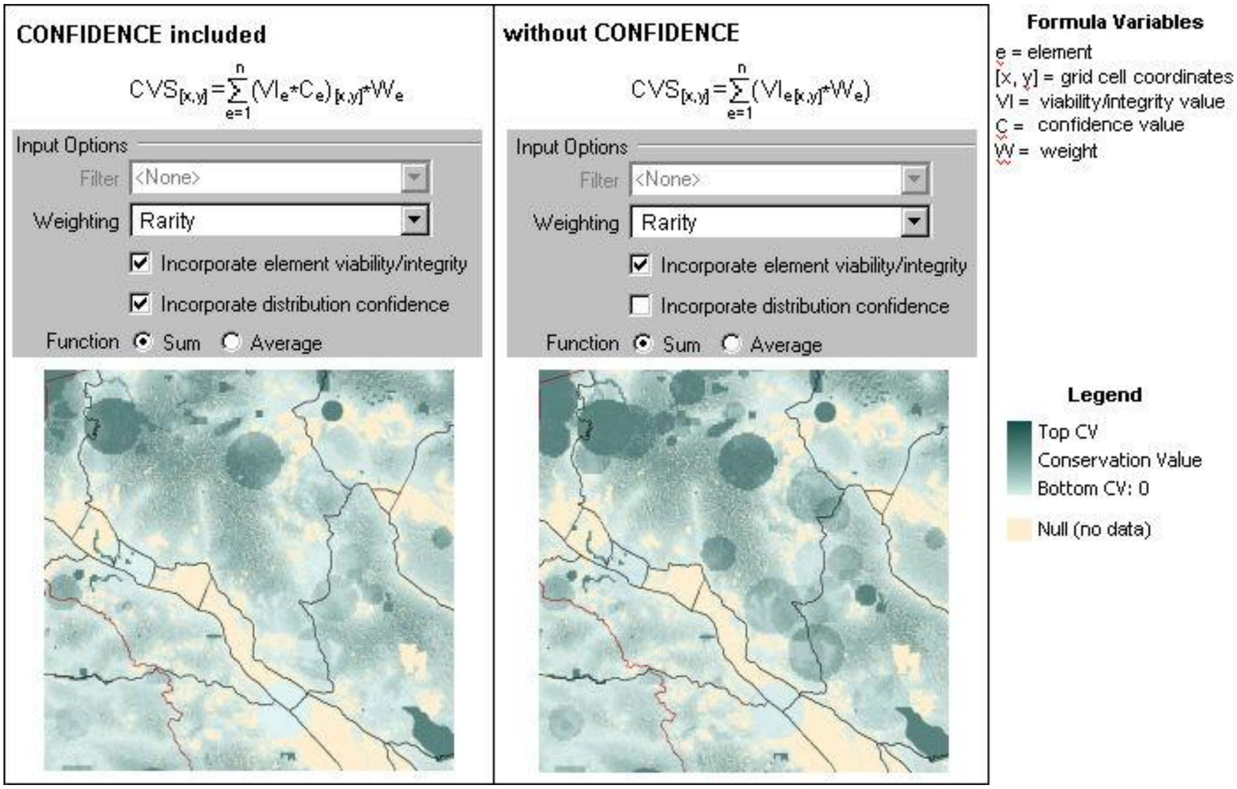
The effects of including confidence attributes in the calculation of a CVS can be summarized as follows:

Including Confidence will depress the grid cell values according to the degree of uncertainty that the element is actually present in that location by multiplying the CVS value of a cell by the confidence value for each element occurrence at that location. Recent confirmed observations of the element will not affect grid cell value (confidence value of 1.0) but most element occurrences will have confidence values less than 1.0 (e.g., 0.7). Multiplying element values by their confidence scores can result in large reductions of CVS cell values. For example: a cell with four elements will have an unweighted CVS value of 4.0. By applying confidence values for the elements (e.g., 0.8, 0.7, 0.4, 0.4), the CVS cell value is reduced from 4.0 to 2.3.

Omitting Confidence may result in overvalued grid cells by including the values for elements that do not actually occur at that location. Omitting confidence is useful for revealing the effects of element characteristics (e.g., richness, weight, viability/integrity) without the large dampening effect of confidence.

Specific details for each of the nine CVS types that can be calculated are described below, including the underlying formulas utilized for each option, the entries to be made in the **Input Options** section of the Summarize Conservation Value window, and illustrations of the same grid cell as it would appear in a CVS resulting from each of the options. To view the sample grid cells resulting from all nine options side by side for comparison purposes, see Illustrations of Different CVS Types.

Weighted Viability/Integrity



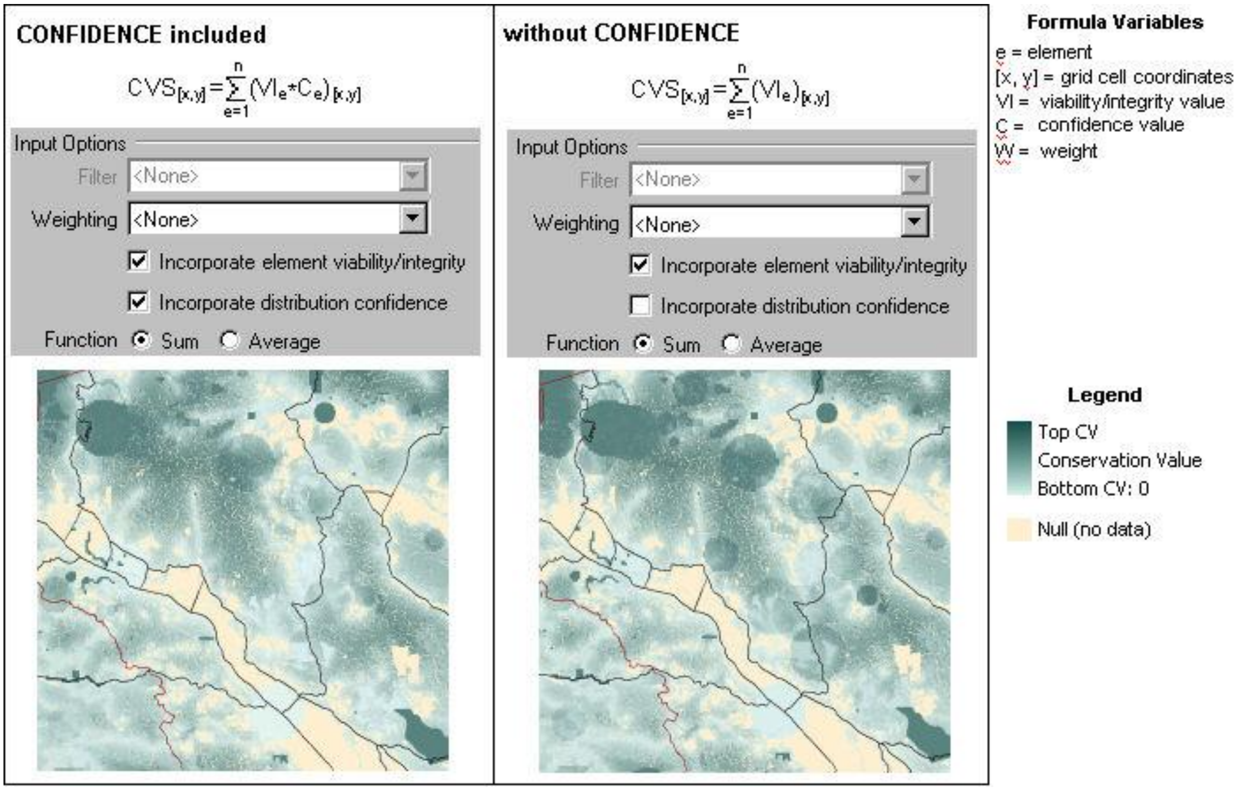
Variables: Element weight, element occurrence viability/integrity

Calculation: Sum of the resulting products of element weights and the viability/integrity values for each occurrence in the grid cell

Interpretation: This summary depicts conservation value based on the number of elements that occur in a grid cell, and the element weight and occurrence viability/integrity values. This option is used to aggregate all element information in order to equally consider the effects of richness, weight, and viability/integrity.

Limitations: The CVS is an index and should be used as such - a general indicator of areas with relatively high and low conservation value, based on user inputs and options. A large amount of data about individual elements and their occurrences is aggregated to a single value in this process, which necessarily results in a loss of precision and information to achieve the summary or averaged value.

Unweighted Viability/Integrity



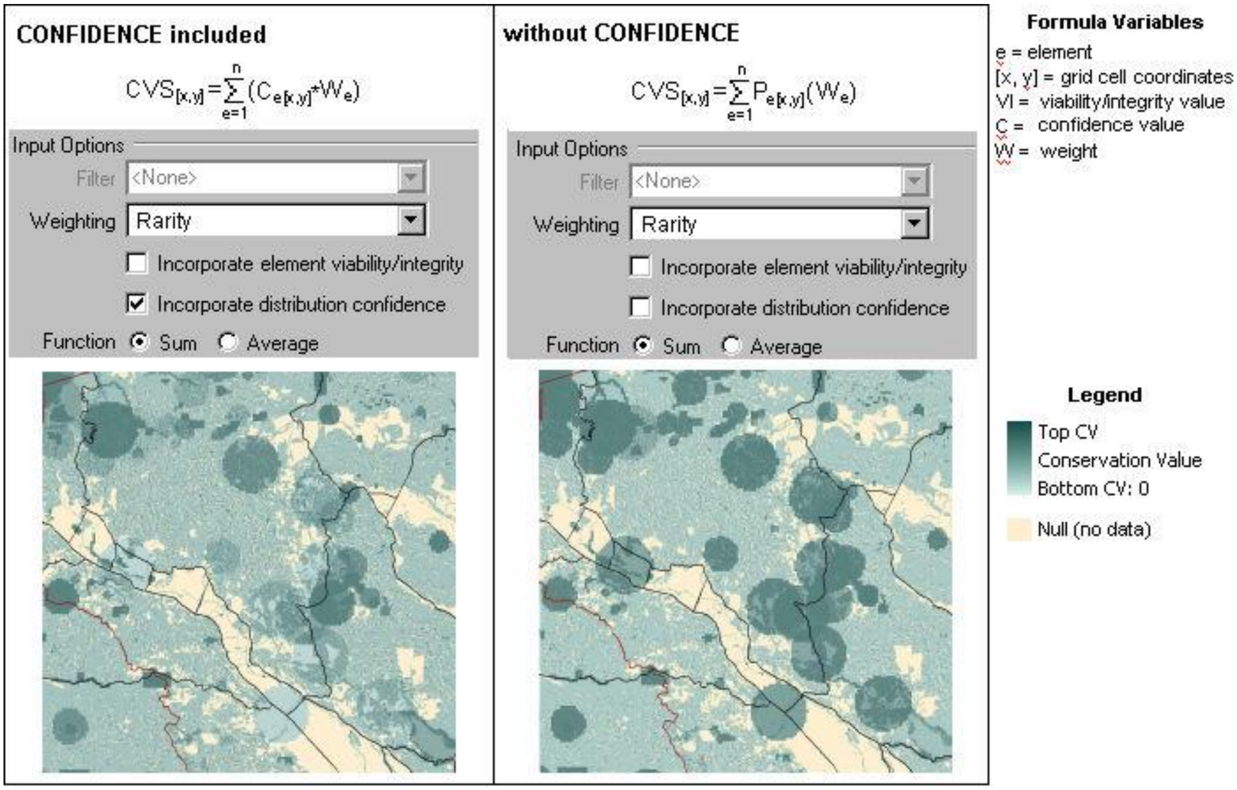
<u>Variable</u>: Element occurrence viability/integrity

<u>Calculation</u>: Sum of the viability/integrity values for the element occurrences in the grid cell

<u>Interpretation</u>: This summary depicts conservation value based on the number of elements that occur in a grid cell, modified by the occurrence viability/integrity values. All elements are treated equally in this option by not including their weights in the CVS. This option is useful when an emphasis on element viability/integrity is desired, accomplished by assuming equal weighting among the elements.

<u>Limitations</u>: The CVS is an index and should be used as such - a general indicator of areas with relatively high and low conservation value, based on user inputs and options. A large amount of data about individual elements and their occurrences is aggregated to a single value in this process, which necessarily results in a loss of precision and information to achieve the summary or averaged value.

Weighted Richness



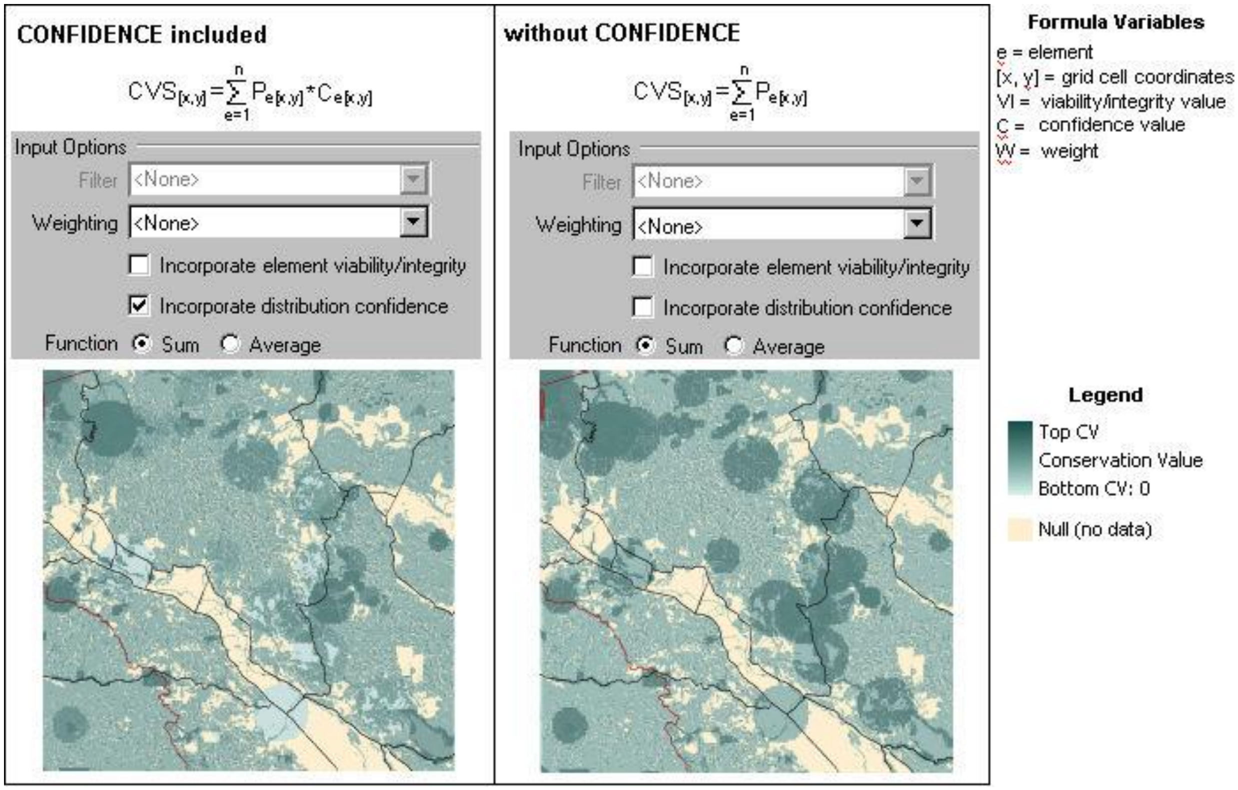
<u>Variable</u>: Element weight and presence

<u>Calculation</u>: Sum of the weights of elements occurring in the cell. Presence is automatically derived from the viability/integrity value, such that if VI > 0, then P = 1, otherwise P = 0.

<u>Interpretation</u>: This summary depicts conservation value based on both the number and weights of elements that occur in a grid cell. All element occurrences are treated equally in this option by not including viability/integrity in the CVS.

<u>Limitations</u>: Because viability/integrity information is not included in this option, some grid cells may be overvalued in cases when the occurrences contained are of low viability/integrity. If viability/integrity information is important to include, the "unweighted viability/integrity" option may be a better choice for generating a CVS.

Richness



Variables: Presence

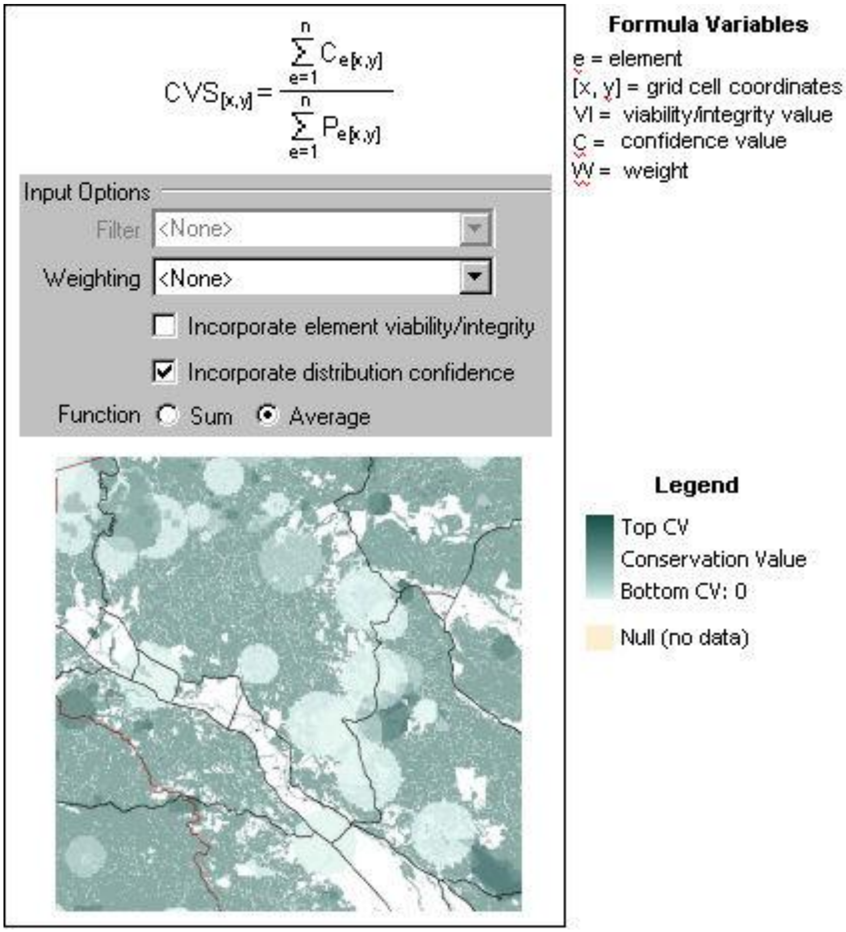
Calculation: Sum of the number of elements occurring in the grid cell

Interpretation: This summary depicts conservation value based solely on the number of elements that occur in a grid cell. All elements and all occurrences of elements are treated equally in this option by not including weight and viability/integrity in the CVS. This option is most useful when elements are weighted equally and information on viability/integrity is lacking, or when the desired outcome is a CVS in which grid cells are valued solely on the basis of element distribution data.

Limitations: Because viability/integrity information is not included in this option, some grid cells may be overvalued in cases when the occurrences contained are of low viability/integrity. If viability/integrity information is important to include, the "unweighted viability/integrity" option may be a better choice for generating a CVS.

The final basic option for deriving a CVS is described below, including the entries to be made in the *Input Options* section of the Conservation Value Summary window, and the underlying formulas utilized with each option.

Unweighted Confidence Index



Variable: Confidence

Calculation: Average (default) of the confidence values of occurrences in the grid cell

Interpretation: This summary depicts the average confidence associated with the element occurrences in a grid cell, which is most useful for identifying areas of uncertainty in the element distribution data (i.e., Conservation Value Layers). This information can be useful in determining if sufficient information exists to make conservation decisions for a particular location, or whether additional field survey work is required before further planning can occur for that location.

Limitations: Because this option results in an average confidence value, a value indicating high uncertainty does not necessarily mean that all elements located in the grid cell require additional field survey work. Individual element occurrence confidence values for any grid cell in the CVS can be obtained from the underlying element conservation layers.

See also:

Overview of Conservation Value Summaries

How to create a Conservation Value Summary

Steps in the CVS Creation Process

Identify the filter, attributes, and/or weighting system, to be used in the CVS

Determine the appropriate filter to use, if any, to define the set of elements to be included in the CVS. Determine which attributes of element occurrences to utilize, specifically viability/ecological integrity values and/or confidence values. In addition, if certain elements and/or groups of elements are to be weighted more or less based on their relative importance, identify the weighting system to be used.

For information on the different options for creating a CVS, including the variables to be used, the type of calculations to be performed, interpretation of the resulting CVS, and any limitations, see the Different Types of Conservation Value Summaries section.

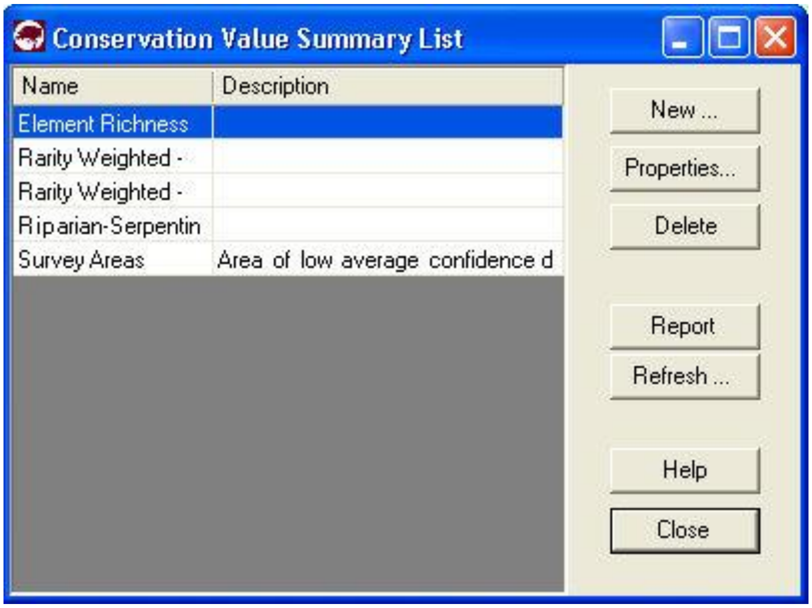
Create a CVS using Vista

Using the Vista Summarize Conservation Value window, select the appropriate filter, viability/integrity attributes, confidence attributes, and/or weighting system, and generate the CVS.

Windows for Conservation Value Analysis

CONSERVATION VALUE SUMMARY LIST

The **Conservation Value Summary List** window is displayed by selecting **Lists ▸Conservation Value Summary List...** from the NatureServe Vista menu. This window lists all the Conservation Value Summaries (CVS) that have been created for the project. See the Conservation Value Analyses section for more detailed information on this analysis.



<u>Button functions</u>:

New... displays a new [Conservation Value Summary window]() that can be used to develop a new CVS for the project.

Properties... displays the Summarize Conservation Value window showing details and allowing edits to the CVS selected in the list.

Delete deletes the CVS selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

Report displays a report for the selected CVS that lists the settings for the summary as well as details on the individual elements that were included. See the [Reports]() section for more details on Conservation Value Summary reports.

Refresh... displays the [Refresh Selected Results]() window that can be used to refresh the data for selected CVS analyses.

Help opens the on-line documentation.

Close closes the window.

<u>Columns displayed</u>:

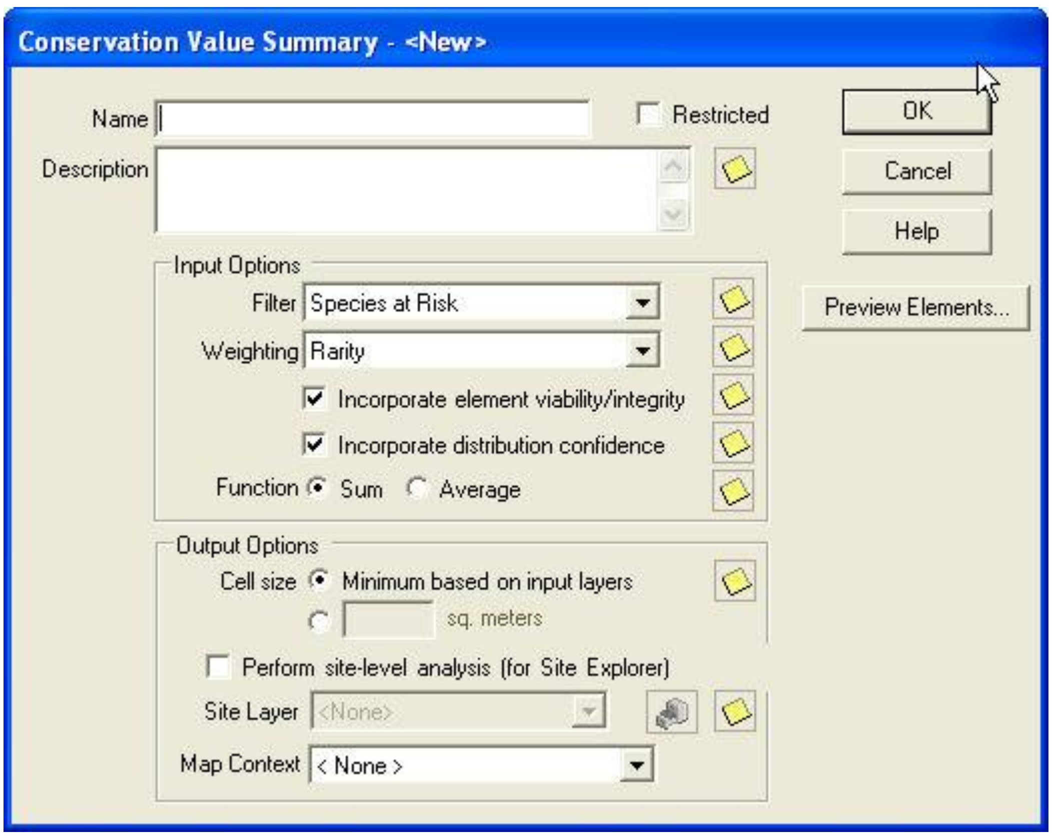
Name - name of the CVS.

Description - description of the CVS, if any.

CONSERVATION VALUE SUMMARY WINDOW

The **Conservation Value Summary - <New>** window is displayed by selecting **Summarize Conservation Value...** from the NatureServe Vista menu. This window is used to create Conservation Value Summaries, which indicate the conservation value of specific locations in the planning region based on attributes of elements and/or their occurrences. For more detailed information on the use of weightings, and the viability/integrity and confidence attributes in creating a Conservation Value Summary and their influence on the results, see the Different Types of Conservation Value Summaries section.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



Create a Conservation Value Summary:

1. Enter a name for the Conservation Value Summary (CVS) being created in the **Name** field. The **<New>** on the window title will change to the name of the new CVS as the entry is typed in.
2. Enter a brief description for the new CVS in the **Description** field.
3. If the ability to edit the CVS should be limited to members of the data development team, place a check in the **Restricted** checkbox.

4. Select the filter to be applied to the data set from the drop-down menu of the **Filter** field located in the *Input Options* group box, or select the **<Add New...>** value to create a new filter, or the **<Show List...>** value to display all existing filters (in order to select and modify an existing filter).
5. Select the weighting system(s) to be applied to the data set from the drop-down menu of the **Weighting** field located in the *Input Options* group box, or select the **<Add New...>** value to create a new weighting system, or the **<Show List...>** value to display all existing weighting systems (in order to select and modify an existing system).
6. Click the **Preview Elements...** button to see a Filtered Weighting System Report showing the set of elements to be included in the summary and the weightings that have been set for these elements, based on the values selected in the **Filter** and **Weighting** fields. This knowledge can be helpful prior to running the CVS. The greater the number of elements included in a summary, the longer it will take to process; adjusting/creating a filter that will limit the CVS to just those elements that are needed will ensure the most efficient use of processing time.
7. If element viability/integrity values are to be included in the new CVS, place a check in the **Incorporate element viability/integrity** checkbox.
8. If confidence is to be included in the new CVS, place a check in the **Incorporate distribution confidence** checkbox. The confidence attribute can be useful in determining if sufficient information exists to make conservation decisions for a particular location.
9. Indicate the function to be used in determining values for grid cells in the CVS by selecting either the **Sum** or **Average** radio button. Note that if confidence is to be incorporated in the CVS and the operation selected is **Average**, richness will not be calculated in the CVS.
10. Select the appropriate radio button to indicate whether the grid cell size in the CVS output is to be the **Minimum based on input layers**, or if the size is to be a specified area; if the latter, the system will automatically display the default cell set for the project in the Project Properties window. If an alternate cell size is desired, enter the area to be used for a grid cell. For more detailed information on cell sizes, see the Determining Grid Cell Size topic.
11. If the CVS will be used in Site Analyses, place a check in the **Perform site-level analysis (for Site Explorer)** checkbox.
12. If appropriate, specify a layer to be used in Site Analyses from the drop-down menu of the **Site Layer** field, or by using the  ArcCatalog button to browse to the layer. The land units in the layer selected will be used for detailed examination of conservation value by unit, and the contributing biodiversity elements present in those units.
13. Select a map context to be used in creating the CVS report from the **Map Context** drop-down menu, or select the **<Add New...>** value to create a

new map context, or the **<Show List...>** value to display all existing map contexts (in order to select and modify an existing context).

14. Generate the CVS by clicking **OK;** otherwise press **Cancel**. Results are displayed in a CVS report. See the Conservation Value Summary Report for more detailed information.

Edit a Conservation Value Summary:

1. Select the CVS from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Conservation Value Summary Properties...** from the context window. The resulting window displays the CVS.
2. Edit the CVS using the processes described above for creating a new Conservation Value Summary as guidelines.
3. Generate the revised CVS by clicking **OK**; otherwise click **Cancel**.

CUSTOM COLUMN FORM

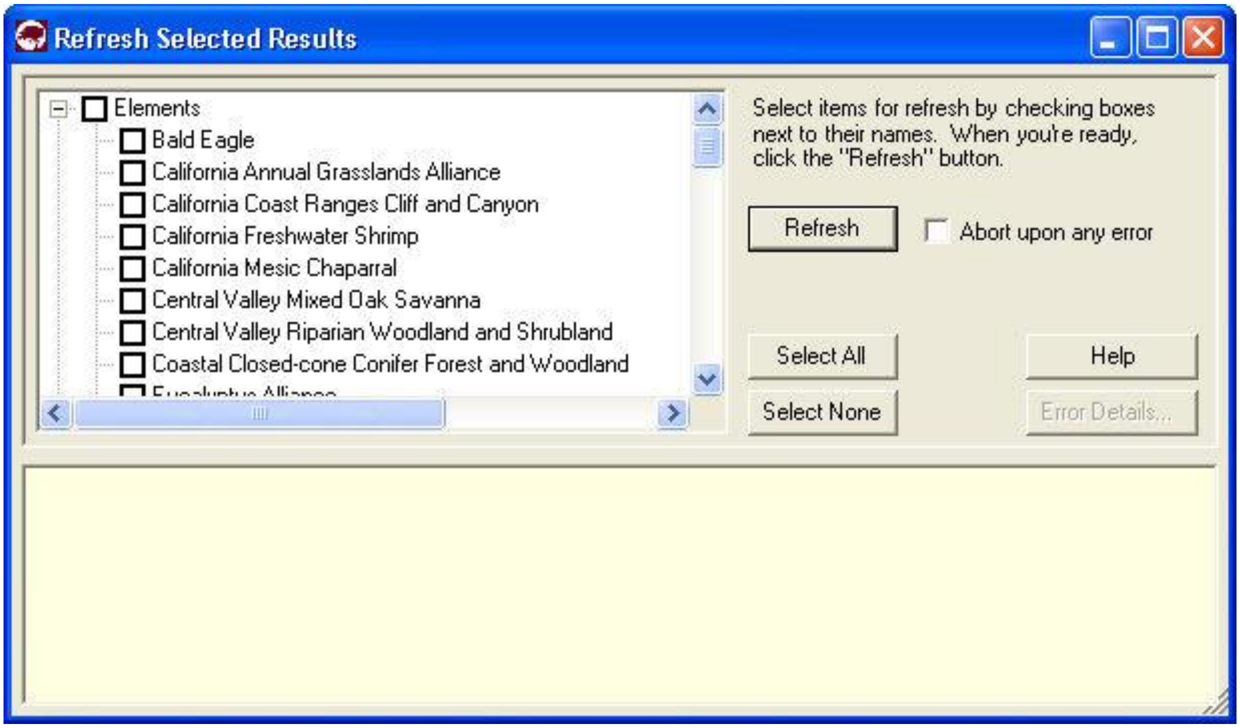
Type topic text here.

related to CVS

REFRESH SELECTED RESULTS WINDOW

The **Refresh Selected Results** window can be opened several ways, depending on the item(s) to be refreshed.

- To display the Refresh Selected Results window listing all items that can be refreshed in the project (that is, elements, Conservation Value Summaries (CVS), and Scenario Evaluations, seen by scrolling down the list), click **Refresh Results...** from the NatureServe Vista menu.
- To display the Refresh Selected Results window listing only elements in the project to be refreshed, click the **Refresh...** button on the Element List window, or right-click on the major heading "Elements" on the NatureServe Vista tab in the Table of Contents (TOC) and choose **Refresh Results...** from the context window.
- To display the Refresh Selected Results window listing only CVS in the project to be refreshed, click the **Refresh...** button on the Conservation Value Summary List window.
- To display the Refresh Selected Results window listing only scenarios and Scenario Evaluations in the project to be refreshed, click the **Refresh...** button on the Scenario List window or the Scenario Evaluation List window, or right-click on the major heading "Evaluations" on the NatureServe Vista tab in the TOC and choose **Refresh Results...** from the context window.



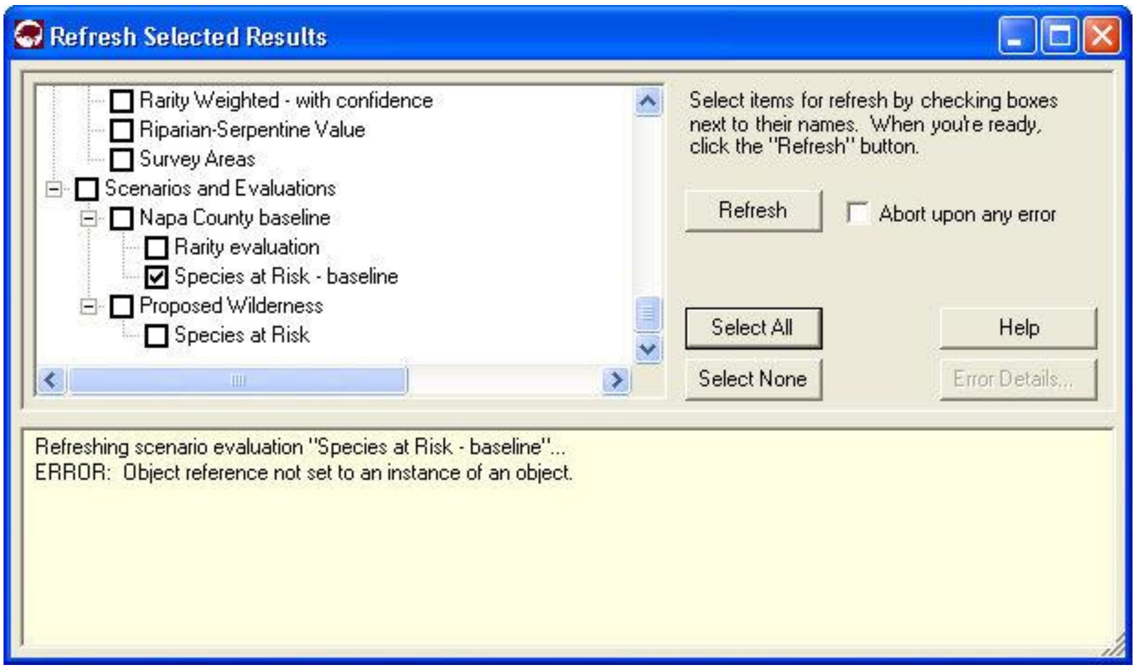
<u>Refresh data</u>:

1. Indicate which data are to be refreshed by using the check-box(es) associated with the element(s) and/or project analyses. The **Select All** button can be used to select the entire list of items; using the **Select None** button will de-select any items that have been selected.
2. Indicate whether the refresh process should be cancelled if an error should occur using the **Abort upon any error** checkbox.
3. Click the **Refresh** button to begin the data refresh process.

If the refresh process completes without errors, the following message is displayed:

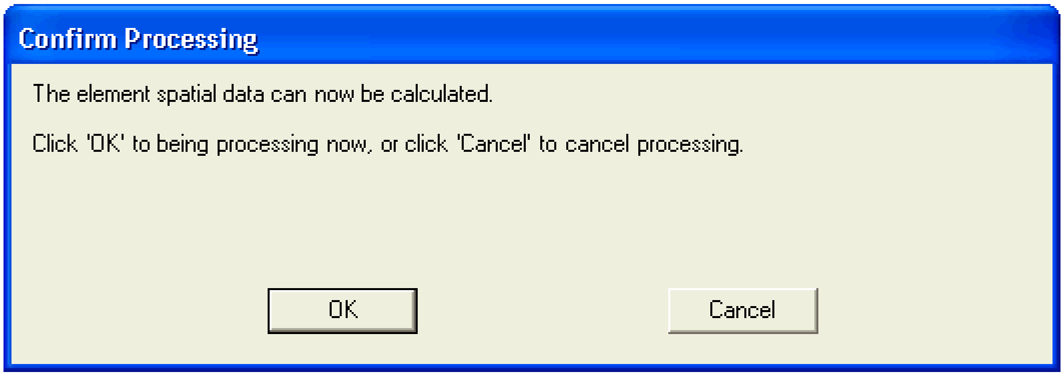
If an error occurs during the refresh, the following message will be displayed

and an error log will be displayed in the lower half of the Refresh Selected Results window.



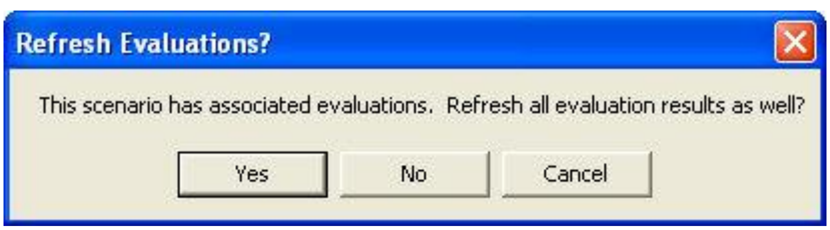
If more detailed information on the error(s) encountered is desired, click on the error log and then click the **Error Details...** button to display an Error Detail window.

Note that elements, CVS, and Scenario Evaluations in the project can be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single element or analysis on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Confirm Processing window will be displayed.



Click **OK** to continue with the refresh process; otherwise, click **Cancel**.

Scenarios in the project can also be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single scenario on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Refresh Evaluations? window will be displayed.



Click **Yes** to refresh both the scenario as well as any Scenario Evaluations that utilize the scenario; click **No** to refresh only the scenario; otherwise, click **Cancel**.

LANDSCAPE CONDITION MODELING

INTRODUCTION TO LANDSCAPE CONDITION MODELS

The condition of an Element Occurrence influences the desirability of conserving it or the need to restore its condition to meet conservation goals. Vista requires values for condition (also known as viability/integrity or quality scores but referred to as condition throughout this section) to create the Element Conservation Value layer, which reflects the combination of condition and confidence of each occurrence. The condition values may then be used in Conservation Value Summaries to identify areas of best condition, for example. Vista also allows you to evaluate how land use scenarios contribute to element goal achievement by conducting condition-based evaluations that determine whether element goals are met, based on whether the land use in that scenario would support a viable condition threshold for occurrences. Condition models can be developed outside Vista to define current element condition, or you can build condition models inside Vista using the Landscape Condition Modeler. The Landscape Condition Modeler allows you to create and model layers that will reflect the condition of an element's occurrences across its distribution in both terrestrial and aquatic ecosystems (the latter via interoperability with NOAA's N-SPECT software [Nonpoint-Source Pollution and Erosion Comparison Tool]). Using internal Vista condition modeling functions allows you to establish either current condition or expected future condition from land use scenarios.

In Vista, the condition values are incorporated into an element's distribution in two ways:

1. During the element import process where the current viability/integrity of an element is defined as an attribute value (e.g., observed condition, such as EO ranks obtained through Natural Heritage Programs), a spatial layer (imported from another source or modeled in Vista based on the current land use scenario), or a single value. Current condition needs to be defined in order for the element's conservation value layer to be created.
2. Element condition can be calculated during the scenario evaluation process. This provides the functionality for running "condition-based" scenario evaluation by allowing the user to create condition models that produce updated results from each scenario that is created. This is especially useful as the user creates multiple alternative scenarios reflecting different compositions of land use.

Incorporating landscape condition modeling into scenario evaluation may allow more accurate and nuanced evaluations than conducting only categorical evaluations (i.e., an element is compatible/not compatible with the land use at this location). Users may now evaluate land uses in a particular scenario for how they affect element condition based on both on-site (direct) and off-site (indirect) impacts, including land use effects on aquatic elements. Goal achievement results use a minimum condition threshold (set by the element expert) to determine whether element occurrences will remain viable under a particular scenario (subject to an optional minimum size threshold). In sum, an element can be assigned a minimum condition threshold that when met, indicates that the element’s required conditions are being achieved. The Vista report can also indicate which elements were approaching the threshold and which were not, helping the user identify which element occurrences were most at risk.

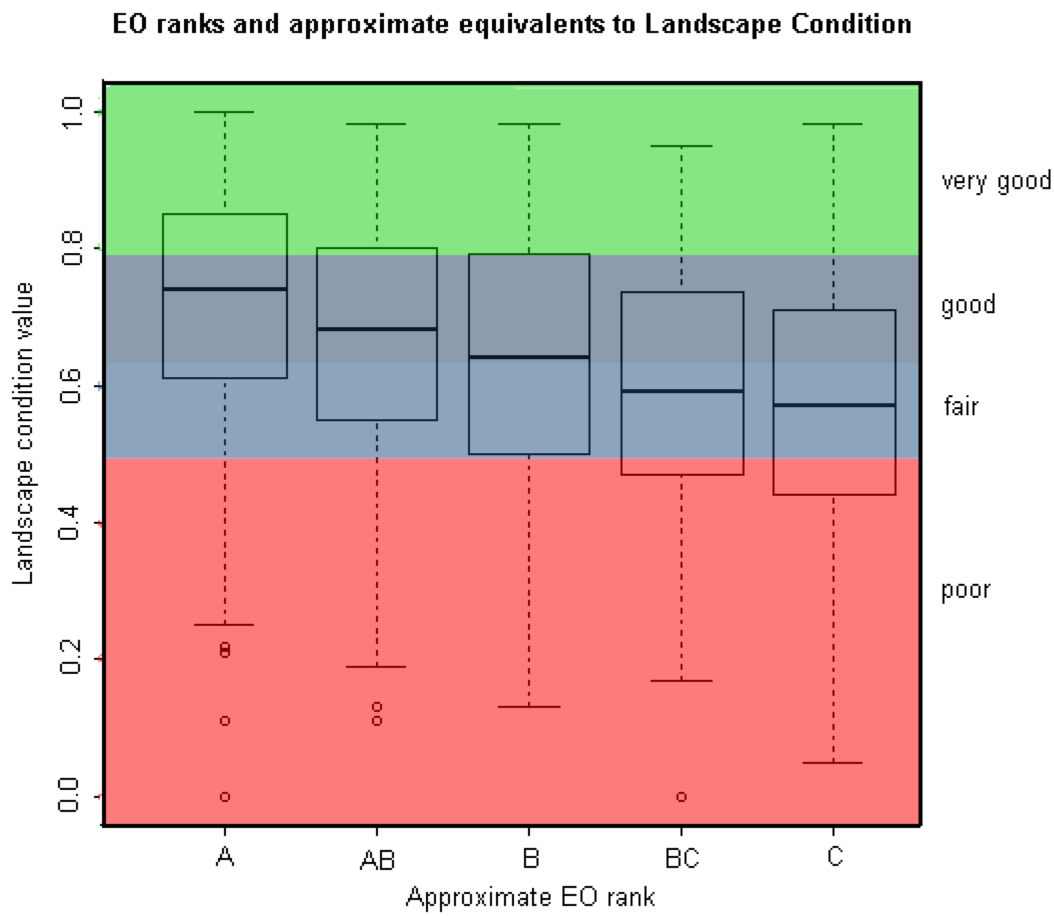
Use of the landscape condition modeling function in Vista provides additional precision to scenario evaluations by incorporating indirect effects, for example “edge effects” near disturbed or developed land or the effects of water pollutants in a stream. This produces more detailed results of spatial land use scenario impacts. Establishing condition thresholds rather than just simple categorical responses creates a more realistic evaluation of the landscape and its effects on your elements.

The intent of the Landscape Condition tools provided with Vista is to link the various land use features in a scenario to the expected effect on the landscape condition for an element or group of elements. The model output is a relative index of the effect of overlapping land uses that describe the resulting landscape condition in values of 0 (poor condition) to 1 (very good condition).

For distance intensity condition models, the tool allows the user to individually set weighting values for both direct impacts (“site intensity”) and indirect impacts or edge effects (“distance intensity”) across all land use types input in the system. The site intensity value is used to set the slope of the distance decay function in which a site with a poor condition (approaching zero) has a steeper slope than a site with a nominal affect (approaching one).

For value range factor condition models, the tool allows the user to define limits that create ranges or categories from continuous value inputs, such as aquatic pollutant levels. These ranges can then be assigned values on a 0.0 to 1.0 scale that depicts landscape condition outcomes. Value range factor values are different from distance intensity, as they represent condition value loss. When they are converted into condition models the value range factor is subtracted from the maximum value of one.

For setting condition thresholds, observed condition and viability standards for specific elements can be informative. For instance, a user’s goal may be to maintain all element occurrences with EO Rank values of C or better (see table below). As such, the condition value threshold would be set to the Vista equivalent of 0.5.



Aquatic condition modeling is accomplished through interoperability with NOAA's N-SPECT software (or other software generating similar outputs) that greatly enhances users' ability to deal with freshwater and estuarine aquatic features and water quality issues. Vista facilitates further modeling of N-SPECT outputs to predict condition impacts or improvements from upstream development, other land uses, and climate change. N-SPECT was designed to be broadly applicable, but the tool operates most accurately in medium-to-large watersheds having moderate topographic relief (NOAA CSC, 2009). Vista's condition modeler allows for the direct use of N-SPECT grid outputs, incorporating these grids to model both initial condition and condition change effects. It is possible to incorporate other grids representing condition factors that have been calculated outside of Vista to represent a variety of factors where additional distance effects do not need to be computed, such as air or water quality plumes, noise, temperature, etc.

Condition modeling can require significant additional involvement of experts and some (though not extensive) additional computing time to projects, and thus is optional. To reduce the time requirement to build models, they can be built for groups of elements instead of individual elements and conducted during the time that element experts are being engaged in developing other required inputs. Obtaining the necessary expert involvement is often challenging, so it is recommended that: a) condition models be built only for those elements where condition-based evaluation will be more informative than categorical responses;

and b) models be built for groups of elements that respond similarly to land and water impacts, rather than building many separate models for individual elements. Utilizing these recommendations should substantially reduce the number of models needed and allow more time to construct, document, and calibrate properly the models that are built.

OVERVIEW OF LANDSCAPE CONDITION MODELING

Objectives

The purpose of this process is to create landscape condition models that reflect the quality of an element throughout its distribution and across the planning area. Condition models or systems, which contain multiple condition models that are element specific, can be created for both terrestrial and aquatic ecosystems, although the latter is typically limited to riverine systems through the use of NOAA's N-SPECT software (Nonpoint-Source Pollution and Erosion Comparison Tool), unless additional software or GIS processes are used to extrapolate N-SPECT results to lacustrine, estuarine, or marine systems.

The starting condition values for an element are integrated during the setup of elements as viability/condition layers are used to depict the element's relative condition across its distribution. The element condition threshold (i.e., Element Properties -> General Tab) represents the minimum condition value below which areas/occurrences of the element will not be counted toward viability and element goal achievement.

Products

This process results in a landscape condition model which, when run against a land use scenario, produces a raster map that is a relative weighted index between 0.0 and 1.0, where the higher values represent the higher integrity of the landscape condition as applied to an element(s).

Outputs

The landscape conditioning outputs are raster grids. Condition systems are incorporated during Scenario Evaluations. In the Initial Condition Model list, condition models can be generated independent of scenario evaluation. This allows the user to access and incorporate the condition model as current condition in the element properties. The output grid size is set by the input grid size. For example, for distance intensity models this will be the scenario grid, for value range factor the default value will be the N-SPECT input grid

Inputs

In NatureServe Vista, the condition values are incorporated into an element's distribution during the element import process where the viability/integrity of an element is defined as an attribute value, a raster spatial layer or a single value (e.g., current condition). Optionally condition can be incorporated during the scenario evaluation process as a raster spatial layer (e.g., condition change effects).

Because condition affects elements, the Condition Systems list to define condition models, it is necessary to have your elements defined.

Creating raster models of observed condition and condition change effects within Vista requires the creation of a condition system in which condition models are defined. In Vista, condition models are either one of two types: distance intensity or value range factor.

Distance intensity models build off the land use list. The land use list can be customized or the default IUCN direct threat categories can be used. For each land use, the user defines a site and distance intensity. A boost factor can also be defined. When spatial layers are introduced into a scenario definition, these layers are then used as inputs to the distance intensity models.

Value range factor models require the user to set factors based on raster layers. Setting factors in this process, the user can import N-SPECT (or other similar) grid layers. Vista includes five default pollutant (lead, nitrogen, phosphorus, total suspended solids and zinc) settings, but any raster that represents landscape or aquatic condition as a value range (i.e. without a distance component) can be created.

Methods Summary

In Vista, condition models are organized as condition systems in the Condition Systems List.

Vista models condition in two raster forms: using value range factors or distance intensity. Value range rasters are used to import N-SPECT outputs and other non-distance dependent condition layers. Value range rasters set condition value based on user-set numerical ranges that reflect different levels of degradation. For example, in aquatic systems, value ranges represent different levels of several freshwater pollutants such as nitrogen or phosphorous accumulating along the course of a river.

Distance intensity rasters allow the user to first set the impact level on condition value at the source of disturbances and then to define a distance effect value from the source. When using distance effect models, consideration needs to be given to what disturbance may be diminishing the quality of the element and how far away the effects of the disturbance extend. For example, in terrestrial ecosystems, distance effects could represent degradation of an ecological community due to a road. The degradation is highest at the site of development but declines with distance. In other words, distance intensity rasters reflect site and edge effects on ecological communities. See the Creating Distance Intensity Models below for more information about how Vista does this.

Setting current element occurrence viability/integrity values is a required part of the process of developing an element database. A raster can be generated using condition systems list and the initial condition list to define these current viability/integrity values, as opposed to being defined as an attribute (e.g., observed condition) of the spatial layer, a single value or as an externally generated landscape condition model.

Alternative future condition is generated from Land Use Scenarios through the Condition Systems List in the Vista drop-down menu.

Limitations

The concept of landscape condition modeling is highly simplified in Vista, resulting in relative indices of condition that take into account a fairly narrow set of considerations especially relative to animal species. Although experts building and documenting the model may consider a number of factors when assigning site and distance intensity weights, the Vista model does not explicitly address issues such as impacts on species mobility, demographics, habitat connectivity among multiple resources, etc. Much more detailed modeling tools exist to consider these issues when knowledge, time, and funding exist to address them. Over time we anticipate adding the ability of Vista to incorporate outputs of such models to allow greater precision while integrating results into the broad Vista planning framework.

References

Bash, J., Berman, C., & Bolton, S. (2001). Effects of Turbidity and Suspended Solids on Salmonids. Retrieved December 5, 2004, from http://depts.washington.edu/cwws/Outreach/Publications/Salmon%20and%20Turbidity.pdf

Murcia, C. 1995. Edge effects in fragmented forests: implications for conservation. Trends in Ecology & Evolution 10 : 58&endash;62.

Newcombe, C.P. and D.D. MacDonald. 1991. Effects of Suspended Sediments on Aquatic Ecosystems. North American Journal of Fisheries Management. 11: 72-82.

Trombulak, S.C. and C. A. Frissell. 2001. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology. 14:18-30

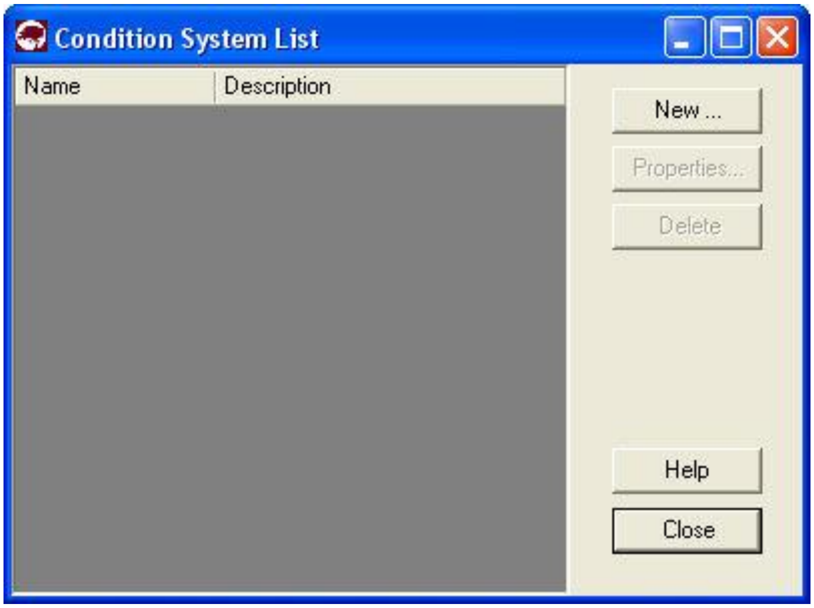
Saunders, D.A., R. J. Hobbs, C. R. Margules. 1991. Biological Consequences of Ecosystem Fragmentation: A Review. Conservation Biology. 5: 18-32

Skole, D. & Tucker, C. 1993. Tropical deforestation and habitat fragmentation in the Amazon: satellite data from 1978 to 1988. Science. 260: 1905-1910

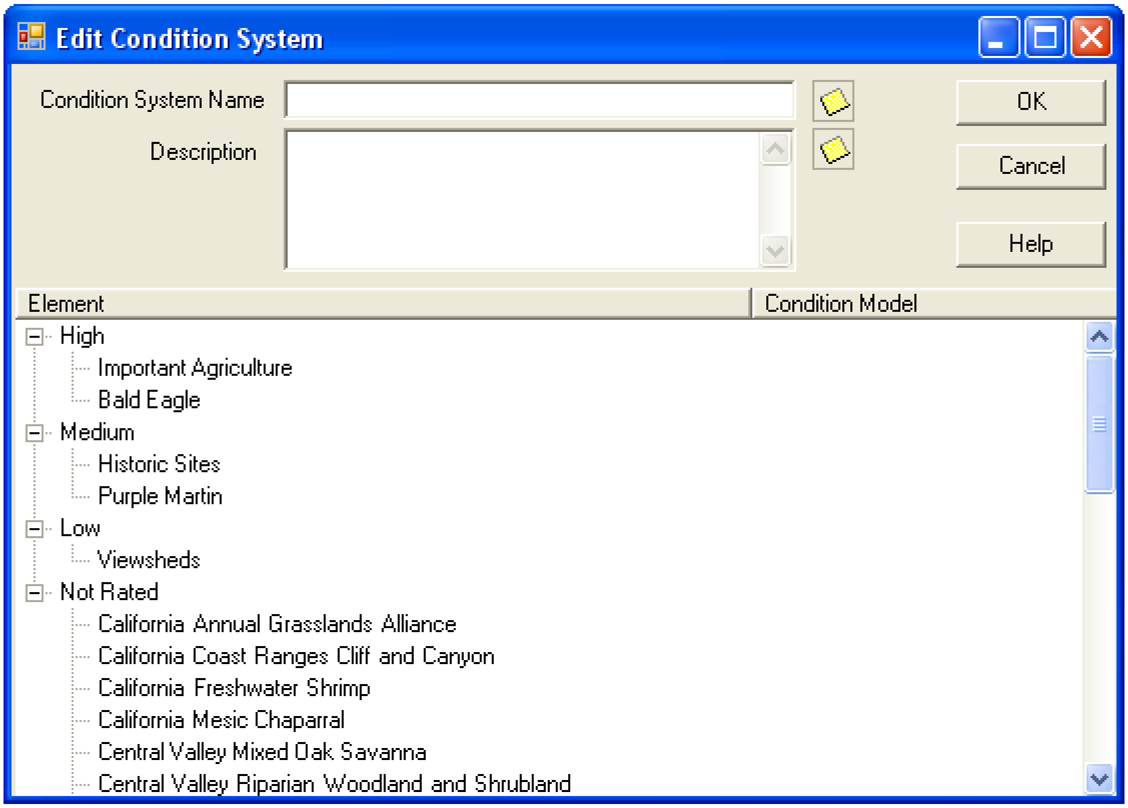
Steps in Creating a Landscape Condition Model

Using the Condition Systems window

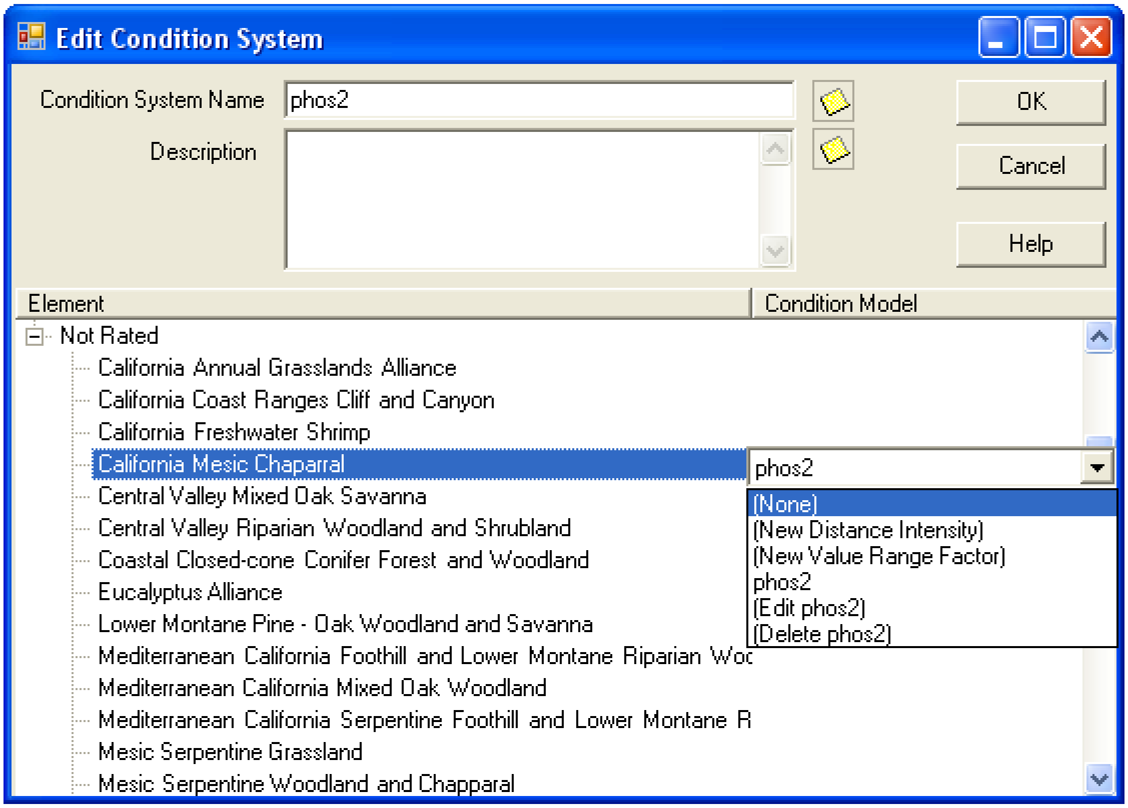
1. Open Vista Drop-down Menu
2. Click Lists
3. Click Condition Systems List



4. Click New to create a new condition model
5. The "Edit Condition Systems" popup window is the user interface for applying individual condition models to elements. When a new condition system is being created for the first time, Vista will ask you to select or create a default category system. Categories are assigned when creating elements and provide a system whereby elements are grouped and viewed. This can be changed later if you wish to create different condition system lists on another category type; which is defined in the Vista pulldown (Vista -> Project -> Preferences -> Default Category System) User may vary the Element display sort.



4. Create or modify a condition model by clicking the blank area in the condition model next to an element. The user options are to select an existing condition model, new model, edit an existing model, or delete a model.



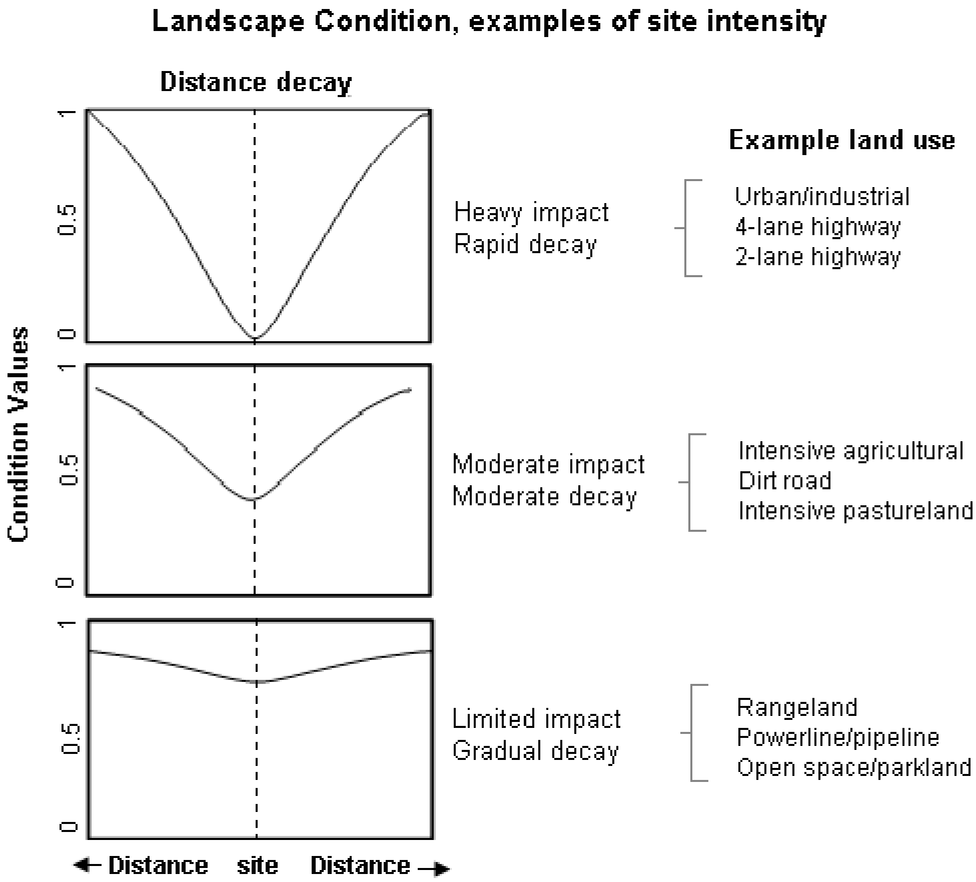
Primary Condition System menu.

Understanding site intensity and distance threshold

Land uses can be modeled in Vista to depict the condition of an element's distribution. In order to understand how Vista uses site and distance intensity to create a condition model, you must first understand friction of distance.

Friction of distance is the notion that as the distance from a point increases, the interactions with that point decrease. This is also referred to as distance decay. Similarly, the effect of a land use on another land use decreases with distance. Vista's Landscape Condition Modeler uses site intensity and distance threshold to define the condition weight of a given land use, the rate at which the land use's effect diminishes and how far away the land use's effect is felt on another. Site intensity establishes the weight of the land use. Distance intensity establishes how far a given land use's effect reaches.

In the diagram below, notice how the curve becomes steeper as the impact of a land use becomes more severe. For example, four lane highways, mines and urban industrial areas have a heavy impact on the surrounding area. The distance decay curve drops lower and more steeply than the distance decay curve of a pasture or power line indicating heavy impact and rapid decay. These same land uses have the lowest site intensity values because in Vista, condition is measured on a scale of 0-1 with 0 representing ”r;worst” condition and 1 representing ”r;best” condition.

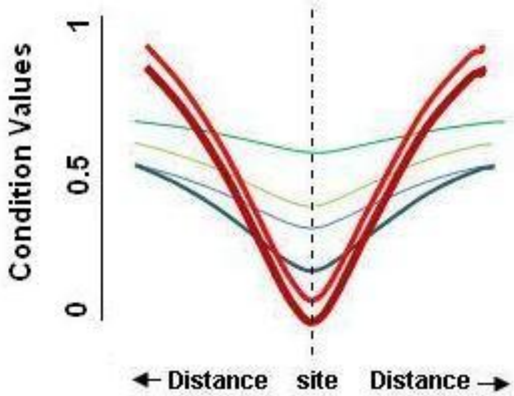


Relative effect of site intensity values represented by three different sets of land use types. The site could represent any pixel where the land use is found. The intensity of this effect diminishes with distance away from the land use, possibly affecting the condition of an element distribution.

The site intensity does not follow a standardized curve as seen in the distance effect model. The purpose of the site intensity weighting is to adjust the landscape condition model to represent specific disturbance responses (e.g. an urban zone is more disturbed at the site than a pasture). The condition model is a multiplicative progression model with the final result representing a maximum value of 1.0, the effect of any one site intensity weight defines the highest condition value the land use can represent. An area with multiple low condition land uses will drive down the condition value at that area to very low levels. For example, an area with a four-lane highway and an industrial area will have a lower average condition value than an area with a four-lane highway and open space/parkland. The overall intensity at a site represents the multiplicative combination of all the land use types which may overlap at a single site (see diagram below). The final landscape condition model surface is a relative index. This means that site and distance intensity may need to be adjusted relative to each other to produce the desired effect. It is possible that if a land use’s Site Intensity is not adjusted correctly, the resulting condition value will not reflect the intended impact of the land use.

Landscape Condition with cumulative site intensity

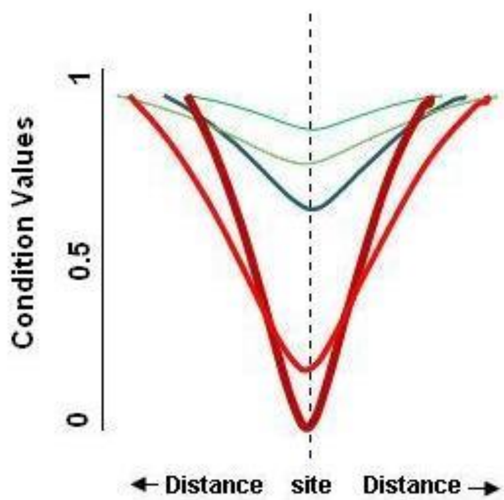
Example land use	Site Intensity
Urban/industrial	0.001
4-lane highway	0.005
2-lane highway	0.1
Intensive agriculture	0.3
Dirt road	0.5
Intensive pastureland	0.5



The effects at a site of overlapping land uses is cumulative. In the above diagram the effects of six land uses are shown at a given site on the landscape where condition is diminished because of the presence of the land uses. As the number of land uses with low site intensity (i.e. land uses that have a greater negative effect on landscape condition), the condition value is pushed closer to zero.

Landscape Condition with cumulative site and distance intensity

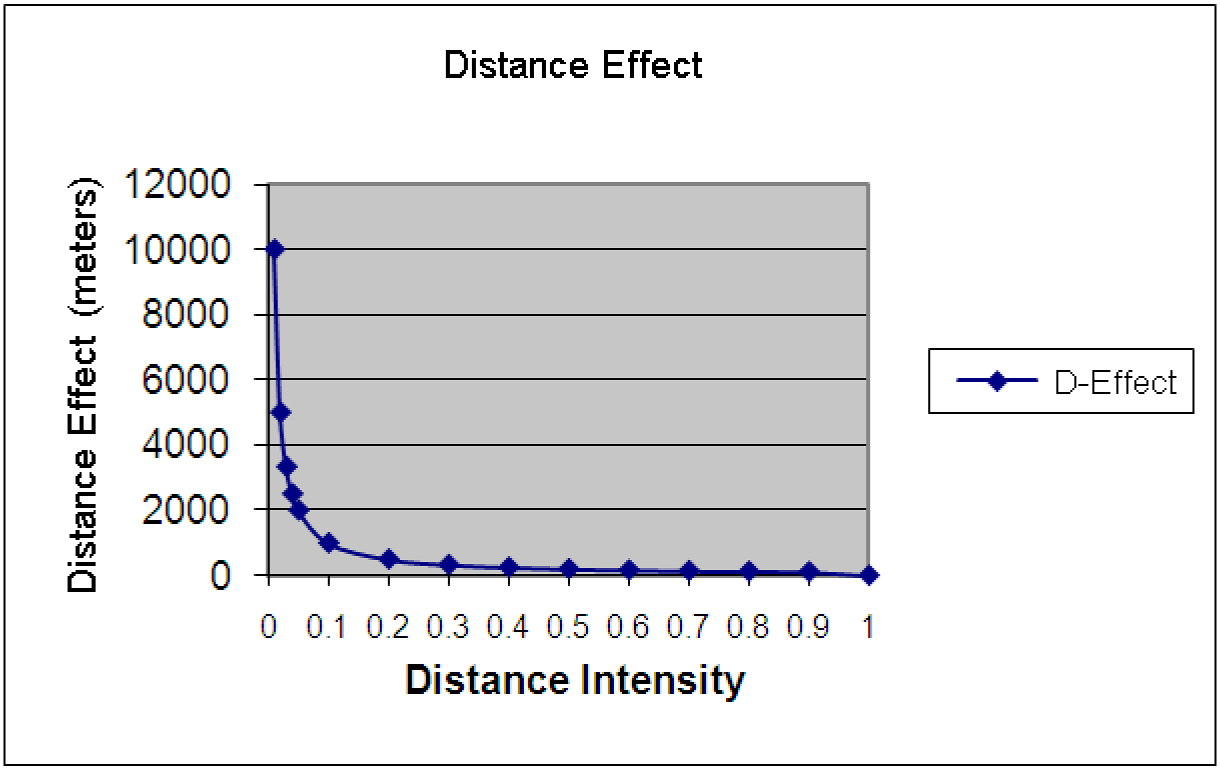
Example land use	Site Intensity	Distance Intensity
Urban/industrial	0.001	0.01
2-lane highway	0.1	0.1
Intensive agriculture	0.3	0.5
Rangeland	0.7	0.6
Open space/parkland	0.9	0.9



In the condition modeler, site and distance intensity could be compared to a second degree polynomial or quadratic function: f(x) = ax2 + bx + c. The variables b and c are closely related to site intensity, governing the position of the crux of the curve relative to the y axis (the ”r;weight” of a disturbance at its origin and steepness or slope of the curve) The variable a is similar to distance intensity, influencing how wide the curve becomes at increasing distance (the degree to which a disturbance is felt near the edge of its effect).

The distance intensity from the land use is intended to function as a representative measure of distance/edge effects. Distance intensity changes the slope of the function by pushing the terminus of the curve further from the land use source causing a more gradual decay to occur. When combined with the site intensity, the decay function may be heavily modified to represent land use types like four-lane highways where the condition at the site is poor and the distance effect (for example, noise) from the feature is large.

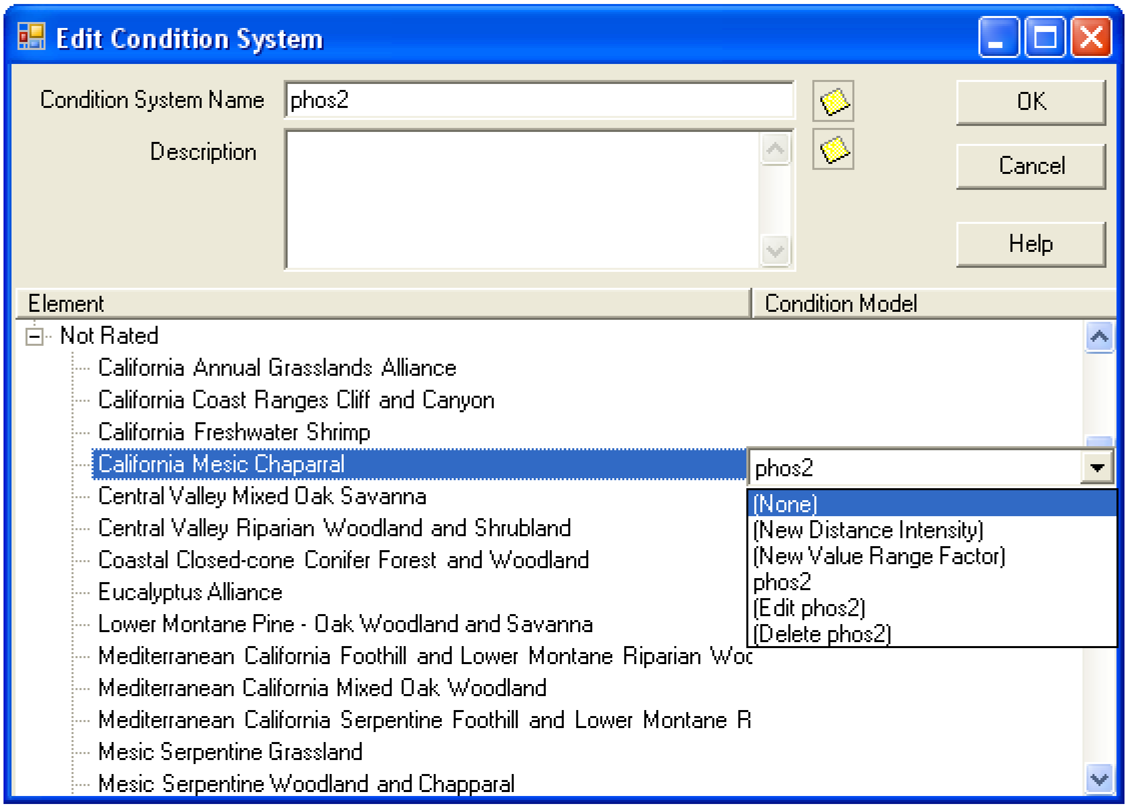
The values applied to the distance effect follow a standardized curve displayed below. For example, a value of 0.1 represents a distance weight of 1 km, and a value of 0.5 is equivalent to 100 meters. For example, distance effects of transportation on many terrestrial flora and fauna species are well documented (Murcia, 1995; Saunders et al, 1991; Skole & Tucker, 1993; Trombulak & Frisse, 2001). Noise and edge effects such as changes in microclimate increased species predation and parasitism. But effects vary by species, location and magnitude of disturbance (e.g. a four-lane highway has greater distance threshold than a two-track dirt road).



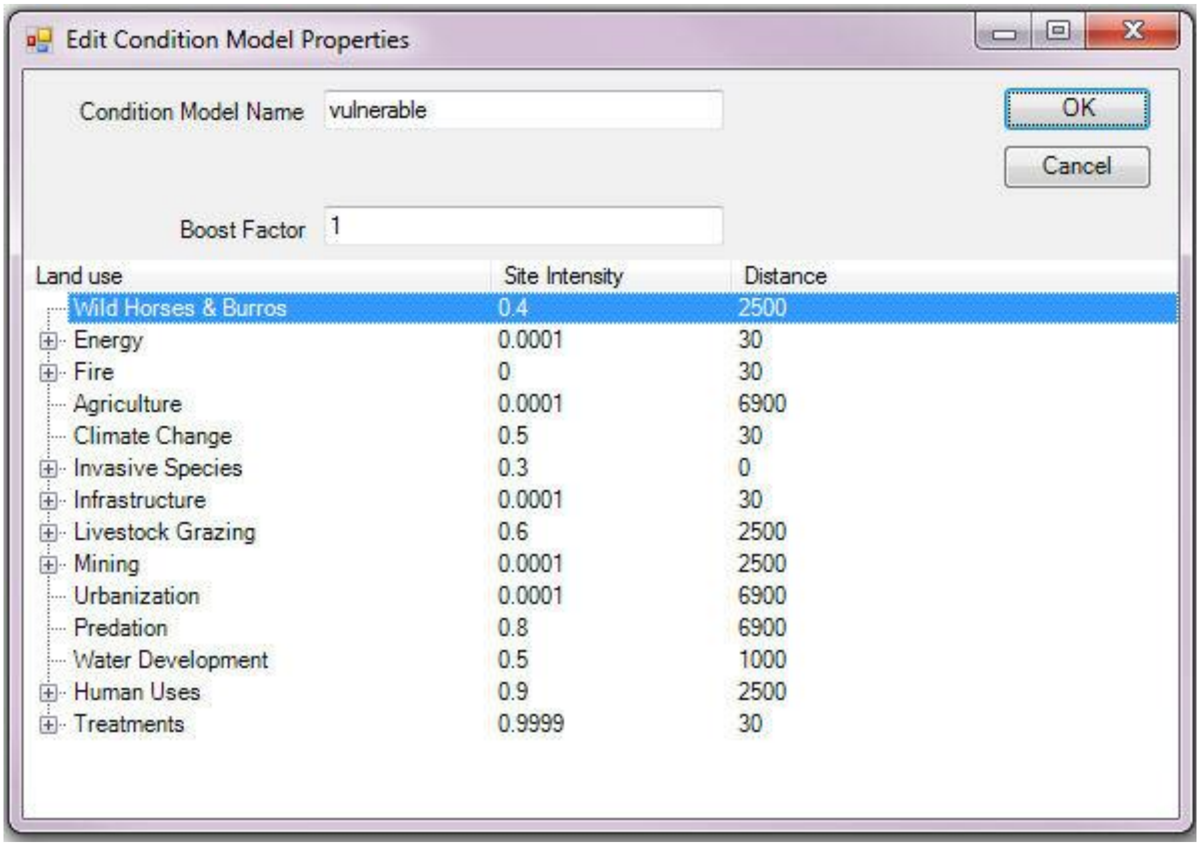
Distance value curve used to define condition model.

Creating distance intensity models

1. Open Vista Drop-down Menu
2. Click Lists
3. Click Condition Systems List
4. Click New to create a new condition model
5. The ”Edit Condition Systems” popup window is the user interface for applying individual condition models to elements. The user may adjust the display order of the elements by setting the Project preferences in the Vista pull-down (Vista -> Project -> Preferences -> Default Category System).
6. Create or modify a condition model by clicking the blank area in the condition model next to an element. The user options are to select an existing condition model, new model, edit an existing model, or delete a model.



7. The displayed land use list displayed in the tool popup window represents all the land use types input into the Vista Land Use List. The user may define a model name and populate the intensity values for the chosen land use types. The Boost Factor is a power function applied to the final condition model to adjust the distribution of the model results. The option defaults to a value of 1; however, the user should only adjust this value with substantial understanding of how the results will be transformed. Each land use type may represent a single land use or may include multiple sub categories represented by land uses preceded by a plus (+) symbol


Edit Condition Model Properties
Condition Model Name
vulnerable
OK
Cancel
Boost Factor
1
Land use
Site Intensity
Distance
Wild Horses & Burros 0.4 2500
Energy 0.0001 30
Fire 0 30
Agriculture 0.0001 6900
Climate Change 0.5 30
Invasive Species 0.3 0
Infrastructure 0.0001 30
Livestock Grazing 0.6 2500
Mining 0.0001 2500
Urbanization 0.0001 6900
Predation 0.8 6900
Water Development 0.5 1000
Human Uses 0.9 2500
Treatments 0.9999 30


Edit Land-use Intent
Maintain Primarily for Natural Values
Biodiversity conservation
Natural area recreation and open s
Unknown specific natural use
Maintained Primarily for Working/Occu
Low intensity working landscape
Intensely managed working landsc
Low-density development
Unknown specific working/occupie
Utilized Primarily for Infrastructure
Cleared transmission corridor
Minor road
Major road
Major highway
Unknown specific infrastructure us
Converted to High Intensity Land Use
High intensity working landscape/r
Mines and active landfills
General urbanization: homes, comm
OK
Cancel
Help
Add Peer
Add Child
Delete

The default value for both the site intensity and distance intensity are zero (0). Land uses with a zero value in either site or distance intensity will not be included in the model. The user must set values greater than 0 and less than 1 in order for a land use to be included in the model.

Site intensity sets condition values at a given land use, the lower the values the more they negatively affect condition values. Distance values influence how much site effects are felt at increasing distance away from the specified land use.

Understanding value range factors

The Value Range Factor allows the user to define limits that create ranges or categories of values from continuous value inputs such as ranges of suspended solids in water that equate to healthy, acceptable, and unacceptable conditions for aquatic vegetation. These ranges can then be assigned values on a 0.0 to 1.0 scale that depicts landscape condition outcomes. Value Range Factors are not directly related to distance but assign ranges based on observed or modeled conditions. In the case of N-SPECT inputs, the distance effect was already calculated in N-SPECT and so does not need to be further modeled in Vista. The ranges and associated condition values are best assigned using expert input or taken from peer-reviewed scientific literature. Value range factor values are different from distance intensity as they represent condition value loss. When they are converted into condition models the value range factor is subtracted from the maximum value of one (see table below).

An example of Value Range Factors would be the effects of Total Suspended Solids (TSS) on salmonids in streams of the Pacific Northwest. Newcombe and MacDonald (1991) grouped the effects of sedimentation on salmonids into three categories: lethal, sublethal and behavioral effects. While duration of exposure plays a role, the levels of TSS provoke different responses that illustrate TSS effects on rainbow trout (Oncorhynchus mykiss). For example, at 1,000-2,500 mg/L TSS there was a 57% mortality in juvenile fish (fingerlings); at 500 mg/L TSS fish suffered physiological ill effects and there was an avoidance response to waters greater than 66 mg/L TSS (Bash et al, 2001). In Vista the different levels of TSS observed in a freshwater stream could categorized into ranges and assigned a value from 0.0 to 1.0, as shown in the table below.

Categories	Range (Total Suspended Solids)	Value Range Factor	Condition model value
No negative effects	0 – 66 mg/L	0.0	1.0
Behavioral effects	66 – 500 mg/L	0.3	0.7
Sublethal effects	500 – 1000 mg/L	0.6	0.4
Lethal effects	1000 – 2,500 mg/L	0.9	0.1

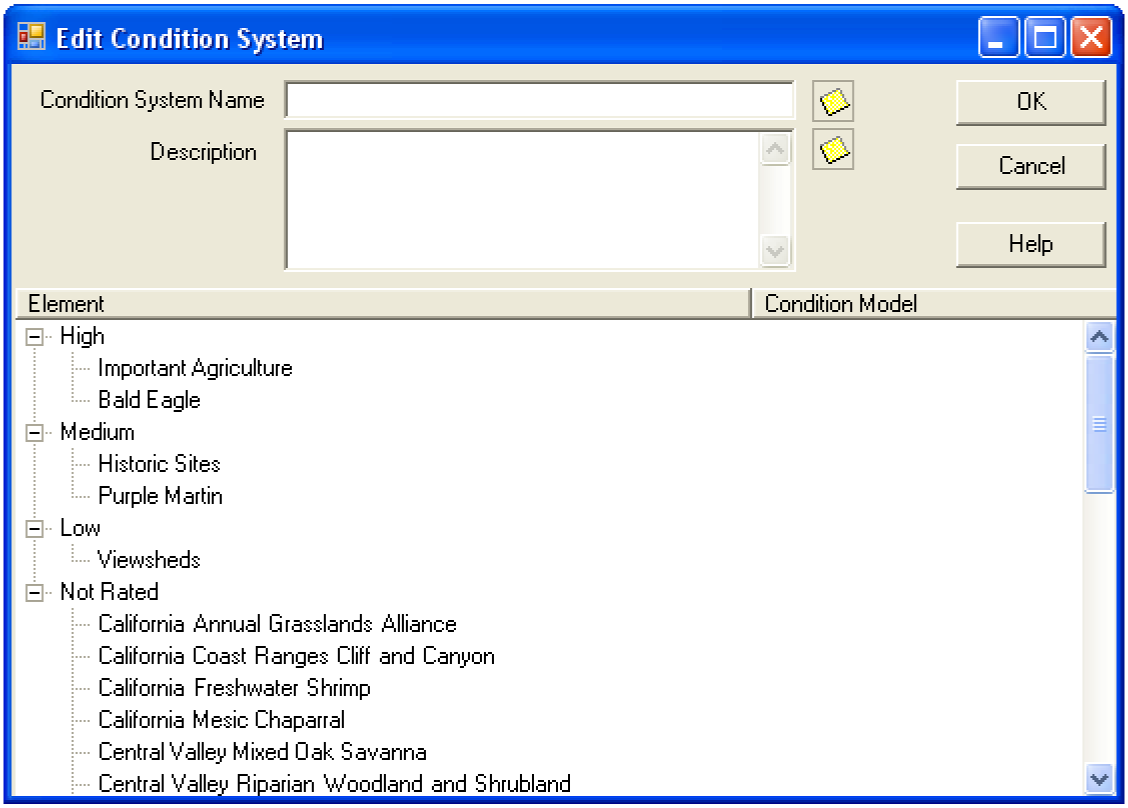
Table representing different effects on rainbow trout given different ranges of total suspended solids, example value range factors applied to those ranges and the resulting value in the condition model raster.

Vista also has the ability to combine Value Range Factors which represent the cumulative impacts of multiple stressors. Returning to the example of rainbow trout, a local fisheries biologist indicates that in areas where no streamside vegetation exists, this condition will often provoke a mild avoidance response. Discussing the effects of TSS the biologists suggests a condition loss value of 0.3.

Vista does not specify value range classes or thresholds as these depend on the element in question. In the above example, rainbow trout had a range of TSS conditions that would produce certain observed effects. These ranges and their effects may be very different for other salmonids or freshwater flora and fauna. A different set of value range factors could be applied for every species or element in the Vista analysis. Drawing from the above example, different aquatic species have different thresholds, cutthroat trout (*Oncorhynchus clarki*) being more sensitive to TSS than rainbow trout, for example. Multiple pollutants can be included creating either an additive or multiplicative effects on the element in question. Expert opinion or published scientific results should be used to establish ranges, the value range factors and the impact that the condition value has on the element.

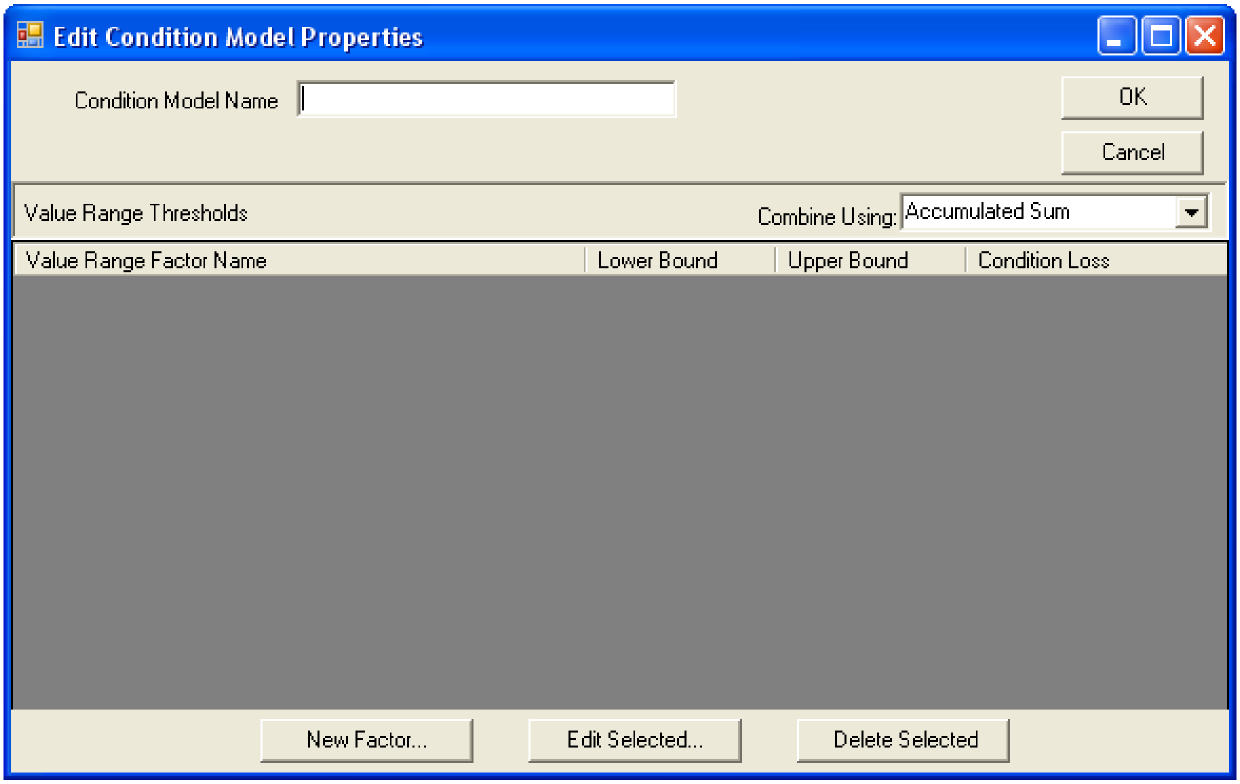
Creating value range factors

1. Open Vista Drop-down Menu
2. Click Lists
3. Click Condition Systems List
4. Click New to create a new condition model
5. The ”Edit Condition Systems” popup window is the user interface for applying individual condition models to elements. When a new condition system is being created for the first time, Vista will ask you to select or create a default category system. Categories are assigned when creating elements and provide a system whereby elements are grouped and viewed. This can be changed later if you wish to create different condition system lists on another category type; which is defined in the Vista pulldown (Vista -> Project -> Preferences -> Default Category System) User may vary the Element display sort.

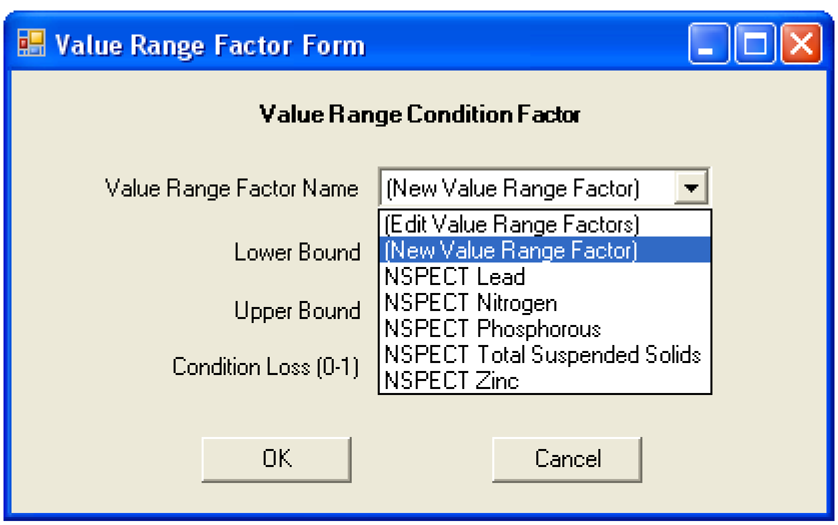


Primary Condition System menu.

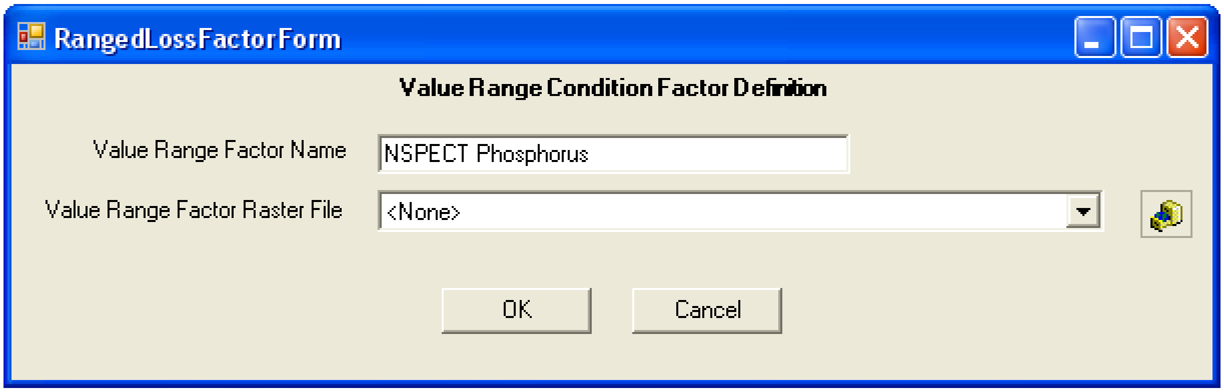
6. Create or modify a condition model by clicking the blank area in the condition model next to an element. The user options are to select an existing condition model, new Distance Intensity, new Value Range Factor, edit an existing model, or delete a model.
7. Select new Value Range Factor
8. Provide a name for the new condition model and click New Factor...



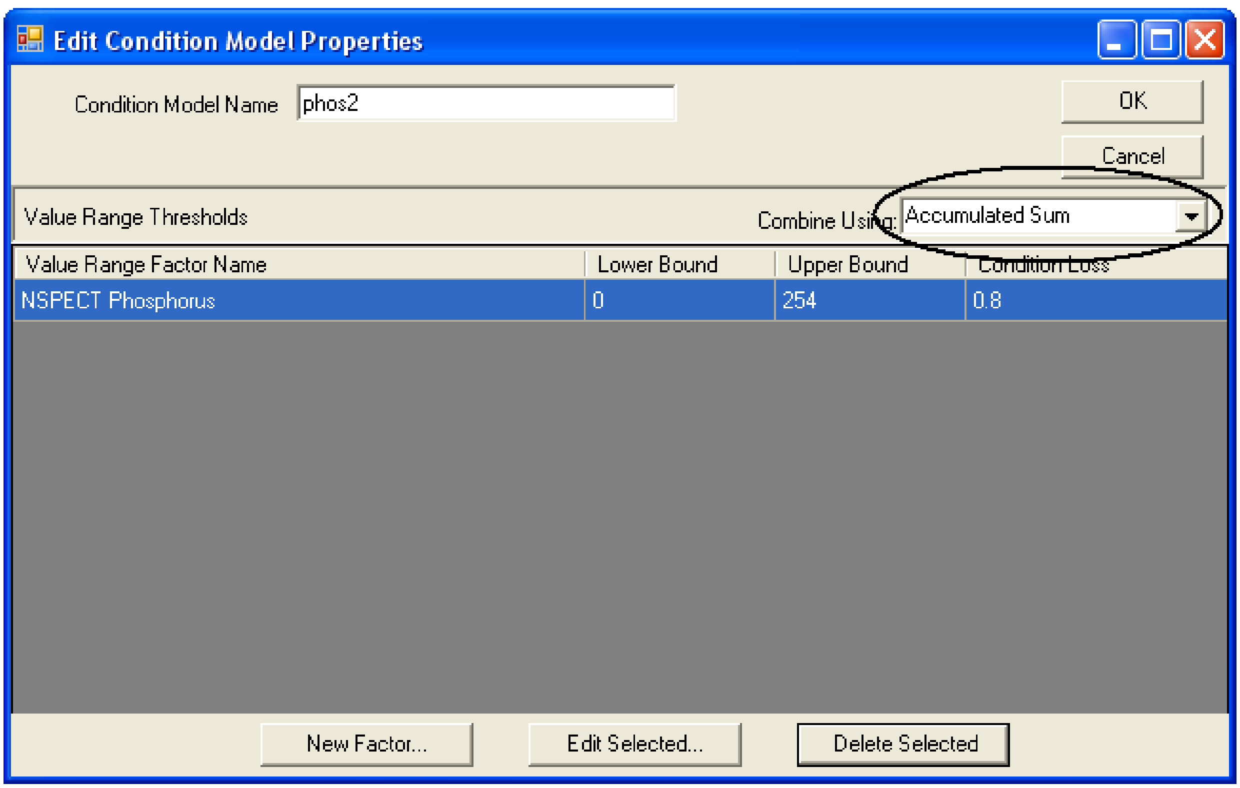
9. Under the Value Range Factor Name a menu of options appears. This menu creates the option for importing N-SPECT raster files for five pollutant types. From this menu you can also edit an existing model or create a value range condition model by importing a floating point or integer grid that represents landscape or aquatic condition.



10. Selecting New Value Range Factor will prompt you to create a Value Range Factor Name and select a raster file. Click OK.

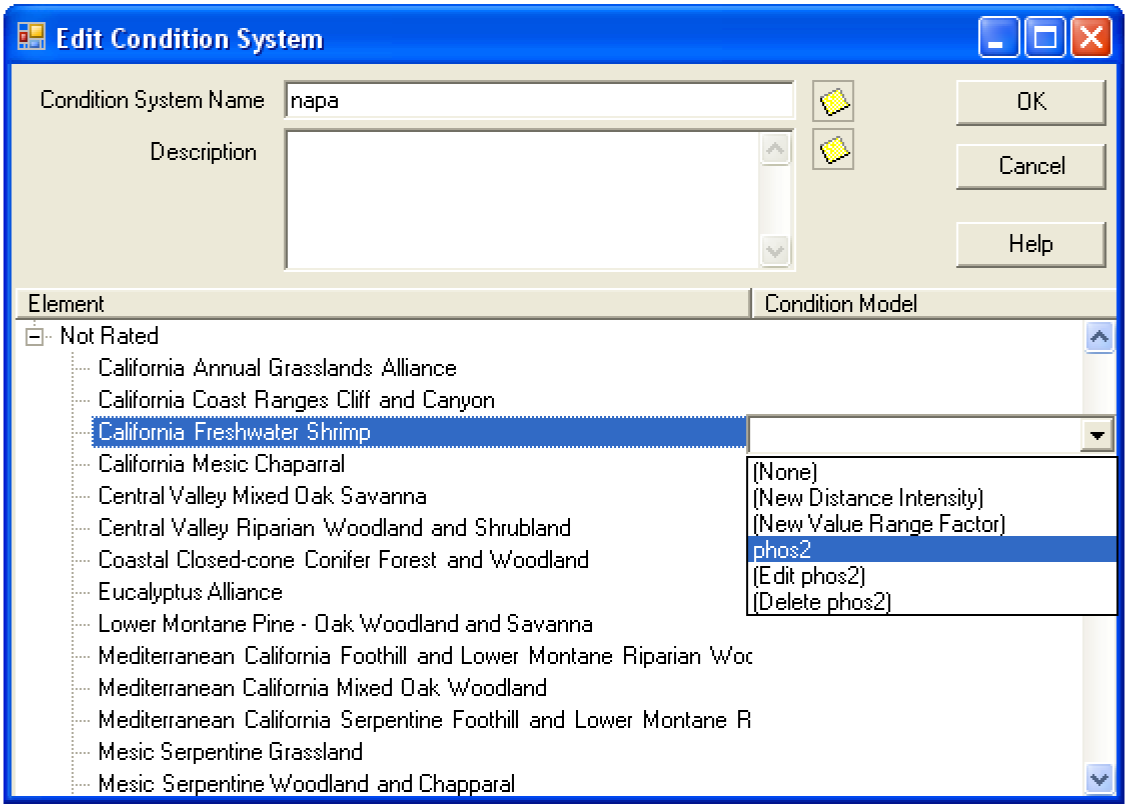


11. You will return to Value Range Factor Form. It will show the minimum and maximum values detected in the raster. Begin creating ranges by defining lower and upper bounds. Assign a condition loss value for the range. Click OK. This will add the range and condition loss to the Edit Condition Model Properties list. Create additional ranges, defining bounds and condition loss value as necessary.



Vista has the flexibility to mathematically combine multiple Value Range Factors in different ways. This is set in the Edit Condition Model Properties window where your value range factors are stored. You can combine different value range factors using: Accumulated Sum, Accumulated Multiply, Maximum and Minimum. Return to the Edit Condition System list to create other condition models for other elements.

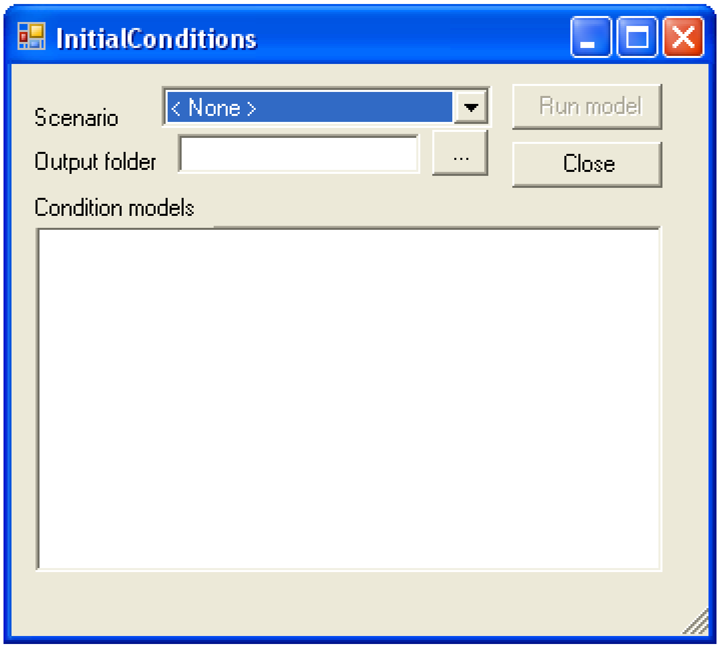
12. Click OK. The Condition model should appear in the Edit Condition Systems window.
13. All of the condition models that you have created should appear in the pulldown menu in the Condition Model window. Other options that will appear here allow you to edit and delete condition models.

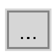


14. Condition systems will appear in Scenario Evaluation window. If you wish to examine the condition model or incorporate it as an initial condition model, see Using the Initial Condition Model section.

Using the initial condition modeler

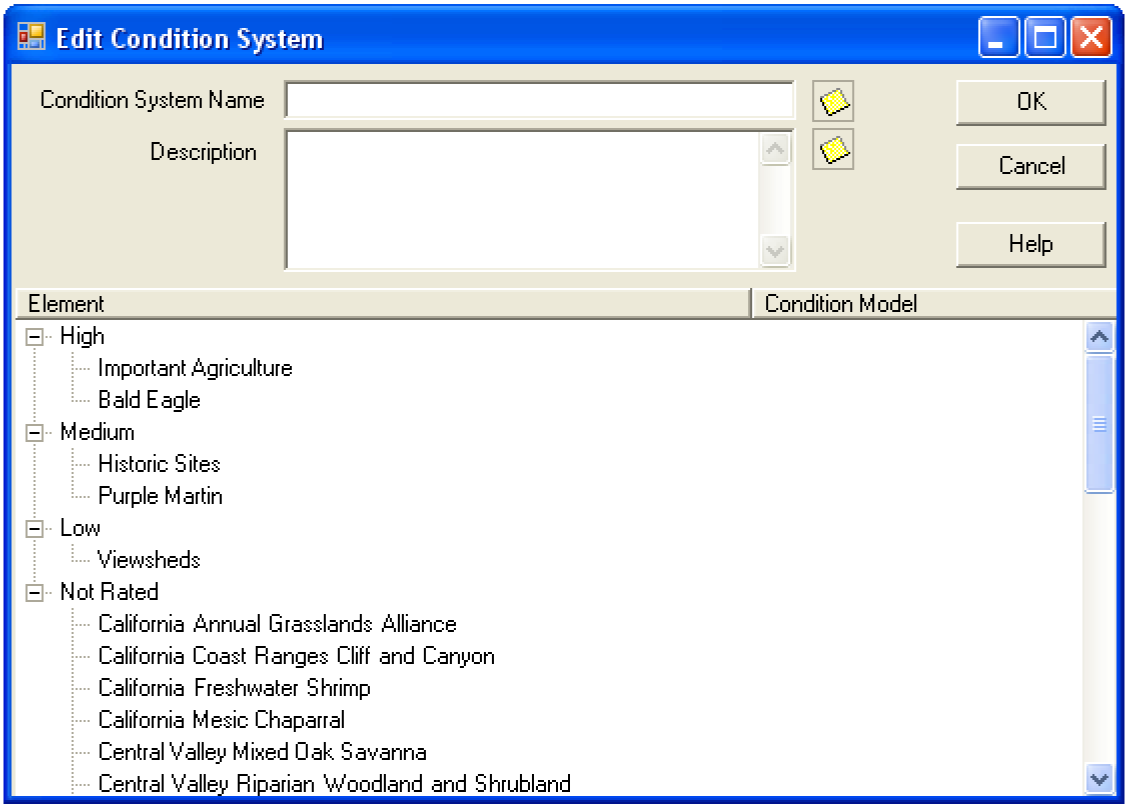
The initial condition model window was developed to let the user generate condition models that have been set up in the Conditions System window. This allows the user to evaluate the individual models for potential errors as well as incorporate them as current or initial condition raster in an element's viability/integrity properties. Vista asks you to select a scenario in order to create an initial condition model. A condition model should reflect the landscape integrity for an element (or group of elements) modeled on a given land use scenario. While Vista doesn't create any link between the scenario and condition model, it is helpful to relate a condition model to a land use scenario. The Initial Condition Model list is accessed through the Vista main menu -> Lists -> Initial Condition Model List.



1. Select a Scenario from the pull down menu.
2. Click on the  button to navigate to the file where you want to store the condition raster.
3. Click on the condition model name that you wish to create a raster for.
4. Click on Run Model. Once the raster model has been created, use the Add Data  button to navigate to the folder where the raster layer is stored and add it to your view.

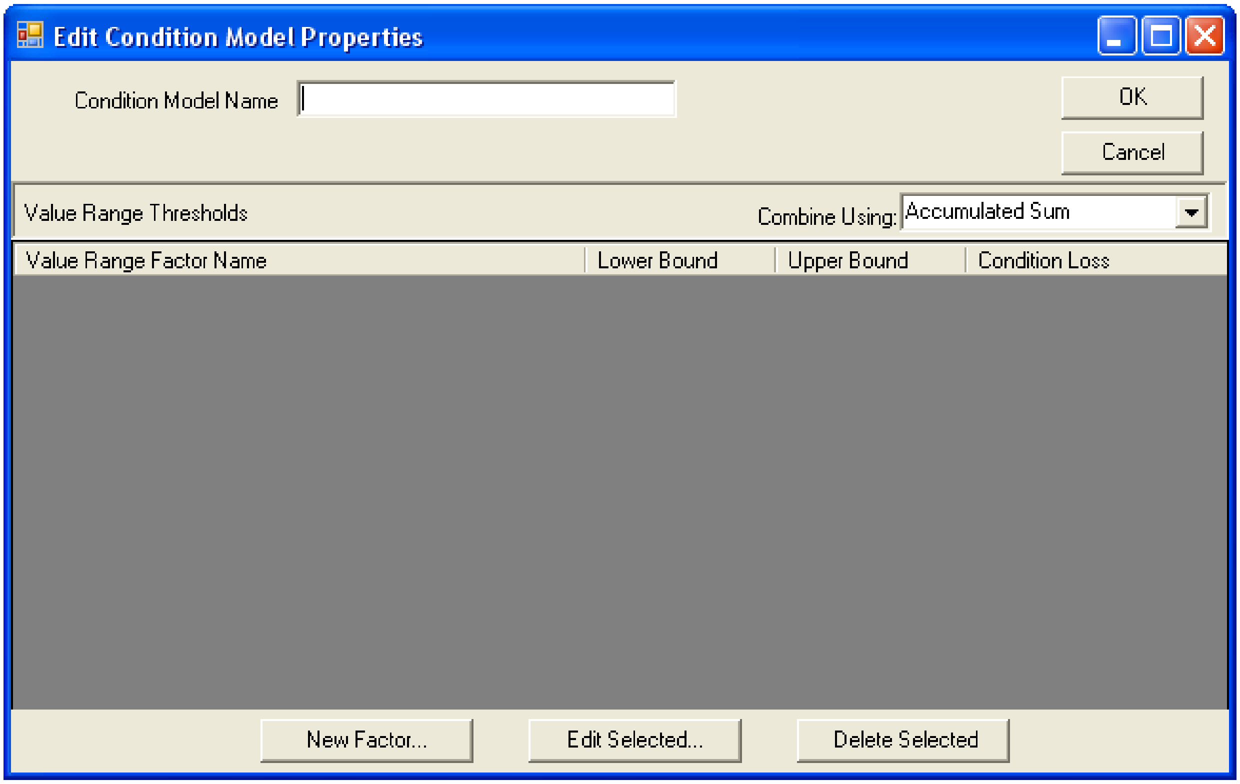
CREATE VALUE RANGE FACTORS

1. Open Vista Drop-down Menu
2. Click Lists
3. Click Condition Systems List
4. Click New to create a new condition model
5. The "Edit Condition Systems" popup window is the user interface for applying individual condition models to elements. When a new condition system is being created for the first time, Vista will ask you to select or create a default category system. Categories are assigned when creating elements and provide a system whereby elements are grouped and viewed. This can be changed later if you wish to create different condition system lists on another category type; which is defined in the Vista pulldown (Vista -> Project -> Preferences -> Default Category System) User may vary the Element display sort.

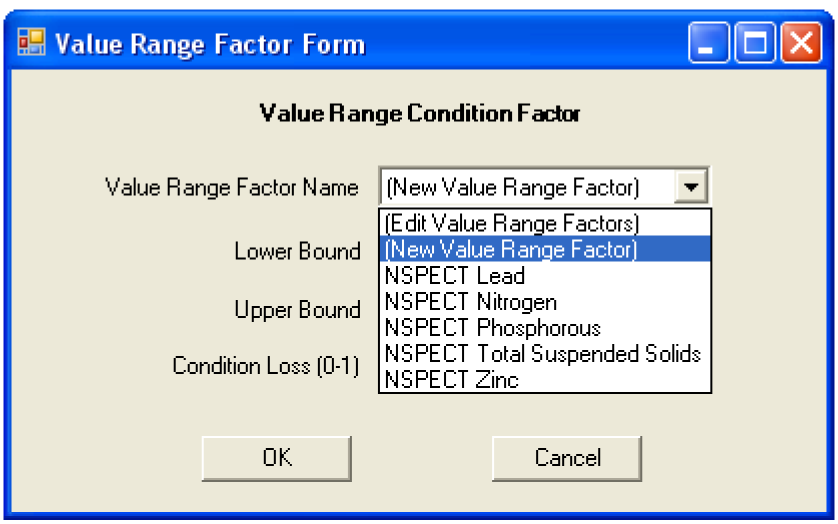


Primary Condition System menu.

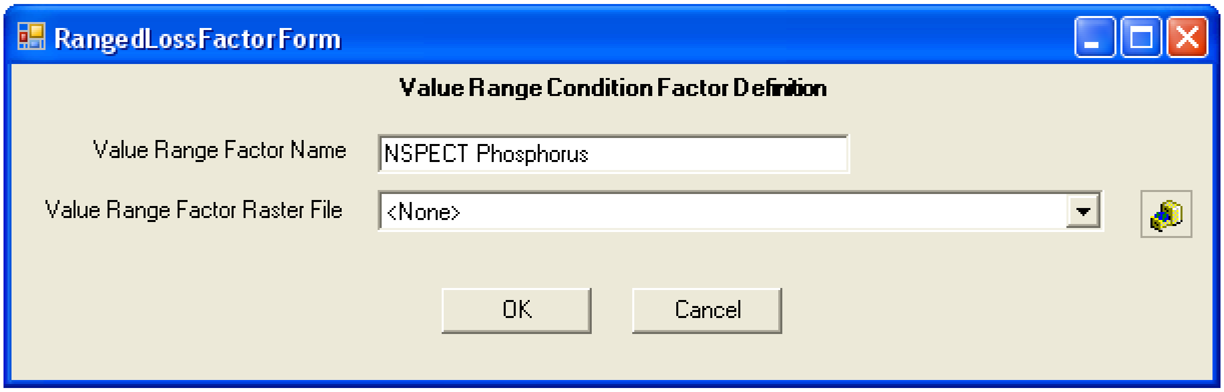
6. Create or modify a condition model by clicking the blank area in the condition model next to an element. The user options are to select an existing condition model, new Distance Intensity, new Value Range Factor, edit an existing model, or delete a model.
7. Select new Value Range Factor
8. Provide a name for the new condition model and click New Factor...



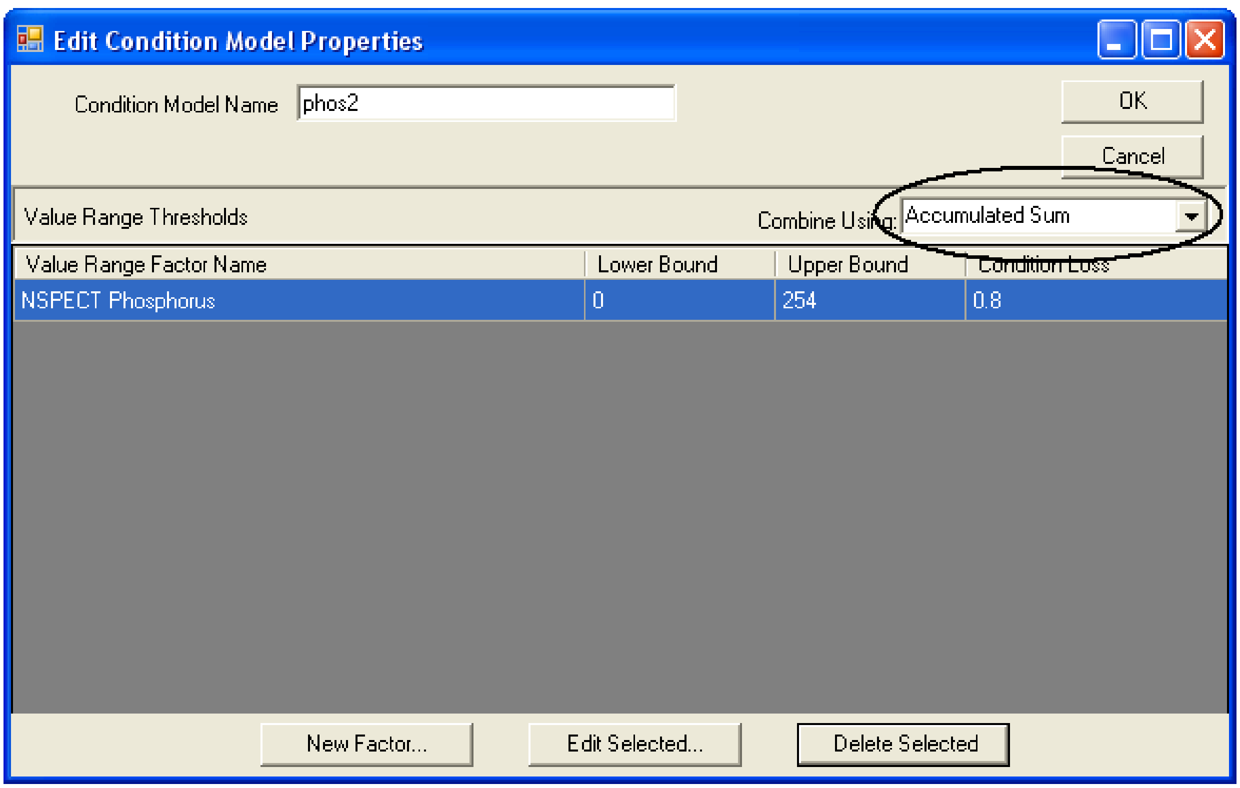
9. Under the Value Range Factor Name a menu of options appears. This menu creates the option for importing N-SPECT raster files for five pollutant types. From this menu you can also edit an existing model or create a value range condition model by importing a floating point or integer grid that represents landscape or aquatic condition.



10. Selecting New Value Range Factor will prompt you to create a Value Range Factor Name and select a raster file. Click OK.

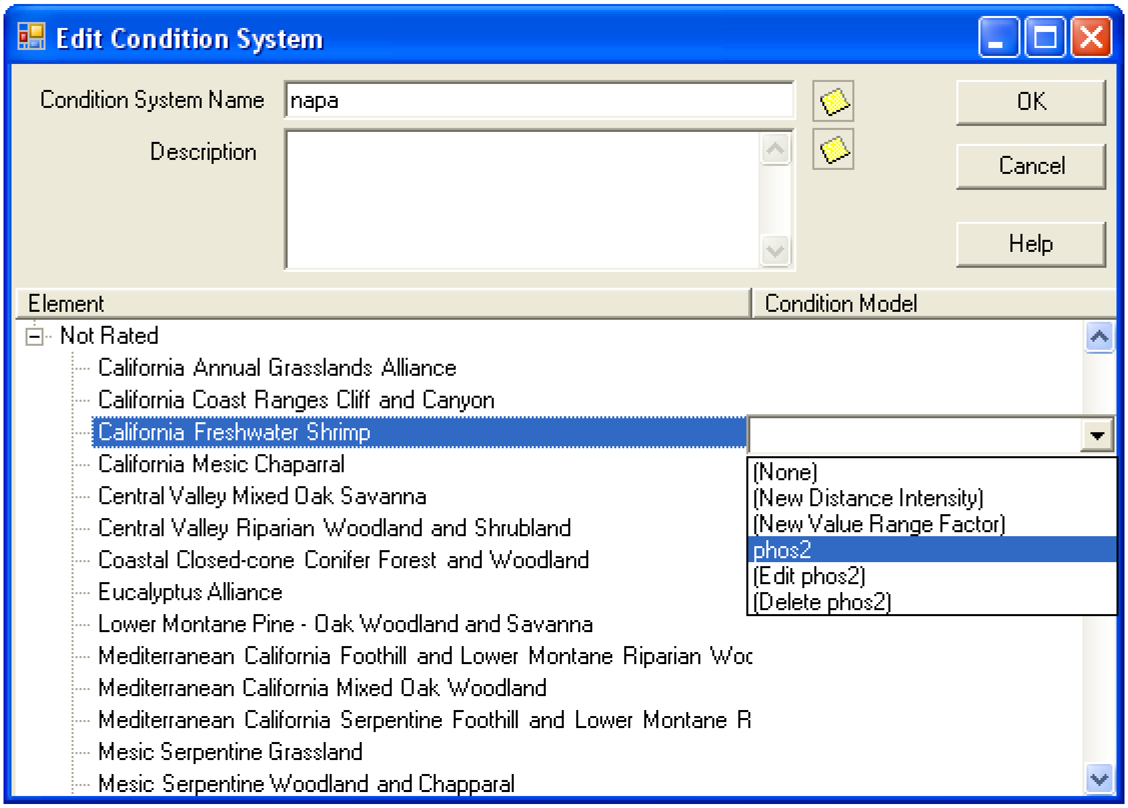


11. You will return to Value Range Factor Form. It will show the minimum and maximum values detected in the raster. Begin creating ranges by defining lower and upper bounds. Assign a condition loss value for the range. Click OK. This will add the range and condition loss to the Edit Condition Model Properties list. Create additional ranges, defining bounds and condition loss value as necessary.



Vista has the flexibility to mathematically combine multiple Value Range Factors in different ways. This is set in the Edit Condition Model Properties window where your value range factors are stored. You can combine different value range factors using: Accumulated Sum, Accumulated Multiply, Maximum and Minimum. Return to the Edit Condition System list to create other condition models for other elements.

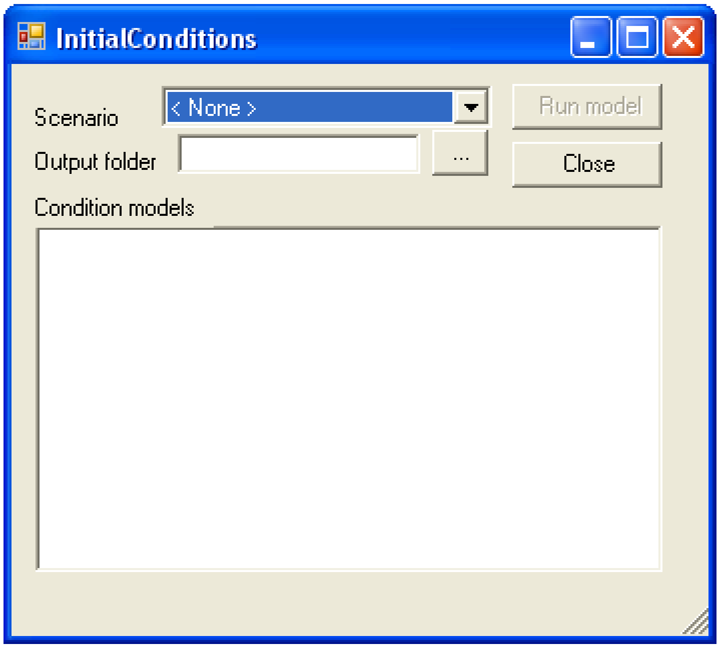
12. Click OK. The Condition model should appear in the Edit Condition Systems window.
13. All of the condition models that you have created should appear in the pulldown menu in the Condition Model window. Other options that will appear here allow you to edit and delete condition models.

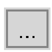


14. Condition systems will appear in Scenario Evaluation window. If you wish to examine the condition model or incorporate it as an initial condition model, see Using the Initial Condition Model section.

Using the Initial Condition Model List

The initial condition model window was developed to let the user generate condition models that have been set up in the Conditions System window. This allows the user to evaluate the individual models for potential errors as well as incorporate them as current or initial condition raster in an element's viability/integrity properties. Vista asks you to select a scenario in order to create an initial condition model. A condition model should reflect the landscape integrity for an element (or group of elements) modeled on a given land use scenario. While Vista doesn't create any link between the scenario and condition model, it is helpful to relate a condition model to a land use scenario. The Initial Condition Model list is accessed through the Vista main menu -> Lists -> Initial Condition Model List.

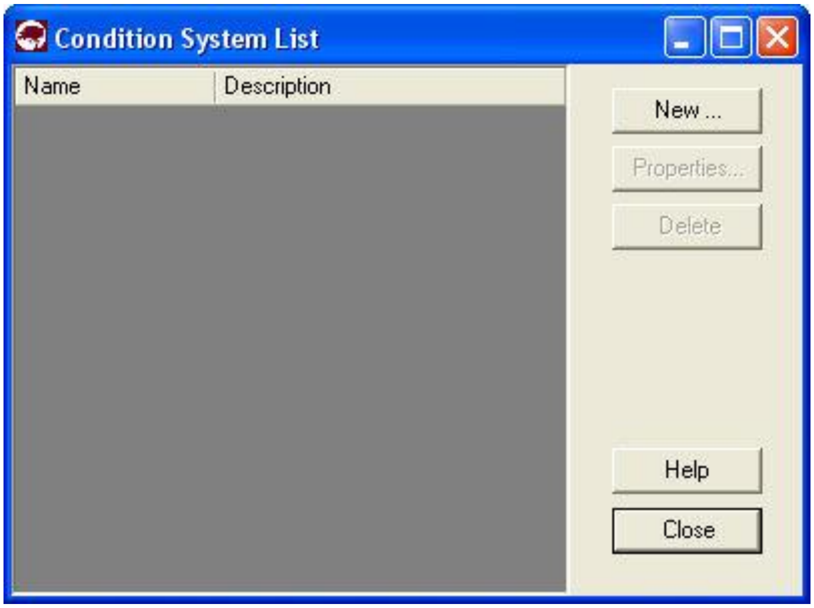


1. Select a Scenario from the pull down menu.
2. Click on the  button to navigate to the file where you want to store the condition raster.
3. Click on the condition model name that you wish to create a raster for.
4. Click on Run Model. Once the raster model has been created, use the Add Data  button to navigate to the folder where the raster layer is stored and add it to your view.

Windows for Landscape Condition Models

Condition System List Window

The **Condition System List** window is displayed by selecting **Lists ▸Condition Systems List** from the NatureServe Vista menu. This window lists all the condition models that have been created in the project. See the Landscape Condition Models section for more detailed information on condition models.



Button functions:

New... displays a new Edit Condition System window that can be used to create a condition model.

Properties... displays the Edit Condition System window showing details and allowing edits to the condition model selected in the list.

Delete deletes the condition model selected in the list.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

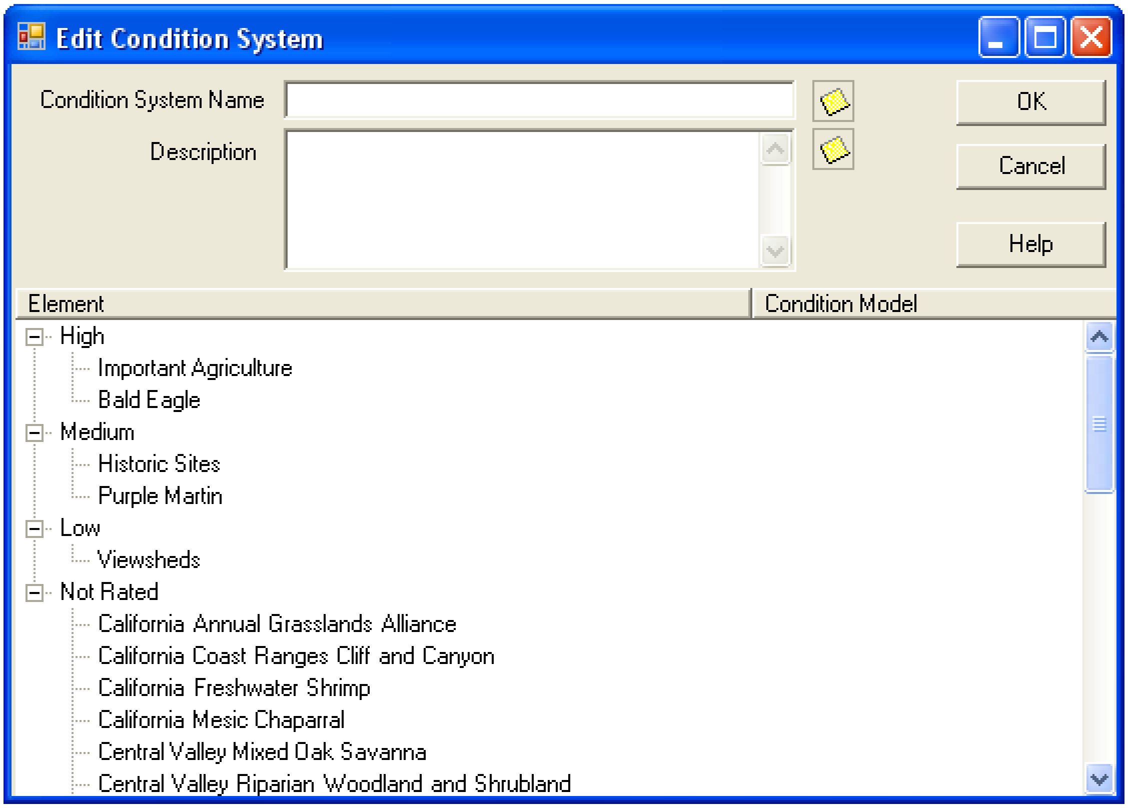
Name - name of the condition model.

Description - description of the condition model, if any.

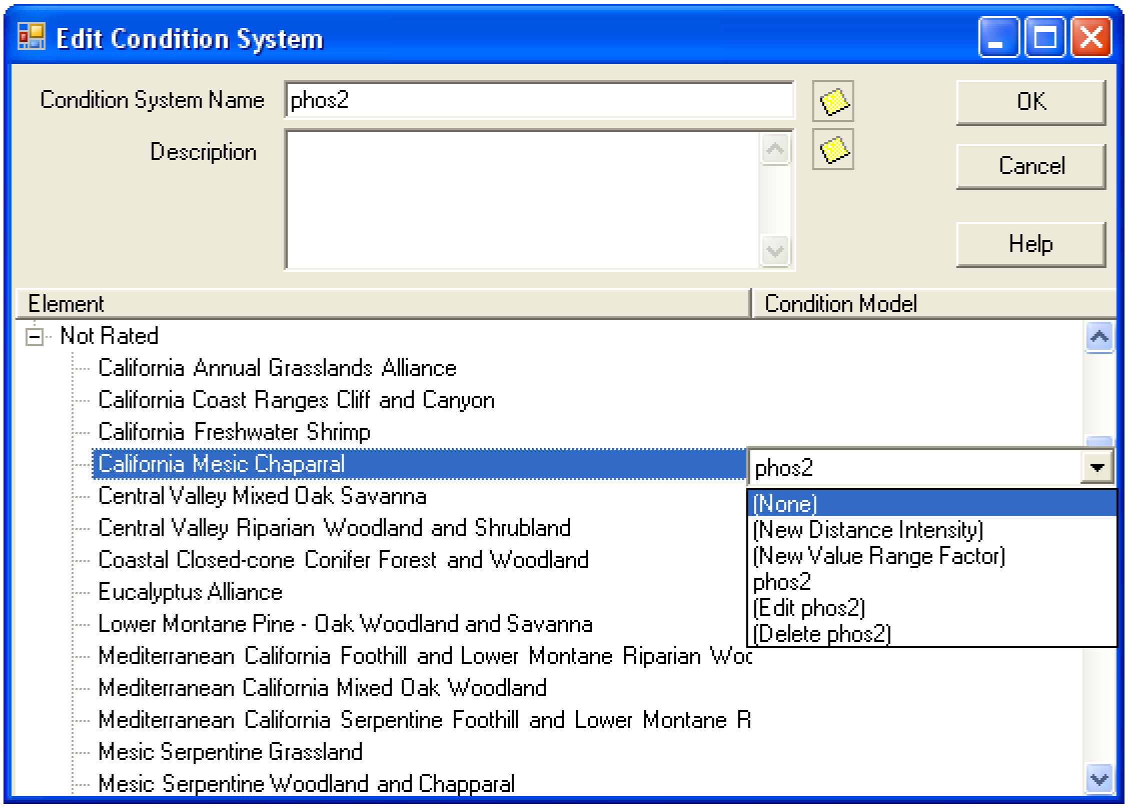
Edit Condition System Window

The **Edit Condition System** window is displayed by clicking the **New...** or **Properties** buttons on the Condition System List window. This edit window is used for applying individual condition models to elements. When a new condition system is being created for the first time, Vista will ask you to select or create a default category system. Categories are assigned when creating elements and provide a system whereby elements are grouped and viewed. This can be changed later if you wish to create different condition system lists on another category type; which is defined in the Vista pulldown (Vista -> Project -> Preferences -> Default Category System). User may vary the Element display sort.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



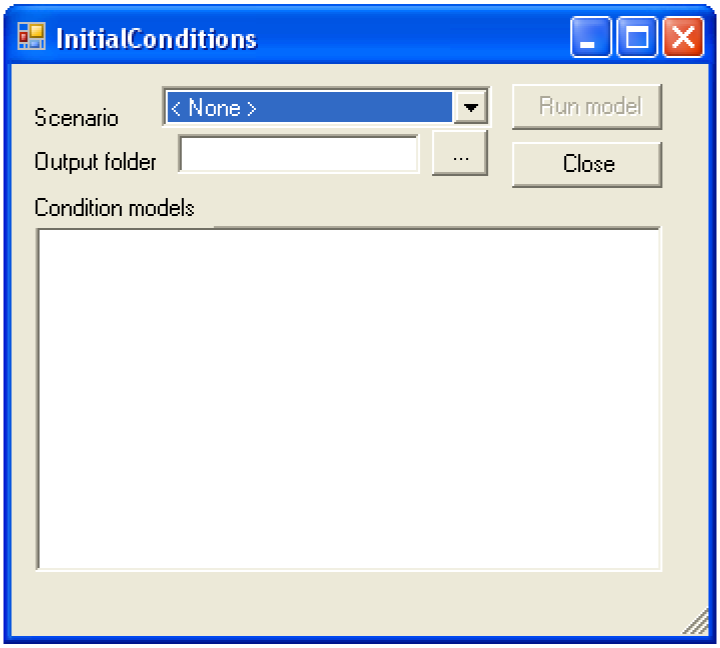
Create or modify a condition model by clicking the blank area in the condition model to the right of an element. The user options are to select an existing condition model, new Distance Intensity, new Value Range Factor,and edit an existing model, or delete a model.



See Using the Condition Systems window for instructions on data entry for this window.

Initial Conditions window

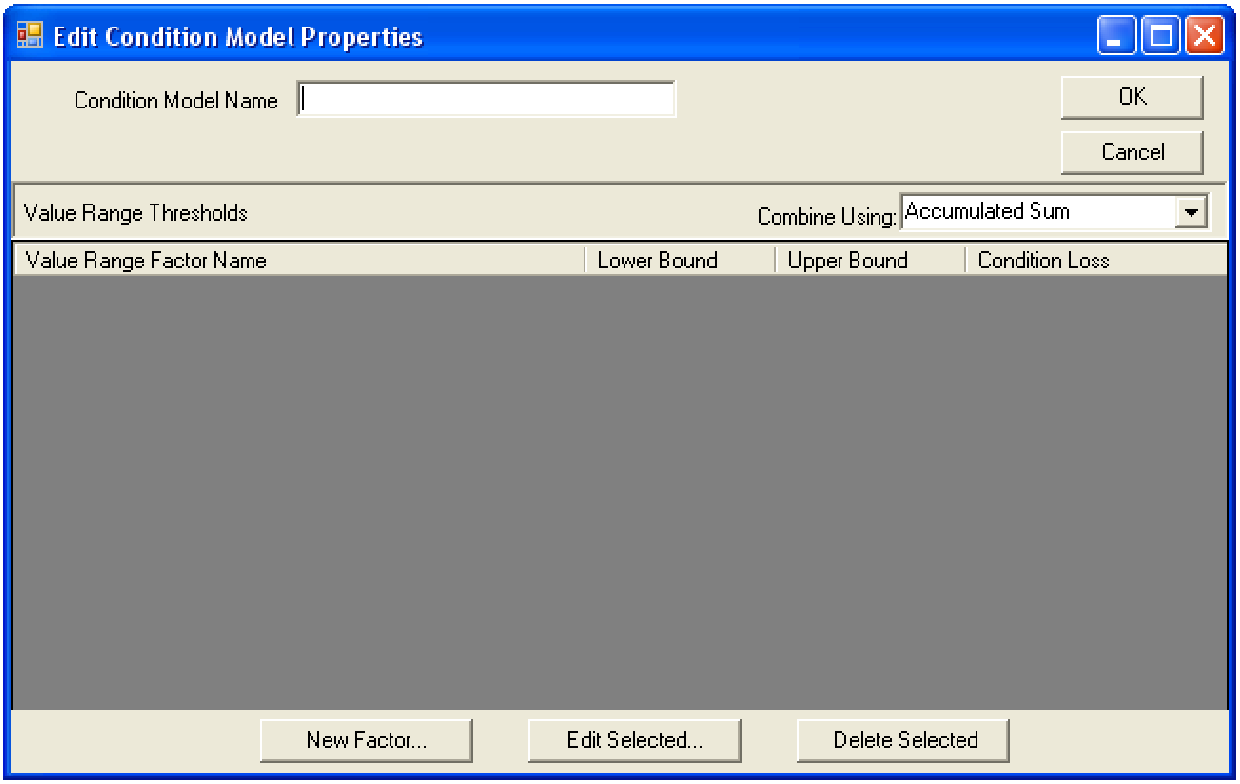
The Initial Condition Model list is accessed through the Vista main menu -> Lists -> Initial Condition Model List.



See Using the initial condition modeler for instructions on data entry for this window.

Landscape Condition Model Properties Window

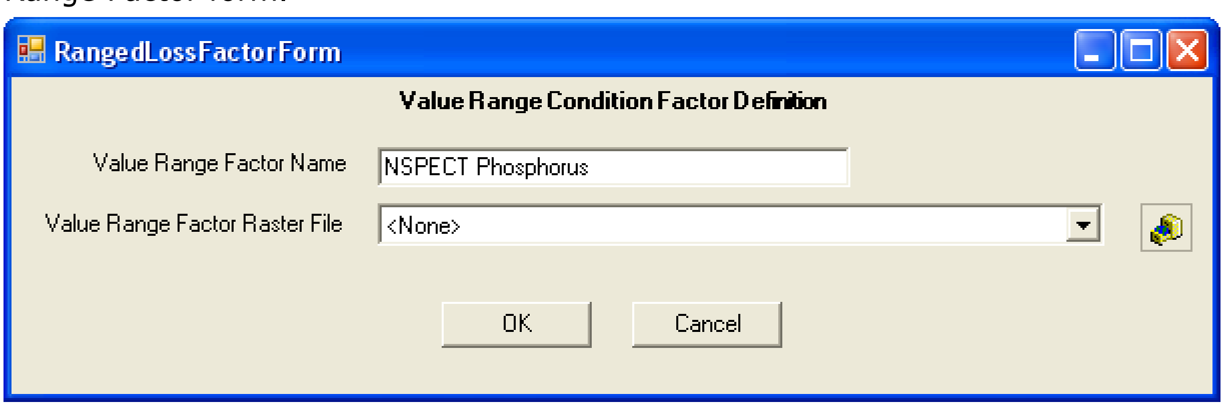
The Landscape Condition Model Properties window is accessed by clicking the blank area in the condition model next to an element and selecting new model.



See [Creating distance intensity models] for instructions on data entry for this window.

RangedLoss Factor Form

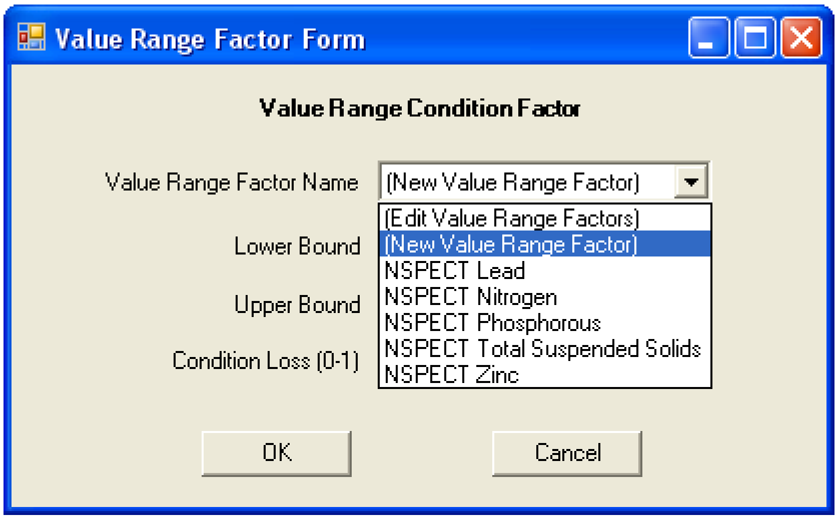
This window is accessed by Selecting New Value Range Factor from the Value Range Factor form.



See [Creating value range factors] for instructions on data entry for this window.

VALUE RANGE FACTOR FORM

This window is accessed by clicking New Factor... from the Edit Condition Model Properties window.



See Creating value range factors for instructions on data entry for this window.

Scenario Evaluations

Introduction to Scenario Evaluations

To judge the conservation compatibility of areas within a planning region, biodiversity value must be integrated with socioeconomic factors, such as current land use, current conservation status, and ownership. One of the most powerful features of Vista is its ability to compare various scenarios representing land use and conservation in the planning region - in other words, alternate plans that identify which places to conserve, areas where there are gaps in protection, and which places to designate for housing, roads, or other development. Land use/management and policy data for the planning region obtained from a variety of sources are defined as scenarios translated into "standard" land use and policy types, which can then be compared against distributions of elements and evaluated in terms of conservation goals. Using Vista, a customized plan can be developed for the planning region that will enable it to conserve what it values most, balancing diverse land uses and priorities, such as natural habitats, farmland, and historic preservation.

Three distinct processes comprise Scenario Evaluation analyses: 1) creating translators, 2) defining scenarios, and 3) evaluating scenarios. The first two components (translators and scenarios) basically prepare data so that it can be effectively evaluated against element distributions and goals.

Translators

Translators are created by utilizing a wizard to crosswalk land use/management practices represented in the input layers to land use intent categories used by Vista in order to assess element compatibility with land use in the planning region. First, attributes of the input layer that are relevant to land use/management practices are identified, and Vista assembles a list of unique permutations of types for these attributes. Then the land use intent category that corresponds to these types is selected. Translators are saved in the Vista database so that new versions of land use/management layers (e.g., an updated stream setback layer) can be directly incorporated into a scenario. The same process is used to translate policy practices into Vista policy types. These types are used to assess the degree to which policy mechanisms allow or prevent land uses of greater intensity, i.e., the amount of protection afforded the element.

Scenarios

Scenarios are composed of individual layers obtained from multiple agencies (e.g., U.S. Forest Service) representing different policies (e.g., zoning). Using translators, attributes of the layers are converted to Vista types according to both the land use permitted (e.g., biodiversity reserve, recreational open space, low-intensity agriculture) and the type of policy providing protection (e.g., voluntary, easement, legislated). Layers are then sequenced according to precedence, with the layer representing the most dominant uses/policies positioned at the top (e.g., zoning is usually the last policy to define allowable land uses, so it typically appears at the bottom of the list). Using the input layers, their translators, and order of precedence, Vista creates two maps to describe the planning scenario: a land use/management raster and a protection policy raster, to be used in evaluations.

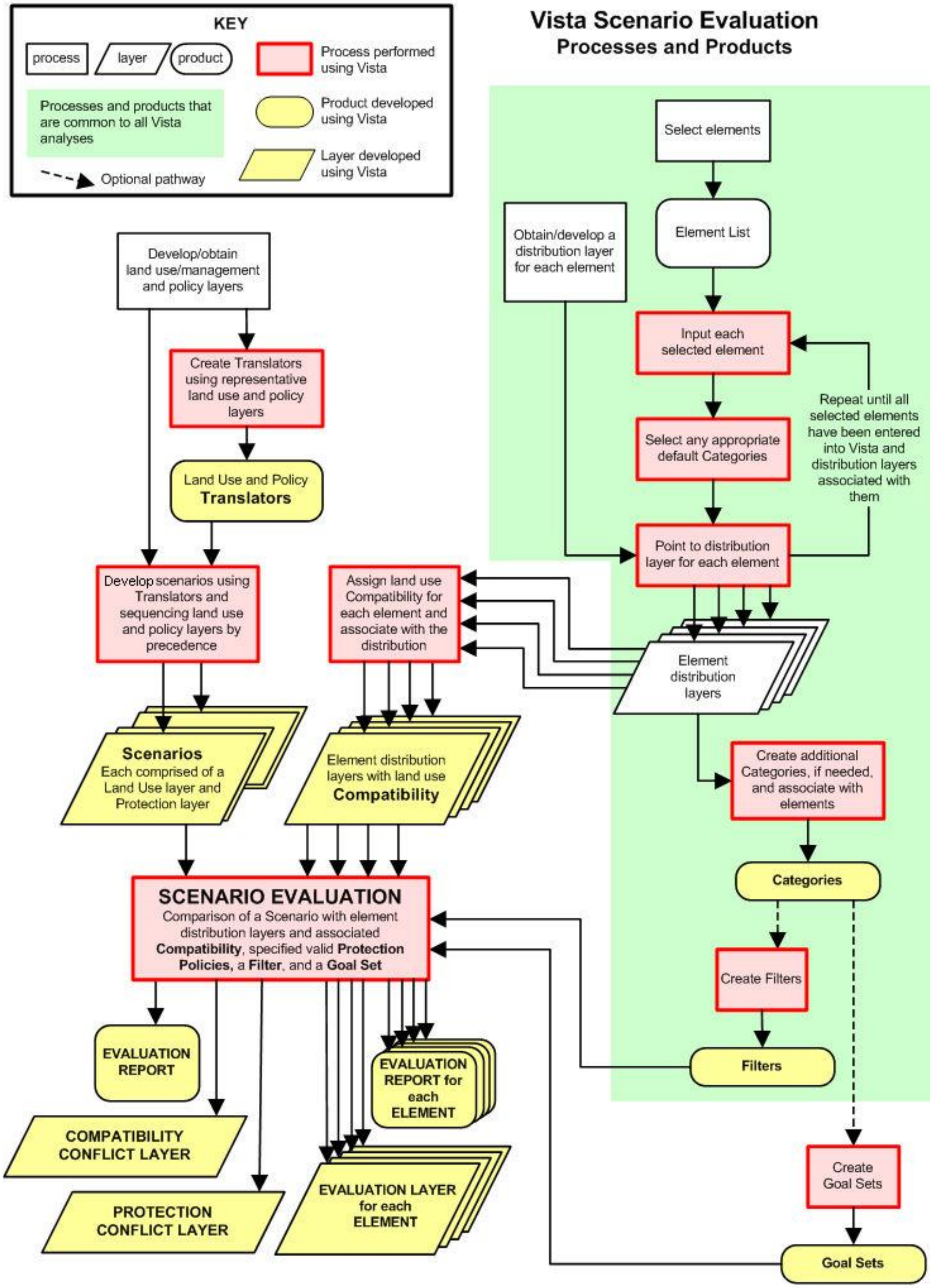
Scenario Evaluations

Vista can evaluate the performance of an input scenario, whether it describes current conditions or potential future conditions, with respect to a specific set of elements and conservation goals. Through this analysis, areas can be identified where land use is incompatible with conservation goals, and where potential land use conflicts may be on the horizon.

The process for evaluating a scenario begins with selection of the scenario, a filter (defining the set of elements to be conserved), and a goal set. If protection is to be evaluated, protection policies considered to offer valid protection to elements must be specified. This decision, like the element filter and goals, may be changed and the evaluation process can be repeated as often as needed to test alternate land use scenarios, or re-run scenarios when new data become available.

The products of a Scenario Evaluation are a report and several visualization layers that can be used in the decision-making process. The report summarizes, in total and by category, the performance of the scenario in terms of the number and percentage of elements that met conservation goals. The report also provides a detailed comparison of individual elements against the scenario: their original distribution, and the amount/percentage that was retained in areas with compatible land use, both with and without adequate protection. The raster layers generated by the Scenario Evaluation identify areas in the planning region where opportunities to improve performance against goals exist. The first layer identifies compatibility conflicts - locations where elements with unmet goals due to incompatibility of land use are concentrated. The second summary layer shows protection policy conflicts - areas where elements are compatible with land use, but insufficiently protected to meet the goals. In addition, a set of separate maps is generated, one per element, which distinguishes between areas of incompatibility, compatibility without protection, and compatibility with protection for that element.

Once a Scenario Evaluation has been generated, land statuses and their impact on element viability in selected land units (e.g., parcels) within the planning region can be examined using the Site Explorer tool. Provided that the data support such resolution, a Scenario Evaluation exploration can provide detailed information on the land uses and/or policies on a specified site along with element attribute data, including the number of viable occurrences that are protected (i.e., by compatible land uses with reliable policy types), and the percentage of conservation goals that have been achieved for the elements on the site.


KEY
process
layer
product
Processes and products that are common to all Vista analyses
Optional pathway
Process performed using Vista
Product developed using Vista
Layer developed using Vista
Vista Scenario Evaluation
Processes and Products
Select elements
Element List
Obtain/develop a distribution layer for each element
Input each selected element
Select any appropriate default Categories
Repeat until all selected elements have been entered into Vista and distribution layers associated with them
Point to distribution layer for each element
Develop/obtain land use/management and policy layers
Create Translators using representative land use and policy layers
Land Use and Policy Translators
Develop scenarios using Translators and sequencing land use and policy layers by precedence
Assign land use Compatibility for each element and associate with the distribution
Element distribution layers
Scenarios
Each comprised of a Land Use layer and Protection layer
Element distribution layers with land use Compatibility
Create additional Categories, if needed, and associate with elements
Categories
SCENARIO EVALUATION
Comparison of a Scenario with element distribution layers and associated Compatibility, specified valid Protection Policies, a Filter, and a Goal Set
Create Filters
Filters
EVALUATION REPORT
EVALUATION REPORT for each ELEMENT
COMPATIBILITY CONFLICT LAYER
PROTECTION CONFLICT LAYER
EVALUATION LAYER for each ELEMENT
Create Goal Sets
Goal Sets

TRANSLATORS

Objectives

The purpose of this function is to automate cross-walking land use/management practices and their supporting policies to a standard list of land-use intent (LUI) types and policy types (PTs) used by Vista. This is done by creating and saving custom translators for individual layers (e.g., a land use zoning map) to be used to automatically translate layers when defined as scenarios in Vista. A translator can be used to translate any specified layers during the scenario definition process - the layer used to build the translator, updated versions of that layer, and any number of totally different layers - and once created, can be edited as needed. Translators are currently used only for defining scenarios, which are utilized in Scenario Evaluations. (See Appendix F for details on LUI categories, and Appendix G for descriptions of PT.)

Products

This process results in a translator, which can then be used to define scenarios.

Inputs

Inputs to the translator creation process consist of geographic information systems (GIS) layers and accompanying information (e.g., digital, hardcopy, personal communications) that can aid in the process of creating a translator. Many different layers (best obtained directly from the institution that implements the land use or management) may be used, including those representing converted lands, as well as layers attributed with present (and potential) land uses/management categories and policy types within the planning region. Because the goal in building translators is to assign a Vista type to each land use and/or policy type that occurs within the planning region, input layers should be selected that will best represent the full set of types with a minimum of redundancy in order to most efficiently create translators.

In addition to layers, the translator process requires sufficient knowledge about land use/management and policy to be able to appropriately assign Vista "standard" types for LUI and/or PT to layer attributes. This knowledge can come from different sources, including descriptive information found in the GIS layers, associated planning documents, and ”expert knowledge” about the layers. Expert knowledge is particularly useful for determining the appropriate translator to use for PT (i.e., the actual mechanism used to ensure the land use/management policies are carried out as stated).

Methods Summary

Translators facilitate cross-walking categories of land use/management and policy types found in the planning region to the LUI categories and PT used by Vista. In addition, Vista stores translators so that new, updated versions of land use/policy layers in the region can be incorporated easily into a scenario, and translators can be edited as opinions on the appropriate LUI and PT to represent various land use/management and policy types change. Further, translators can be exported for use in another Vista project, or imported to the current project from another.

Virtually all zoning plans permit more than one land use for a tract. Thus, when cross-walking land use/management and/or policy types in the planning region to "standard" Vista LUI categories and/or PT, a number of Vista types may apply to a single land use or policy type. For example, residential land use lacking unit density and lot size information may be associated with several different LUI. Another example is an easement that cannot be more specifically described, which may relate to multiple PT. Despite the difficulty in some cases of matching each land use/management and/or policy type in the planning region to a single Vista type, the system enforces this restriction. As a result, building more than one translator for a given layer and then using them to translate layers during the scenario definition process will, through evaluation of these scenarios, illustrate the range of different impacts to elements that are possible in the planning region.

Examples:

LUI: A translator is created for a layer by cross-walking each land use/management type in the planning region to the most intensive appropriate LUI. The translator is then used to define one or more scenarios. The scenario(s) is/are utilized in the Scenario Evaluation process, yielding information on potential minimum and maximum (i.e., "worst-case") impacts to elements in the planning region. A second translator for the layer is created by cross-walking types to the most likely LUI during the planning time frame, typically derived from urban growth models, economic forecasts, or expert opinion. Scenario(s) are then defined using this translator. Evaluating the scenario(s) indicate(s) the LUI that are most likely to occur and, thus, affect elements in the region.

PT: A translator is created by associating each policy practice in the planning region with the least stringent appropriate type of PT in terms of offering protection through reliably enforcing the designated land use or preventing a use of greater intensity. Scenario(s) are defined using the translator, and are then used in Scenario Evaluations.

Results of the evaluation(s) reveal which PTs reliably provide protection/ensure management practices that permit element conservation goals to be met. Creating a second translator for the layer that cross-walks types to more stringent PTs might, instead, through scenario definition and evaluation(s), produce results that provide a false sense of security about the protection of elements on those lands.

When assigning LUI and PT to land use/management and policies, respectively, there are no restrictions on the number of Vista types that can utilize a particular translator. This means that the number of LUI or PT that need to be used in creating a translator can be delimited for each project to ensure that, through scenario definition and evaluation, the important conservation impacts of land use/management and/or policy types will be captured in the results.

Note that even if policy can only be influenced on land owned by the planner/planning agency, it is important to characterize the LUI and/or PT for all the land in the planning region to get a reasonably accurate assessment of conservation goals met through analyses. In cases where time and resources limit the Vista LUI and/or PT assigned to only those lands owned or controlled by the planner/planning agency, analyses performed with layers using such translators will need to be limited to only those lands, with elements and conservation goals adjusted accordingly.

Background

The majority of institutions and agencies within planning regions use their own custom designations for land use/management and policy types. For practical application of the Vista software, these different designations must be standardized to a single set of Land Use Intent (LUI) categories and a single set of Policy Types (PT) that are utilized by Vista (described in Appendix F and Appendix G, respectively). The intent of translating custom types to standard descriptions of LUI and PT is to reduce the complexity of evaluating element compatibility and the protection afforded by the policy type (i.e., Scenario Evaluations) against the hundreds of potential land use/management and policy types within a planning region. This is typically accomplished by aggregating the types into fewer categories that are most relevant for this type of assessment. An example of this would be the aggregation of the many urbanized/industrial/commercial uses that most planning jurisdictions allow into several categories since they all have similar impacts on elements of biodiversity.

Limitations

Vista translators serve to convert the many land use/management and policy types used in different jurisdictions to a circumscribed set of "standard" LUI categories and PT that can be utilized effectively in analyses. While the default LUI and PT descriptions attempt to capture the range of conditions on a land unit that may affect ecological compatibility, they are very limited in their ability to address more complex conditions that typically occur (e.g., the multiple effects of land use, management practices, disturbances, and invasions of exotic species). Thus, the default LUI and PT are offered as a useful generic categorization, but they may not be entirely suited to any particular planning region or project. Vista provides the flexibility to permit users (working with NatureServe Vista support staff) to substitute custom LUI and PT lists comprised of types that better capture the important conservation impacts of specific land uses, management practices, and/or supporting policies in the planning region.

Steps in the Translator Creation Process

PROCESS FOR CREATING TRANSLATORS

Identify/obtain GIS layers and associated information for land use/management and policy practices

Identify and obtain geographic information systems (GIS) layers that represent converted lands, land use/management practices, and related policies that currently exist for the planning region. In addition, any layers that indicate proposed, potential, and/or allowed land uses and policies for the region should also be acquired. Supplemental information (e.g., digital and/or hard copy documents, personal communications) associated with the GIS layers is also very useful for creating translators. Because the goal in building translators is to assign a Vista Land Use Intent (LUI) and/or Policy Type (PT) to each land use/management and/or policy practice that occurs within the planning region, input layers should be selected that will best represent the full set of types occurring in the region with a minimum of redundancy in order to most efficiently create translators. That said, however, the full set of layers and associated information for the planning region is needed for the process of defining scenarios, and so information obtained but not used for creating translators will later be used in the scenario definition process. (See Appendix F for details on LUI categories, and Appendix G for descriptions of PT.)

Many of the different layers, along with associated information, are best obtained from the institution implementing the land use/management and/or policy in the planning region. Similarly, information on any potential or proposed land uses or policies in the region is best acquired from the institution that has developed such plans. Other sources of information include public and institutional landowners, managers, and regulatory agencies.

Along with layers and associated information, the process of creating translators requires knowledge about land use/management and policy in the planning region. While this knowledge can often be found in descriptions associated with the GIS layers and associated planning documents obtained for the process, ”expert knowledge" is particularly useful for determining the most appropriate translation of a regional land use/management or policy type to the "standard" Vista LUI and PT.

Create and reformat layers as needed

The GIS layers obtained for use in creating translators may need to be reformatted (and in some cases, new ones created) to represent the set of current (and potential) land use/management and policy types utilized in the planning region. To make use of layers that have been created and maintained by different institutions typically requires some custom GIS work. The various layers must be edited to ensure compatibility in format, projection, etc., and/or new layers created (from existing layers) that better represent the various land use/management and/or policy types in the region (e.g., a new layer that aggregates different policy types into a single layer).

Note that any layers obtained for the planning region that are not used for creating translators will still need to be reformatted for use in the scenario definition process. Thus, it may be most efficient to prepare all the layers for use in both creating translators and defining scenarios at the same time, instead of preparing a subset to be used for creating translators now and then the rest later as part of the definition process.

Create translators using Vista

Use the Vista Translator Properties - <New> wizard to create the land use/management practices and/or policy type translators needed for the project.

Note that if a particular layer will be used to build both a land use intent (LUI) and policy type (PT) translator, the assignment of conflicting LUI and PT for a given attribute in the layer should be avoided. While the system will not compare and validate LUI and PT assigned to the same attribute, an attempt should be made to avoid illogical combinations. For example, the LUI assigned to the attribute "1401" might be "Biodiversity Conservation" while the PT assigned might be "Land use restricted by regulation"; these translation types could logically apply to the same attribute. However, if the assigned PT for that attribute was "Unrestricted from conversion to higher intensity uses", this may not make sense given the assigned LUI of "Biodiversity Conservation."

Defining Scenarios

SCENARIO DEFINITION

Objectives

The purpose of this function is to define scenarios, which consist of any map (or collection of maps) that represents a set of actual, expected, or proposed land uses and/or policies for areas within the planning region. Scenarios are currently used only in Scenario Evaluations, where they are overlaid with element distributions to assess compatibility with land use and/or the protection afforded by the policy type of different areas, as they might impact element conservation objectives.

Products

Each scenario defined generally results in a raster layer (or multiple layers if land uses are co-occurring or combined [see below]) representing Land Use Intent (LUI) categories across the region, and, optionally, another raster layer (or collection of layers) representing the Policy Types (PTs) for that region. (See Appendix F for details on LUI categories, and Appendix G for descriptions of PTs.) In cases when just LUI or PT is specified during the definition process, only a single layer will result.

The number of scenarios is unlimited but typically a user begins with defining a baseline scenario that reflects current actual land use in the region, producing a baseline LUI and/or PT layer. This scenario can then be readily copied and modified to reflect other scenarios such as a ”r;policy baseline” that reflects concepts like ”r;build out;” trend scenario addressing expected development patterns based on market drivers or ecological trends in fire or exotic species invasion; proposed scenarios in terms of existing proposals for transportation or development for example; and finally alternative future scenarios developed within Vista or other tools to remedy issues in the other scenarios.

The scenario report generated by Vista will provide area calculations for each combination of land use intent and policy type in the planning region. This information can be useful for tracking representation of different land uses to assure proper balance and that non-conservation land use goals are also achieved. However, the user may choose to represent land uses as conservation elements as well so that goal seeking can actually be conducted while maintaining the ability to detect conflicts with incompatible elements and other land uses.

Inputs

The scenario definition process in Vista may utilize many different inputs, depending on the available information for the planning region, to provide the required spatial and non-spatial inputs. Vista was designed specifically for this situation and contains tools to assist in the integration and cross-walking of information from multiple sources.

Sources used for the initial baseline scenario, defined by the data development team, can include:

- Data for existing "converted" (i.e., agricultural and developed) lands. What constitutes converted land is further described in the Background section below. Examples include:
    - Recent land-use/land cover maps interpreted from aerial or satellite imagery
    - Land use attributes for parcels obtained from local assessors' databases
    - Detailed layers from agency owners/managers that track current land use
    - Local knowledge about current land uses on specific tracts that can be attributed to a parcel layer through custom GIS processes
- Layers that show present (and potential or allowable) land use or management practices, generally obtained from an agency or institution. These can be quite variable depending on the complexity of land ownership and management in the planning region. Examples include:
    - Local government land use zoning layers
    - Land trust easement layers
    - Local, state, or federal agency management layers
    - Tribal reservation management layers
- Layers that show present (and potential) policy types, typically derived from the same sources as those for land use layers described above.
- Other Information, such as planning documents and expert opinion, provide details on policy types. These sources are further described in the Translators section.
- Knowledge about the dominance of any layer relative to other layers. For example, knowledge that a riparian setback layer takes precedence over land use zoning.

Additional scenarios, whether defined by the data development team or the end user, are most efficiently created by modifying an existing scenario - in most cases the baseline scenario reflecting current conditions is used - and saving it as a new scenario. This helps to ensure that all the necessary layers are included in the new scenario (e.g., converted lands layer) and that the layers are appropriately sequenced, as well as helping to reduce the time needed to define new scenarios. Typically only a small number of policies are changed from an existing scenario to a new scenario; thus, only layers that represent new, proposed, or potential land use/management and/or policy changes need to be added, or used to replace other layers, in the definition process for these scenarios. For example, when a new zoning layer becomes available, an existing scenario that includes the zoning layer could be used to create a new, more current, scenario by substituting the revised zoning layer for the outdated layer and retaining the existing layer sequence. Another example would be when a new policy for stream setbacks is proposed; the baseline scenario could be used to create a new scenario by adding the proposed setback layer, and then sequencing it appropriately in the layer hierarchy (e.g., if setbacks take precedence over zoning regulations, then it would be placed directly above the zoning layer or higher, depending upon which other layers it has precedence over).

Utilizing land use and policy layers representing various land use and management plans maintained by different institutions typically requires some expertise in geographic information systems (GIS) in order to edit the input layers as needed to ensure compatibility in format, projection, etc. In addition to data preparation, defining a scenario requires sufficient knowledge about land use and policy types to be able to select the appropriate translators to be applied to specific layers.

The input to Vista consists of layers representing current, potential, and allowable land use and/or policy for the planning region, along with assigned translators. Note that maintaining an up-to-date baseline scenario is important for both routine and long-term planning activities for the region. This entails updating the converted lands layer on a regular basis, and keeping any land use and management plans obtained from institutions current. Cooperative use of Vista, or adoption of information standards that can allow such data to routinely and directly be input into Vista will greatly facilitate this process. Building such cooperation in the planning region for scenario definition and maintenance is, therefore, recommended.

Methods Summary

The Vista scenario definition process facilitates the translation of input layers into separate LUI and PT layers for the planning region. In addition, Vista provides the user with the flexibility to edit stored scenarios as conditions in the planning region change, thus increasing the accuracy of the LUI and PT layers produced for use in Scenario Evaluations.

Background

In order to effectively understand the impact of different land use and management practices on elements of biodiversity, Vista facilitates the definition of scenarios - alternate plans that represent different Land Use Intent (LUI) categories and Policy Types (PTs) in the planning region. A baseline scenario reflecting current conditions can be utilized in Scenario Evaluations, along with alternate views representing some possible future LUI/PT conditions in order to identify the likely impact of potential changes in land use and management practices on elements in the planning region.

In the Vista approach, characteristics of land use (i.e., what is expected to happen on the ground/water) are separated from characteristics of policy (which is what will cause the land use to happen). This allows the user to distinguish between the ecological effect of a land use on a conservation element separate from the probability that the land use will actually happen, which results from the type or reliability of the policy mechanism. Most classification systems combine these two characteristics, which makes it difficult to use the resulting information to understand why a particular area is not supporting conservation goals (is it incompatibility of the land use, or unreliability of the implementation mechanism?). Thus, while using PT is completely optional, in practice it is highly useful for determining whether the lack of goal achievement for element conservation is caused by unreliable policies (e.g., when zoning designations are overturned in local governments to allow previously unplanned development).

In practice land uses can be any phenomena that can likely be mapped now or in the future and for which element responses to it can be discerned by experts. This includes not only the typical types of land uses (agriculture, industry, housing, infrastructure) but also:

- working land management practices (e.g., forestry, prescribed fire, weed treatment)
- "natural' disturbance phenomena (e.g., wildfire, wind throw, storm surge)
- exotic species, pest, and disease invasions

Policy types represent implementing mechanisms and so may include types that are not typically mapped which can, nonetheless, be associated with spatial locations. For example there may be a conservation funding source for land acquisition in a region that is not place-specific. Using Vista's Site Explorer function, however, that funding source can be selected as the PT for implementing an alternative land use. Therefore, PTs may include not only the typical mechanisms of legislative acts, regulations, and statutes but also, for example, funding sources and targeted education campaigns.

Limitations

The scenario definition process in Vista is used to create layers that represent LUI and PT conditions for the planning region, which can then be used in Scenario Evaluations. However, because Vista will convert all data to raster format before conducting the analysis, there is a danger of losing information if the cell size is too great. This risk is of greater concern for thin linear features such as streams, rivers, or roads. See discussion in the Determining Grid Cell Size topic for additional details related to the rasterization of features.

Steps in the Scenario Definition Process

PROCESS FOR DEFINING SCENARIOS

Develop land use intent and policy type lists from Vista default lists

It is recommended that the Vista default lists for land use intent/management practices (LUI), and related policy types (PTs) be modified as needed for local application rather than beginning the lists from scratch. For Vista versions 2.0 and later, the LUI was adapted from the IUCN / Conservation Measures Partnership classification of land use and conservation practices, which was selected for use because it was developed through extensive partnerships and is documented and maintained on a global website.

Considerable time should be invested in developing the LUI to be used for local land use analyses, including work with partners among implementing institutions and element experts to insure that the LUI is as correct as possible. Although the LUI list can be modified at any time, any changes will require review by those with element expertise to obtain revised designations of element responses to the new or revised land use types. Because the availability of these experts is often limited, it is highly recommended that the need for such follow-up be avoided. In contrast, the policy type list can be readily modified with few ramifications as there are no dependencies to other information in Vista.

PROCESS FOR DEFINING SCENARIOS

Identify/obtain GIS layers and associated information for land use/management and policy practices

Identify and obtain geographic information systems (GIS) layers that represent the converted lands, land use intent/management practices (LUI), and related policy types (PTs) that currently exist for the planning region. In addition, any layers that indicate proposed, potential, and/or allowed land uses and policies for the region should also be acquired. Supplemental information (e.g., digital and/or hard copy documents, personal communications) associated with the GIS layers is also very useful for defining scenarios. (See Appendix F for details on LUI categories, and Appendix G for descriptions of PT.)

Many of the different layers, along with associated information, are best obtained from the institution implementing the land use/management and/or policy in the planning region. Similarly, information on any potential or proposed land uses or policies in the region is best acquired from the institution that has developed such plans. Other sources of information include public and institutional landowners, managers, and regulatory agencies.

Along with layers and associated information, the scenario definition process requires knowledge about land use/management and policy in the planning region, particularly knowledge about which LUI and PT layers take precedence over others. While this knowledge can often be found in descriptions associated with the GIS layers and associated planning documents obtained for the process, ”r;expert knowledge" is particularly useful for determining the layers and sequence to be used in creating different scenarios that best represent conditions - current or potential - in the planning region.

Note that the LUI and PT layers and related information needed to define scenarios may already have been obtained during the first step of the process for creating a translator.

Create and reformat layers as needed

Create and reformat layers as needed to facilitate development and translation of spatial data and attributes.

The GIS layers obtained for use in scenario definition may need to be reformatted (and in some cases, new ones created) to represent the full set of current (and potential) land use/management and policy types utilized in the planning region. To make use of layers that have been created and maintained by different institutions typically requires some custom GIS work. The various layers must be edited to ensure compatibility in format, projection, etc., and/or new layers created (from existing layers) that better represent the various land use/management and/or policy types in the region (e.g., a new layer that aggregates different policy types into a single layer).

Note that any layers obtained for the planning region that are not used for creating translators will still need to be reformatted for use in the scenario definition process. Thus, it may be most efficient to prepare all the layers for use in both creating translators and defining scenarios at the same time, instead of preparing a subset to be used for creating translators now and then the rest later as part of the definition process.

Define scenarios using Vista combine and override functionality

Use the Vista combine and override land use functionality in the Scenario Properties - <New> window to define scenarios. Scenarios describe land use and optionally, land policy of your project area. Vista provides a translator function to allow users to crosswalks land use information from a variety of sources and then Vista will reclassify it to the user-defined land use categories. Translators and land use categories are discussed in separate sections of the Vista Help.

Diverse land use information can be brought into Vista to create a scenario (conservation lands, disturbances, infrastructure, transportation systems, etc). Typically one land use takes precedence when features from different maps overlap. For example, in a hierarchy of land uses roads are often at the top because they are the single dominant use where they occur. Occasionally however, you have cases of co-existing land uses. For example, you might have a working landscape type use such as grazing in an area expected to have an exotic plant species invasion. In this case both “uses” would be expected to co-occur. Both combined and override land uses can be included in a scenario.

Naturally, if override land uses are placed on top of combined land uses in the scenario layer stack, the override land uses will take precedence.

When using just override land uses, just one land use scenario is created. However, when using combined land uses, Vista will generate minimum number of additional scenario rasters to display each combined land use. For example, if two land uses are input as combined on top of a set of override land uses Vista will create three scenario layers: the first with just the override layers, the second with one combined land use and the third displaying the other combined land use. This functionality can be more complex to implement but can provide much more realistic results. It is important, however, to check over the outputs to verify that the combine/override rules you developed for the scenario are correct.

Scenario Evaluations

SCENARIO EVALUATIONS

Objectives

The purpose of this function is to assess the effects of various land use and/or policy conditions on specific conservation goals for a set of elements. Scenario Evaluations have two components: 1) the likely maintenance of element viability/ecological integrity by compatible land use/management practices, and 2) the implementation of land use designations guided by policy mechanisms that allow or prevent land uses of greater intensity (that would fail to protect elements). Scenarios, developed to reflect land use/management and policy conditions in the planning region, are used to evaluate the effects of existing land uses and policies on elements, and the potential impacts of proposed future conditions.

Products

Each Scenario Evaluation produces a detailed report on the scenario inputs and results, and several geographic information system (GIS) visualization layers. The report summarizes, in total and then by category, the performance of the scenario in terms of the number and percentage of elements that met conservation goals. The report also provides a detailed comparison of individual elements against the scenario: their original distribution, and the number/percentage of elements that were retained in compatible areas, and areas where the elements were both protected and compatible. The raster layers generated by the Scenario Evaluation include

1. Compatibility conflict layer, which represents the distribution of elements that were compatible at the given location such that their conservation goals we met; elements that were incompatible at the given location and whose goals were not met are also shown.

2. Protection conflict layer, which represents the distribution of elements that were both compatible and protected at the given location such that they met their conservation goals.
3. A separate layer for every element that identifies each area of the distribution according to the following categories (if policy reliability was included in the analysis):
    - Unreliable and compatible (positive) element distributions; these areas do not contribute to goals.
    - Unreliable and incompatible (negative) element distributions; these areas do not contribute to goals.
    - Reliable and incompatible (negative) element distributions; these areas do not contribute to goals.
    - Reliable and compatible (positive) element distributions; these areas contribute to goals.

Uses for Scenario Evaluations

The Scenario Evaluation is a powerful and flexible tool that indicates areas where element conservation is incompatible with land use intent (LUI) and/or where protection through policy type (PT) is inadequate for maintaining compatible land use conditions. Whether a scenario describes current LUI/PT conditions or some allowable, potential, or future conditions, Scenario Evaluations can be used in the planning process to assess the performance of an input scenario with respect to selected sets of elements and conservation goals. This analysis can be valuable in identifying which LUI/PT conditions will allow a planning region to meet its conservation goals, areas where conditions are incompatible with element conservation goals, and areas where potential land use conflicts may occur in the future. (See Appendix F for details on LUI categories, and Appendix G for descriptions of PT.) The results of a Scenario Evaluation will display all viable occurrences of elements included in the analysis coded according to compatibility, protection, and conservation goals met.

Once various scenarios have been compared, final maps and reports can be produced to aid the decision-making process. Because scenarios, elements, and conservation goals can be modified, this process can be repeated as often as needed to test alternative land use scenarios, evaluate assumptions about the reliability of particular policies to prevent changes to more intense land uses, or to incorporate new data as it becomes available. The results of Scenario Evaluations are saved and documented in Vista, which may be useful in defending regulatory decisions.

Scenario Evaluations can also be examined using the Vista Site Explorer tool to provide data on the land use and/or policy types for a selected site or sites, along with detailed information on elements occurring on the selection in terms of conservation goals achieved. Further, the Site Explorer enables the user to examine the effects on goal achievement for elements in the selection if alternative land statuses are used.

Inputs

Each Scenario Evaluation requires an input scenario. The baseline scenario is a required input in order to assess the effects of current conditions on element conservation goals. Other scenarios that are needed to represent alternate possible future land use and policy conditions in the planning region should also be used as inputs to the evaluation process.

Along with scenarios, the evaluation process requires a high degree of interaction by the user including decisions regarding the selection of elements and the sets of goals to be evaluated. User-assigned values are another input to Scenario Evaluations, specifically

- Reliability of protection by PT for the set of elements in the evaluation (i.e., a judgment whether a particular PT will prevent land uses of greater intensity during the planning time frame, thus adequately protecting those elements); and/or
- Compatibility, by element, with different LUI categories.

Note that while the reliability of PT is not assessed until the Scenario Evaluation parameters are being defined, element LUI compatibility should have been assigned on the Compatibility tab of the Element Properties window when the element database was developed in Vista.

Methods Summary

The Scenario Evaluation process combines LUI and PT conditions in a scenario with information on which LUIs are compatible with elements and which PTs provide reliable protection. This is accomplished by intersecting element distribution layers with the LUI and PT layers previously generated for the scenario. The element distributions attributed with LUI and PT are then referenced to the existing lookup tables for element LUI compatibility and PTs specified as valid. The resulting raster layers generated by the Scenario Evaluation identify areas of incompatibility and inadequate protection in the planning region, and indicate the degree to which conservation goals for the elements were met.

Select a task below to see a detailed description of the Scenario Evaluation process.

Confirm that element compatibility has been defined

Create and run a Scenario Evaluation using Vista

Background

Scenario Evaluations are used in conservation planning to determine whether a scenario (i.e., a set of LUI/PT conditions) will allow conservation goals for the planning region to be achieved, and to identify areas where incompatible land uses could be changed and/or policies that afford acceptable levels of protection are needed to increase goal achievement. Specifically, Scenario Evaluations assess the number or percentage of element occurrences or area adequately protected by comparison with element conservation goals to ascertain the benefit or impact of conditions represented by the scenario. Multiple evaluations of the same scenario can be compared by altering the input designating which policies are considered to offer valid protection, the set of elements included in the evaluation (using filters), and/or the desired goals (perhaps representing minimum and preferred levels of element conservation). These variations can help determine if any particular scenario is better at meeting the goals for a particular group of elements under different assumptions about whether policies will reliably prevent land uses of greater intensity during the planning time frame. Note that in cases when an element in the Vista database has not been included in any goal sets, its conservation goal will default to 0.0 in analyses. Thus, Scenario Evaluations that include the element will falsely indicate that its goals have been met.

Once areas have been designated for conservation, they may still be managed for multiple uses, but conservation of elements of concern would be a primary consideration. To make that consideration operational, management actions would need to be compatible with the ecological processes that support targeted conservation elements in each area. So, for example, aspects of composition, structure, and dynamic processes supporting forest, riparian/wetland, and aquatic systems, and the habitat requirements of sensitive species, would be principle considerations in establishing compatible land management within these selected areas.

In Scenario Evaluations ecological and policy attributes are considered separately, leaving the subjective decision about policy reliability to the planner – an approach that is unlike other systems for evaluating element protection, such as the Stewardship Map of the U.S. Geological Survey Gap Analysis Program or the IUCN Protected Area Management Categories. Also, unlike the IUCN system, category assignments are made without any assumptions about the physical ability of an area to meet conservation goals, but rely instead on the Vista spatial analysis to assess that capability uniquely for each land unit.

Limitations

Scenario Evaluation in Vista is intended to provide an indication of the degree to which conditions represented by a scenario support conservation goals for elements. It should not be used as a substitute for ground surveys, specific site design review, or expert opinion when element viability/ecological integrity must be ensured because:

- It makes use of simplified and generalized assumptions about compatibility between land uses and element viability/ecological integrity, and
- It may not incorporate specific and current information on species demographics or the viability/ecological integrity of elements.

Vista currently lacks the ability to calculate two important measures in conservation, specifically:

- Irreplaceability of land units to meet goals, which relates to how many options exist for achieving goals. A land unit containing an occurrence of an element with a conservation goal of 100% is essential for meeting that goal, and would be ranked 100% irreplaceable. As the options for achieving goals increase, irreplaceability values decrease.
- Complementarity of land units to contribute to goals, which refers to the degree to which a unit can represent elements not already conserved elsewhere in the planning region. A land unit that can be used to conserve occurrences of five elements for which goals are not already met, when compared with another unit that contains three such occurrences, will have a higher complementarity value.

Irreplaceability and complementarity are currently very difficult to infer with no direct processes for calculating them. However, some expert tools exist that can be used to derive values for these conservation measures. NatureServe Vista support staff can provide services that utilize such tools to obtain values, and then integrate the results with Vista output.

The freedom to determine what combinations of land use compatibility and policy types define protection for elements in a Vista project is an important advantage over other regional, state, and national conservation projects, which typically do not allow any consideration of local policies. However, it is also an enormous responsibility on the part of the user to create a realistic definition of protection and to be conservative about the true nature of land use/management practices and policies in the planning region. A conservative approach will, at worst, demonstrate less protection than currently exists, and can be easily corrected. However, a less moderate approach that validates policies which are, in practice, unreliable for protecting elements may indicate that conservation goals have been achieved while elements are actually at serious and permanent risk.

Steps in the Scenario Evaluation Process

PROCESS FOR EVALUATING SCENARIOS

Confirm that element compatibility has been defined

Confirm that compatibility has been assessed for elements to be included in the evaluation. If not yet assessed, indicate compatibility with land use intent (LUI) types for each element using the Compatibility tab on the Element Properties window.

Create and run a Scenario Evaluation using Vista

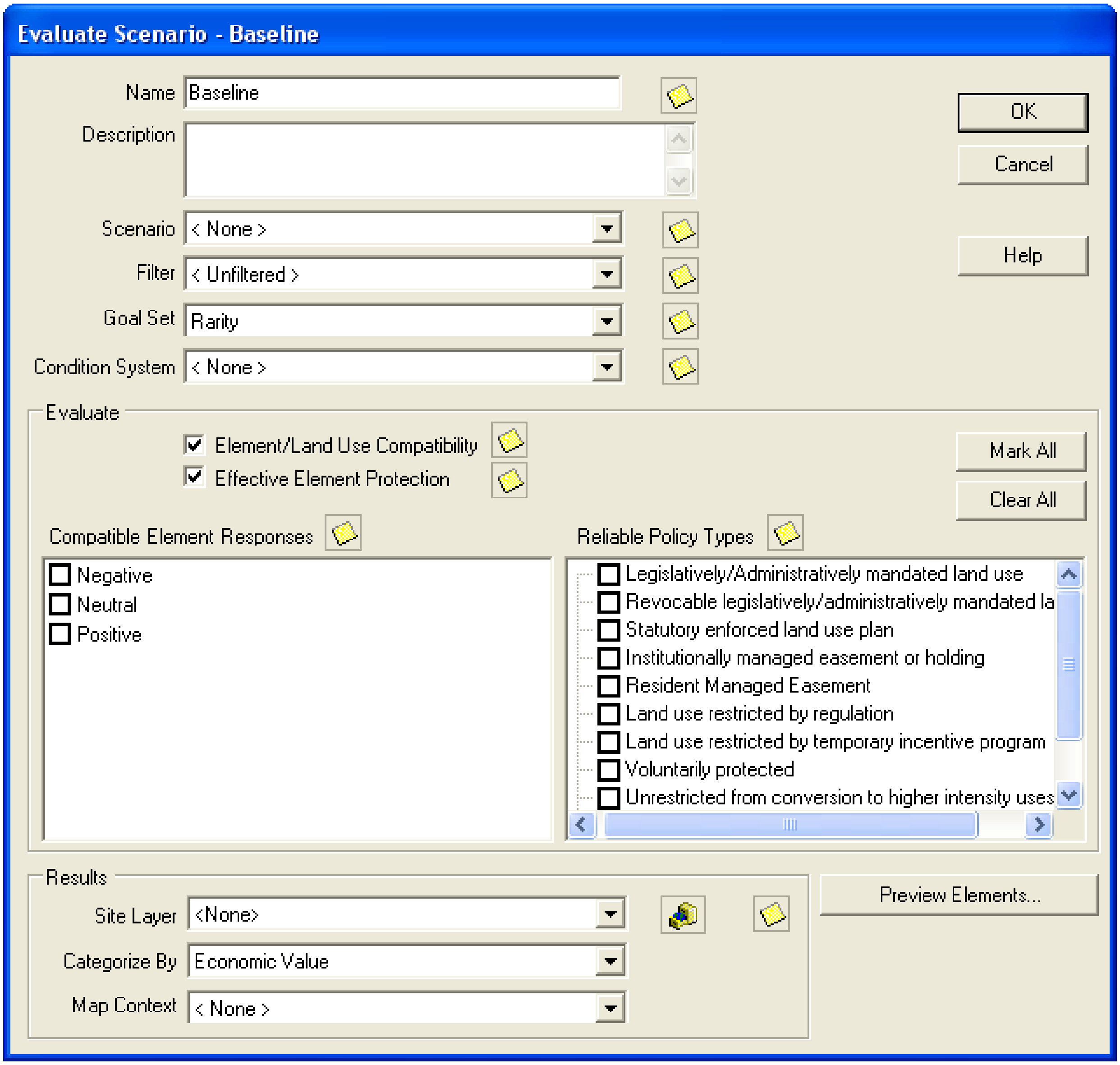
Use the Vista Evaluate Scenario - <New> window to specify the scenario to be used, as well as the category system, filter, and/or goal set, to create the new evaluation, and then run the analysis.

Windows for Scenario Evaluations

EVALUATE SCENARIO WINDOW

The **Evaluate Scenario- <New>** window is displayed either by selecting **Evaluate Scenario...** from the NatureServe Vista menu or clicking the **Evaluate...** button on the Scenario List window. This window is utilized for evaluating different land use and conservation scenarios (see the Scenario Evaluations section for more detailed information).

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



<u>Evaluate a scenario</u>:

1. Enter a name for the evaluation being performed in the **Name** field. The **<New>** on the window title will change to the name of the new scenario evaluation as the entry is typed in.
2. Enter a brief description for the new evaluation in the **Description** field.
3. Select the scenario to be evaluated from the **Scenario** drop-down list, or select the **<Add New...>** value to develop a new scenario, or the **<Show List...>** value to display all developed scenarios (in order to select and modify an existing scenario).
4. Select the Filter (which determines the elements to be included in the evaluation) from the **Filter** drop-down list, or select the **<Add New...>**

value to create a new Filter, or the **<Show List...>** value to display all existing filters (in order to select and modify an existing filter).

5. Select the Goal Set for the evaluation (which will be used to assess whether viable element occurrences are adequately conserved in different locations) from the **Goal set** drop-down list, or select the **<Add New...>** value to create a new Goal Set, or the **<Show List...>** value to display all existing goal sets (in order to select and modify an existing set of goals). Note that to evaluate multiple goal sets, a separate evaluation will need to be created for each set.
6. Click the **Preview Elements...** button to see a Filtered Goal Set Report showing the set of elements to be included in the evaluation and the goals that have been set for these elements, based on the values selected in the **Filter** and **Goal Set** fields. This knowledge can be helpful prior to running the scenario evaluation. The greater the number of elements included in an evaluation, the longer it will take to process; adjusting/creating a filter that will limit the evaluation to just those elements that are needed will ensure the most efficient use of processing time.
7. Indicate whether the scenario will be evaluated for compatibility of elements with the land uses (indicated on the Compatibility tab of the Element Properties window) and/or for protection in the region by checking one or both of the **Element/Land Use Compatibility** and **Effective Element Protection** checkboxes.
8. If element protection will be evaluated (denoted using the **Effective Element Protection** checkbox in the previous step), indicate which policy types are considered to reliably protect viable occurrences if elements in the scenario during the planning time frame by utilizing the appropriate checkboxes in the **Reliable Policy Types** section. To check all the boxes with one keystroke, click the **Mark All** button; clicking the **Clear All** button will remove any checkmarks from the boxes. At least one protection type must be selected as valid for the evaluation or an error indicator will be displayed.

This is a subjective process that separates scientific knowledge (land use intent [LUI] compatibility) from sociopolitical considerations (policy types [PT]). Whether a particular policy provides adequate protection for viable occurrences of elements is determined by judging the degree to which the policy mechanism guides the implementation of LUI designations, allowing or preventing land uses of greater intensity (that would fail to protect viable occurrences). For example, a zoning policy may be generally reliable in enforcing a particular land use but, because it can be changed with relative ease, it may not effectively insure implementation of a particular LUI over the planning time frame; thus, it may not offer adequate protection for viable occurrences from a conservation perspective. In comparison, lands held by nongovernment conservation organizations are typically managed for much less intense uses than are allowed under the local zoning regulations; such lands would, thus, offer better protection for viable occurrences than the allowable uses that would likely occur with different ownership/management.

Any assumptions made in designating specific PTs as reliable for protection should be documented (e.g., "zoning is now more strictly enforced than it was in previous years, and so was designated 'reliable' in this project"). The ability to designate different PTs as reliably providing protection can be used to test the benefits of enforcing particular policies in the planning region by creating separate evaluations for different combinations of reliable PTs and then comparing the results.

9. Specify a layer to be used in Site Analyses from the drop-down menu of the **Site Layer** field, or by using the ArcCatalog button to browse to the layer. The land units in the layer selected will be used for detailed examination of land use/policy type and element goals by unit.
10. Indicate how the Scenario Evaluation report should be summarized by selecting a category system from the **Categorize By** drop-down list, or selecting the **<Add New...>** value to create a new system, or the **<Show List...>** value to display all existing category systems (in order to select and modify an existing system).
11. Select a map context to be used in creating the scenario evaluation report from the **Map Context** drop-down menu, or select the **<Add New...>** value to create a new map context, or the **<Show List...>** value to display all existing map contexts (in order to select and modify an existing context).
12. Generate the Scenario Evaluation by clicking **OK**; otherwise press **Cancel**. Results are displayed in a Scenario Evaluation report. See the Scenario Evaluation report for more detailed information.

Note: The grid cell size used to create the visualization layers generated by the Scenario Evaluation is set on the Spatial tab of the Element Properties window. If that cell size differs greatly from the cell size specified for the scenario used in the evaluation (set in the Scenario Properties window), the visualization layers may not overlay the scenario correctly.

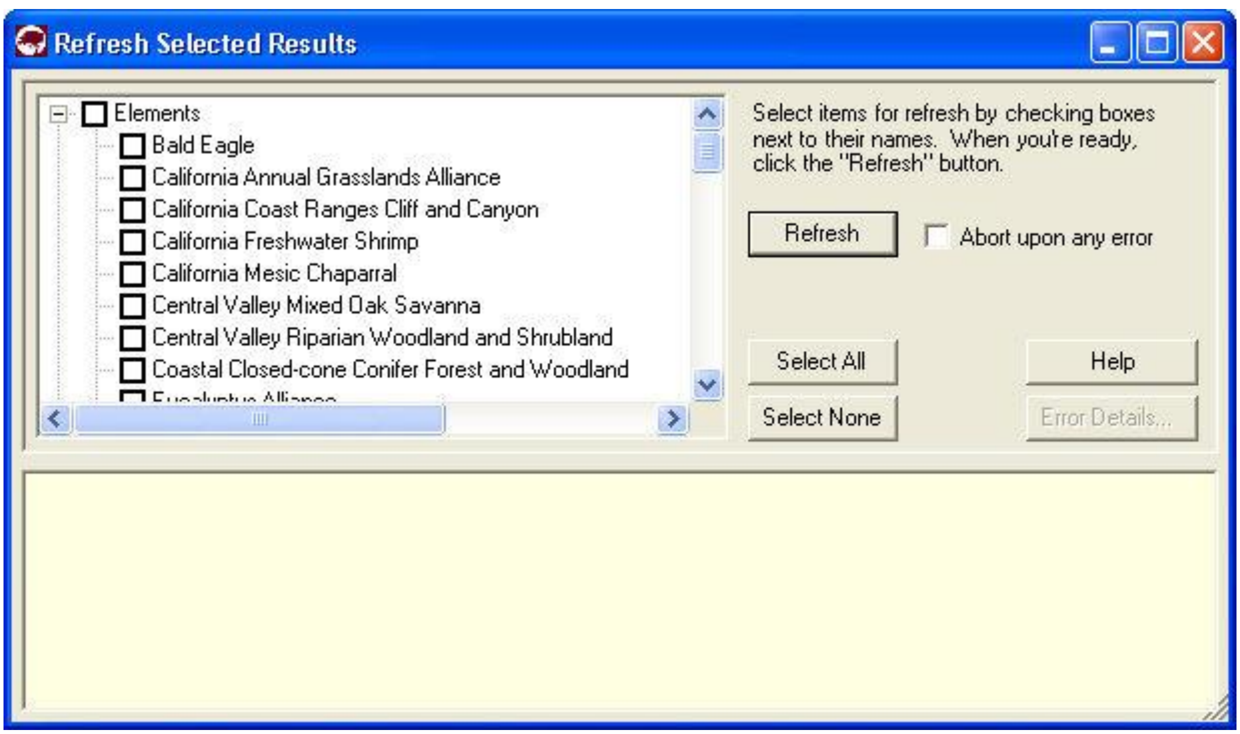
Edit a Scenario Evaluation:

1. Select the Scenario Evaluation from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Scenario Evaluation Properties...** from the context window. The resulting window displays the evaluation.
2. Edit the Scenario Evaluation using the processes described above for creating a new evaluation as guidelines.
3. Generate the revised Scenario Evaluation by clicking **OK**; otherwise press **Cancel**.

REFRESH SELECTED RESULTS WINDOW

The **Refresh Selected Results** window can be opened several ways, depending on the item(s) to be refreshed.

- To display the Refresh Selected Results window listing all items that can be refreshed in the project (that is, elements, Conservation Value Summaries (CVS), and Scenario Evaluations, seen by scrolling down the list), click **Refresh Results...** from the NatureServe Vista menu.
- To display the Refresh Selected Results window listing only elements in the project to be refreshed, click the **Refresh...** button on the Element List window, or right-click on the major heading "Elements" on the NatureServe Vista tab in the Table of Contents (TOC) and choose **Refresh Results...** from the context window.
- To display the Refresh Selected Results window listing only CVS in the project to be refreshed, click the **Refresh...** button on the Conservation Value Summary List window.
- To display the Refresh Selected Results window listing only scenarios and Scenario Evaluations in the project to be refreshed, click the **Refresh...** button on the Scenario List window or the Scenario Evaluation List window, or right-click on the major heading "Evaluations" on the NatureServe Vista tab in the TOC and choose **Refresh Results...** from the context window.



Refresh data:

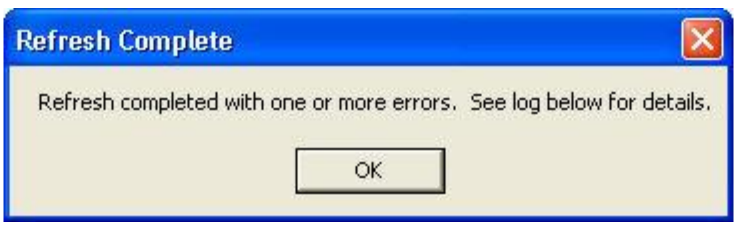
1. Indicate which data are to be refreshed by using the check-box(es) associated with the element(s) and/or project analyses. The **Select All**

button can be used to select the entire list of items; using the **Select None** button will de-select any items that have been selected.

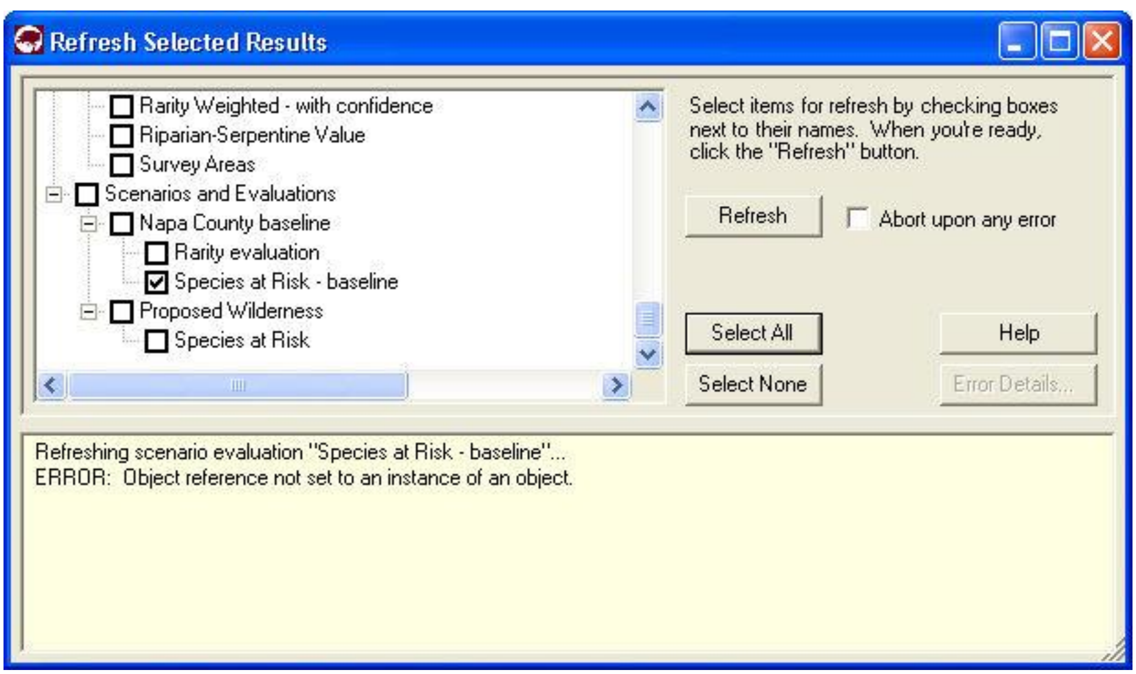
2. Indicate whether the refresh process should be cancelled if an error should occur using the **Abort upon any error** checkbox.
3. Click the **Refresh** button to begin the data refresh process.

If the refresh process completes without errors, the following message is displayed:

If an error occurs during the refresh, the following message will be displayed

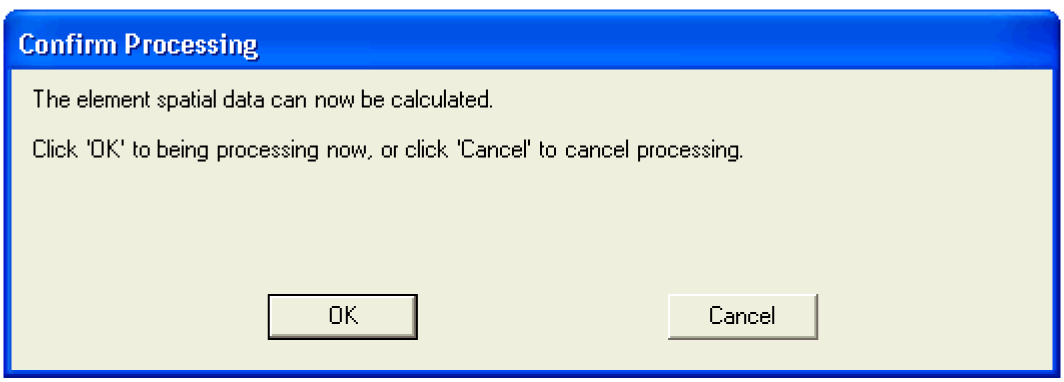


and an error log will be displayed in the lower half of the Refresh Selected Results window.



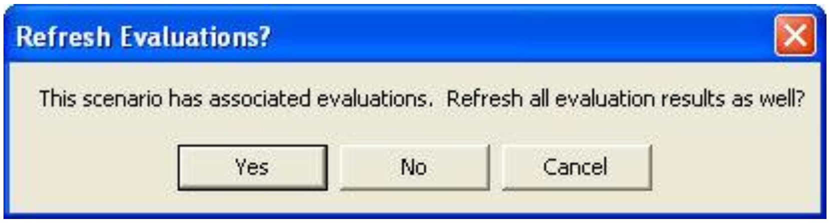
If more detailed information on the error(s) encountered is desired, click on the error log and then click the **Error Details…** button to display an Error Detail window.

Note that elements, CVS, and Scenario Evaluations in the project can be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single element or analysis on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Confirm Processing window will be displayed.



Click **OK** to continue with the refresh process; otherwise, click **Cancel**.

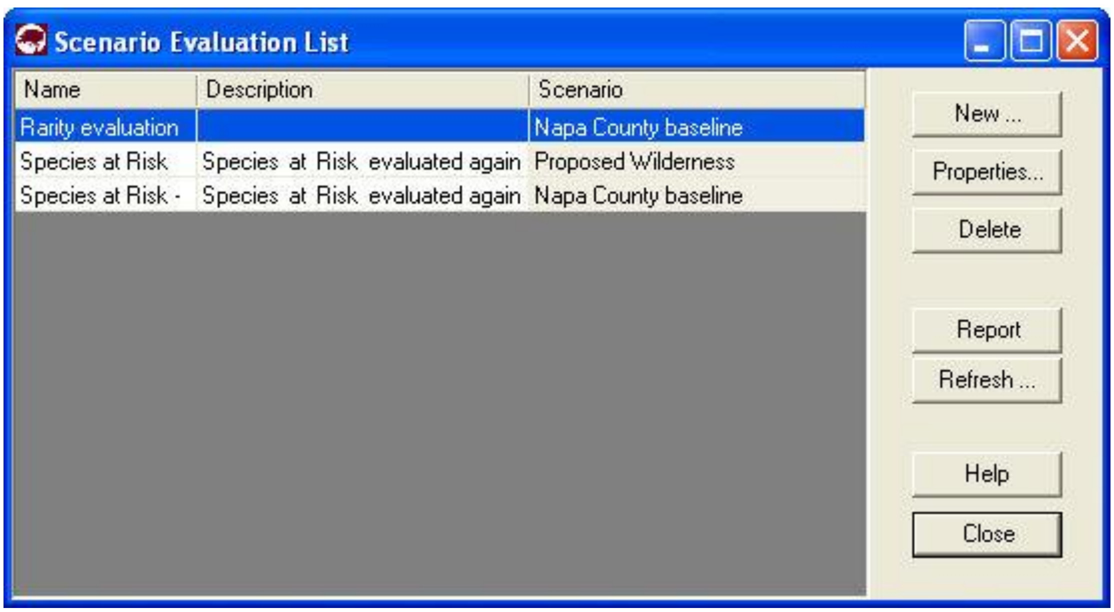
Scenarios in the project can also be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single scenario on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Refresh Evaluations? window will be displayed.



Click **Yes** to refresh both the scenario as well as any Scenario Evaluations that utilize the scenario; click **No** to refresh only the scenario; otherwise, click **Cancel**.

SCENARIO EVALUATION LIST WINDOW

The **Scenario Evaluation List** window is displayed by selecting **Lists ▸Scenaria Evaluation List...** from the NatureServe Vista menu. This window lists all the Scenario Evaluations that have been created for the project. See the Conservation and Land Use Scenarios section for more detailed information on this analysis.



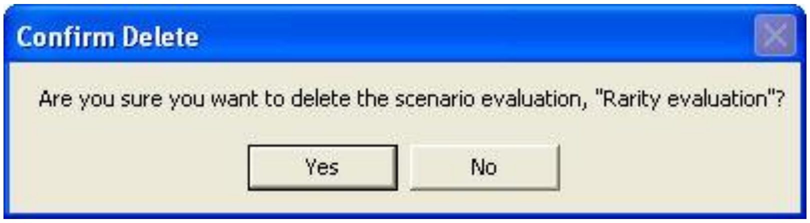
Button functions:

New... displays a new Evaluate Scenario window that can be used to develop a new evaluation for the project.

Properties... displays the Evaluate Scenario window showing details and allowing edits to the analysis selected in the list.

Delete deletes the Scenario Evaluation selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.



Report displays a report for the selected Scenario Evaluation that displays the land use or policy scenario that was evaluated in terms of element goals. See the Reports section for more details on Scenario Evaluation reports.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for selected Scenario Evaluation.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

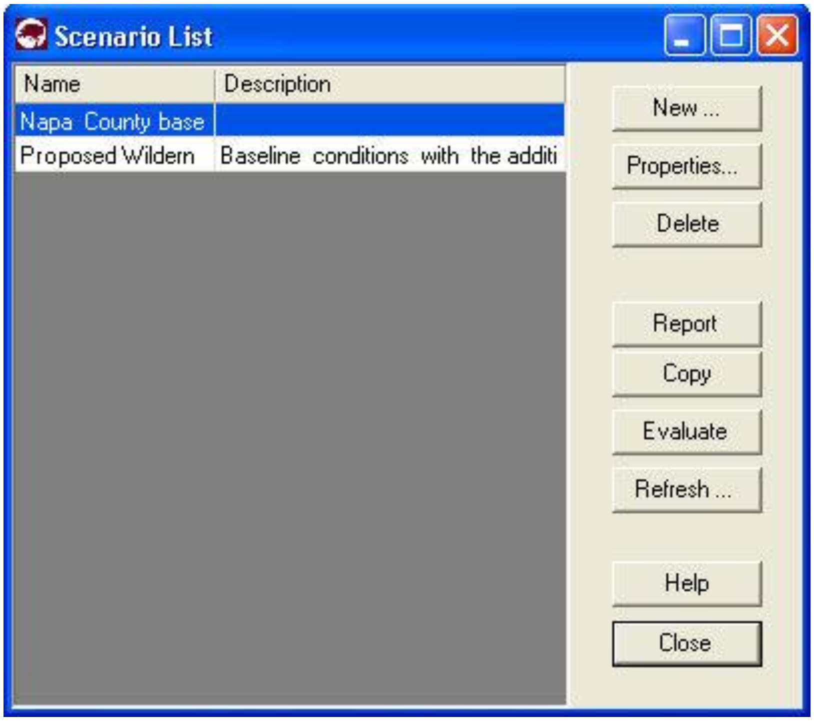
Name - name of the Scenario Evaluation.

Description - description of the evaluation, if any.

Scenario - name of the scenario used in the evaluation.

SCENARIO LIST WINDOW

The **Scenario List** window is displayed by selecting **Lists ▸Scenario List** from the NatureServe Vista menu. This window lists all the scenarios that have been imported into the project. See the Land Use and Conservation Scenario Evaluations section for more detailed information on defining and using scenarios.



Button functions:

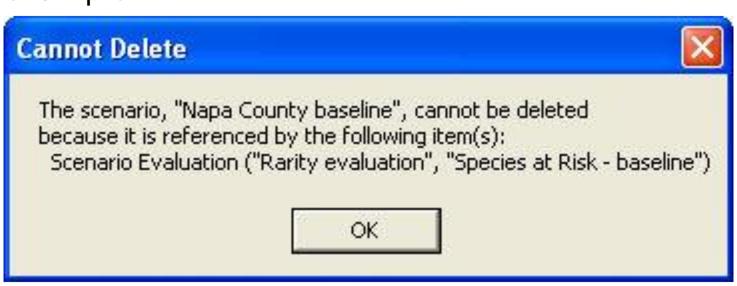
New... displays a new Scenario Properties window that can be used to define a new scenario to be imported into the project.

Properties... displays the Scenario Properties window showing details and allowing edits to the scenario selected in the list.

Delete deletes the scenario selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the scenario is referenced by one or more Scenario Evaluations, as shown in the following example.



Report displays a report for the selected Scenario that displays the settings used to create the scenario. See Reports section for more details on Scenario reports.

Copy creates a copy of the scenario selected in the list, which can then be edited to create a new scenario for import.

Evaluate opens a new Evaluate Scenario window that uses the scenario selected in the list.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for the selected scenario.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of the scenario.

Description - description of the scenario, if any.

SCENARIO PROPERTIES WINDOW

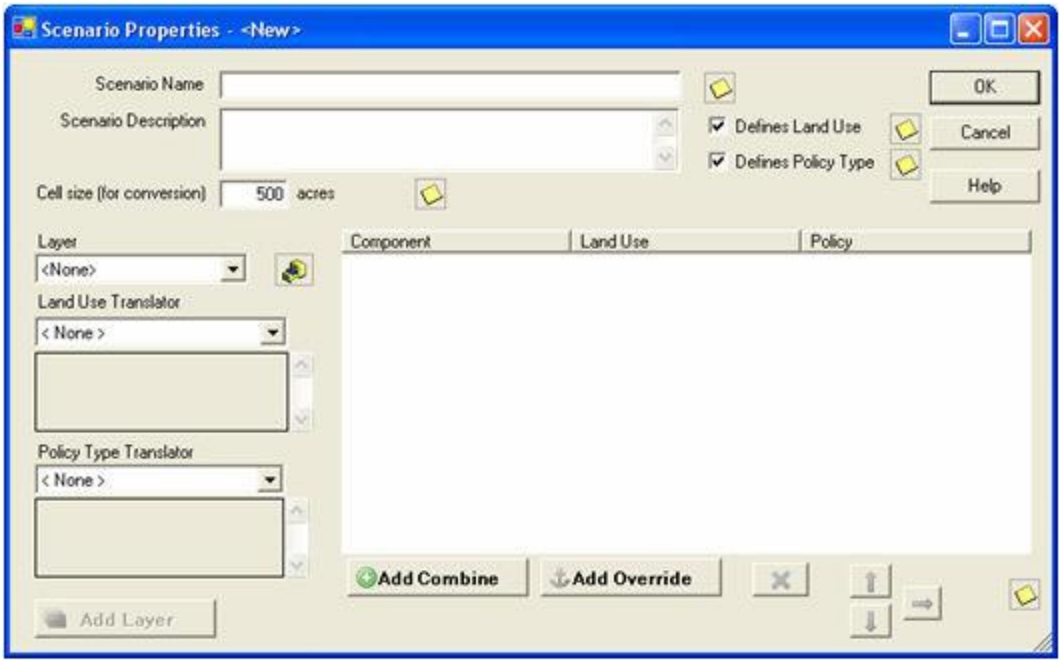
The **Scenario Properties - <New>** window is displayed by either clicking the **New...** button on the Scenario List window or choosing **Define Scenario...** from the NatureServe Vista menu. The new properties window is used to define new scenarios that can be utilized in Land Use and Conservation Scenario Evaluations. Note that typically a baseline scenario (representing current conditions in the planning region) will be defined first. See the section on Scenarios for more detailed information on defining and using scenarios in analyses.

New scenarios can be defined using scenarios that have already been developed in Vista. The process for defining a new scenario based on an existing one involves first copying the existing scenario using the **Copy** button on the Scenario List window, and then renaming and modifying the copy in the Scenario Properties window before defining it as a new scenario (see the section below on editing a scenario for more details).

Override nodes function in order of precedence. If layers are stacked in an Override node and there are instances of overlap between the layers, whichever layer is higher in the scenario list, will override, or trump the one below it.

Combine nodes function as additive features. Any number of land uses can exist in one place if they are stacked in a Combine node. Element compatibility and response to multiple land uses is discussed in the Scenario Evaluations section of this manual.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

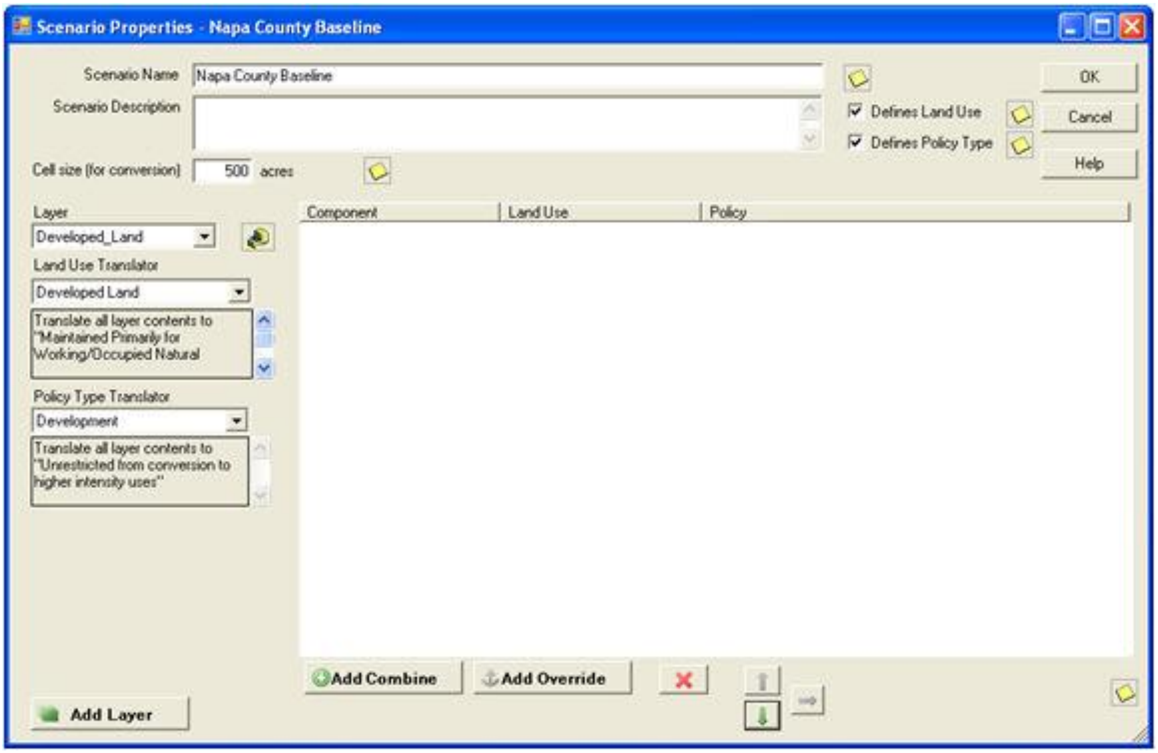


Define a scenario:

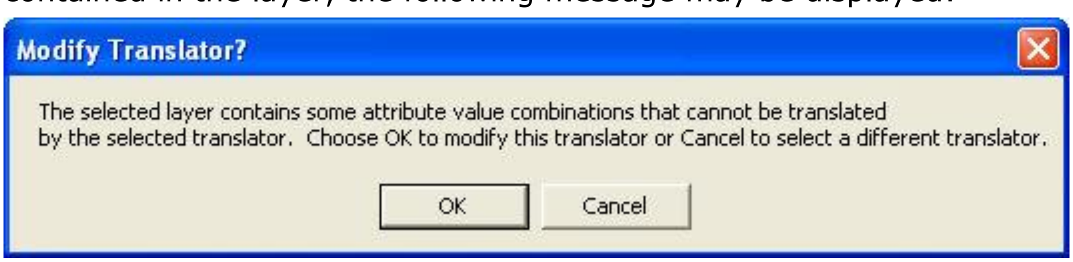
1. Specify a name for the new scenario in the **Name** field. The **<New>** on the window title will change to the name of the new scenario as the entry is typed in.
2. Enter a brief description of the scenario in the **Description** field, if desired.
3. Indicate whether both land use and policy type evaluations will be performed using the scenario (the default), or only a single type of evaluation will be performed, by using the **Defines Land Use** and/or **Defines Policy Type** checkboxes.
4. If desired, edit the value in the **Cell size (for conversion)** field, which displays the default grid cell size specified for the project in the Project Properties window. Note that if this cell size differs greatly from the cell size used to create the visualization layers generated by a Scenario Evaluation (which are set in the Spatial tab of the Element Properties window), the visualization layers may not overlay the scenario correctly. For a discussion of optimal cell size to be used for a planning project, see the Determining Grid Cell Size topic.
5. Select a layer to be added to the scenario from the drop-down list in the **Layer** field, or by using the  ArcCatalog button. Values in the drop-down list are determined by what is in the Table of Contents (TOC), or a subset thereof (by layer type). If the ArcCatalog button is used, a Select Polygon or Raster Input window is displayed; browse to the appropriate layer, select, and click the **Add** button.

6. Select the translator(s) to be applied to the selected layer for this scenario.
    - If land use evaluations will be performed using the scenario, select the land use translator to be applied to the layer from the **Land Use Translator** drop-down list, or select the **<Add New...>** value to create a new translator, or the **<Show List...>** value to display all existing translators (in order to select and modify an existing translator).
    - If policy type evaluations will be performed using the scenario, select the policy translator to be applied to the layer from the **Policy Type Translator** drop-down list, or choose the **<Add New...>** or **<Show List...>** values as described above.

The box below the drop-down list will display information on the selected translator.

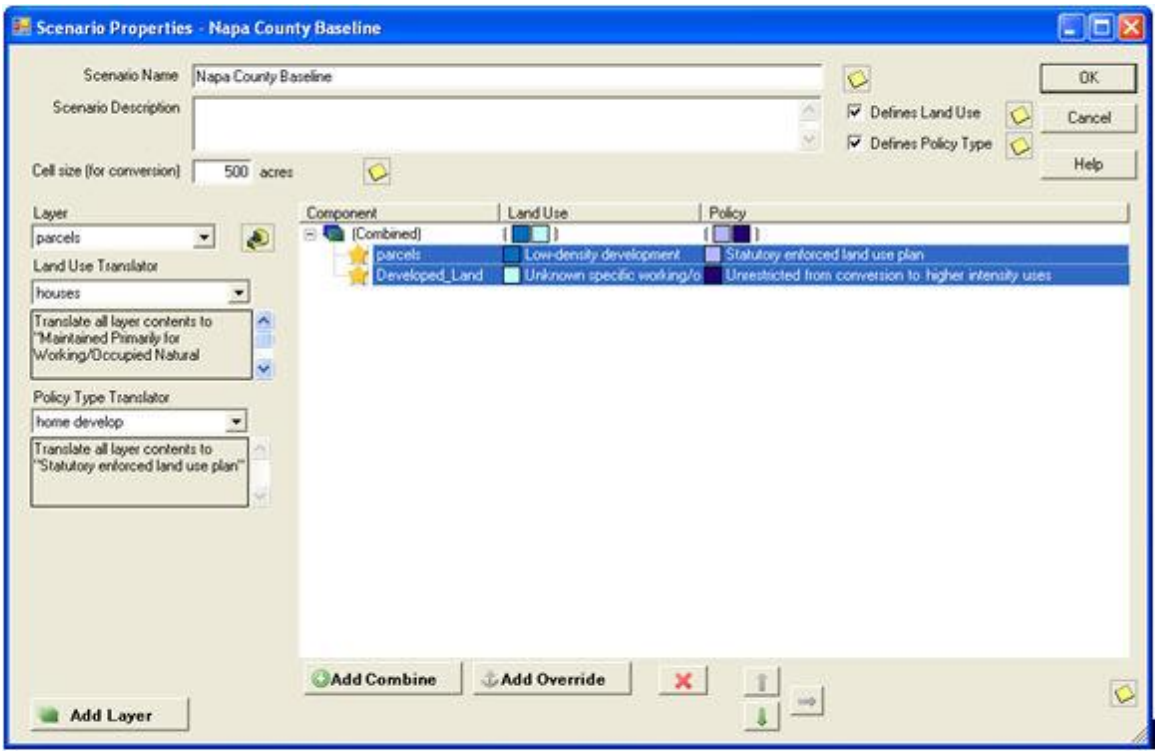


If a selected translator was defined on the basis of attributes that are not contained in the layer, the following message may be displayed:



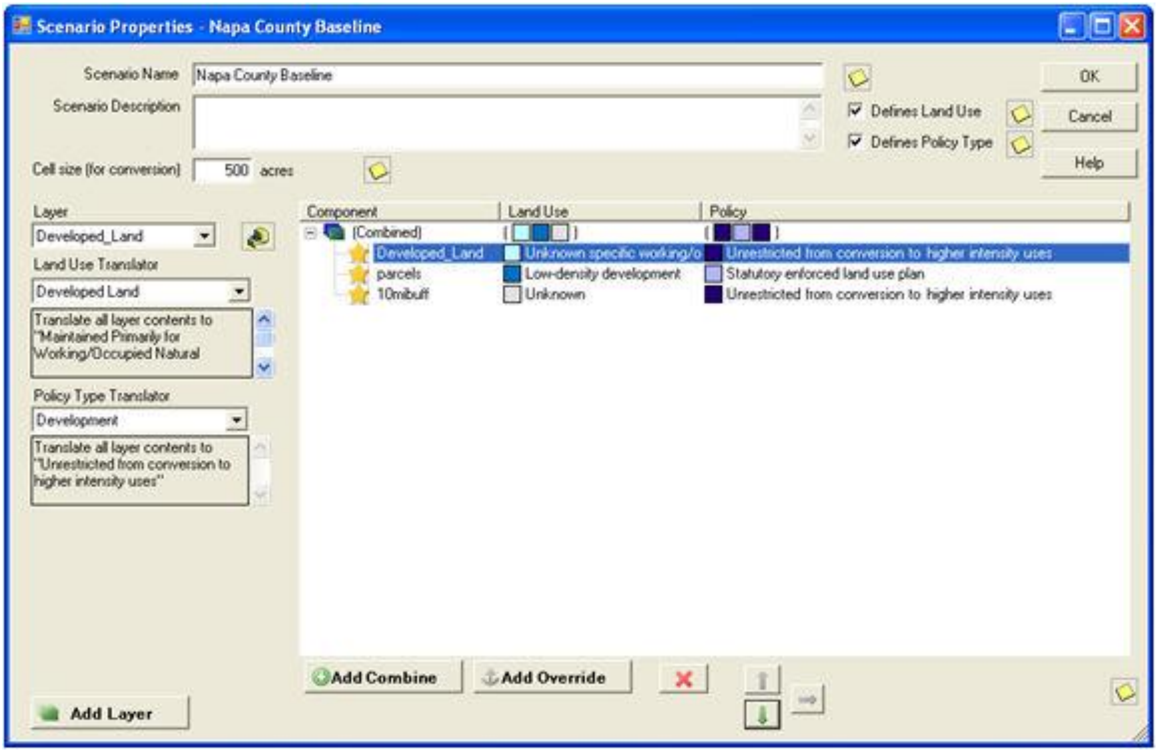
Click **OK** to edit the translator to add translations for the attributes that are lacking; otherwise, click **Cancel** to choose another translator.

7. When the selection of either or both translators for the layer has been completed, decide whether the land use layer overrides other land uses or whether it is a co-occuring land use using the Add Override or Add Combine buttons respectively (See [Define scenarios using Vista combine and override functionality]() for more information). Click the Add Layer button to add the layer, along with the selected translator(s), to the Scenario Layers grid.



8. Continue the process of selecting layers, specifying translator(s) for them, and then adding them to the grid as desired for the scenario. Note that the same layer can be reused in the scenario, as long as the associated translator(s) are different each time. Similarly, the same translator can be reused in the scenario, as long as the layer(s) to which it is applied are different each time.

Note: It is important to include the boundary layer specified for the project in every scenario, with all features of both the Land Use and Policy Type attributes translated to the single value "Unknown." If such translators have not yet been created, use the **<Add New...>** value in both the Land Use and Policy Type Translator drop-down lists to create new translators to accomplish this (as described in step 6 above). Including the project boundary layer with these translations in all scenarios will insure that no area within the project boundary will fall out as "unspecified" in a [Scenario Evaluation]().



9. Use the up and down arrow buttons to change the order of layers in the grid as needed to ensure that LUI and/or PT attributes for overlapping areas are obtained from the layer representing the dominant policy. Because data is processed beginning with the first layer in the list, then the second, third, and so forth, each layer takes precedence over (i.e., modifies) the layer directly below it. Thus, layers should be sequenced so that those representing dominant policies (or those that are not subject to such policies) are placed higher than subordinate layers. In almost all cases, the dominant layer in a planning region should be a converted lands layer, since changes in policy will rarely result in making such lands immediately compatible with biodiversity.

Note: The project boundary layer in which all features are translated to LUI and PT values of "Unknown" should always be positioned at the bottom of the list, that is, as the "base" layer.

10. To delete a selected layer, use the **X** button.
11. To close the window and save the developed scenario click **OK**; otherwise, click **Cancel**.

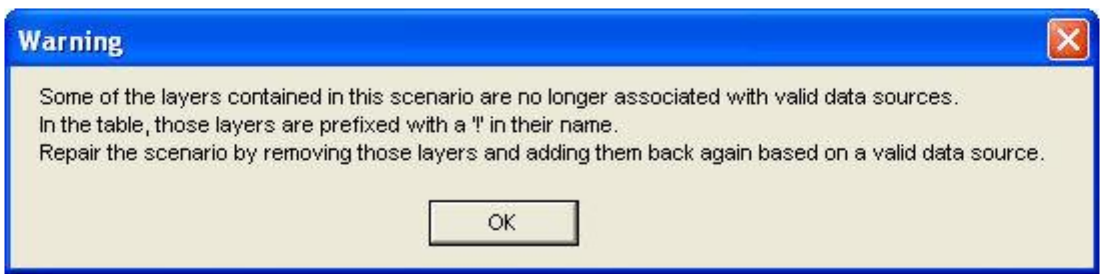
The Scenario Properties window can be used to edit existing scenarios, for example, in cases when data sources have been changed in the project after scenarios were first defined. This window can also be used to define a new scenario using an existing one (e.g., the baseline scenario). However, the existing scenario must first be copied using the **Copy** button on the Scenario List window before being renamed and modified in the Scenario Properties window. Making changes to the name and other information for an existing scenario rather than to a copy will result in actual modifications to the original scenario instead of a separate, new scenario.

Typically the baseline scenario is first defined, next copied, and then the copy modified (as described below) to define other scenarios, although any scenario can be used as the basis for a new one.

Edit an existing scenario:

1. Select the scenario to be edited, or the copy of a scenario to be used for defining a new one, from the list on the Scenario List window and click the **Properties...** button, or select the scenario from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Scenario Properties...** from the context window. The resulting properties window displays the scenario.

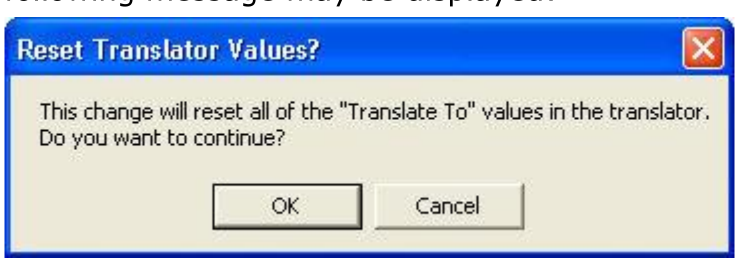
   In cases when data sources have been changed in the project after the scenario was originally defined, the following message may be displayed:

   In such cases, click **OK**; edit the scenario by removing the layers lacking data sources and then redefining the scenario so that the layers utilized have valid sources.

2. Edit the scenario using the processes described above for defining a new scenario as guidelines.

   If the type of translator (i.e., land use or policy type) is changed, the following message may be displayed:

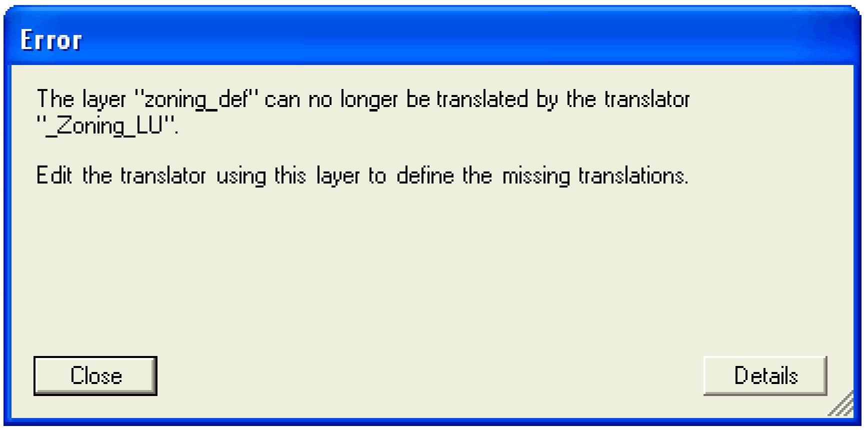
   

   Click **OK** to continue with the revision and the previously assigned values for attributes will be deleted; otherwise, click **Cancel**.

   In cases when the newly specified layer is lacking attributes previously defined for the translator, the following message may be displayed:

Click **OK** to continue with the revision and the previously assigned values for attributes will be deleted; otherwise, click **Cancel**.

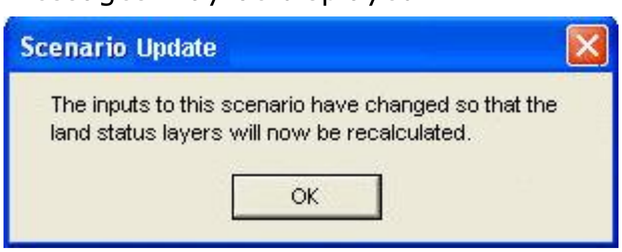
In cases when a translator cannot translate all of the attributes in the newly specified layer, the following message may be displayed:



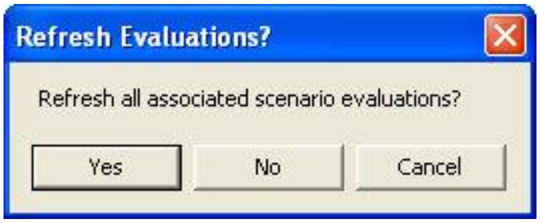
In such cases, click **Close** to cancel the process, or **Details** to view information on the error.

3. To close the window and save the edited scenario click **OK**; otherwise, click **Cancel**.

If **OK** was clicked to save the revised scenario, one of the following messages may be displayed:



Click **OK** to continue with the revision, and layers in the scenario will be recalculated; otherwise, click **Cancel**.



Click **OK** to refresh the Scenario Evaluations that utilize the scenario; **No** if evaluations should not be refreshed; otherwise, click **Cancel**.

EDIT LAND-USE INTENT WINDOW

The **Edit Land-use Intent** window is displayed by selecting **Lists ▸Land Uses List...** from the NatureServe Vista menu. This window displays the default Vista land use intent (LUI) categories (described in Appendix F), which are utilized in land use and conservation Scenario Evaluations.

This window is used to customize the LUI categories in order to better capture the important conservation impacts of specific land uses and/or management practices in the planning region. LUI categories are used specifically in assigning land use compatibility for elements (described under the Compatibility tab section of the Element Properties window), and for developing translators that are used to define land use scenarios (described in the Translators section, with details on creating translators found in the Translator Properties window topic).

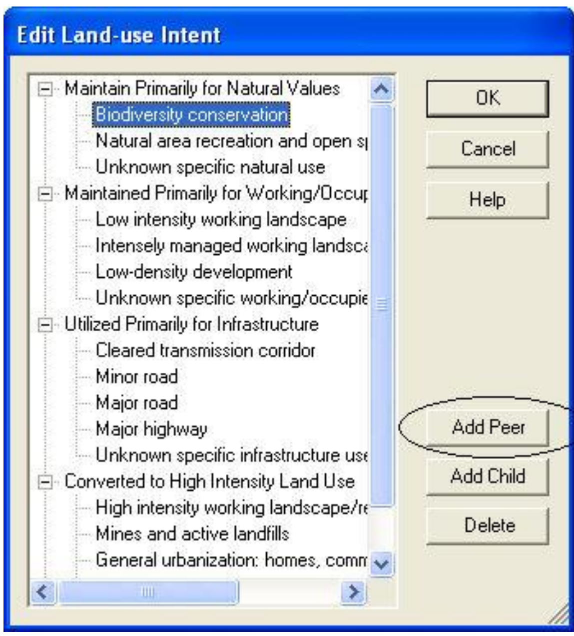
<u>Button functions</u>:

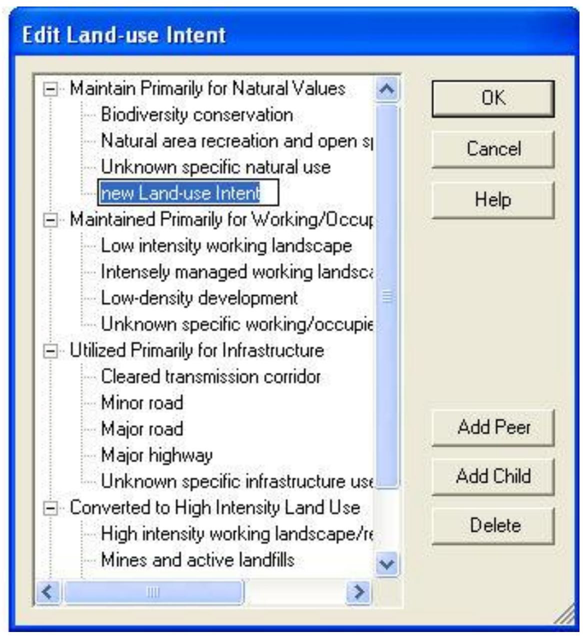
OK saves changes made to the LUI categories and closes the window.

Cancel closes the window without saving any changes made to the LUI categories.

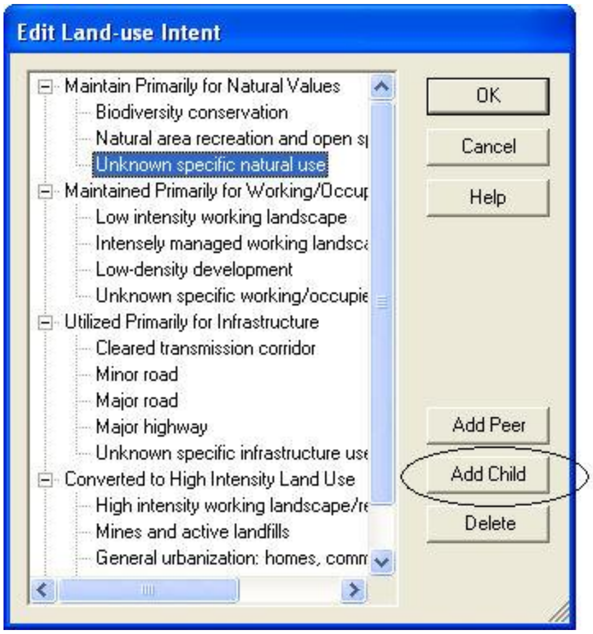
Help opens the on-line documentation.

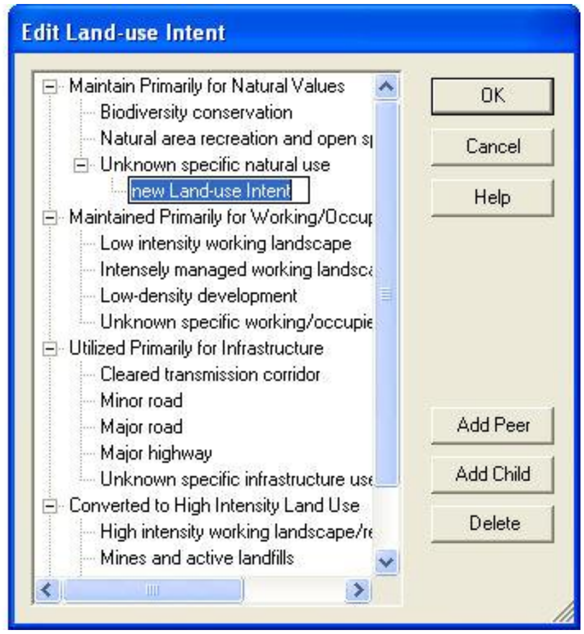
Add Peer adds a new LUI category at the same hierarchical level as that of the selected land use. The new category will appear as a new entry at the end of existing LUI categories at that level, and can then be labeled as desired. In the following example, selecting the minor category "Biodiversity conservation" and clicking the **Add Peer** button will result in a new LUI category at the same level, added after those already existing beneath the "Maintain Primarily for Natural Values" major category to which it belongs.





Add Child adds a new LUI category within, or under, the hierarchical level of the selected land use. The new category will appear as a new entry at the end of any existing child categories beneath the selected category, and can then be labeled as desired. In the following example, selecting the LUI category "Unknown specific natural use" and clicking the **Add Child** button will result in a new child land use category within/under that selected LUI.





Delete deletes the land use category selected in the LUI hierarchy.

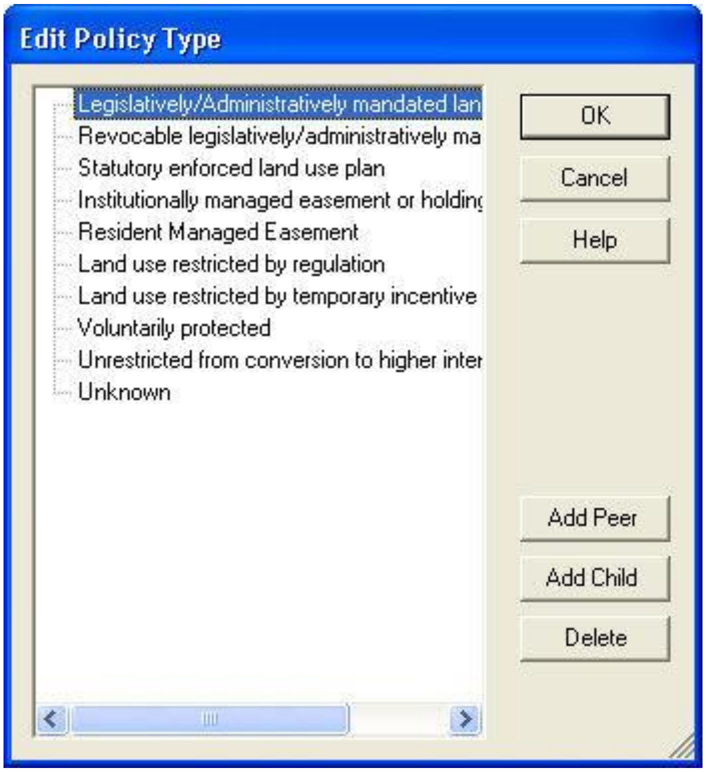
A **Confirm Delete** window is displayed before the deletion is implemented. In cases when the LUI selected for deletion contains child (minor) categories, the **Confirm Delete** window informs the user so that inadvertent deletion of these subcategories can be avoided.

A **Cannot Delete** window is displayed in cases when the LUI category is referenced by one or more items, as shown in the following example.

Edit Policy Type Window

The **Edit Policy Type** window is displayed by selecting **Lists ▸Policy Type List...** from the NatureServe Vista menu. This window displays the default Vista policy type (PT) categories (described in Appendix G), which are utilized in land use and conservation Scenario Evaluations.

This window is used to customize the PTs in order to better capture the important conservation impacts of specific policy mechanisms in the planning region. PTs are used specifically for developing translators that define policy scenarios (described in the Translators section, with details on creating translators found in the Translator Properties window topic).



Button functions:

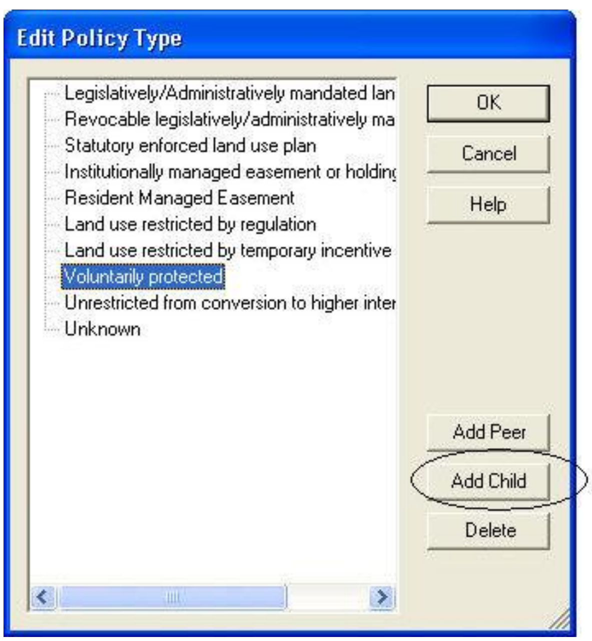
OK saves changes made to the PTs and closes the window.

Cancel closes the window without saving any changes made to the PTs.

Help opens the on-line documentation.

Add Peer adds a new PT at the same hierarchical level as that of the selected type. The new PT will appear as a new entry at the end of existing PTs at that level, and can then be labeled as desired. In the following example, selecting the type "Voluntarily protected" and clicking the **Add Peer** button will result in a new PT at the same level, added after those already existing.

Add Child adds a new PT within, or under, the hierarchical level of the selected type. The new PT will appear as a new entry at the end of any existing child types beneath the selected PT, and can then be labeled as desired. In the following example, selecting the PT "Voluntarily protected" and clicking the **Add Child** button will result in a new child PT within/under that selected type.

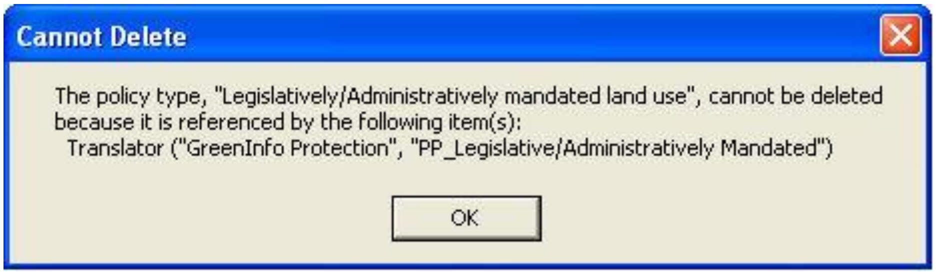


Delete deletes the PT selected.

A **Confirm Delete** window is displayed before the deletion is implemented. In cases when the PT selected for deletion contains child types, the **Confirm**

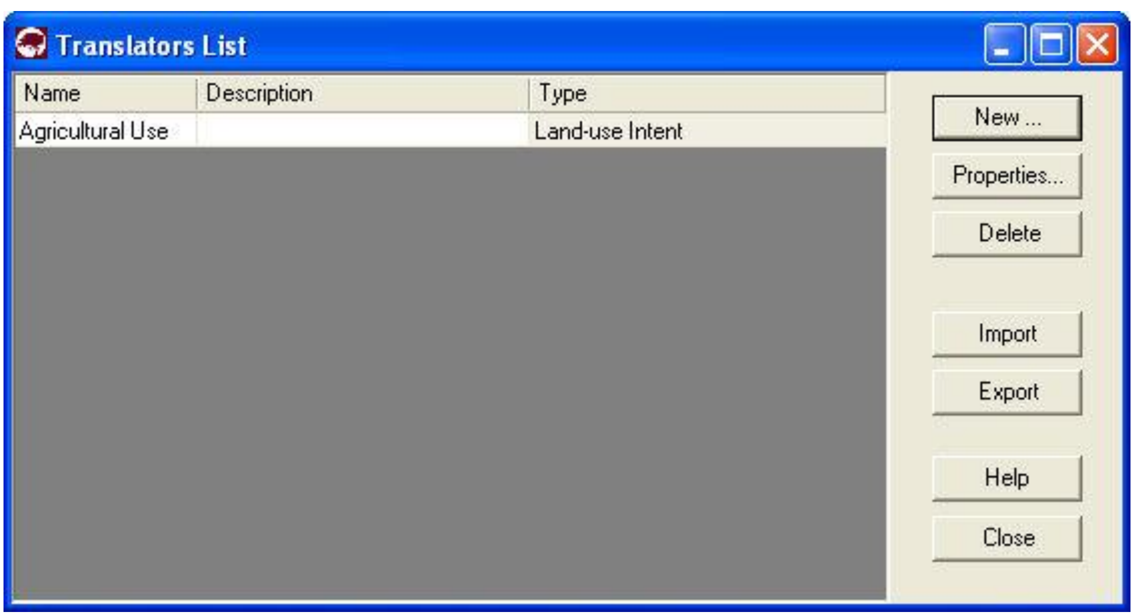
Delete window informs the user so that inadvertent deletion of these subtypes can be avoided.

A **Cannot Delete** window is displayed in cases when the PT is referenced by one or more items, as shown in the following example.



TRANSLATOR LIST WINDOW

The **Translator List** window is displayed by selecting **Lists ▸Translator List** from the NatureServe Vista menu. This window lists all the translators that have been created for land use and protection layers in the project, which are used for Scenario Evaluations.



Button functions:

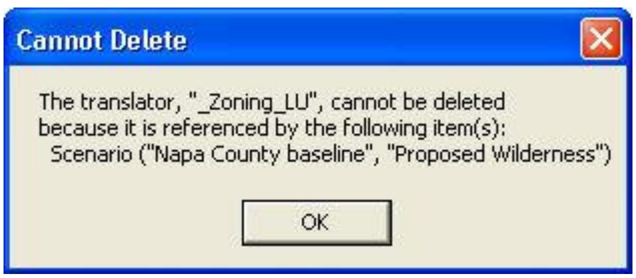
New... displays a new Translator Properties window that can be used to develop a new translator for a land use or protection layer to be imported into the project.

Properties... displays the Translator Properties window showing details and allowing edits to the translator selected in the list.

Delete deletes the translator selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the translator is referenced by another item used in scenario evaluations, as shown in the following example.



Import... opens a browse window to locate a translator (developed in another project) to be imported into this project.

Export... opens a browse window to find the desired location to place a copy of the selected translator so that it can be imported into another project.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of the translator.

Description - description of the translator, if any.

Type - type of translator, Land-use Intent or Policy Type.

TRANSLATOR PROPERTIES WINDOW

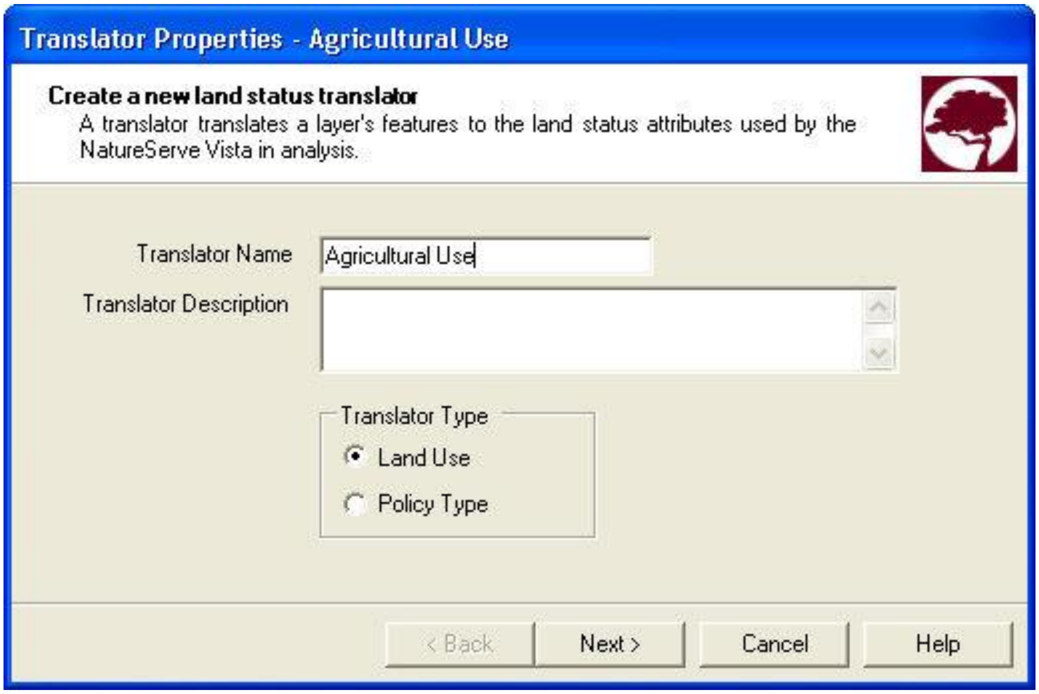
The **Translator Properties - <New>** wizard is displayed by clicking the **New...** button on the Translator List window. The new properties wizard is used to create a translator used to translate land use/management or policy practices layer into land status types, specifically land use intent (LUI) categories or policy types (PTs) utilized by Vista in Land Use and Conservation Scenario Evaluations. See the Creating Translators section for more detailed information on the development and use of translators for importing scenarios. For detailed descriptions of Vista land use statuses, see Appendix F for LUI categories, and

Appendix G for PT. The Translator Properties wizard consists of a series of screens for recording specific information that defines the new translator.

Note that at any time during the process of creating a new translator, the previous step in the process can be revisited (and data changed, if desired) by clicking the **<Back** button, or the action can be canceled altogether by clicking the **Cancel** button.

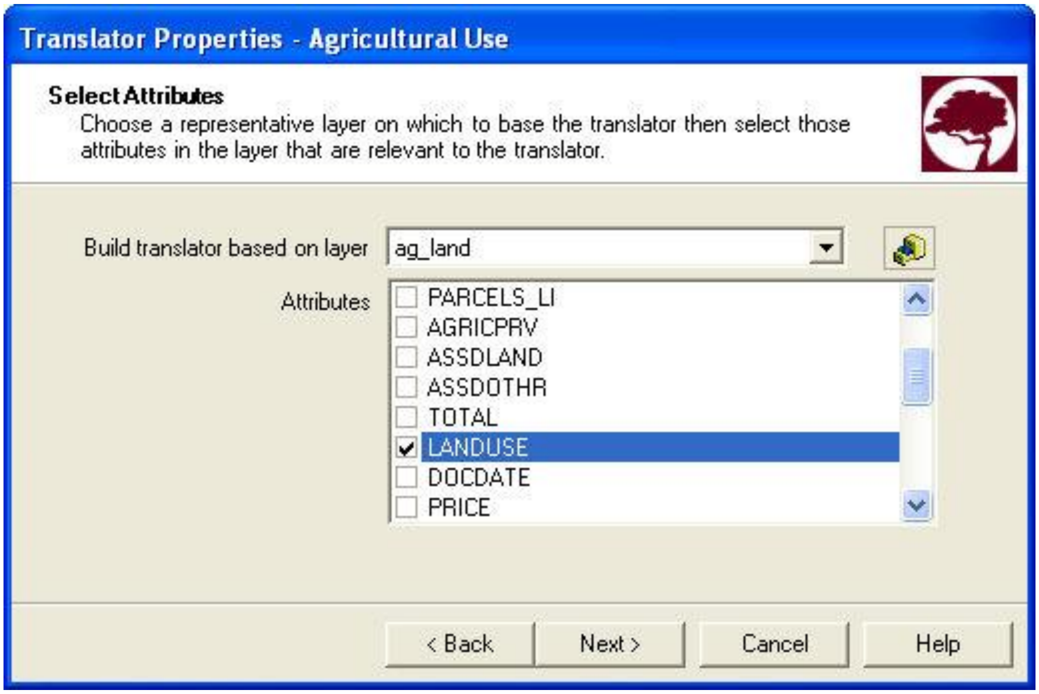
Create a translator:

1. Specify a name for the new translator in the **Translator Name** field. The **<New>** on the window title will change to the name of the new translator as the entry is typed in.
2. Enter a brief description of the translator in the **Translator Description** field, if desired.
3. Indicate whether the translator will assign land use or policy types using the appropriate **Land Use** (the default) or **Policy Type** radio button. Click **Next>**.

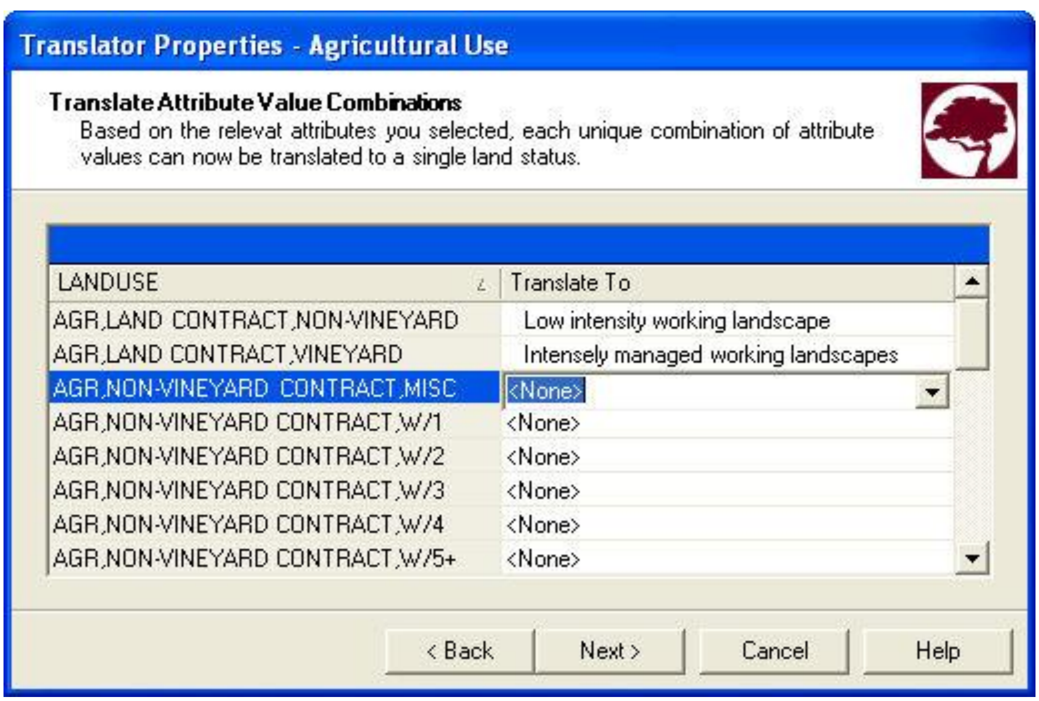


4. Indicate, using the appropriate radio button, whether the translator will 1) assign a **single Vista land status** (i.e., LUI or PT) for the entire group of land use categories or policy types in that layer (the default), or 2) assign an individual Vista type for each of the different land use categories or policy types (i.e., **translate all features based on attribute values**). Generally, option 1 is most useful for single purpose layers (such as a stream setback regulation), while option 2 is useful for general land use and zoning layers that have different land uses and perhaps policies for specific areas/zones within the layer.
5. If the **Translate all features to a single land status** radio button was chosen, select the appropriate land status type to be used for all features. The most sensitive elements should be used to determine the single value to be assigned for this option. However, this has the effect of reducing the precision of the compatibility assessment for less-sensitive elements. Element-specific response requires greater information but increases the precision of the analysis and flexibility for the client to meet element conservation goals in a variety of land use types. Click **Next>**, and then **Finish** to complete the new translator. Disregard the remaining steps in the process.
6. If the **Translate features based on attribute values** radio button was chosen, click **Next>**.
7. Select the layer to be used for developing the translator from the drop-down list in the **Build translator based on layer** field, or by using the  ArcCatalog button. Values in the drop-down list are determined by what is in the Table of Contents (TOC), or a subset thereof (by layer type). If the ArcCatalog button is used, a Select Polygon Input window is

displayed; browse to the appropriate layer, select, and click the **Add** button.



8. A list of attributes for features in the selected layer is displayed in the **Attributes** box. Indicate the feature attribute(s) to be used to create the translator, i.e., those that are most relevant to land use/management or policy practices, by placing a check in checkbox next to the attribute(s). Click **Next>**.



9. For each type or combination of types listed in the attribute column (in the above example, **LANDUSE**), select a single translated status from the drop-down menu provided in the **Translate To** column. Status types displayed in the drop-down menu are determined on the basis of the kind of translator indicated in step 3 above (i.e., LUI or PT), and consist of a single entry for each different type of the attribute/attribute combination selected in the previous step. Every attribute/combination must have a land status selected in order to complete the translator; land status types that are unchanged from the default <None> entry will be flagged as needing an assigned LUI or PT. Any specific interpretations employed for assigning a particular LUI or PT should be documented.

   LUI translators: Select the Vista type that best describes the unique land use for each attribute or attribute combination. Note, however, that the selected LUI type must be from the lowest (i.e., minor category) level; selection of a major category type will be flagged as an invalid entry. Assigning the major category "Unknown" will result in the assumption of "incompatible" in analyses that utilize LUI compatibility information.

   PT translators: Select the Vista type that identifies the appropriate policy practice for each attribute or attribute combination. The assigned PT indicates the mechanism that guides the implementation of an LUI designation, including processes that prevent or allow land uses of greater intensity. Because some of the policy types are fairly dynamic (e.g., zoning), a conservative approach should be used in assessing whether a PT category is likely to permit LUI changes. Assigning the category "Unknown" will result in the assumption of "unprotected" in analyses that utilize PT information.

   Keystrokes that can be used to navigate through the list of land status types for data entry include the following:

   - Clicking on an entry in the Translate To column will display a drop-down menu
   - Clicking <Tab> twice will move the cursor to the next item and highlight it
   - Clicking <Shift><Tab> will move the cursor to the previous item
   - The down and up arrow keys can be used to move down or up, respectively, the list of types in the drop-down menu

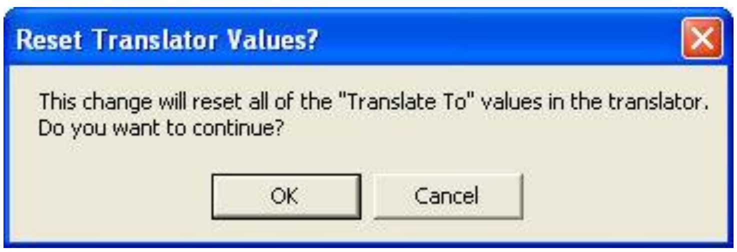
10. Once every attribute has an assigned Vista type, click **Next>**, and then **Finish** to complete the new translator.

Note: It is important to create both a LUI translator and a PT translator that translate all features to the single value "Unknown." These will be used to translate the boundary layer for the project, which should be included in all scenarios to insure that no area within the project boundary will fall out as "unspecified" in a Scenario Evaluation.

Edit a translator:

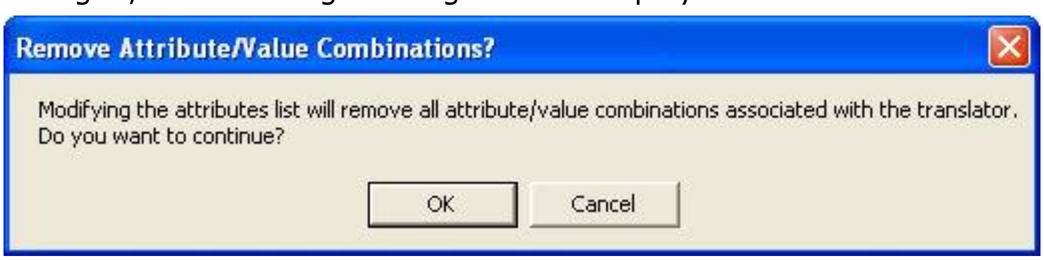
1. Select the translator from the list on the Translator List window and click the **Properties...** button. The resulting properties wizard displays the translator.
2. Edit the translator using the processes described above for creating a new translator as guidelines.
3. To close the window and save any changes made to the translator click **OK**; otherwise, click **Cancel**.

Note that if the translator type, that is **Land Use** or **Policy Type** (originally selected in step 3 of the creation process) is changed, the following message will be displayed:



Clicking **OK** will continue with the change, and an entirely new set of land status types will need to be selected for the attributes (as described in step 9 above); clicking **Cancel** will leave the translator type unchanged.

Note also that if the set of attributes associated with the translator is changed, the following message will be displayed:



Clicking **OK** will continue with the change, and an entirely new set of land status types will need to be selected for the attributes (as described in step 9 above); clicking **Cancel** will leave the attributes used for the translator unchanged.

Note also that if the layer to be used for the translator, selected in the **Build translator based on layer** field (step 7, above) is edited, the following message to confirm the change may be displayed:

Clicking **OK** will continue with the edit, and an entirely new set of land status types will need to be selected for the new attributes (as described in step 9 above); clicking **Cancel** will leave the original layer, along with the status types assigned to its attributes, unchanged.

Note also that if the translator is edited such that the full set of attributes previously addressed by the translator will no longer be handled, the following message will be displayed:

Clicking **OK** will continue with the edit, and scenarios that were defined using the translator will need to be modified; clicking **Cancel** will leave the set of attributes associated with the translation unchanged.

Site Explorer

Site Analysis

Objectives

Site Explorer is used to examine sites related to existing Vista analyses, specifically Conservation Value Summaries (CVS) or Scenario Evaluations. The objectives for Site Explorer differ depending on which analysis is being explored.

The **CVS** exploration objective is to identify and understand the elements and associated attributes that contribute to the conservation value of one or more selected site(s).

The **Scenario Evaluation** exploration objective is twofold:

1. To reveal the land use(s) and/or policy(ies) operating at one or more specified sites, and the conservation element(s) occurring on the site(s), including element responses to those land statuses and the achievement of element conservation goals.
2. To provide the ability to conduct site-level ”r;what if” inquiries to examine the effects of different land uses and/or policy types for the designated site(s) on element goal achievement, and/or to facilitate the development of alternative (e.g., mitigation) scenarios specifying more compatible land uses and/or more reliable implementation policies.

Products

Because Site Explorer can be used to examine either a CVS or a Scenario Evaluation, the products resulting from the exploration will differ depending on which analysis is utilized.

CVS exploration produces a detailed Site Selection report that indicates the conservation value of the selected site(s), along with details for each element on the site(s), including the number and percentage of viable occurrences. For more detailed information on the data that result from a CVS exploration, see CVS Site Inventory Data.

Scenario Evaluation exploration produces a detailed Site Selection report that indicates the land status(es) of the selected site(s), along with details for each element on the site(s), including the number and percentage of occurrences that are compatible and protected (i.e., areas with compatible land uses along with policy types that will reliably ensure that the actual land uses will be no more intensive than the uses indicated), and the achievement of element conservation goals. For more detailed information on the data that result from evaluation exploration, see Scenario Evaluation Site Inventory Data.

In addition to data on the selected site(s) and elements that occur, exploration of Scenario Evaluations provides a mechanism for the user to develop and save alternative (e.g., mitigation) scenarios specifying more compatible land uses and reliable policy types on the site(s). Thus, another product that results from the exploration of Scenario Evaluations can be user-generated alternative scenarios and reports.

Inputs

Required inputs for the Site Explorer are:

- A site layer imported into Vista, specifically a vector layer that represents land units of interest, such as ownership parcels, forest stands, management units, watersheds, etc. If multiple types of planning units are to be used with Site Explorer, it is highly recommended that the various layers be merged into a single layer to provide the most relevant results for land use/policy implementation.
- A Vista analysis (either a Conservation Value Summary or a Scenario Evaluation) that was run using the site layer described above.

Methods Summary

Site Explorer is used to evaluate the conservation properties of one or more specified sites. Output from Site Explorer includes details on the conservation value and contributing biodiversity elements. It may also include data on land status(es) of the site, information on the achievement of element conservation goals, and the effects on element goal achievement if alternative land statuses are used.

Limitations

Limitations described for data inputs and dependent Vista analyses, specifically for Conservation Value Summaries and Scenario Evaluations, are carried forward as limitations of Site Explorer. Additional limitations that are specific to Site Explorer include:

- When evaluating alternative land uses and/or policy types for the site selection, the alternative land status(es) must be applied to the entire selection. This suggests that care be taken to use a planning unit of sufficiently small size to reflect the scale of most land use patterns.

Steps in the Process of Defining Sites for Exploration

PROCESS OF DEFINING SITES FOR EXPLORATION

Identify/obtain GIS layers and associated information on land units

Identify and obtain one or more geographic information systems (GIS) vector layers that represent land units of interest in the planning area, such as ownership parcels, forest stands, management units, watersheds, etc.

Create, reformat, and merge site layers as needed

If multiple types of planning units are to be used with Site Explorer, it is highly recommended that the various layers be merged into a single layer in order to provide the most relevant results for site analyses. More specifically, when exploring a Scenario Evaluation, using a single site layer will allow a more accurate assessment of policy implementation.

Merging data is a basic GIS task that is performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

When exploring alternative land statuses for a Scenario Evaluation, each status must be applied to the entire site selection. Thus, the site layer should utilize a planning unit of sufficiently small size to reflect the scale of most land use patterns. For example, when working in a planning region that contains private land parcels, industry forest stands, and public land management units, the site layer should contain all of these units. However, in many cases, particularly for large region conservation assessments, simply combining these different units into a single layer would produce a complex layer containing a large number of irregular polygons. Thus, it may be more practical to produce a site layer that utilizes equal area units that are of appropriate size to the region and project objectives, such as 40-acre blocks or 25-hectare hexagons.

CVS Exploration

Element Inventory Data for a CVS Exploration

The data that result from site exploration of a Conservation Value Summary (CVS) provide details on the conservation value of the site(s) selected in the exploration, along with information on the contributing biodiversity elements present on that site selection.

The set of data to be displayed in the Site Explorer window can be defined by selecting desired attributes using the Site Explorer Options window. A Custom Column Form accessed from the Options window provides users with the ability to select various metrics that can be used to further customize the exploration. Once metrics have been chosen and site(s) selected in ArcMap, the metrics will appear as columns in the grid located in the lower portion of the Site Explorer window. Those metrics will represent values calculated for the elements included in the CVS that occur on the site(s) selected for exploration. Data for the entire set of element attributes will be included in the Site Selection report resulting from the exploration.

The element attributes available for use in a CVS exploration are grouped according to type of data below, listed by Site Explorer column label (with Options window entry in parentheses), along with a brief explanation of what each represents. For site data calculated on the basis of intersections with elements, it is important to note that overlap by even a single pixel will result in inclusion of that element data in the total. Note also that for data represented by bar charts, combining the values represented by the dark green and red portions will result in the total contained within the site selection.

General attributes

Name - Name of an element that occurs on the selection.

Total - Number of occurrences intersecting the selection and their area within the entire Conservation Value Summary (CVS).

Selection - Number of occurrences intersecting the selection and their area within the selection.

Conservation Value attributes

Wt (Weight) - Weight assigned to the element in the CVS.

Selection Avg CV (Selection Average CV) - The average conservation value for the element on the selection, calculated by averaging the different conservation value(s) for that portion of the Element Conservation Value (ECV) raster that intersects the selection.

Selection Min CV (Selection Minimum CV) - The lowest conservation value for the element on the selection, through comparison of the different conservation value(s) for that portion of the ECV raster that intersects the selection.

Selection Max CV (Selection Maximum CV) **-** The highest conservation value for the element on the selection, through comparison of the different conservation value(s) for that portion of the ECV raster that intersects the selection.

Viability attributes

Viable - Total number of viable element occurrences intersecting the CVS.

% Viable - Percent of viable occurrences intersecting the CVS, and percent of viable area within the CVS.

Selection Viable - Number of viable occurrences intersecting the selection, and their area within the selection.

Selection % Viable - Percent of viable occurrences intersecting the selection, and percent of viable area within the selection.

Viable Occ (Chart: Viable Occurrences) - Chart showing the ratio of *viable* to *non-viable* occurrences (dark green vs. red), and the ratio of occurrences *intersecting* versus *not intersecting* the selection (dark color vs. light color), as follows:

- Viable occurrences outside the selection; that is, the total number of viable occurrences intersecting the CVS that do not intersect the selection.
- Viable occurrences intersecting the selection.
- Non-viable occurrences intersecting the selection.
- Non-viable occurrences outside the selection; that is, the total number of non-viable occurrences intersecting the CVS that do not intersect the selection.

Viable Area (Chart: Viable Area) - Chart showing the ratio of *viable* to *non-viable* area (dark green vs. red), and the ratio of area *within* versus area *external* to the selection (dark color vs. light color), as follows:

- Viable area outside the selection; that is, the total viable area within the CVS that is external to the selection.
- Viable area within the selection.
- Non-viable area within the selection.
- Non-viable area outside the selection; that is, the total non-viable area within the CVS that is external to the selection.

Steps in a CVS Exploration

PROCESS OF EXPLORING SITES USING A CVS

Create a Conservation Value Summary that specifies a site layer for exploration

Using the Vista Summarize Conservation Value window, indicate that the CVS will be used for site analyses by checking the **Perform site-level analysis (for Site Explorer)** checkbox, and specifying the site layer that will be used in the exploration in the **Site Layer** field.

▸Explore sites using the Conservation Value Summary

Right-click on the Conservation Value Summary that you wish to explore and select Site Explorer. Or select **Lists ▸ Site Analysis List** from the NatureServe Vista menu to open the Site Analysis List window, which will display analyses in the project that can be used in site exploration. Select the desired Conservation Value Summary from the list and use the resulting Site Explorer window to evaluate sites.

To start exploring use the Site Explorer pointer to select a site or select a site from the pull-down window in the upper left-hand portion of the Site Explorer Window. The Site Explorer may take a few minutes to initiate. You may select multiple sites by holding down the CTRL button on your keyboard while you select. The pointer can also be dragged to define a rectangle to indicate multiple sites. You may use other tools to navigate around (zoom in, zoom out, pan, etc) while using the Site Explore. To retrieve the Site Explorer pointer (the arrow with the circular Vista logo), click on the Vista logo in the menu tool bar.

Scenario Evaluation Exploration

ELEMENT INVENTORY DATA FOR A SCENARIO EVALUATION EXPLORATION

The data that result from site exploration of a Scenario Evaluation represent the land uses, with or without policy types, operating at the site(s) selected, and their impact on elements, including element response to those land statuses and the achievement of element goals.

The set of data to be displayed in the Site Explorer window can be defined by selecting desired attributes using the Site Explorer Options window. The attribute values displayed in the grid in the lower portion of the Site Explorer window represent values calculated for those elements included in the Scenario Evaluation that occur on site(s) selected for exploration. Data for the entire set of element attributes will be included in the Site Selection report resulting from the exploration.

The full set of element attributes available for use in a Scenario Evaluation exploration are grouped according to type of data below, listed by Site Explorer column label (with Options window entry in parentheses), along with a brief explanation of what each represents; for evaluations that include land use compatibility only, the attributes related to protection will not be displayed. For site data calculated on the basis of intersections with elements, it is important to note that overlap by even a single pixel will result in inclusion of that element data in the total. Note also that for data represented by bar charts, combining the values represented by the dark green and red portions will result in the total contained within the site selection.

General attributes

Name - Name of an element that occurs on the selection.

Total - Number of occurrences intersecting the selection and their area within the entire Scenario Evaluation.

Selection - Number of occurrences intersecting the selection and their area within the selection.

Goal - Conservation goal assigned for the element in the Scenario Evaluation, which is to achieve a number of element occurrences or an amount of area, or a percentage of occurrences or percentage of area. Conservation can be defined in terms of compatibility, protection, or both.

Response - Response of an element (specifically, **compatible**, **incompatible**, or **mixed**) to land uses in the scenario that was evaluated. Select a single row in the Scenario Composition portion of the Site Explorer window to view the element's specific response to the land use in that row.

Viability attributes

Viable - Total number of viable element occurrences intersecting the Scenario Evaluation.

% Viable - Percent of viable occurrences intersecting the Scenario Evaluation, and percent of viable area within the evaluation.

Selection Viable - Number of viable occurrences intersecting the selection, and their area within the selection.

Selection % Viable - Percent of viable occurrences intersecting the selection, and percent of viable area within the selection.

Viable Occ (Chart: Viable Occurrences) - Chart showing the ratio of *viable* to *non-viable* occurrences (dark green vs. red), and the ratio of occurrences *intersecting* versus *not intersecting* the selection (dark color vs. light color), as follows:

- Viable occurrences outside the selection; that is, the total number of viable occurrences intersecting the Scenario Evaluation that do not intersect the selection.
- Viable occurrences intersecting the selection.
- Non-viable occurrences intersecting the selection.
- Non-viable occurrences outside the selection; that is, the total number of non-viable occurrences intersecting the Scenario Evaluation that do not intersect the selection.

Viable Area (Chart: Viable Area) - Chart showing the ratio of *viable* to *non-viable* area (dark green vs. red), and the ratio of area *within* versus area *external* to the selection (dark color vs. light color), as follows:

- Viable area outside the selection; that is, the total viable area within the Scenario Evaluation that is external to the selection.
- Viable area within the selection.
- Non-viable area within the selection.

- Non-viable area outside the selection; that is, the total non-viable area within the Scenario Evaluation that is external to the selection.

Compatibility attributes

Compatible - Number of compatible occurrences intersecting the Scenario Evaluation, and their area within the evaluation.

% Compatible - Percent of compatible occurrences intersecting the Scenario Evaluation, and percent of compatible area within the evaluation.

% of Goal: Compatible - Percent of the Scenario Evaluation goal for the element that is achieved either in compatible occurrences or area, as defined in the goal itself.

Selection Compatible - Number of compatible occurrences intersecting the selection, and their area within the selection.

Selection % Compatible - Percent of compatible occurrences intersecting the selection, and percent of compatible area within the selection.

Selection % of Goal, Compatible - Within the selection, percent of the Scenario Evaluation goal for the element that is achieved either in compatible occurrences or area, as defined in the goal itself.

Compatible Occ (Chart: Compatible Occurrences) - Chart showing the ratio of *compatible* to *incompatible* occurrences (dark green vs. red), and the ratio of occurrences *intersecting* versus *not intersecting* the selection (dark color vs. light color), as follows:

- Compatible occurrences outside the selection; that is, the total number of compatible occurrences intersecting the Scenario Evaluation that do not intersect the selection.
- Compatible occurrences intersecting the selection.
- Incompatible occurrences intersecting the selection.
- Incompatible occurrences outside the selection; that is, the total number of incompatible occurrences intersecting the Scenario Evaluation that do not intersect the selection.

Compatible Area (Chart: Compatible Area) - Chart showing the ratio of *compatible* to *incompatible* area (dark green vs. red), and the ratio of area *within* versus area *external* to the selection (dark color vs. light color), as follows:

- Compatible area outside the selection; that is, the total compatible area within the Scenario Evaluation that is external to the selection.
- Compatible area within the selection.
- Incompatible area within the selection.
- Incompatible area outside the selection; that is, the total incompatible area within the Scenario Evaluation that is external to the selection.

Protection attributes

Protected - Total number of protected occurrences intersecting the Scenario Evaluation, and their area within the evaluation.

% Protected - Percent of protected occurrences intersecting the Scenario Evaluation, and percent of protected area within the evaluation.

% of Goal: Protected - Percent of the Scenario Evaluation goal for the element that is achieved either in protected occurrences or area, as defined in the goal itself.

Selection Protected - Number of protected occurrences intersecting the selection, and their area within the selection.

Selection % Protected - Percent of protected occurrences intersecting the selection, and percent of protected area within the selection.

Selection % of Goal, Protected - Within the selection, percent of the Scenario Evaluation goal for the element that is achieved either in protected occurrences or area, as defined in the goal itself.

Protected Occ (Chart: Protected Occurrences) - Chart showing the ratio of *protected* to *unprotected* occurrences (dark green vs. red), and the ratio of occurrences *intersecting* versus *not intersecting* the selection (dark color vs. light color), as follows:

- Protected occurrences outside the selection; that is, the total number of protected occurrences intersecting the Scenario Evaluation that do not intersect the selection.
- Protected occurrences intersecting the selection.
- Unprotected occurrences intersecting the selection.
- Unprotected occurrences outside the selection; that is, the total number of unprotected occurrences intersecting the Scenario Evaluation that do not intersect the selection.

Protected Area (Chart: Protected Area) - Chart showing the ratio of *protected* to *unprotected* area (dark green vs. red), and the ratio of area *within* versus area *external* to the selection (dark color vs. light color), as follows

- Protected area outside the selection; that is, the total protected area within the Scenario Evaluation that is external to the selection.
- Protected area within the selection.
- Unprotected area within the selection.
- Unprotected area outside the selection; that is, the total unprotected area within the Scenario Evaluation that is external to the selection.

Conservation Value attributes

Selection Avg CV (Selection Average CV) - The average conservation value for the element on the selection, calculated by averaging the different conservation value(s) for that portion of the Element Conservation Value (ECV) raster that intersects the selection.

Selection Min CV (Selection Minimum CV) - The lowest conservation value for the element on the selection, through comparison of the different conservation value(s) for that portion of the ECV raster that intersects the selection.

Selection Max CV (Selection Maximum CV) **-** The highest conservation value for the element on the selection, through comparison of the different conservation value(s) for that portion of the ECV raster that intersects the selection.

Steps in a Scenario Evaluation Exploration

PROCESS OF EXPLORING SITES USING A SCENARIO EVALUATION

▸Create a Scenario Evaluation that specifies a site layer for exploration

Using the Evaluate Scenario window, indicate that the Scenario Evaluation will be used for site analyses by specifying the layer to be used in the exploration in the **Site Layer** field.

PROCESS OF EXPLORING SITES USING A SCENARIO EVALUATION

▸Explore sites using the Scenario Evaluation

Right-click on the Conservation Value Summary that you wish to explore and select Site Explorer. Or select **Lists ▸ Site Analysis List** from the NatureServe Vista menu to open the Site Analysis List window, which will display analyses in the project that can be used in site exploration. Select the desired Scenario Evaluation from the list and use the resulting Site Explorer window to evaluate sites.

To start exploring use the Site Explorer pointer to select a site or select a site from the pull-down window in the upper left-hand portion of the Site Explorer Window. The Site Explorer may take a few minutes to initiate. You may select multiple sites by holding down the CTRL button on your keyboard while you select. The pointer can also be dragged to define a rectangle to indicate multiple sites. You may use other tools to navigate around (zoom in, zoom out, pan, etc) while using the Site Explore. To retrieve the Site Explorer pointer (the arrow with the circular Vista logo), click on the Vista logo in the menu tool bar.

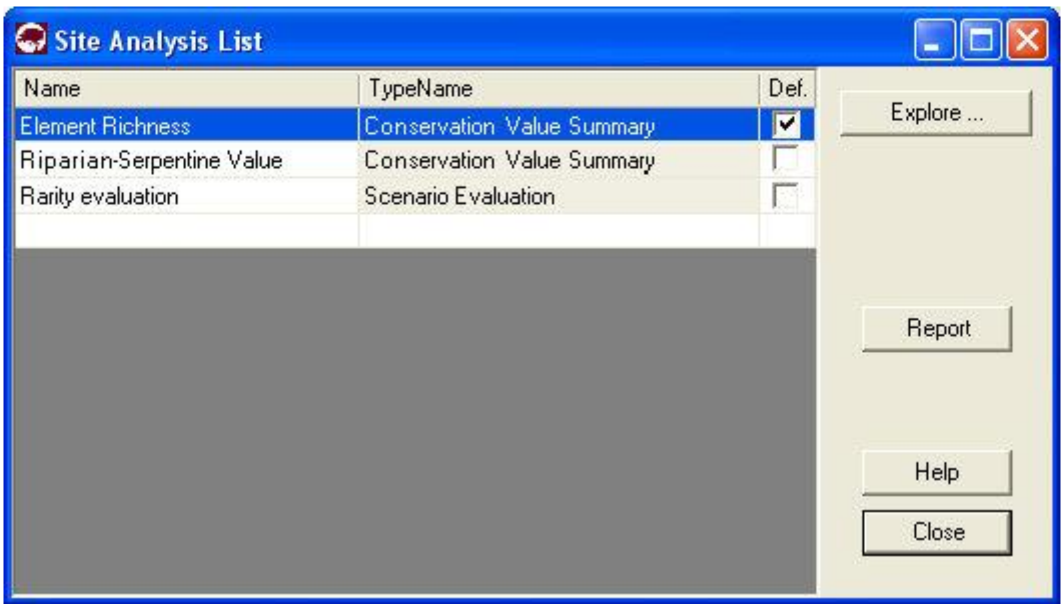
▸Evaluate and save alternative land statuses, if desired

Detailed process steps for exploring different land uses and/or policy types and their effect on element conservation goals, as well as saving the results of these explorations, are described in the Evaluate alternative land statuses section of the Site Explorer window.

Windows for Site Explorations

SITE ANALYSIS LIST WINDOW

The **Site Analysis List** window is displayed by selecting **Lists ▸Site Analysis List** from the NatureServe Vista menu. This window lists all of the analyses in the project, specifically Conservation Value Summaries and/or Scenario Evaluations, that can be examined in detail using the Site Explorer tool. In order to be included in this list, a site layer must be specified for the analyses. See the Site Analyses section for more detailed information on the use of Site Explorer.



Button functions:

Explore... displays the Site Explorer window with data from the analysis that is selected.

Report displays the report for the selected analysis. See the Reports section for more details on Conservation Value Summary and Scenario Evaluation reports.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of an analysis that can be evaluated using Site Explorer tool.

TypeName - type of analysis, specifically Conservation Value Summary or Scenario Evaluation.

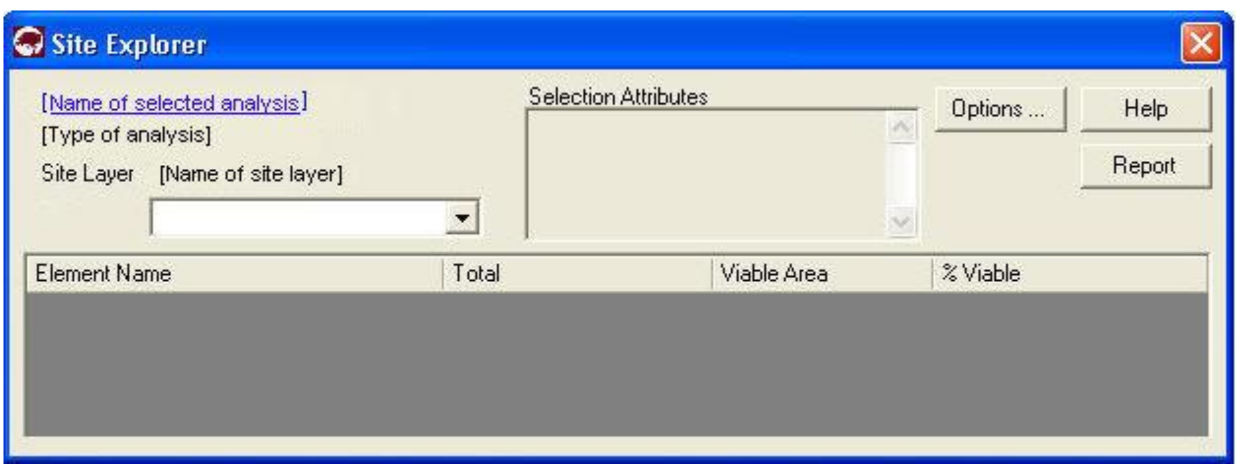
Def. (Default) - checkbox used to designate an analysis as the default displayed in the Site Explorer window.

SITE EXPLORER WINDOW

The **Site Explorer** window is used to evaluate the conservation properties of a specified site or set of sites that are of interest, with functionality and results that differ depending on the type of Vista analysis that is examined, specifically a Conservation Value Summary (CVS) or Scenario Evaluation). When used for a CVS, the Site Explorer window displays details on the conservation value for the site selection, along with information on the contributing biodiversity elements present on the selection. For a Scenario Evaluation, the Site Explorer tool provides data on the land use and/or policy types for the site selection along with detailed information on elements occurring on the selection in terms of conservation goals achieved, and enables the user to examine the effects on goal achievement if alternative land statuses are used.

The Site Explorer window can be opened several ways:

- Clicking the **Explore...** button on the Site Analysis List window will display the Site Explorer window with data from the analysis (CVS or Scenario Evaluation) that is selected.
- Right-clicking on a CVS or Scenario Evaluation displayed on the NatureServe Vista tab of the Table of Contents and selecting **Site Explorer...** from the resulting menu will display the Site Explorer window with data for that analysis.
- Selecting **Explore Sites...** from the NatureServe Vista menu will display the Site Explorer window with data for the analysis marked as the default in the Site Analysis List window.
- Clicking the  button on the NatureServe Vista toolbar will open the Site Explorer window with data for the analysis marked as the default in the Site Analysis List window.



Button functions:

Options... displays the Site Explorer Options window to set the attributes (columns of data) to be displayed for elements and the site selection.

Help opens the on-line documentation.

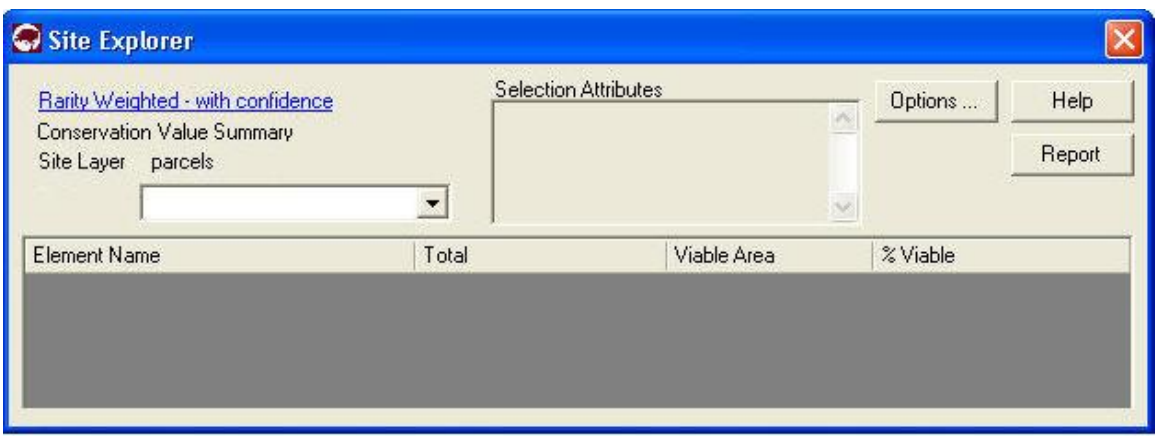
Report displays the report for the attribute data resulting from the exploration. See the Reports section for more details on Site Selection reports.

Explore sites related to a Vista analysis:

The basic process for exploring sites related to a CVS and a Scenario Evaluation is the same. Additional functionality is provided when evaluations are explored, permitting the user to examine the effects on element goals caused by altering land uses and/or policy types for the site selection, and then save the results as new scenarios for use in Scenario Evaluations.

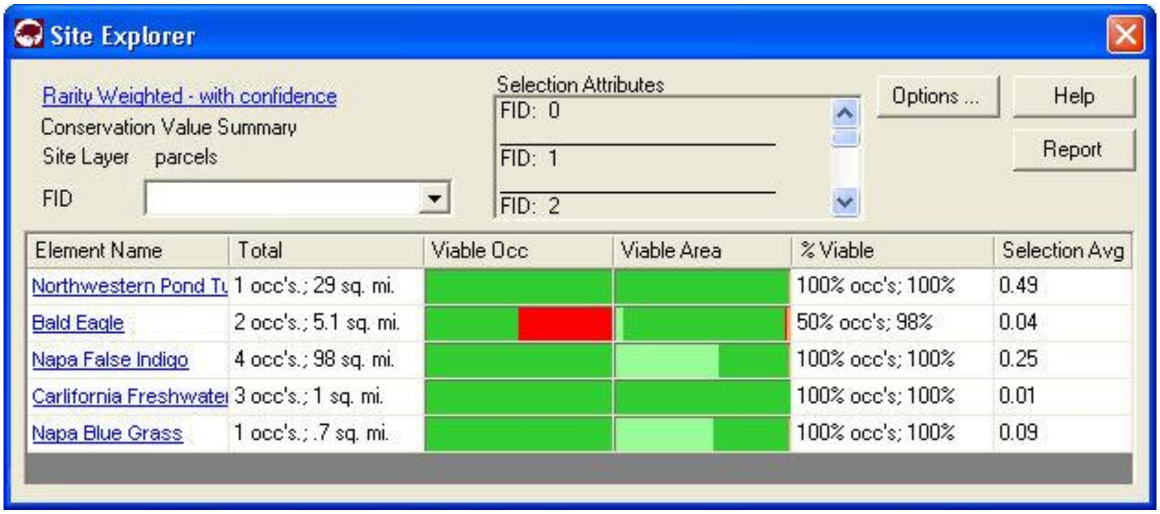
The process for exploring either a CVS or a Scenario Evaluation is described below. Following the process steps that are common to both types of analyses is a description of how to evaluate alternative land statuses for a Scenario Evaluation.

1. Open the Site Explorer window for the desired analysis using one of the methods described above.



2. Click the **Options...** button to set the attributes to be displayed for elements and the site selection in the Site Explorer window for the analysis. See the Site Explorer Options window for details on the process for selecting element attributes.
3. Using the Site Explorer pointer, select one or more land units in the site layer (parcels in this example) to be examined, or choose the desired site from the Site Layer drop-down menu (populated only if a site attribute has been specified on the Site Explorer Options window). Holding the button while selecting sites with the pointer will permit multiple sites to be considered together. The pointer can also be dragged to define a rectangle to indicate multiple sites to be examined as a set. To deselect units, click outside of the area included in the analysis, or select one or more different sites to be explored.

Data for the identified site selection will be displayed in the Site Explorer window.



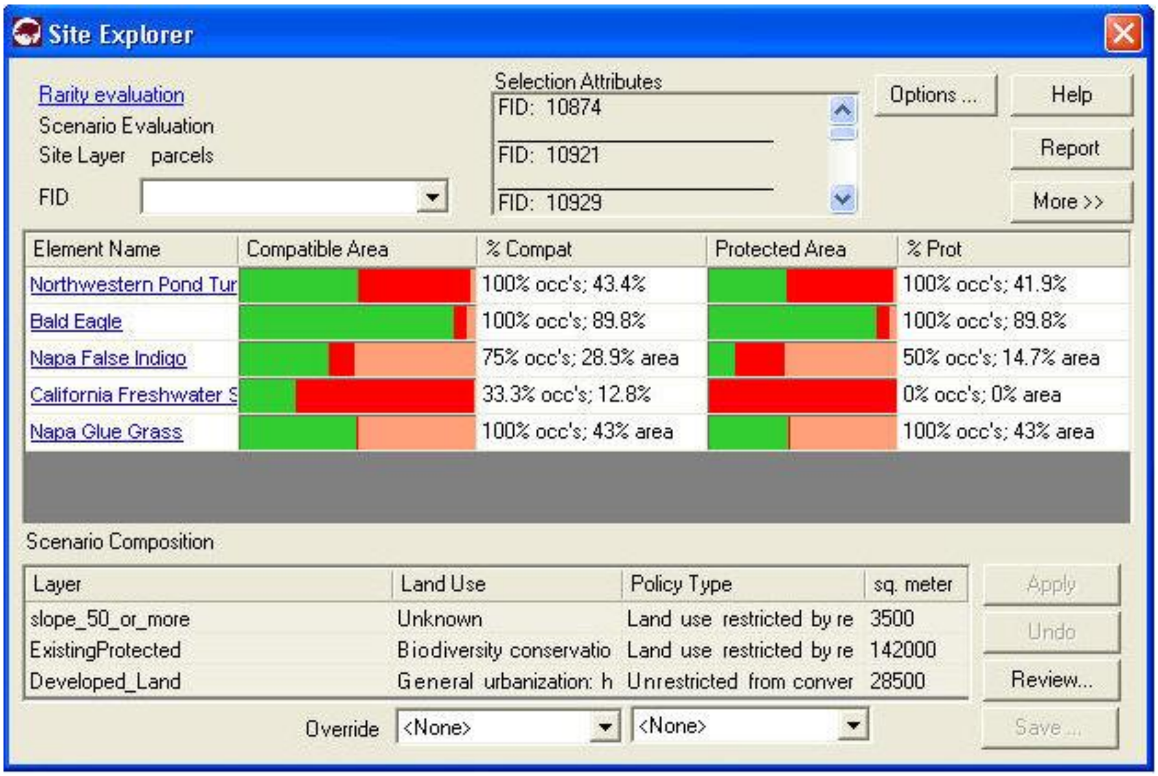
Attribute definitions that will describe briefly what the column data represent can be found in the topics Element Inventory Data for a CVS Exploration and Element Inventory Data for a Scenario Evaluation.

Back to process steps above

Evaluate alternative land statuses and their effects on element goals:

Once the Site Explorer window has been opened and sites selected for a Scenario Evaluation, the functionality related to evaluation of alternative land uses and policy types can be utilized, as described below.

Click the **More>>** button to expand the window to display composition details for the scenario used for the evaluation, including the land status(es) assigned to the layer(s) that comprise that scenario.



Button functions for the Scenario Composition portion of the Site Explorer window:

Apply changes land use statuses to those selected in the **Override** fields.

Undo returns any land statuses changed by "Override" values back to their original statuses.

Review... opens a Site Change List window used to modify statuses for individual layers.

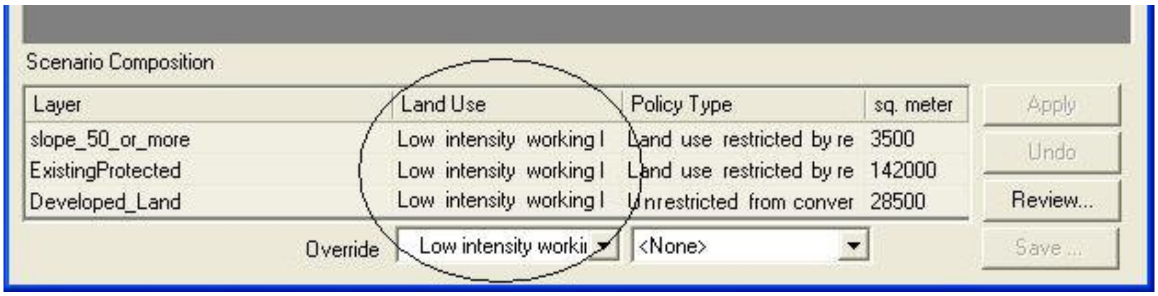
Save opens a Save Changes to Shape File window to capture the modified layers and land statuses as a shape file.

Response attribute functionality:

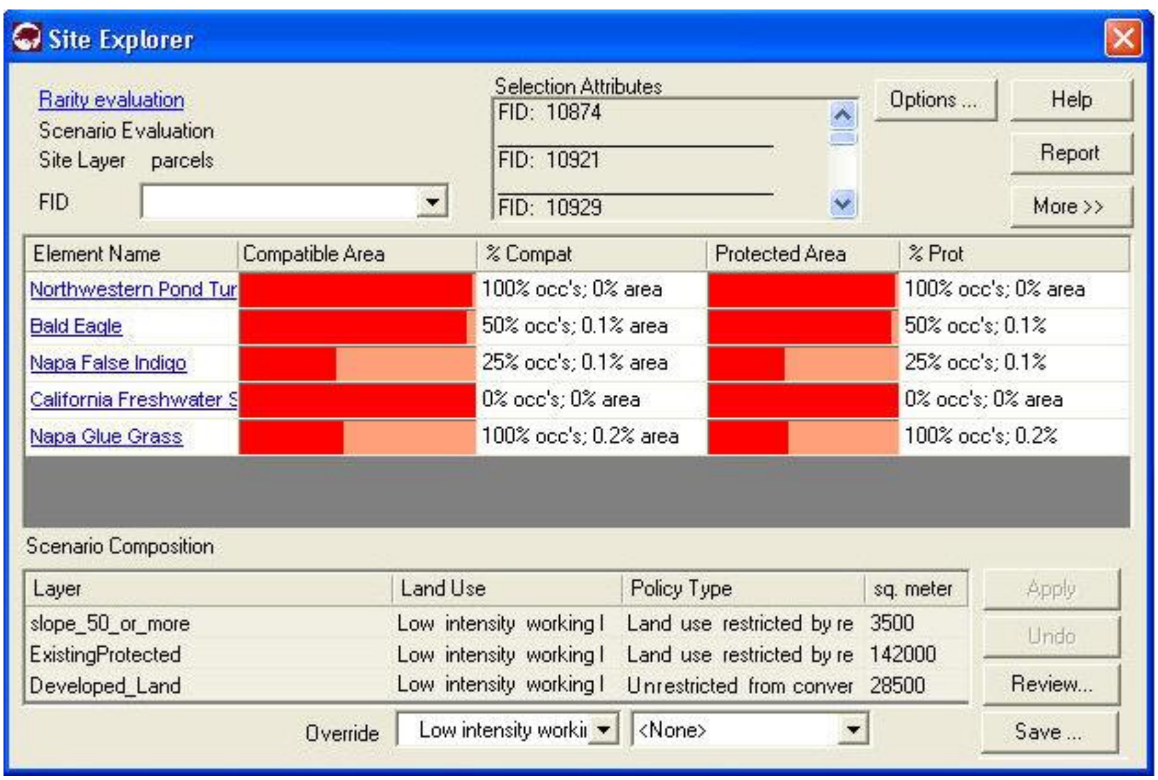
Provided the **Response** attribute is included in the site exploration and displayed as a column, selecting a single row in the Scenario Composition portion of the Site Explorer window will display each element's specific response to the land use in that row.

1. Change land use status(es)

Using the Scenario Composition portion of the Site Explorer window, select a different land use and/or policy type to be applied to scenario layers by selecting value(s) from the appropriate **Override** drop-down list(s) and clicking **Apply**.



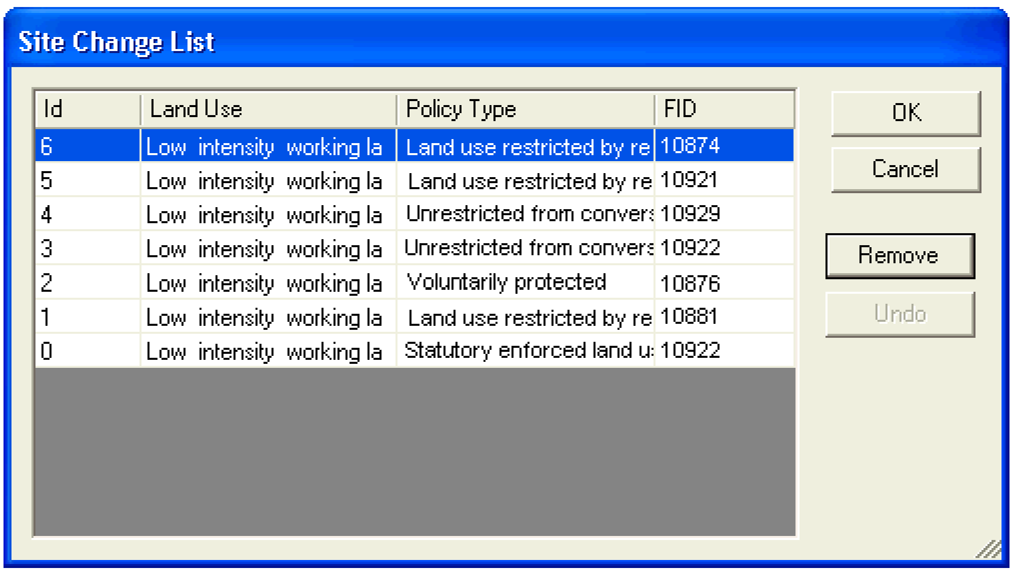
The land status value(s) selected in the **Override** field(s) will be applied to the layers that comprise the scenario used for the Scenario Evaluation. Any resulting changes to the element attribute data for the site exploration will change accordingly, as shown in the example below (compared with the initial results, above).



2. Review land status changes

Click **Report** to display the Site Selection report showing the effects of the alternative land status(es) on element attributes and goal achievement. See the Reports section for more details on Site Selection reports.

If desired, click **Review...** on the Site Explorer window to display the Site Change List window, which lists all layers that have modified land status(s) resulting from any override values selected in the Site Explorer window. Modify the change list if desired using the buttons provided on the window, described below.



Button functions for the Site Change List window:

OK saves any revisions to the list of land use status changes.

Cancel closes the window without retaining any revisions made to the land status change list.

Remove removes a selected layer (row) with modified land status values from the list. As a result, this layer will now be displayed in the Scenario Composition part of the Site Explorer window with its original land status(es); that is, the land status(es) in effect before any override values were specified.

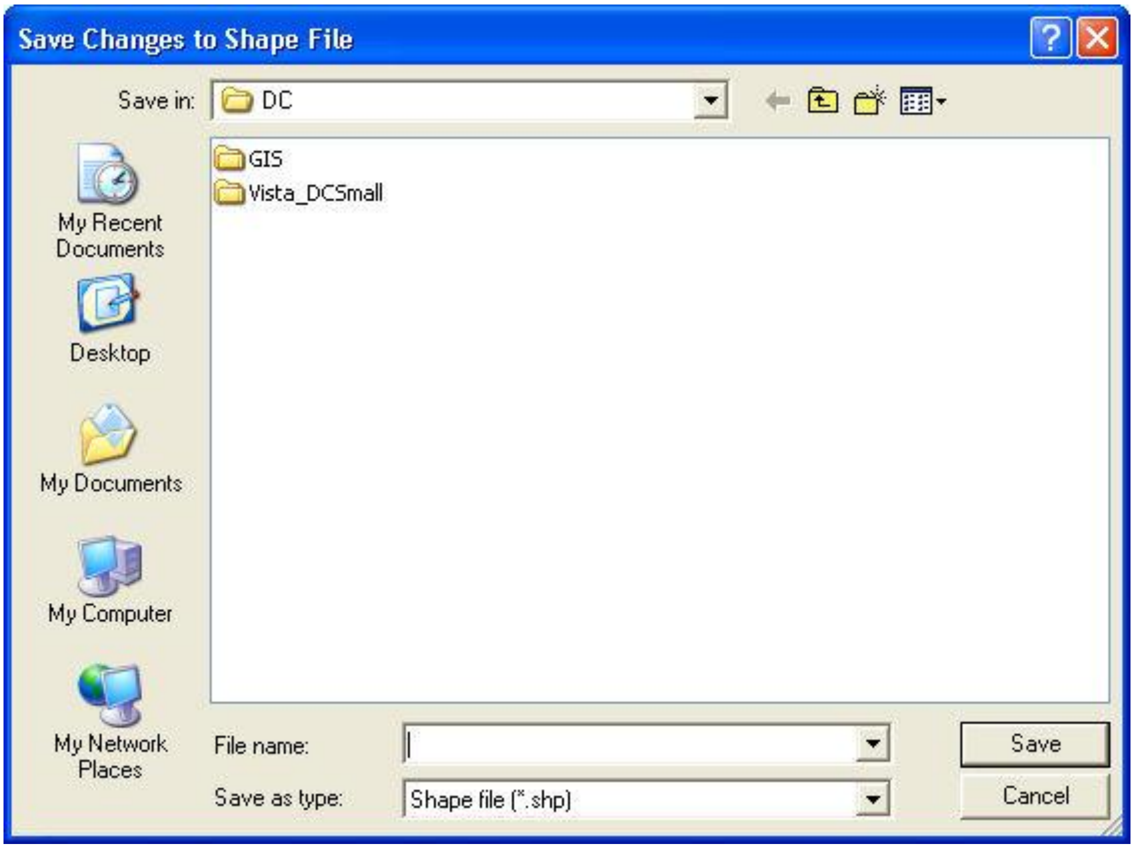
Undo restores a layer removed from the Site Change List window back to the list, again with the land status modified by override values.

3. Determine optimal land statuses

Repeat the process of selecting new land status(s) for the layers in the site exploration by changing override value(s), and reviewing and accepting any values (steps 1 and 2, above) that result in desirable changes to element goal achievement.

4. Save alternative scenario layers

Once a combination of land statuses in the site exploration is deemed to be acceptable/useful, use the **Save...** button in the Scenario Composition portion of the window to display the **Save Changes to Shape File** window. Designate a folder and file name for the location of the saved data, and click **Save**.



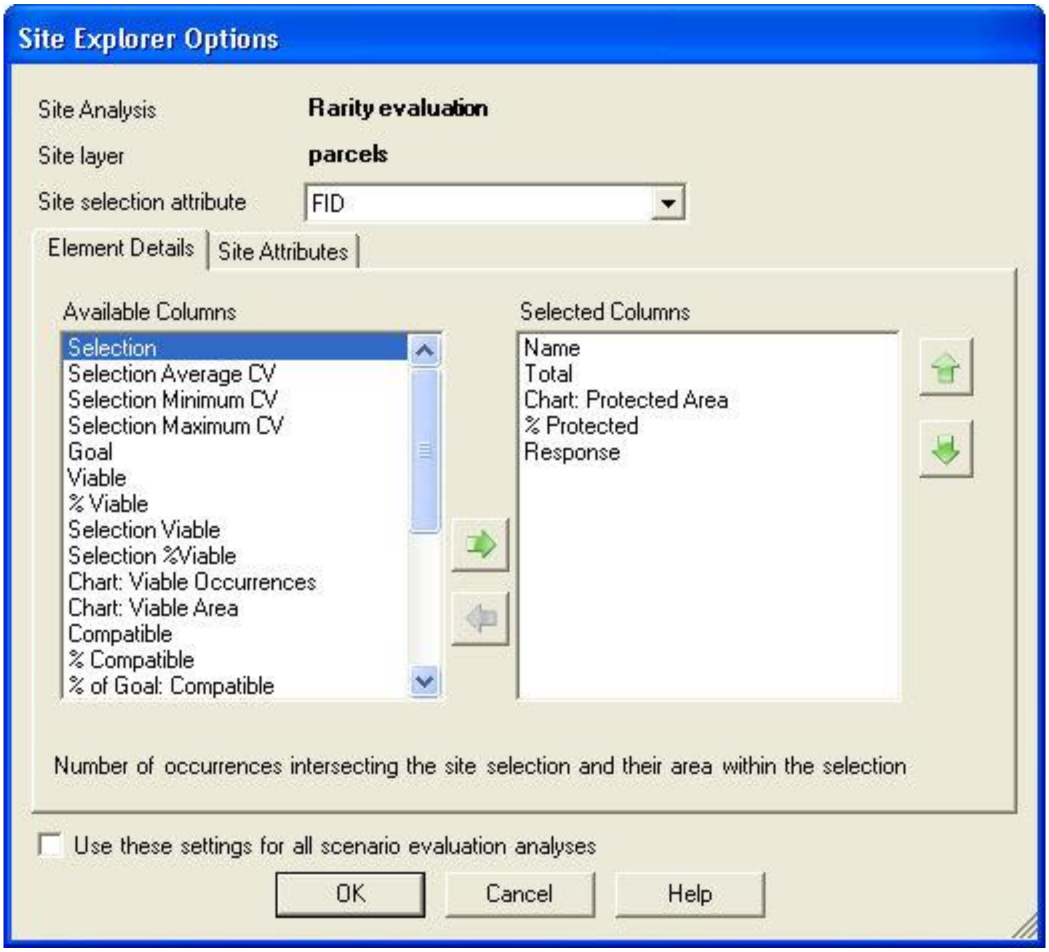
The saved shape file and associated land status data can then be used to define new scenarios for use in Scenario Evaluations.

SITE EXPLORER OPTIONS WINDOW

The **Site Explorer Options** window is displayed by clicking the **Options** button on the Site Explorer window, and is used to set attributes related to the element and site information displayed for a particular analysis (i.e., a Conservation Value Summary (CVS) or Scenario Evaluation).

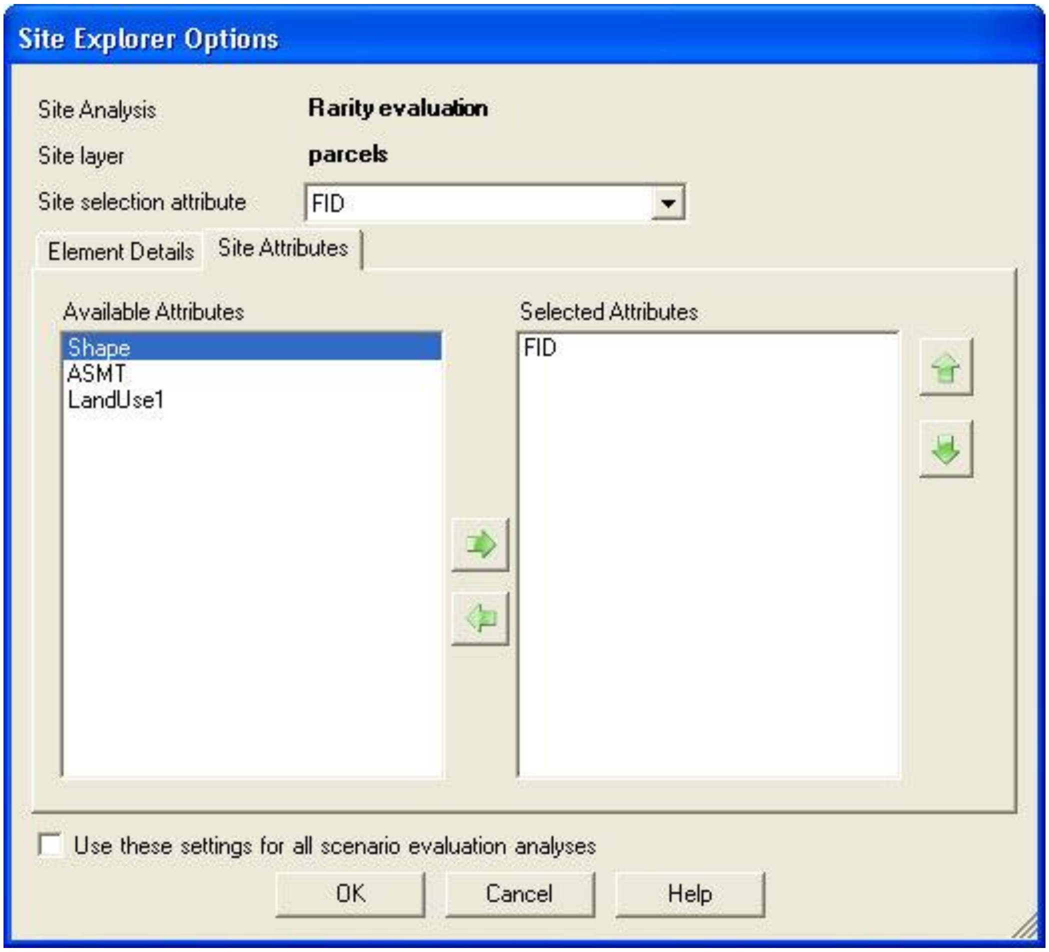
Set options:

ELEMENT DETAILS TAB INPUT



1. Indicate the attributes (i.e., columns) of data to be displayed for elements that occur in the site selection, using the right arrow button to move one or more highlighted attributes from the **Available Columns** list to the **Selected Columns** list, and the left arrow to remove attribute(s) from the set to be displayed. The up and down arrow buttons can be used to set the order for the attributes to be displayed in the Site Explorer window. While an attribute is selected, a brief description for the attribute is displayed near the bottom of the tab. A complete list of attributes and their definitions can be found in the topics Element Inventory Data for a CVS Exploration and Element Inventory Data for a Scenario Evaluation Exploration.

SITE ATTRIBUTES TAB INPUT



2. Select an attribute from the **Site selection attribute** drop-down list near the top of the window to be used to select land units for Site Explorer. The values for this attribute will then be displayed in the Site Layer drop-down list on the Site Explorer window.
3. Indicate the attribute(s) to be displayed for the site(s) selected in the **Selection Attributes** box, using the right arrow button to move one or more highlighted attributes from the **Available Attributes** list to the **Selected Attributes** list, and the left arrow to remove attribute(s) from the set to be displayed. The up and down arrow buttons can be used to set the order for the attributes to be displayed in the Site Explorer window.
4. To use the set of attributes specified on both the Element Details and Site Attributes tabs as the default for all site explorations of Conservation Value Summaries or Scenario Evaluations, indicate so using the checkbox near the bottom of the window.
5. To close the window and save any changes made to the attribute lists click **OK**; otherwise, click **Cancel**.

CONSERVATION SOLUTIONS

Objectives

The major purpose of the Vista Conservation Solution functionality is to facilitate data "exchange" between Vista and external conservation solution applications, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). Both MARXAN and SPOT evaluate different units of land according to criteria to determine which sets, when combined into larger units (i.e., reserve systems or portfolios, respectively) result in optimal conservation solutions in terms of several factors, including cost and representation of conservation targets.

Different objectives are specified for the two Vista Conservation Solution tool functions:

- The "generate conservation solution" function is designed to prepare the input data needed to generate a solution using either MARXAN or SPOT, and then effectively walk the user through the process of initiating solution runs using the designated application.
- The "capture solution results" function utilizes solution results generated by MARXAN or SPOT to produce a shape file that can be used to more easily visualize the results, as well as to define new Vista scenarios, which can then be utilized in Scenario Evaluations.

For more detailed information on the external conservation solution applications, see http://www.ecology.uq.edu.au/marxan.htm and http://www.conserveonline.org/workspaces/spot.

Products

The "generate solution" function of the Conservation Solution tool produces a folder containing the input data necessary for running a solution using either MARXAN and SPOT.

The "capture results" function results in a shape file produced from solution results generated by either MARXAN or SPOT.

Inputs

The "generate solution" function of the Conservation Solution tool requires the following inputs:

- An analysis unit layer, which can be associated with an existing Vista site analysis
- Cost attribute values
- Selection status attribute values

- A Vista goal set
- A penalty factor value OR a Vista weighting system
- Number of iterations to be performed in a run
- Number of runs to be performed for a solution

Depending on the parameters needed for the solution, the following inputs for the "generate solution" function are optional:

- A Vista filter
- A value for the boundary length modifier (default is 0)

The "capture results" function of the Conservation Solution tool requires the input of solution results generated by either MARXAN or SPOT.

Methods Summary

The "generate solution" and "capture results" functions of the Vista Conservation Solution tool require different processes for their use. Select a task below to see a detailed description of the process.

References

Game, E. T. and H. S. Grantham. (2008). Marxan User Manual: For Marxan version 1.8.10. University of Queensland, St. Lucia, Queensland, Australia, and Pacific Marine Analysis and Research Association, Vancouver, British Columbia, Canada.

Ball, I. R. and H. P. Possingham, (2000) MARXAN (V1.8.2): Marine Reserve Design Using Spatially Explicit Annealing, a Manual.

Possingham, H. P., I. R. Ball and S. Andelman (2000) Mathematical methods for identifying representative reserve networks. In: S. Ferson and M. Burgman (eds) Quantitative methods for conservation biology. Springer-Verlag, New York, pp. 291-305.

Steps in the "Generate Solution" Process

PROCESS OF GENERATING A CONSERVATION SOLUTION

Identify an analysis unit layer

Identify and obtain a geographic information systems (GIS) layer that represents land units of interest, such as ownership parcels, forest stands, management units, watersheds, etc.

Determine the parameters to be used for generating the solution

Identify values for the various parameters to be used in generating a conservation solution.

Parameters that must be defined for the solution are as follows:

- External conservation solution generator - MARXAN or SPOT (the Spatial Portfolio Optimization Tool)
- Analysis unit layer, which can be associated with an existing Vista site analysis
- Cost attribute(s) and values
- Selection status attribute and values
- Vista goal set
- Penalty factor value OR a Vista weighting system
- Number of iterations to be performed in a run
- Number of runs to be performed for a solution

Parameters that are optionally defined for the solution are as follows:

- Vista filter
- Value for the boundary length modifier (default is 0)

Add cost attributes to the layer

Add one or more attribute columns to the analysis unit layer in order to represent costs to be considered in generating a conservation solution. Costs can be broadly described in terms of ecological, social, and economic costs. Examples of costs include:

- Base cost of units (dollars)
- Mitigation costs (dollars)
- Cost can also be any relative social, economic or ecological measure. For instance, it may reflect the likelihood of success in different areas based on social willingness, enforceability, or the presence of uncontrollable threats (Game & Grantham, 2008)

Adding attributes (columns) and values to a layer are basic GIS tasks that are performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
    - The Contents tab shows a list of topics that can be browsed through.
    - The Index tab provides the ability to search an index of help topics.

- The Find tab provides the ability to search for a particular word in all of the help topics.

Add the selection status attribute to the layer

Add one attribute column to the analysis unit layer to represent selection status, which indicates whether a unit is to be included in a solution. Values for this attribute are limited to **Locked In**, **Locked Out**, or may be null. Units with an assigned value of **Locked In** are to be included in the solution, while those to be excluded have the **Locked Ou**t value. Null values for this attribute will permit the solution generator to choose whether or not to include the unit in the solution.

Adding attributes (columns) and values to a layer are basic GIS tasks that are performed outside of the Vista application. For guidance on performing this task, see the help for the Environmental Systems Research Institute (ESRI) application being used to develop the element distribution layers (e.g., Arc9). To browse or search the contents of the help:

1. From the Help menu, choose Help Topics.
2. Choose a tab.
   - The Contents tab shows a list of topics that can be browsed through.
   - The Index tab provides the ability to search an index of help topics.
   - The Find tab provides the ability to search for a particular word in all of the help topics.

Prepare solution input data using Vista

Select **Generate a Conservation Solution...** from the NatureServe Vista menu to open the Generate Conservation Solution wizard, which will walk through the process of assigning parameters to be used to generate input files for use by the external MARXAN or SPOT (Spatial Portfolio Optimization Tool) applications.

Use input data to generate a solution using MARXAN or SPOT

Once input data have been generated based on parameters entered in the Generate Conservation Solution wizard, instructions will be displayed on the last wizard screen which, along with message windows, will step through the process of generating a conservation solution using either MARXAN or SPOT (the Spatial Portfolio Optimization Tool).

To run Marxan with the generated inputs, drag the marxan.exe file into the Vista generated inputs folder created in the 'Generating a Conservation Solution' wizard and double-click to run the marxan.exe file. Marxan will automatically use the input files within the folder.

Steps in the "Capture Results" Process

PROCESS OF CAPTURING SOLUTION RESULTS

Determine the location of solution results generated by MARXAN or SPOT

Determine the location of results that were generated by either MARXAN or SPOT (the Spatial Portfolio Optimization Tool), external conservation solution generation applications.

Load results into Vista to create a shape file

Select **Capture Solution Results...** from the NatureServe Vista menu to open the Capture Solution Results window, which will generate a shape file from solution results generated by the external MARXAN or SPOT (the Spatial Portfolio Optimization Tool) applications.

Windows for Conservation Solutions

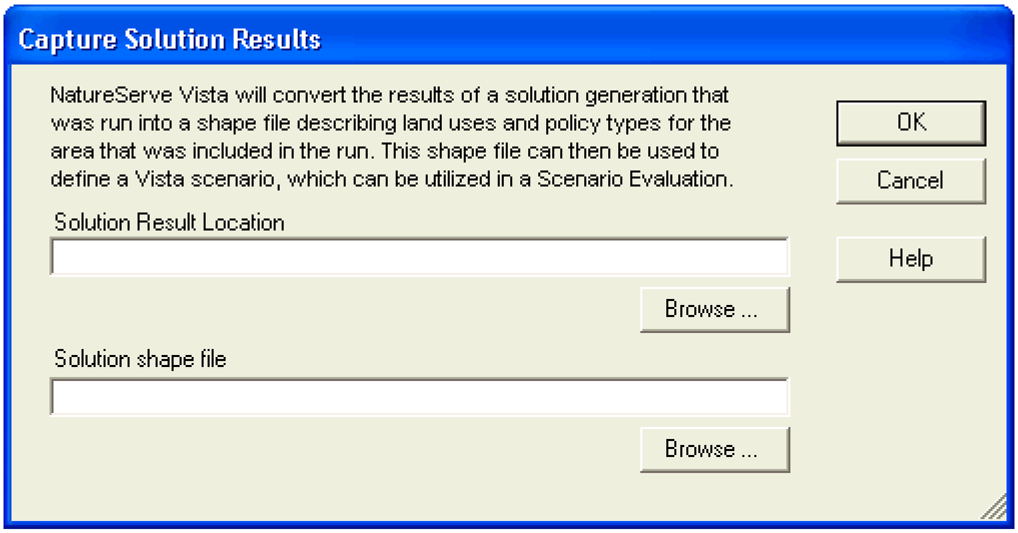
Capture Solution Results Window

The **Capture Solution Results** window is displayed by selecting **Capture Conservation Solution...** from the NatureServe Vista menu. This window is used to load results generated by external conservation solution software, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). These applications evaluate different units of land according to criteria to determine which sets, when combined into larger units (e.g., portfolios or reserve systems) result in optimal conservation solutions in terms of several factors, including cost and representation of conservation targets. The results used in Vista can consist of separate runs identifying analysis units that were selected for the solution, or can be a summed solution that indicates, for each unit, the number of runs in which it was selected. In capturing results generated by an external software, Vista produces a shape file that can be used to more easily visualize the results, as well as to define new Vista scenarios, which can then be utilized in Scenario Evaluations.

For more detailed information on the MARXAN and SPOT applications, see http://www.ecology.uq.edu.au/marxan.htm and http://www.conserveonline.org/workspaces/spot, respectively.

Capture solution results:

1. Specify the location of the solution results generated from the external application in the **Solution Result Location** field, or click the **Browse** button to navigate to the location and select it.
2. Specify the location to be used for shape file that will result from conversion of the generated solution in the **Solution shape file** field, or click the **Browse** button to navigate to the location. Enter a file name, and click **Save**.



3. Click **OK** to convert the conservation solution results into a shape file.

GENERATE CONSERVATION SOLUTION WINDOW

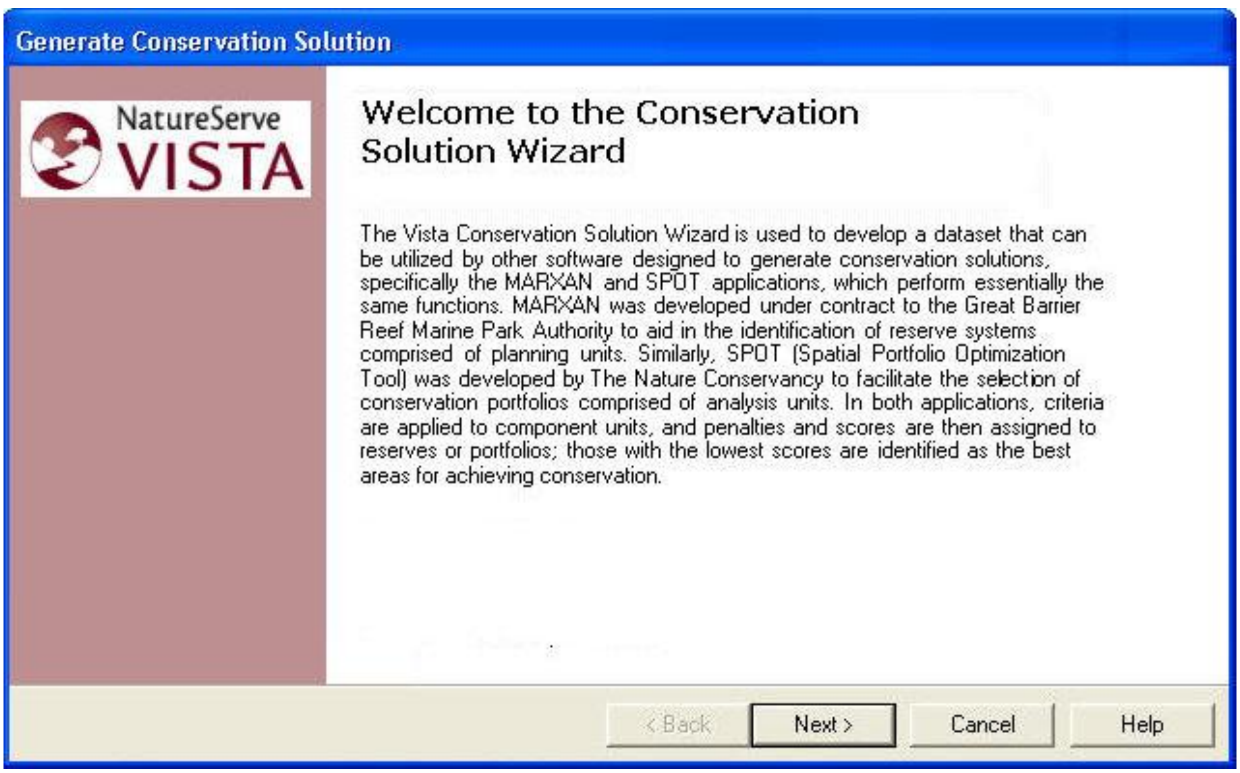
The **Generate Conservation Solution** wizard is displayed by selecting **Generate a Conservation Solution...** from the NatureServe Vista menu. This window is used to prepare the necessary input data for analysis by external conservation solution software, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). These applications evaluate different units of land according to criteria to determine which sets, when combined into larger units (e.g., portfolios or reserve systems) result in optimal conservation solutions in terms of several factors, including cost and representation of conservation targets. Once the input data are generated by Vista, the user is walked through the process of initiating solution runs using the external application.

For more detailed information on the MARXAN and SPOT applications, see http://www.ecology.uq.edu.au/marxan.htm and http://www.conserveonline.org/workspaces/spot, respectively.

Prepare for generating a conservation solution:

Before beginning the solution generation process, two or more attribute columns must be added to the analysis unit layer (identified in step 2 below) that will be used in the process.

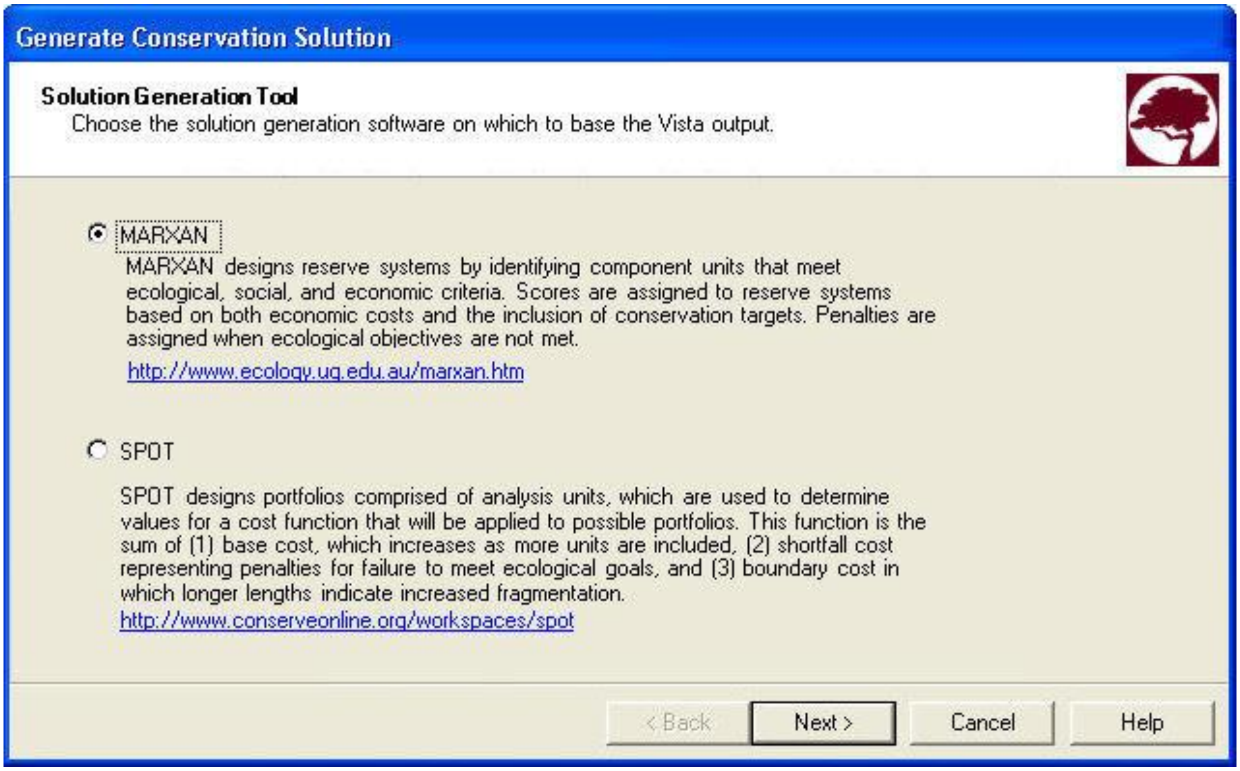
- One or more columns must be added to represent different types of costs (e.g., effort [in days], mitigation costs), with values associated with units to be considered in the solution (indicated in step 4, below).
- One column must be added to represent the attribute selection status (indicated in step 5, below); values for this attribute are limited to **Locked In**, **Locked Out**, or may be null. The selection status attribute serves to identify units to be included (Locked In) or excluded (Locked Out) when a solution is generated; null values will permit the solution generator to choose whether or not to include the unit in the solution.



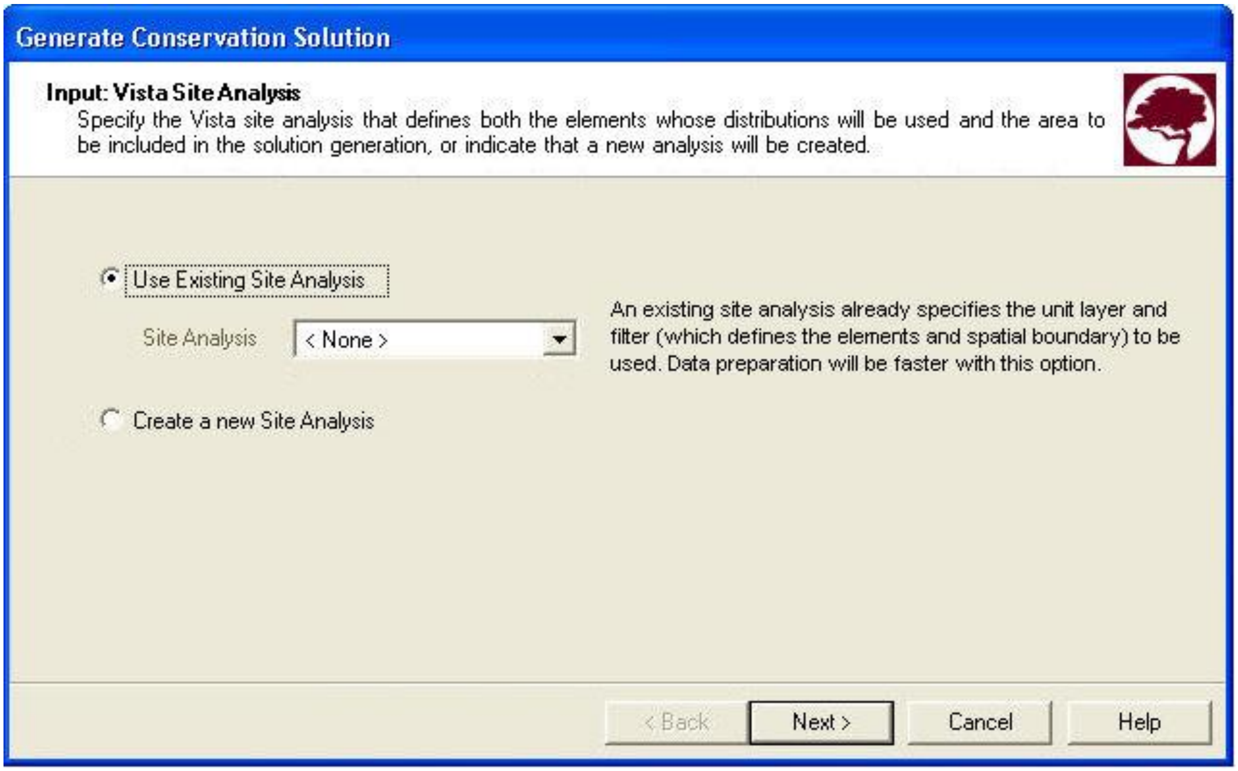
Note that at any time during the process of generating a solution, the previous step in the process can be revisited (and data changed, if desired) by clicking the **<Back** button, or the action can be canceled altogether by clicking the **Cancel** button.

<u>Generate a conservation solution</u>:

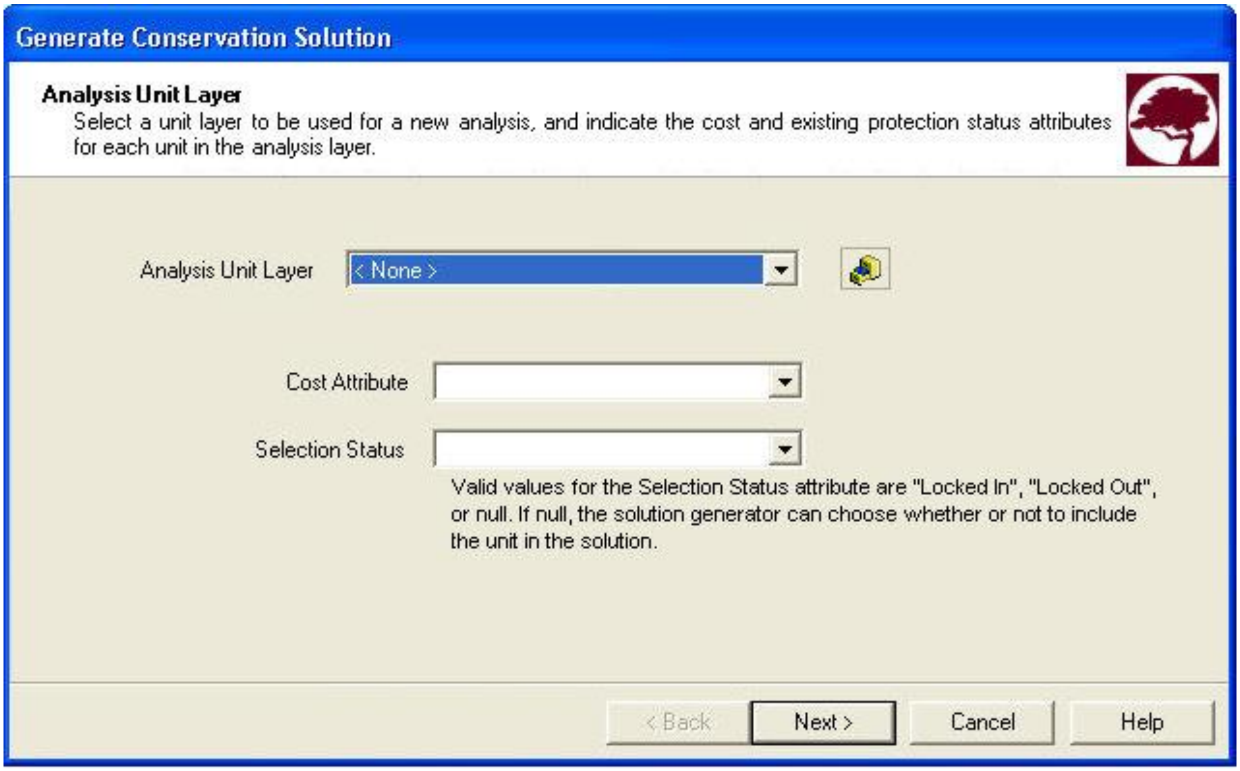
1. Indicate which application should be used as the basis for the solution to be generated by Vista using the appropriate **MARXAN** or **SPOT** radio button. Click **Next>**.



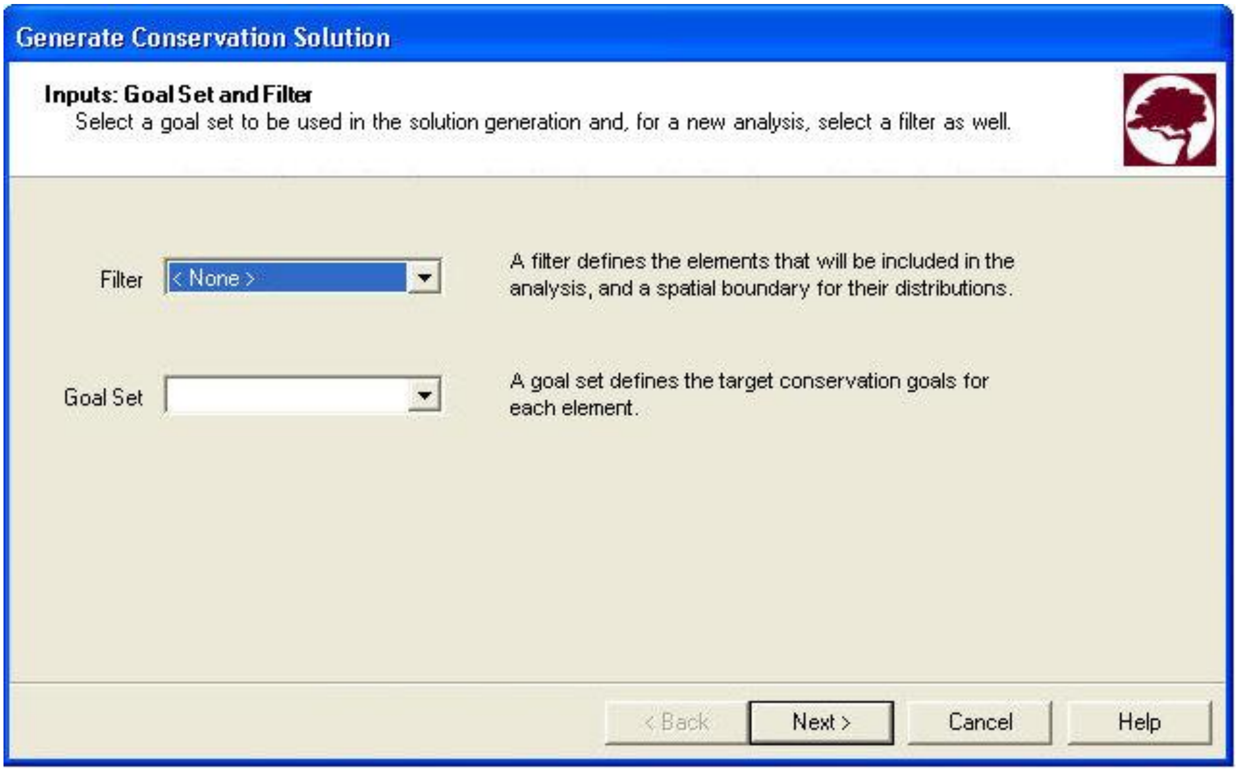
2. Indicate whether a new or existing site analysis will be used to generate the solution using the appropriate **Use Existing Site Analysis** or **Create a new Site Analysis** radio button. If an existing analysis will be used, select the analysis from the **Site Analysis** drop-down list. Click **Next>**.



3. If an existing analysis is being used for the solution, select the layer to be used from the drop-down list in the **Analysis Unit Layer** field, or by using the  ArcCatalog button.
4. Select the attribute (column) to be used to represent the costs associated with different units in the solution from the drop-down list in the **Cost Attribute** field.
5. Select the attribute (column) to be used to indicate whether units are to be included or excluded in the solution from the drop-down list in the **Selection Status** field. Click **Next>**.

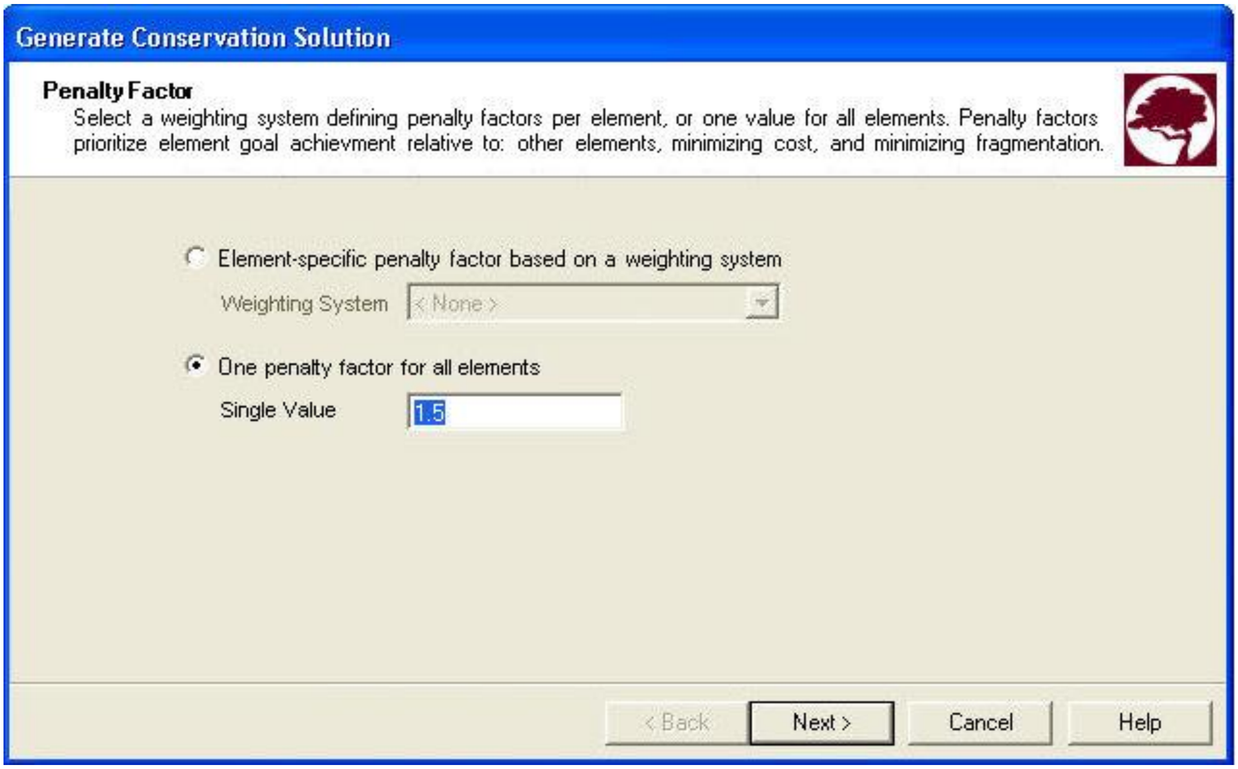


6. If a new analysis is being created for the solution, select the filter to be used in generating the solution from the drop-down list in the **Filter** field.
7. Select the element conservation goals to be used in the solution from the drop-down list in the **Goal Set** field. Click **Next>**.

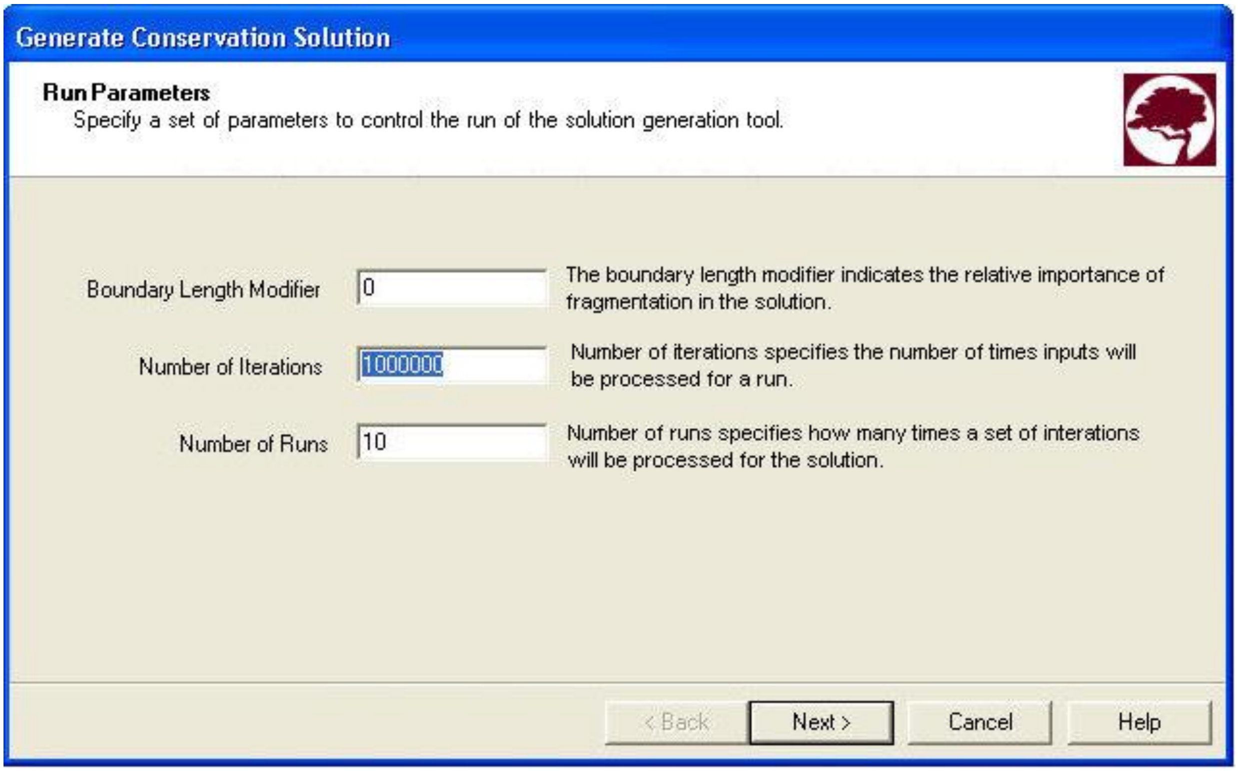


8. Indicate whether a weighting system that assigns a penalty for each element is to be used in generating the solution, or a single penalty factor should be utilized for all elements using the appropriate radio button.
    - If an element-specific penalty is to be used, select the appropriate system from the **Weighting System** drop-down list.
    - If a penalty is to be assigned to all elements in the solution, specify the value to be used in the **Single Value field**.

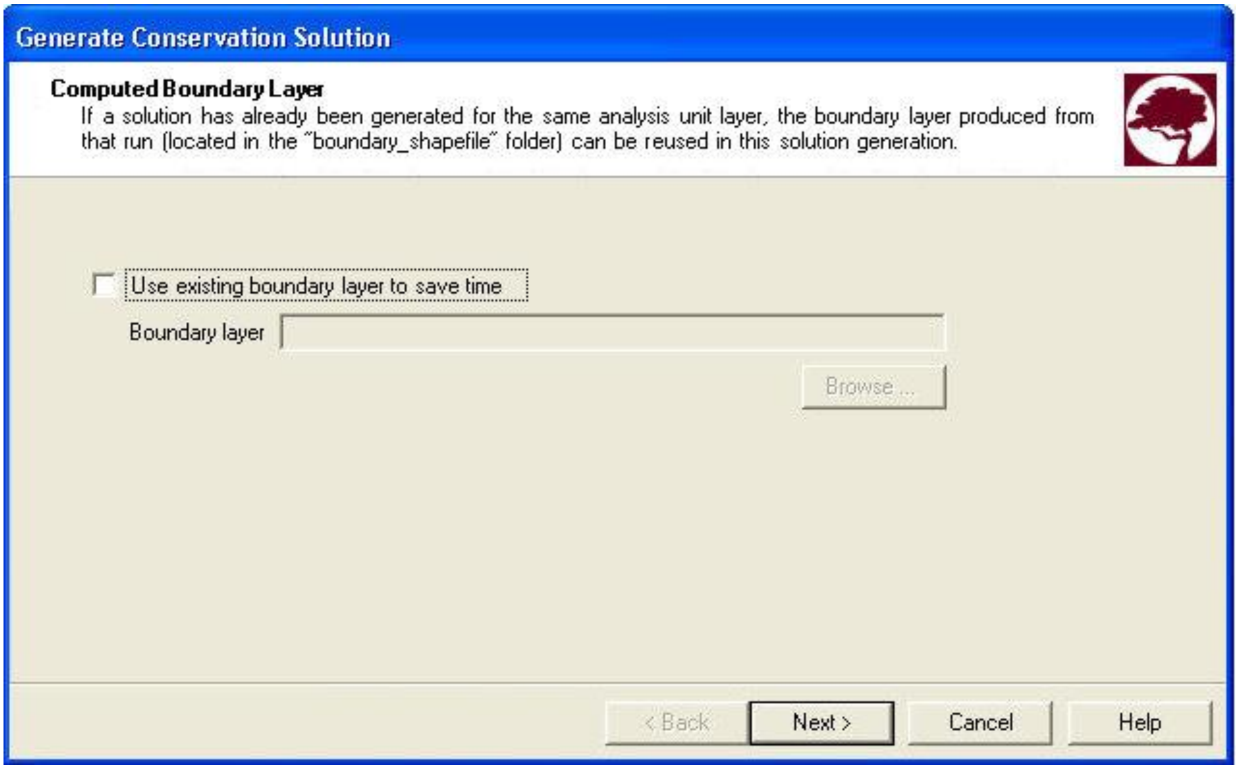
   Click **Next>**.



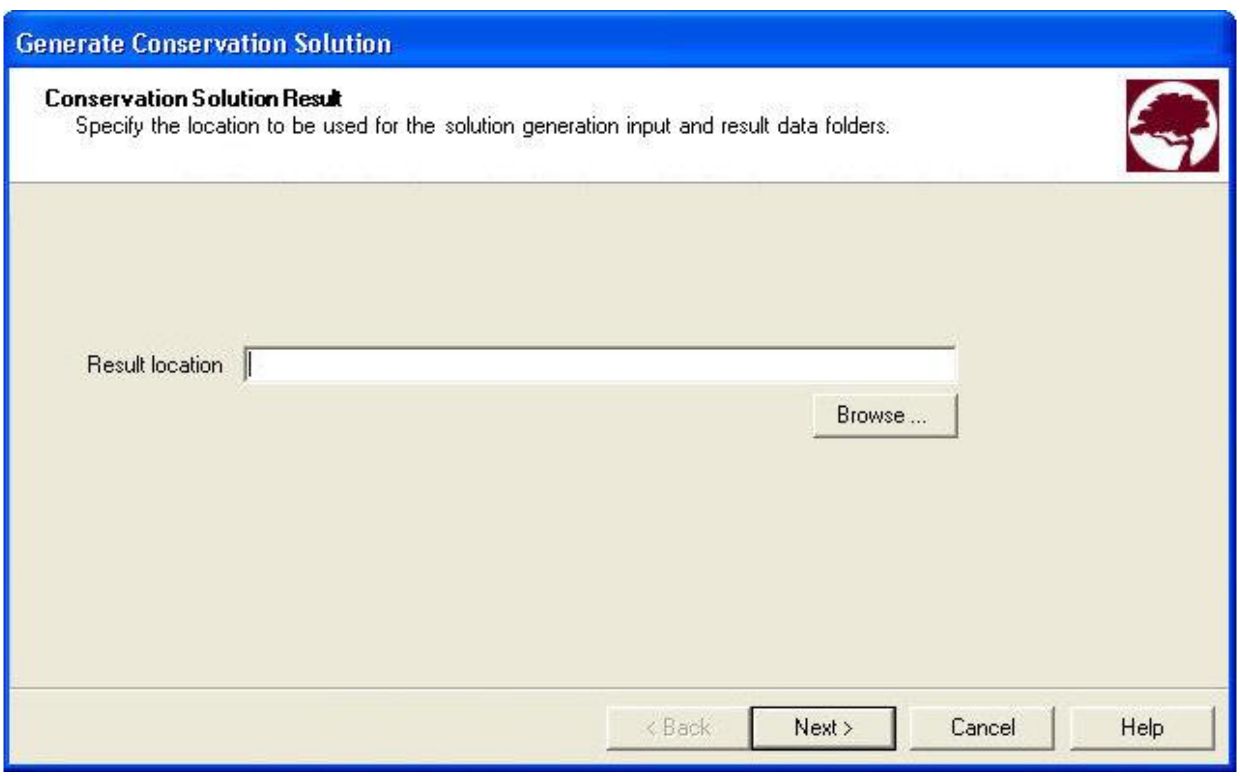
9. Specify the value to be used as the boundary length modifier in generating the solution.
10. Specify the number of iterations to be performed per run in the generation process.
11. Specify the number of runs to be performed in generating the solution. Click **Next>**.



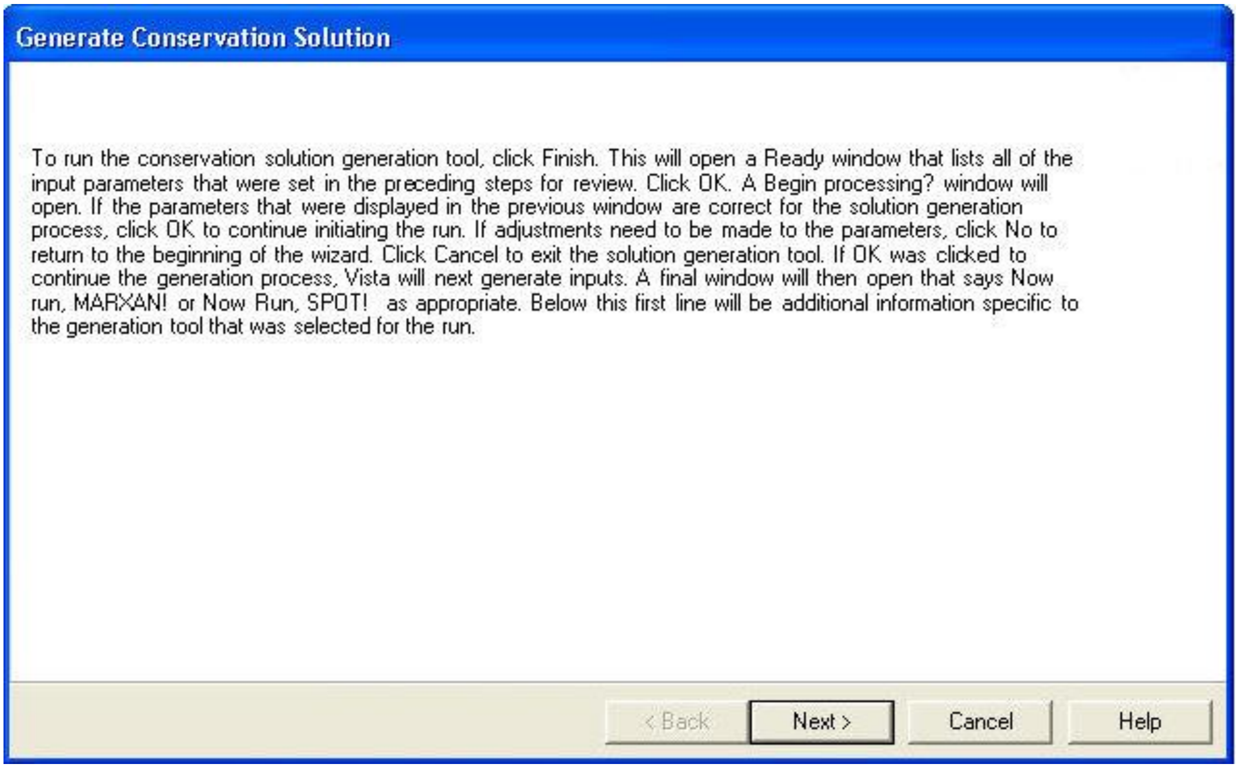
12. If a solution has already been generated using the same analysis layer as that specified for this solution, the generation time can be reduced by utilizing the boundary layer that was produced from the previous run. In such an instance, check the box to indicate that an existing layer will be used, and enter its path in the **Boundary layer** field, or click the **Browse** button to navigate to the layer (found in the ”r;boundary_shapefile” folder) and select it. Click **Next>**.



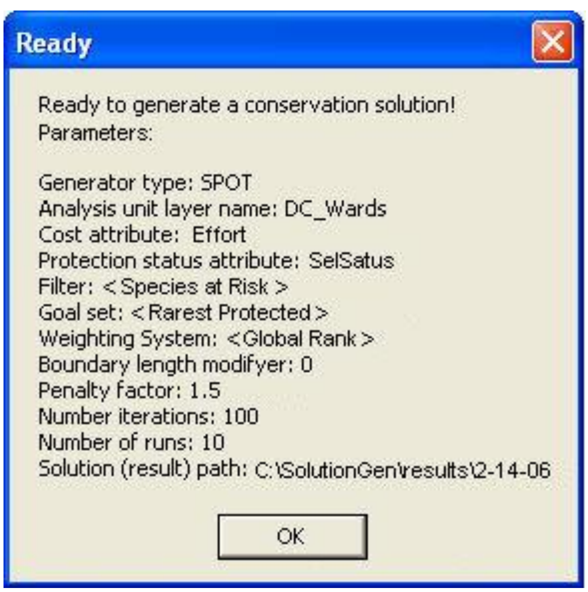
13. Specify the location to be used for folders created for the solution generation in the **Result location** field, or click the **Browse** button to navigate to the location. Click **Next>**.



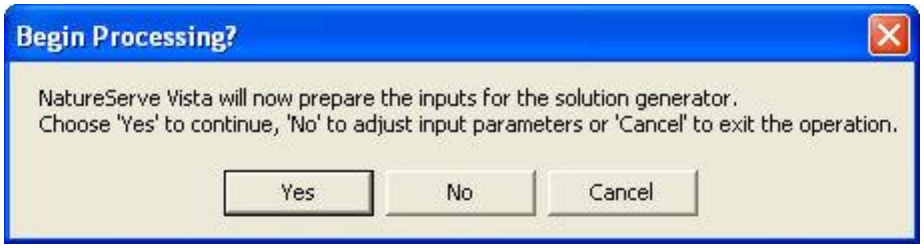
14. To begin the generation process for the solution, click **Next>**.



15. A **Ready** window will open that displays the parameters set for solution generation using the specified external solution generating application. Review the list of parameters for accuracy and click **OK**.



16. A **Begin Processing?** window will open. If the parameters that were displayed in the previous window are correct for the solution generation process, click **Yes** to continue initiating the run. If adjustments need to be made to the parameters, click **No** to return to the beginning of the wizard. Click **Cancel** to exit the solution generation tool.



If **Yes** was clicked to continue the generation process, Vista will next generate inputs.

17. A final window will then open that says **Now run, MARXAN!** or **Now Run, SPOT!** as appropriate. Click **OK** to begin generating a solution using the designated external software application.

REPORTS FROM NATURESERVE VISTA

OVERVIEW OF REPORTS

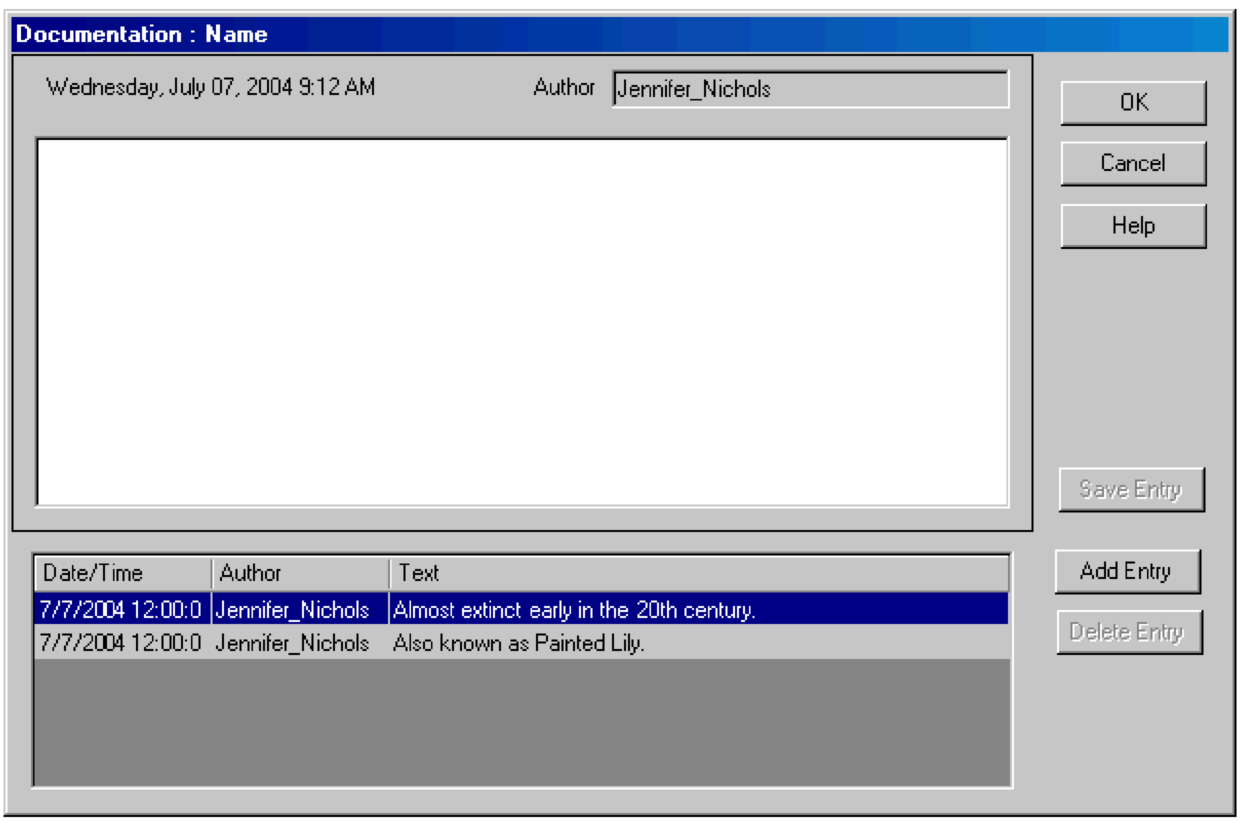
All Vista reports are presented in a web-browser interface. Reports are produced on-demand in XML (eXtensive markup language) and then transformed into HTML using XSLT stylesheets. Reports can be exported from the system to a file location, thus facilitating publication on a web site for public feedback.

Reports are produced in HTML for publication or XML for further analysis.

How to Include Associated Documentation in Reports

Information recorded in Documentation windows can be optionally included in reports. The process for including documentation is illustrated below with notes associated with the element Adobe-lily as an example.

Documentation notes for the Adobe-lily (sample entries, neither factual nor accurate) have been entered for the Name field on the Element Properties window by clicking the associated button.

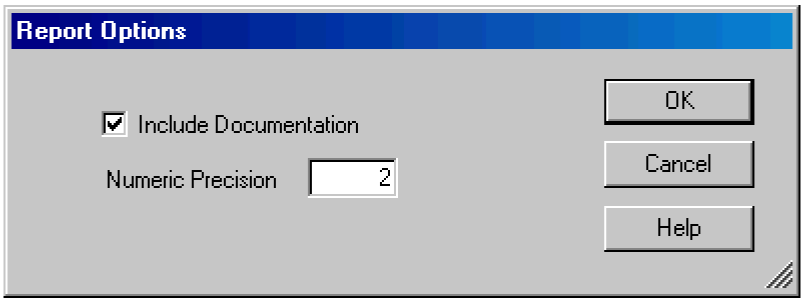


▸Using the **Report** button on the Element List window, or double-clicking on a hyper-linked entry of Adobe-lily in another window or report, generate an Element Details report for the Adobe-lily.

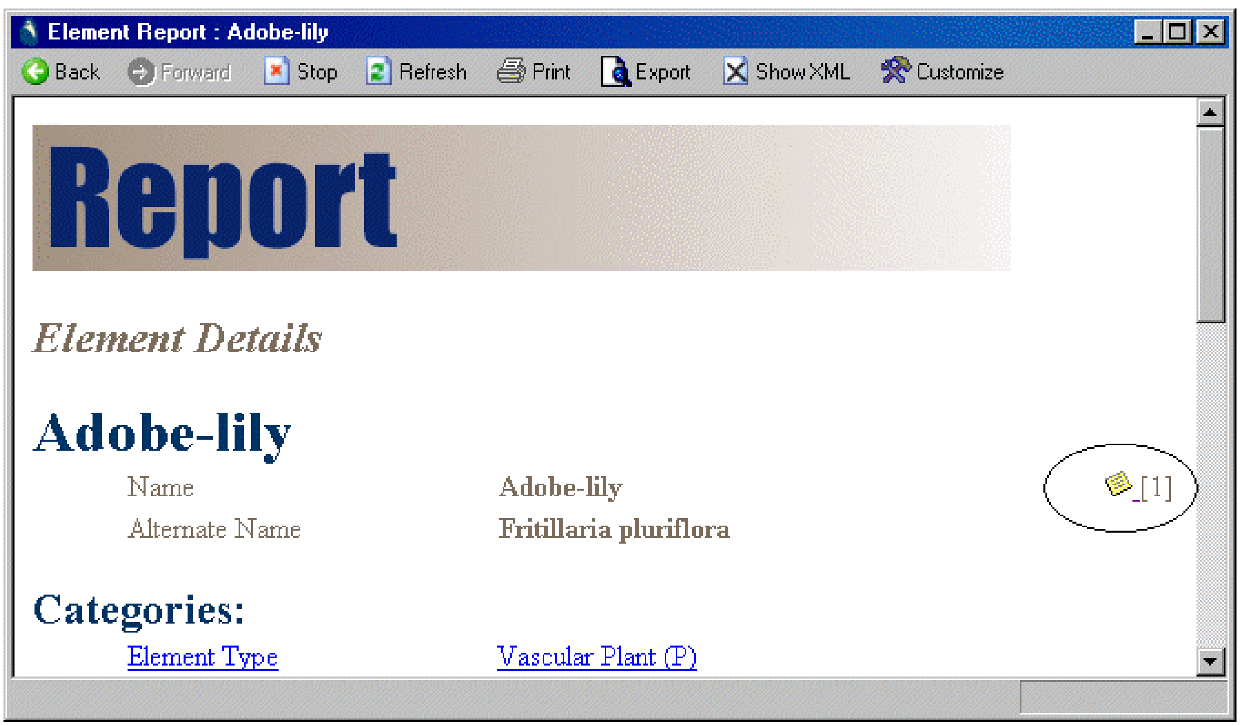
▸Click the 

button on the report toolbar.

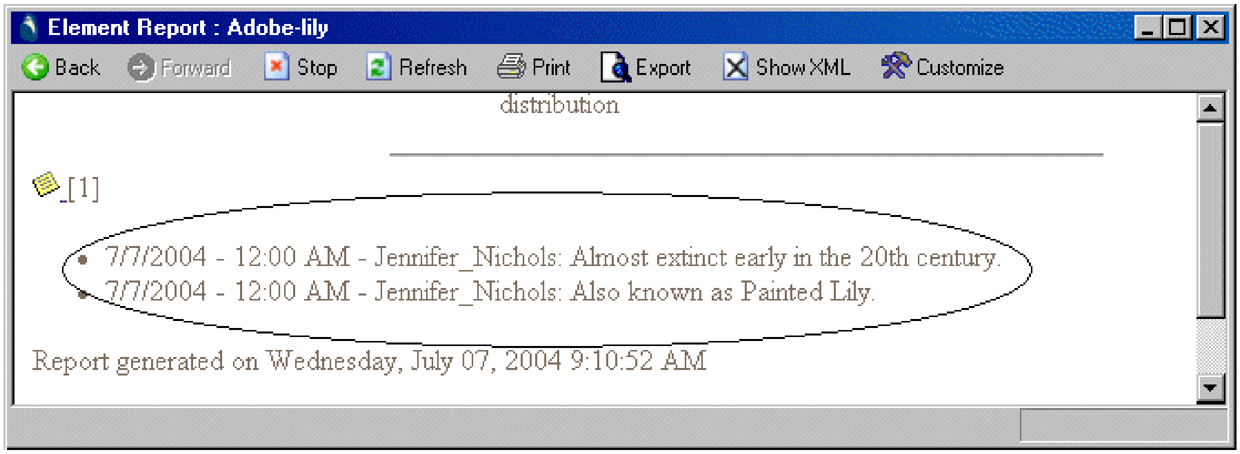
▸Check the **Include Documentation** checkbox on the resulting Report Options window, then click **OK**.



The resulting report will contain a documentation icon  to the right of any item for which additional documentation has been entered, as shown below.



The documentation associated with each icon will be displayed at the bottom of the report.



Specific Report Details

Conservation Value Summary Report

Element Details Report

Filtered Goal Set Report

This is displayed when Preview Elements button is clicked in the Evaluate Scenario window. May be other ways to display this, haven't checked yet.

Filtered Weighting System Report

This is displayed when Preview Elements button is clicked in the Summarize Conservation Value window. May be other ways to display this, haven't checked yet.

Scenario Evaluation Report

The report generated by a Scenario Evaluation provides information on both scenario inputs and results, as well as for the individual elements that were included in the evaluation.

The Scenario Evaluation Report can be opened several ways.

- Click the **Report** button on a Scenario Evaluation List window, or on a Site Analysis List window, with the desired evaluation selected in the list.
- Select the desired Scenario Evaluation on the NatureServe Vista Table of Contents (TOC), right-click, and choose **Scenario Evaluation Report** from the context window.
- With the desired Scenario Evaluation in the view, select **Reports ▸** from the NatureServe Vista menu, and then choose the evaluation from the list of reports displayed.

A list of the report entries and brief descriptions of what they represent, grouped by report headings, follows.

Scenario Evaluation

Section that provides summary information on the evaluation.

Name: Name of the Scenario Evaluation

Scenario: Name of the scenario used in the evaluation; clicking on this name will display a Scenario report

Cell size: The cell size used in the evaluation, set on the Spatial tab of the Element Properties window

Evaluates: The land status type(s) evaluated - land use compatibility and/or protection policy

Policies considered to offer "Protection": List of policies that were considered to offer reliable protection, if policy was evaluated

Filter: Name of the filter used to select elements to be evaluated for conservation goals; clicking on this name will display a Filter report

Goal set: Name of the conservation goal set utilized in the evaluation; clicking on this name will display a Goal Set report

Categorize by: Name of the category system utilized to group elements; clicking on this name will display a Category System report

Visualizations: Names of the raster layer(s) produced by the evaluation - Compatibility Conflict and/or Protection Conflict; clicking on either of these layers will display a Compatibility Conflict report or Protection Conflict report, respectively

Summary

Section that provides summary information on the entire set of elements in terms of goals met in areas that are protected and/or compatible.

Protected and Compatible: The number and percent of viable occurrences of elements with goals met in areas having policies that provide both adequate protection and compatible land uses, and the number with goals unmet in these areas

Compatible: The number and percent of viable occurrences of elements with goals met in areas having compatible land uses, and the number with goals unmet in these areas

Results by [Category System]

If a category system was specified in the **Summarize Report by** field on the Evaluate Scenario window, summary information on elements grouped according to the in terms of goals met in areas that are protected and/or compatible is provided. If a category system was not specified, elements are simply listed individually under a **Results** heading.

[Category System heading]

For each heading, the number of elements in the category is listed. Clicking on the category system heading will display a ??? report.

Other information on this tab:

Protected and Compatible: The number and percent of elements with goals met in areas having policies that provide both adequate protection and compatible land uses, and the number with goals unmet in these areas

Compatible: The number and percent of elements with goals met in areas having compatible land uses, and the number with goals unmet in these areas

Element details

Provides summary information on elements individually, although still grouped under category system headings if a system was specified, in terms of distribution and goals met in areas that are protected and/or compatible. Note that selecting any element in this section will display an Element/Scenario report for that element.

[Category System heading]

For each heading, the number of elements in the category is listed. Clicking on the category system heading will display a ??? report.

Other information on this tab:

[Name of an element]

For each element, the following information is provided:

Distribution: The total area and total number of occurrences for the individual element

Goal: The conservation goal for the element, expressed as either a percentage of the viable distribution area or as a number of viable element occurrences

Protected and Compatible: The viable area, number of viable occurrences, and percent of the total element distribution with goals met in areas having policies that provide both adequate protection and compatible land uses, and the number with goals unmet in these areas.

Compatible: The viable area, number of viable occurrences, and percent of the total element distribution with goals met in areas having compatible land uses, and the number with goals unmet in these areas.

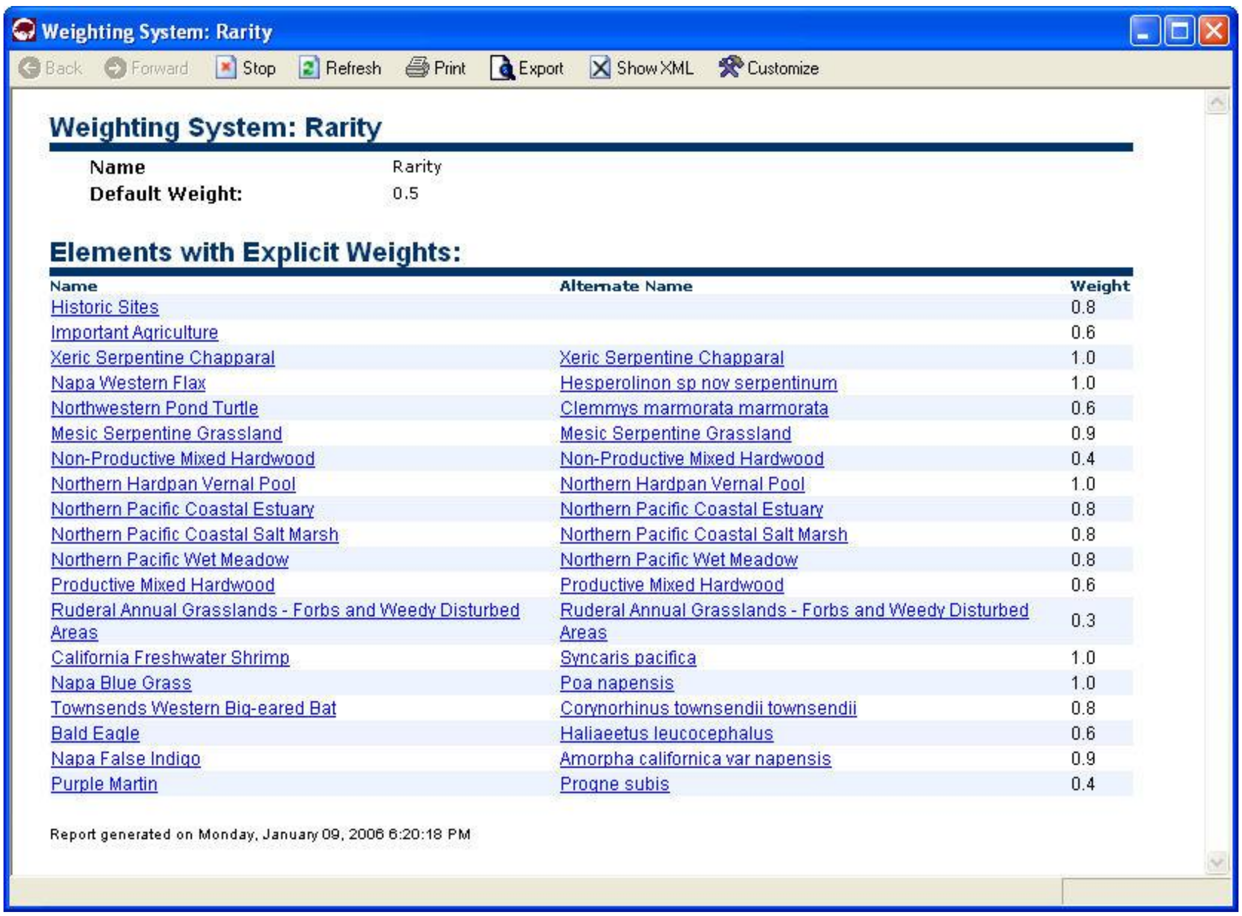
Scenario Report

Site Selection Report for a CVS

Note that, regardless of the attributes chosen in the Site Explorer Options window for display in the Site Explorer window, the Site Selection Report will display the full set of available attributes for each element in the **Element Inventory - Detail** section of the report, and all of the attributes for the site in the **Selected Sites Listing** section.

SITE SELECTION REPORT FOR A SCENARIO EVALUATION

WEIGHTING SYSTEM REPORT



Weighting System: Rarity

Name	Rarity
Default Weight:	0.5

Elements with Explicit Weights:

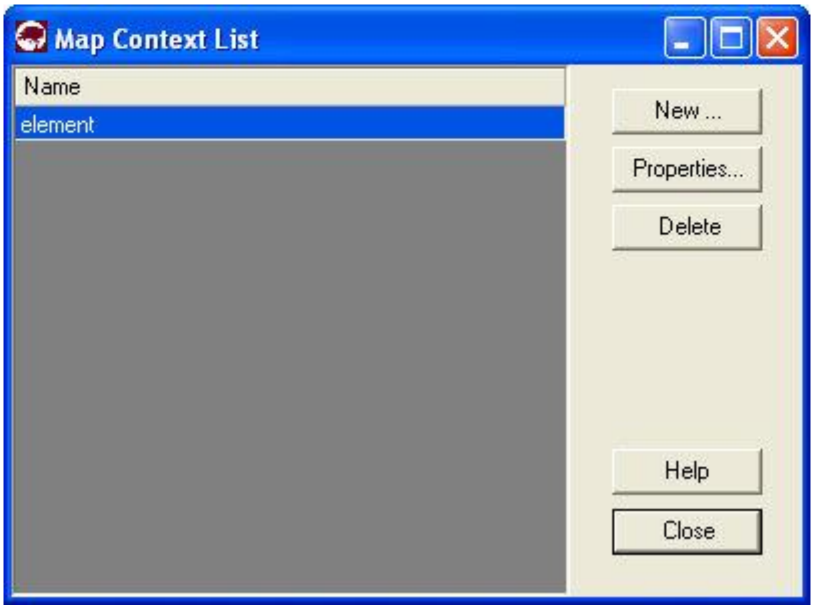
Name	Alternate Name	Weight
Historic Sites		0.8
Important Agriculture		0.6
Xeric Serpentine Chapparal	Xeric Serpentine Chapparal	1.0
Napa Western Flax	Hesperolinon sp nov serpentinum	1.0
Northwestern Pond Turtle	Clemmys marmorata marmorata	0.6
Mesic Serpentine Grassland	Mesic Serpentine Grassland	0.9
Non-Productive Mixed Hardwood	Non-Productive Mixed Hardwood	0.4
Northern Hardpan Vernal Pool	Northern Hardpan Vernal Pool	1.0
Northern Pacific Coastal Estuary	Northern Pacific Coastal Estuary	0.8
Northern Pacific Coastal Salt Marsh	Northern Pacific Coastal Salt Marsh	0.8
Northern Pacific Wet Meadow	Northern Pacific Wet Meadow	0.8
Productive Mixed Hardwood	Productive Mixed Hardwood	0.6
Ruderal Annual Grasslands - Forbs and Weedy Disturbed Areas	Ruderal Annual Grasslands - Forbs and Weedy Disturbed Areas	0.3
California Freshwater Shrimp	Syncaris pacifica	1.0
Napa Blue Grass	Poa napensis	1.0
Townsends Western Big-eared Bat	Corynorhinus townsendii townsendii	0.8
Bald Eagle	Haliaeetus leucocephalus	0.6
Napa False Indigo	Amorpha californica var napensis	0.9
Purple Martin	Progne subis	0.4

Report generated on Monday, January 09, 2006 6:20:18 PM

Windows for Reports

MAP CONTEXT LIST WINDOW

The **Map Context List** window is displayed by selecting either **Lists ▸Map Context List...** or **Reports▸ Map Context List...** from the NatureServe Vista menu. This window lists all the map contexts that have been created for the project to be used in creating reports, if any. A map context is a stored legend that can be used to help ensure that certain features are consistently included in specific reports. Note that Vista can apply map context individually for elements in the database. Thus, a specific map context can be defined and named for every element, if desired. For example, a map context could be created for a particular element, such as bald eagle, which would include layers that should always be displayed in a report on bald eagles (e.g., hillshade, rivers, county boundaries, watersheds).



Button functions:

New... displays a new Map Context Properties window that can be used to develop a new map context to be used in the project.

Properties... displays the Map Context Properties window showing details and allowing edits to the context selected in the list.

Delete deletes the map context selected in the list. A **Confirm Delete** window is displayed before the deletion is implemented.

Help opens the on-line documentation.

Close closes the window.

MAP CONTEXT PROPERTIES WINDOW

The **Map Context Properties - <New>** window is displayed by clicking the **New...** button on the Map Context List window. The new properties window is used to create a new map context that can be used to help ensure that certain features are consistently included in specific reports.

Create a map context:

1. Specify a name for the new map context in the **Name** field. The **<New>** on the window title will change to the name of the new map context as the entry is typed in.
2. Select the content layers to be displayed when the map context is applied by either selecting the layers from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. (Layers will be displayed in the drop-down menu only if the layer is the correct feature type and is included on the Display Type tab of the left pane of the Vista application, referred to as the Table of Contents [TOC].)
3. Using the up and down arrow buttons, set the order in which features will draw by changing the order of the layers as needed. Click the delete button (red X) to remove any layers.
4. If the application should automatically display the full extent of the content layers selected when the map context is applied, check the **Zoom to Content Extent** checkbox.
5. To close the window and save the data entered for the map context click **OK**; otherwise, click **Cancel**.

Edit a map context:

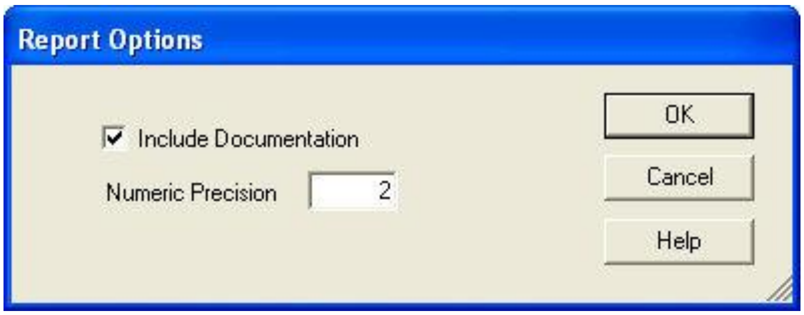
1. Select the map context from the list on the [Map Context List window](#) and click the **Properties...** button. The resulting properties window displays the map context.
2. Edit the map context using the processes described above for creating a new map context as guidelines.

3. To close the window and save any changes made to the map context click **OK**; otherwise, click **Cancel**.

REPORT OPTIONS WINDOW

The **Report Options** window is displayed by clicking the 

button on the toolbar displayed in a report. This window provides the ability to set options for data to be included in a report.



Set report options:

1. Indicate that documentation is to be included in the report by checking the **Include Documentation** checkbox. The term "documentation" refers specifically to any information entered in a Documentation window associated with data included in the report.
2. Enter a number in the **Numeric Precision** field that indicates the digits to be displayed to the right of the decimal point for numeric values in the report.
3. To close the window, saving any changes made to the options click **OK**; otherwise, click **Cancel**.

ADDITIONAL TOPICS

DETERMINING GRID CELL SIZE

All data sets that are derived and used in analysis in NatureServe Vista are in raster format. (For an explanation of raster data, please see Environmental Systems Research Institute [ESRI] help files). The grid cell size (pixel size) to be used as the default for rasters throughout the project is specified in the Project Properties window. While it is possible to select a different cell size for each NatureServe Vista analysis, it is recommended that the project default be used unless a different size is warranted by particular circumstances (e.g., having a large input data set and limited hard disk space). In such cases, it is important to select the grid cell size that will produce the most reliable results for the analysis. In determining cell size there are several considerations, listed and then described in detail below.

- Resolution of inputs
- Snap raster
- Space requirements
- Processing time

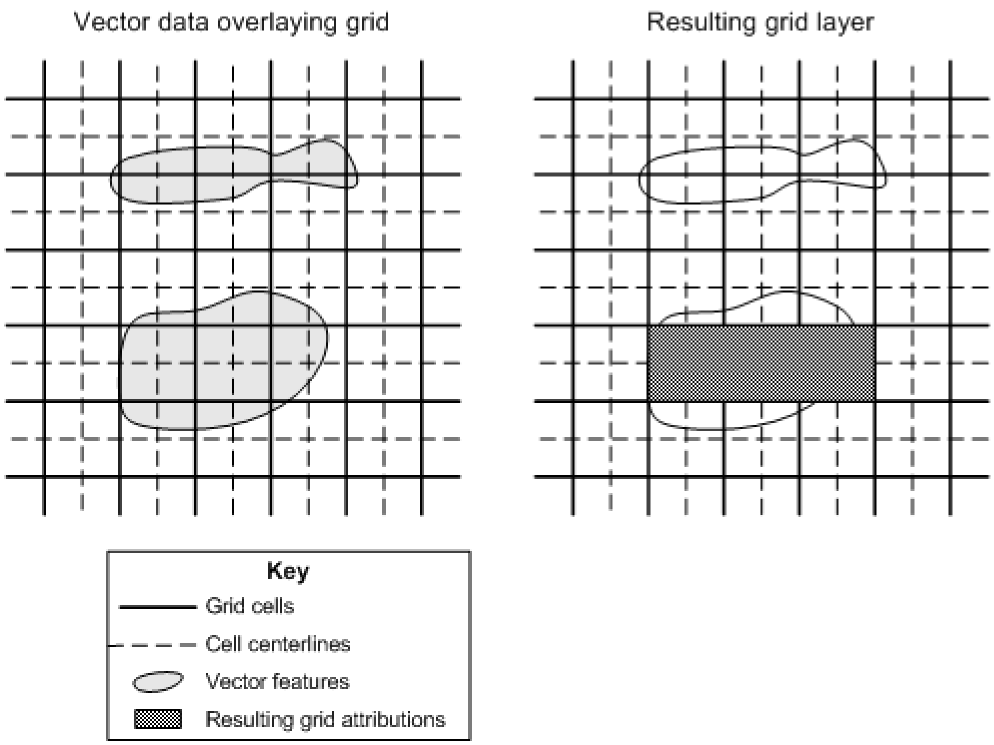
Resolution of inputs

No data set can be more precise and accurate than the original source data. If the input data have a cell size of 100 meters, it would be impossible for any derivative data set to be more precise than that 100 m. So, selecting a cell size smaller than this (i.e., <100 m) would cause unnecessary processing without increasing the reliability of the data. Similarly, if the input source data are in vector format, selecting a cell resolution that represents a scale more precise than the input data sets would result in unnecessary processing, and could falsely imply more precision than is actually represented in the data set.

On the other hand, selecting a cell size that is too large for input data can cause the ”loss” of information. When a vector layer is rasterized, it is possible for an entire vector feature to be positioned in the new grid such that it completely disappears from the data set. The process implemented by a GIS system to determine which cells will be attributed with a vector’s value works like this:

- An imaginary line is drawn horizontally through the grid cells
- Any cell whose centerline is overlapped by a vector feature is attributed with that feature’s attribute

The following example illustrates how a cell size that is too large for the input data can cause information to be unrepresented in the resulting raster. The upper polygon completely disappears from the resulting raster data set because of its size and position in the grid.



Snap raster

NatureServe Vista utilizes the snap raster functionality in ESRI's ArcView application to tie spatial data layers as closely as possible so that relationships can be maintained between the layers throughout analyses, and results will be reliable. To insure this, the same cell size as that in the snap raster, or an even subdivision of that size (a power of 2, i.e., 1/8, 1/4, 1/2, 2, 4, 8) should be used for layers in analyses. (See the section on Snap Raster for more details.)

Space requirements

Using a larger cell size means that fewer cells are required to cover the project area. Fewer cells correspond to less space required on the hard drive for each analysis. For example: Halving the cell size used for a data set may increase the disk space required to house it by up to 4 times (depending on storage type).

Processing time

Since using smaller cell sizes requires more cells to be used to cover a project area, the cell size directly affects the processing time required for each analysis. More cells mean longer processing time. A decrease in cell size can cause a dramatic increase in the time that it takes for an analysis to run.

Assessing space and time requirements for analyses

While it is very important that the results of analyses are as precise as possible, determining the cell size to be used for an analysis will likely be dependant to some degree on the speed of the processor and the space available on the computer to be used for running analyses, as well as on the cell size used for snap raster. The objective in selecting a cell size is to, then, balance the need for precision against the practical factors of disk space and processing speed.

There are different methods for determining the ”best" cell size to be used for a particular analysis, described below. It should be recognized, however, that because of the great variability in input data - both element distributions as well as land use and policy layers - used to develop rasters, using these methods may, at best, provide only a very rough estimate of the time and space requirements for the analysis using a particular cell size.

Conservation Value Analyses:

1. Determine the smallest feature in the distribution layers for elements to be included in the analysis that needs to be represented in the raster developed for the analysis. This will help to ensure that all the input data is represented in the resulting rasters.
2. Divide the area of that feature by 4, or its length by 2 if it is an arc.
3. Adjust this value slightly as needed for snap raster. This will be the cell size to be evaluated.
4. Develop an Element Conservation Value (ECV) layer for a representative element using this cell size and take note of the time required to finish processing.
5. Browse to the resulting layer on the computer hard drive and take note of its size.
6. Inspect the resulting layer to insure that occurrences were not "lost."

This method will provide a baseline cell size for the analysis. If the decision is made to use this cell size for the Element Conservation Value rasters to be included in a Conservation Value Summary (CVS), a rough calculation of the space and time required for developing the layers can be calculated as follows:

# of elements * baseline processing time

or

# of elements * baseline size of resulting raster

If the estimated time and/or space requirements for the analysis are impractical, increase the cell size and re-evaluate. The cell size that strikes an appropriate balance between precision and processing requirements is the size appropriate for use in the analysis.

Note that unless specifically set, a Conservation Value Summary will utilize the minimum cell size of the raster Element Conservation Value layers that are used as input. This size should only be changed if there are problems with disk space and/or processing time. In cases when the cell size is changed, it should be changed consistently for all Conservation Value Summaries that cover the same area.

Scenario Evaluations:

1. Determine the smallest feature in the distribution layers for elements to be included in the analysis, and the smallest planning unit on which decisions will be based (e.g., parcel), and then use the smaller of these two features. This will help to ensure that all the input data is represented in the resulting rasters.
2. Divide the area of that feature by 4, or its length by 2 if it is an arc.
3. Adjust this value slightly as needed for snap raster. This will be the cell size to be evaluated.
4. Define a scenario (land use and/or policy depending on the scenario evaluation to be performed) using this cell size and take note of the time required to finish processing.
5. Then evaluate the scenario using a single element, again taking note of the time required to finish processing.
6. Browse to the resulting layers on the computer hard drive and take note of their sizes individually.

This method will provide a baseline cell size for the analysis. If the decision is made to use this cell size for defining and evaluating scenarios, a rough calculation of the space and time required for each part of the analysis can be computed as follows:

Defining scenarios:

# of scenarios to be defined * baseline processing time for import process

or

# of scenarios to be defined * baseline size of resulting raster(s)

Evaluating scenarios:

# of elements * baseline processing time for evaluation * # of scenarios evaluated (considering different goal sets)

or

# of elements * baseline size of resulting raster(s) * # of scenarios evaluated (considering different goal sets)

The total estimated space and processing time for scenario evaluation analyses might then be calculated by summing the values for the separate scenario processes of defining and evaluating scenarios. Note that it may be complicated to determine accurate totals for scenario evaluations due to the fact that different numbers of elements can be evaluated with the same or different scenarios, using the same or different goal sets.

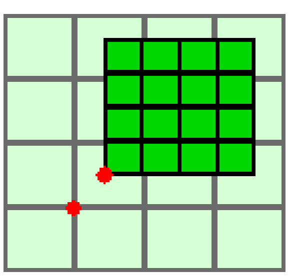
If the estimated time and/or space requirements for the analysis are impractical, increase the cell size and re-evaluate. The cell size that strikes an appropriate balance between precision and processing requirements is the size appropriate for use in the analysis.

It should be recognized that there can be great variability in the input data - both element distributions as well as land use and policy layers - used to develop rasters, and so using either of the above methods may, at best, provide only a very rough estimate of the processing time and space requirements for an analysis using a particular cell size.

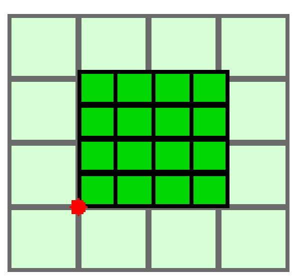
SNAP RASTER

Internally, all analyses in NatureServe Vista utilize layers in raster format. The information a user can designate for element distributions or scenario inputs, however, can be either in raster or vector format. (For information on raster and vector data, see the Environmental Systems Research Institute (ESRI) help files.) Vista converts all vector data layers received into raster layers before processing them during an analysis. This conversion can lead to the introduction of positional error. To minimize this error, Vista utilizes the snap raster functionality in ESRI's ArcView application.

It is important to tie the differing layers in space as closely as possible so that relative spatial relationships can be maintained throughout analyses and results will be reliable. To accomplish this, each imported layer is "snapped" to the raster layer designated in the **Snap Raster** field of the Project properties window. When a snap raster is utilized, the extents of an imported layer are essentially rounded off so that a corner falls exactly on a cell boundary of the snap raster, specifically the closest intersection of four cells in the snap raster, as illustrated below.

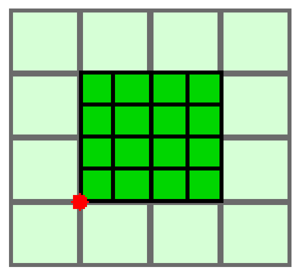


Layers associated without snap raster.



Layers aligned using snap raster.

While a snap raster improves the correspondence between different data layers, the results of analyses become even more reliable the closer the cell size designated for imported layers is to that of the snap raster. The best way to insure alignment of spatial data for analyses is to use the same cell size as the snap raster, or an even subdivision of that size (a power of 2, i.e., 1/8, 1/4, 1/2, 2, 4, 8) for imported layers, as illustrated below.



Layers aligned better using an even division of snap raster cell size.

If the snap raster and analysis cell sizes are the same, the layers will line up exactly even if the original extent of the data layer did not.

When selecting a snap raster, make sure that the cell size is appropriate for the project.

METADATA

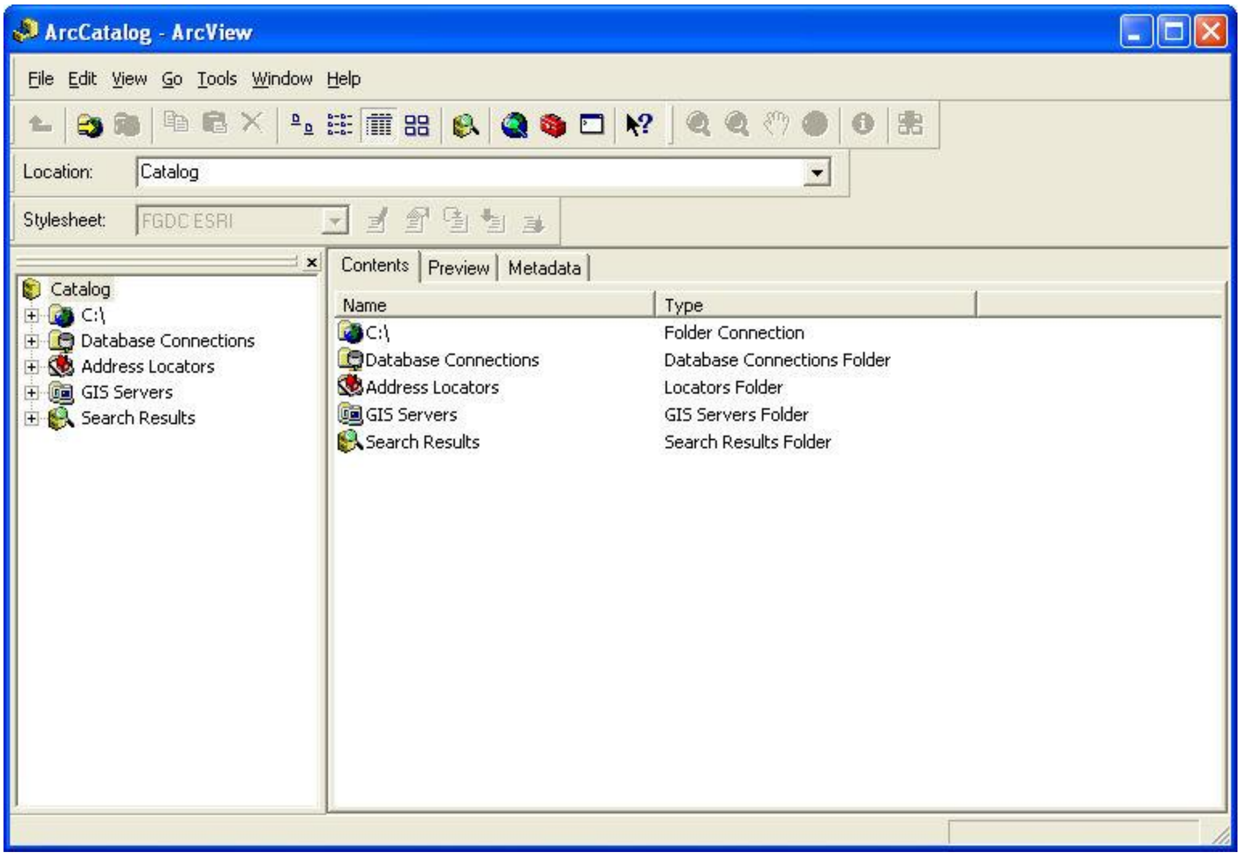
Metadata is data about data. More specifically, metadata provides a user of the data with information on all of the important characteristics of the data set (e.g., when it was created, what its limitations are, what attributes are stored in the data, etc).

The metadata created by Vista conforms to the metadata standards developed by the Federal Geographic Data Committee (FGDC), referred to as the FGDC Content Standard for Digital Geospatial Metadata (CSDGM). The CSDGM standard has been adopted by all federal agencies, and is quickly becoming the most widely-used and accepted metadata standard in the United States. (Additional information on the FGDC can be found at http://www.fgdc.gov.)

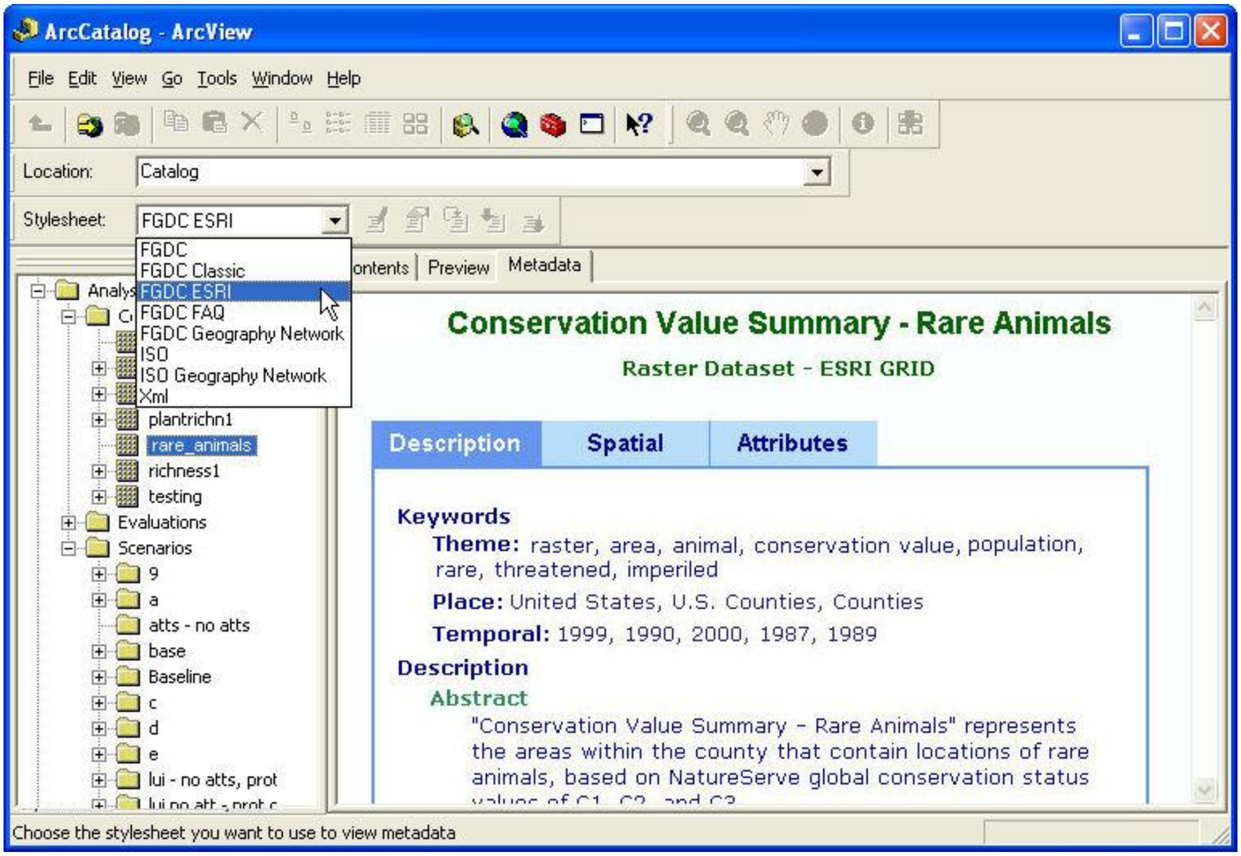
The metadata for derived layers in Vista are stored with the data set they describe. Since all the derived layers are in raster format, the files are found within the raster's directory and are named ”metadata.xml." The format of these files is extensible markup language (xml), so they can be read by any xml reader software. One such reader is included in the Environmental Systems Research Institute (ESRI) ArcCatalog software.

<u>To display metadata</u> associated with a Vista data set in an easily readable form:

1. Open ArcCatalog (AC) from the Tools menu or using the  ArcCatalog button.



2. Navigate to the raster data set through the directory hierarchy in the left portion of the AC window, and double-click to select the data set.
3. In the right hand section of the window, choose the metadata tab.



4. Select the desired format for viewing the metadata from the **Stylesheet:** drop-down list.

Different metadata can be viewed for the data set by selecting the **Description**, **Spatial**, and **Attributes** labels displayed in the right portion of the AC window.

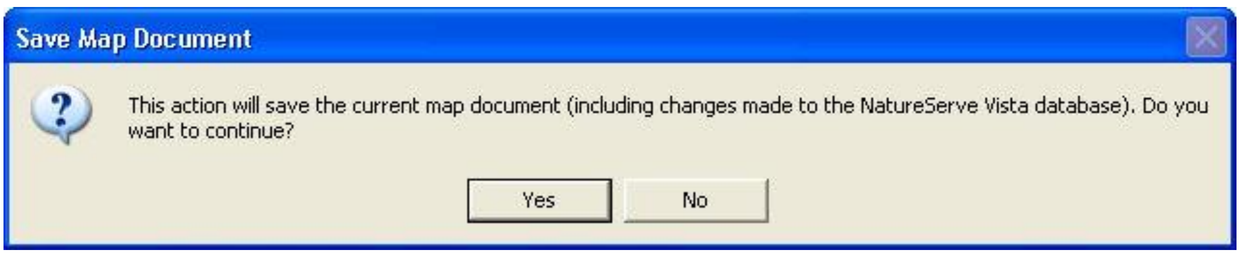
PROJECT MANAGEMENT FUNCTIONS

DETACH / ATTACH A VISTA PROJECT

When a Vista project is created, it is associated with an ArcView map document. Whenever this map document is opened, the Vista project will be loaded. However, a map document can be either detached from or re-attached to a Vista project, as described below:

Detach a Vista project

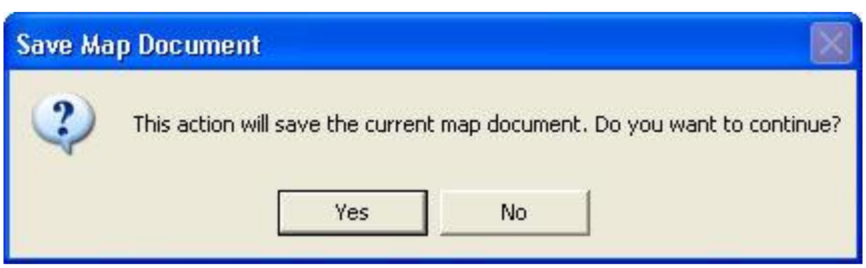
To detach a Vista project from its associated map document, select **Project ▸Detach...** from the NatureServe Vista menu. Detaching the project will cause the map document to become a regular map document (i.e., opening the map document will not cause a Vista project to load).



Click **Yes** in the Save Map Document window to finalize the detach process.

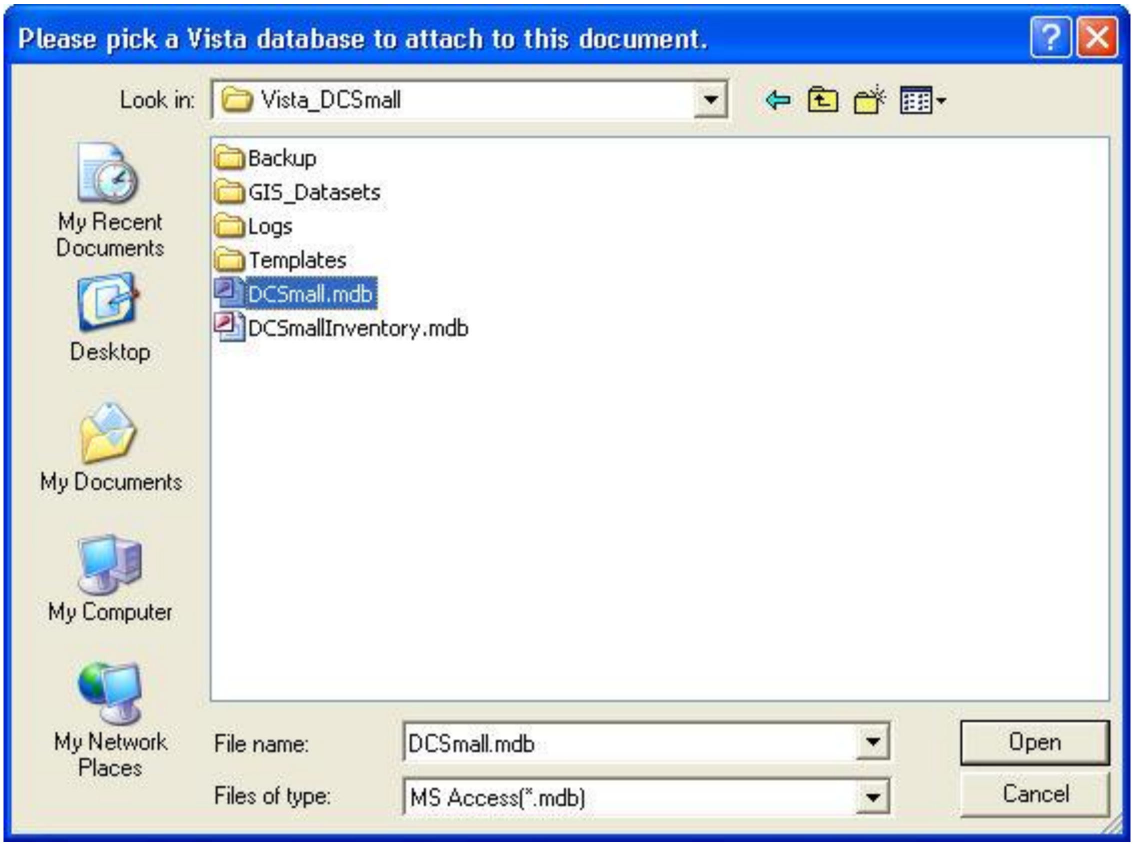
Attach a Vista project

To re-attach a map document to a Vista project, select **Project ▸Attach...** from the NatureServe Vista menu.



Click **Yes** in the Save Map Document window to continue the attach process.

A window will open for browsing to the Vista project database; typically the window will open to the appropriate folder for the Vista project. In some cases, however, the application may be unable to find the Vista project database that was associated with the map document; this typically results when the individual Vista project database or map document has been moved. However, if an entire directory containing both the map document and the project database is moved, then the application should be able to find the Vista project.

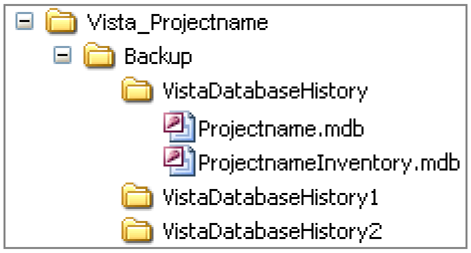


Navigate to the Vista project database, select the appropriate database file, and click **Open**. Once the correct Vista project database has been opened, it will be attached to the map document automatically.

Backup and Restore a Vista Project

Backup a Vista project

Every time a Vista project is opened or created, backup copies of the database are created automatically as two Microsoft Access files: Projectname.mdb and ProjectnameInventory.mdb. These files are stored in the Vista project location in the **VistaDatabaseHistory** folder within a **Backup** folder. When a new set of backup files are created, those in the VistaDatabaseHistory folder are replaced by the more current backup files, and those that were in that folder are moved to the VistaDatabaseHistory**1**, while those in the VistaDatabaseHistory**1** folder are moved to the VistaDatabaseHistory**2** folder. This process, then, automatically stores the last three backups of the database.



The actual replacement of backup database files with more current edited versions only occurs when the ArcMap document for the Vista project is saved (that is, **Yes** is selected in the Save Vista Project window). However, if ArcMap is exited without saving the revised project data, or if **No** is selected in the Save Vista Project window, then any changes made after the last ArcMap save will be rolled back. A Vista project will also roll back to the most recent backup database if ArcMap crashes for any reason.

Restore a Vista project

The backup databases for Vista projects described above can be used in worst case scenarios, such as when the current Vista database becomes corrupted or is accidentally deleted. In such cases, the database files in VistaDatabaseHistory folder can be copied to the Vista project location to replace the missing or corrupted database.

Summary List of Vista Windows

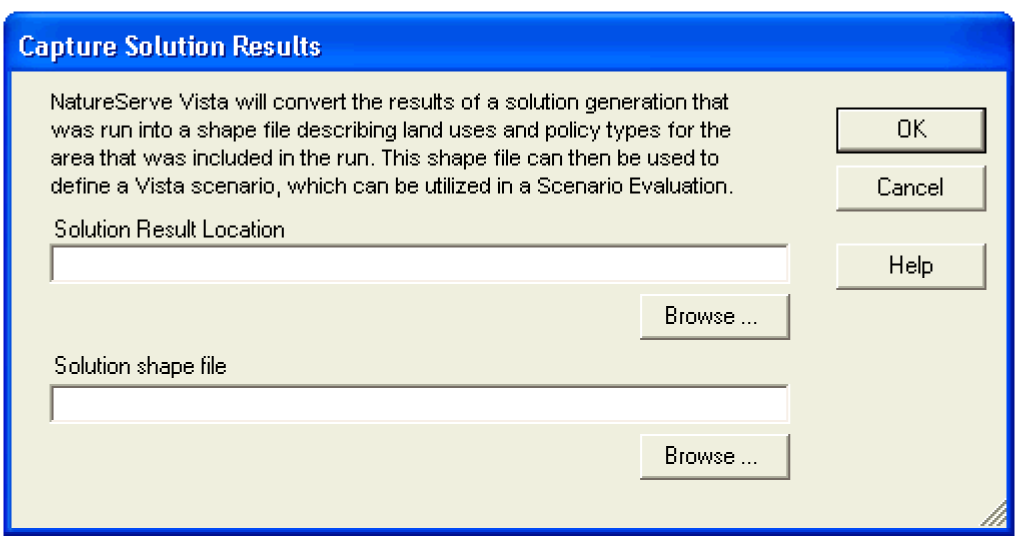
Capture Solution Results Window

The **Capture Solution Results** window is displayed by selecting **Capture Conservation Solution...** from the NatureServe Vista menu. This window is used to load results generated by external conservation solution software, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). These applications evaluate different units of land according to criteria to determine which sets, when combined into larger units (e.g., portfolios or reserve systems) result in optimal conservation solutions in terms of several factors, including cost and representation of conservation targets. The results used in Vista can consist of separate runs identifying analysis units that were selected for the solution, or can be a summed solution that indicates, for each unit, the number of runs in which it was selected. In capturing results generated by an external software, Vista produces a shape file that can be used to more easily visualize the results, as well as to define new Vista scenarios, which can then be utilized in Scenario Evaluations.

For more detailed information on the MARXAN and SPOT applications, see http://www.ecology.uq.edu.au/marxan.htm and http://www.conserveonline.org/workspaces/spot, respectively.

Capture solution results:

1. Specify the location of the solution results generated from the external application in the **Solution Result Location** field, or click the **Browse** button to navigate to the location and select it.
2. Specify the location to be used for shape file that will result from conversion of the generated solution in the **Solution shape file** field, or click the **Browse** button to navigate to the location. Enter a file name, and click **Save**.



3. Click **OK** to convert the conservation solution results into a shape file.

CATEGORY SYSTEM LIST WINDOW

The **Category System List** window is displayed by selecting **Lists ▸Category System List…** from the NatureServe Vista menu. This window lists all the category systems that have been created for the project. See the Category Systems section for more detailed information on the development and use of category systems in analyses.

Button functions:

New… displays a new Category System Properties window that can be used to develop a new category system to be used in the project.

Properties… displays the Category System Properties window showing details and allowing edits to the category system selected in the list.

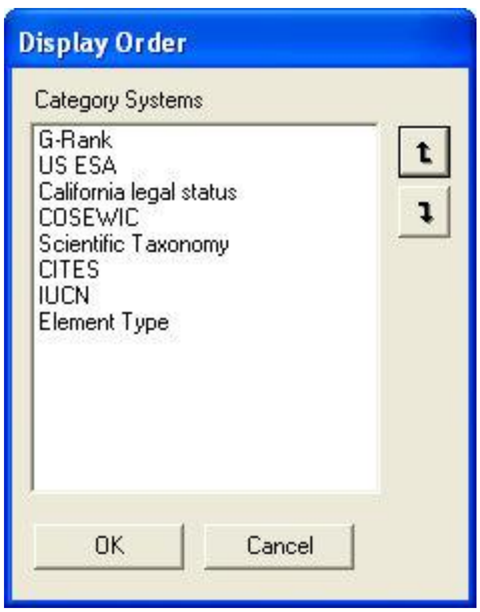
Delete… deletes the category system selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the category system is referenced by another item used in project analyses, as shown in the following example.

Report... displays a report for the selected category system that lists the categories within that system. See the Reports section for more details on Category System reports.

Display Order... results in a Display Order window, which can be used to edit the order that the category systems are listed in the Category System List window. Category systems are moved up or down in the order using the appropriate arrow button.



Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of the category system.

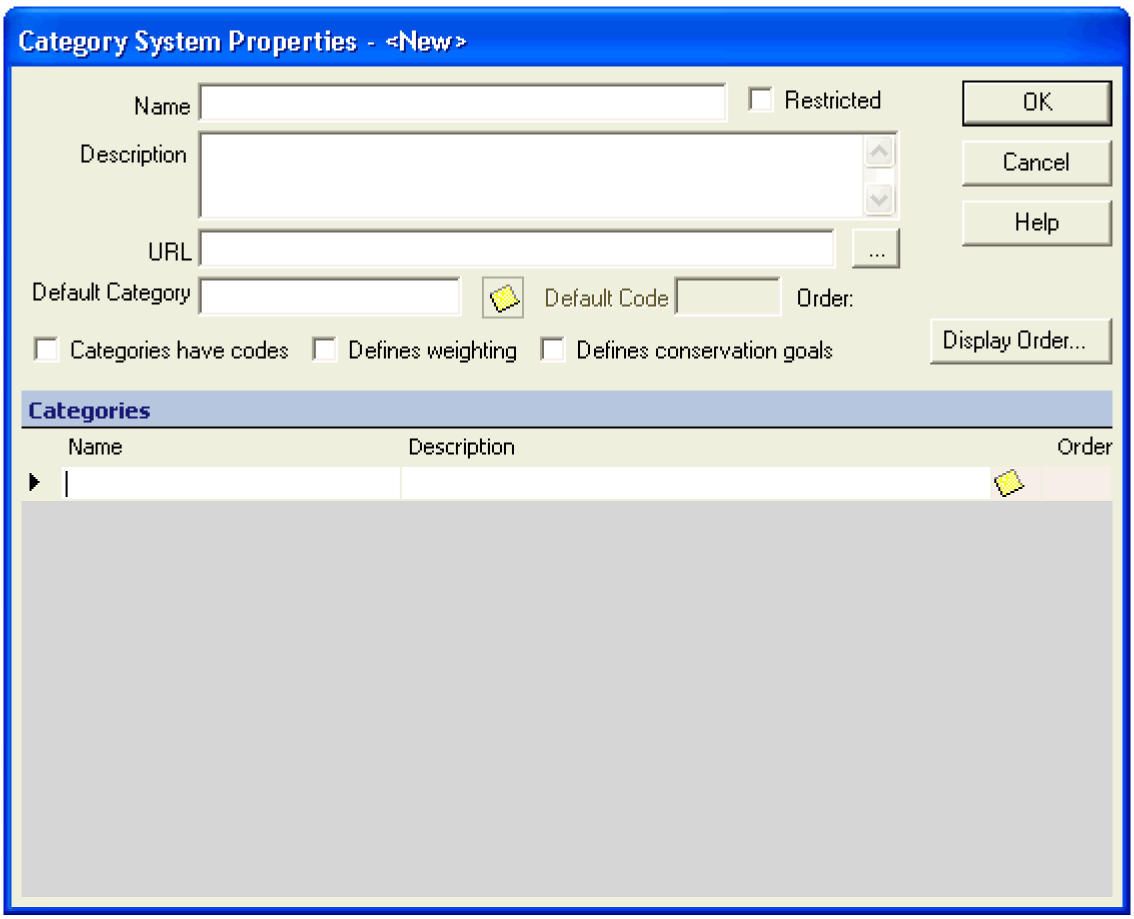
Description - description of the category system, if any.

Order - number indicating the display order sequence assigned to the category system.

Category System Properties Window

The **Category System Properties - <New>** window is displayed by clicking the **New...** button on the Category System List window. The new properties window is used to create a category system for use in the project. See the Category Systems section for more detailed information on the use of category systems in developing filters, goal sets, and weighting systems.

Note that the button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



Create a category system:

1. Specify a name for the new category system in the **Name** field. The **<New>** on the window title will change to the name of the new category system as the entry is typed in.
2. If the ability to edit the category system should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the category system in the **Description** field, if desired.

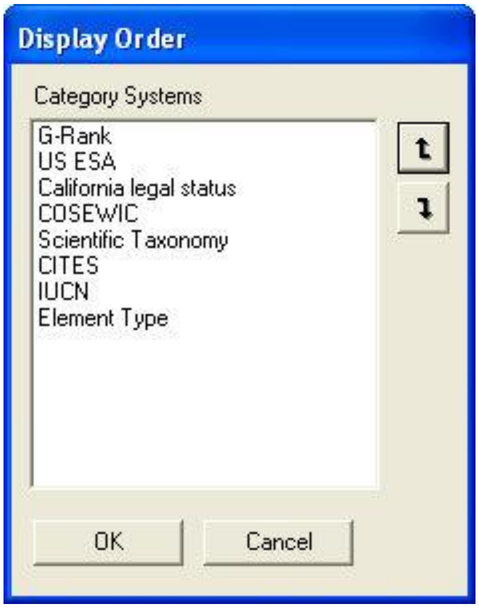
4. Enter a web address in the **URL** (Uniform Resource Locator) field. The  button can be used to open an explorer window that goes directly to the URL entered in the field, or if there is no address specified, the explorer default window will open.
5. Enter the category to be used as the default for elements not explicitly categorized in this system in the **Default Category** field. For example, if an element does not have an assigned global NatureServe conservation status, in the category system G-Rank that element would have an assigned category of Unknown (which would be the value entered in this Default Category field for the G-Rank category system). Most category systems utilize "Unknown" or "Unranked" as the default category.
6. If codes will be assigned to categories in this category system, place a check in the **Categories have codes** checkbox. Checking this item will result in the addition of a Code column to the Categories table, shown in the window below. Note that this box can be checked at any time if it is later determined that codes should be assigned for categories in the category system.
7. If codes are to be assigned for categories within the system (indicated using the checkbox described in item 6 above), then enter a code in the **Default Code** field to be used for elements not explicitly categorized in this system. The default code indicated in this field is based on the entry in the Default Category field (described in step 5 above). For example, if the default category is "Unknown", the default code entered could be "UK", as shown below.
8. If the category system will be used to define a weighting scheme, place a check in the **Defines weighting** checkbox. (See the Weighting Systems section for detailed information on weighting.) Checking this item will result in the addition of a Weighting column to the Categories table in the lower half of the window. However, this will not automatically cause weights to be added to elements during the process of creating a Conservation Value Summary, but will aid in the creation of weighting schemes later. Note that this box can be checked at any time if it is later determined that the category system will be used to define a weighting scheme.
9. If the category system will be used to define conservation goals, place a check in the **Conservation goals** checkbox. (See the Goal Sets section for detailed information on goals.) Checking this item will result in the addition of a Goal column to the Categories table in the lower half of the window. However, this will not automatically cause goals to be added to elements during the process of creating scenarios for use in Scenario Evaluations, but will aid in the creation of goal sets later. Note that this box can be checked at any time if it is later determined that the category system will be used to define conservation goals.
10. Using the Categories table in the lower half of the window, enter the name of each category in the new category system, along with a brief description, if desired. In addition, entries should be made as appropriate

in any columns added for defining codes, goals, and/or weightings associated with each category. Note that if a value for code is not assigned for a particular category, Vista will use the default code specified in step 7 above. The value in the Order column of the Categories table is automatically generated as each new category is entered.

11. If it is necessary to delete a category, move the cursor to the column to the left of the Name column in the Categories table and click next to the entry to be deleted; the entire line for the category should be highlighted. Click the **Delete** button on your keyboard to delete the category. A **Cannot Delete** window is displayed in cases when the category is referenced by another item used in project analyses, as shown in the following example.

12. If the order that the different categories within the category system are listed needs to be changed, use the **Display Order...** button to invoke the Display Order window. Although an order column is shown in the Categories table on the Category System Properties window, changes to the order of listed categories can only be made using the Display Order window. Categories are moved up or down in the order using the appropriate arrow button.

13. The value displayed for Order (located to the right of the Default Code field) indicates the position of the default code in the list of categories for the system. For example, if the category system is G-Rank, the default category is "Unknown," and the display order for categories was set by the user to be G1, G2, Unknown, G3, G4, then the value would be "Order: 3" indicating that the default category and code are in the third position in the display order. If there is no order specified for the default category, then the value for Order is automatically set to the last position in the category sequence.



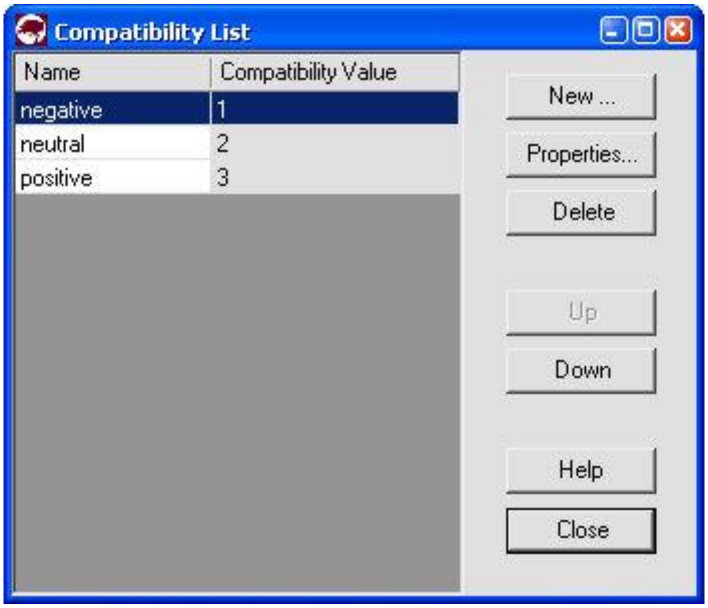
14. To close the window and save the data entered for the category system click **OK**; otherwise, click **Cancel**.
15. To review details on the new (saved) category system, select the system on the Category System List window and click the **Report** button. Settings for the category system, as well as goals and/or weights assigned to specific categories will be displayed. See the Reports section for more details on Category System reports.

Edit a category system:

1. Select the category system from the list on the **Category System List** window (e.g., Element Type) and click the **Properties...** button. The resulting properties window displays data for each category in the category system.
2. Data for the existing category system displayed in this window can be edited using the processes described above for creating a new category system as guidelines.
3. To close the window and save any changes made to the category system click **OK**; otherwise, click **Cancel**.

Compatibility List Window

The **Compatibility List** window is displayed by clicking the **Responses...** button on the Compatibility tab of the Element Properties window, and is used to create and edit the set of Land Use Intent (LUI) compatibility responses used for Scenario Evaluations. For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.



Button functions:

New... displays an Edit Compatibility Response window that can be used to develop a new compatibility response to be used in the project analyses.

Properties... displays the Edit Compatibility Response window showing details of existing compatibility responses and allowing edits to the response selected in the list.

Delete deletes the compatibility response selected in the list.

A window is displayed in cases when the compatibility response is assigned to one or more LUI categories in the Element Properties window and cannot be removed.

Up Moves the selected compatibility response higher in the list of responses, and changes the associated sequential number accordingly. The resulting order of responses is displayed on the Compatibility tab of the Element Properties window.

Down Moves the selected compatibility response lower in the list of responses, and changes the associated sequential number accordingly. The resulting order of responses is displayed on the Compatibility tab of the Element Properties window.

Help opens the on-line documentation.

Close closes the window.

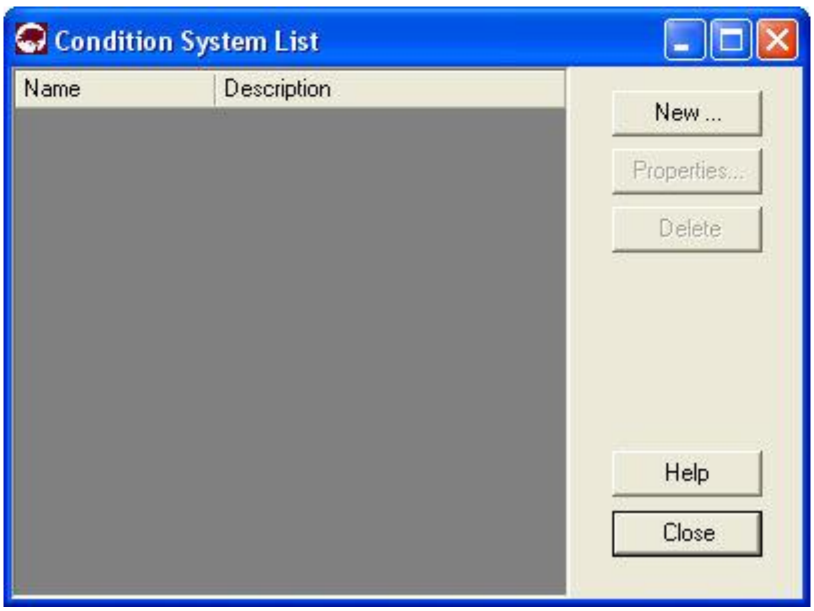
Columns displayed:

Name - name of the compatibility response.

Compatibility Value - sequential number associated with a particular compatibility response.

Condition System List Window

The **Condition System List** window is displayed by selecting **Lists ▸Condition Systems List** from the NatureServe Vista menu. This window lists all the condition models that have been created in the project. See the Landscape Condition Models section for more detailed information on condition models.



Button functions:

New... displays a new Edit Condition System window that can be used to create a condition model.

Properties... displays the Edit Condition System window showing details and allowing edits to the condition model selected in the list.

Delete deletes the condition model selected in the list.

Help opens the on-line documentation.

Close closes the window.

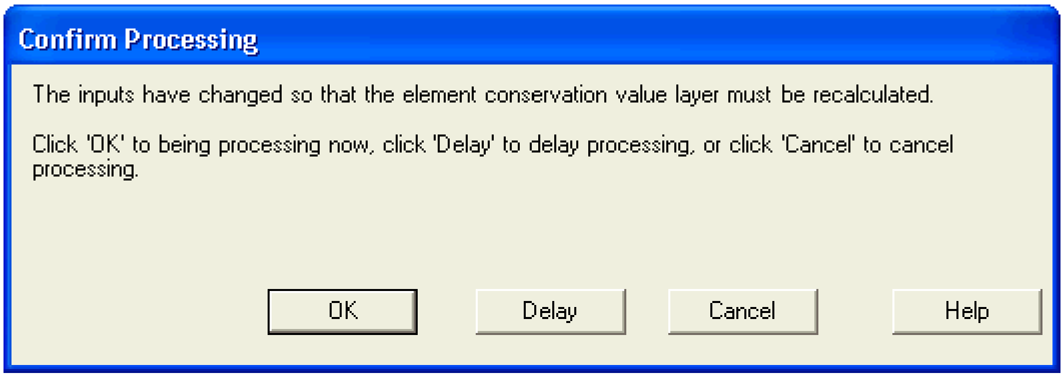
Columns displayed:

Name - name of the condition model.

Description - description of the condition model, if any.

Confirm Processing Window

Message displayed by Vista when the layer used to represent an element's distribution, specified on the Spatial tab of the Element Properties window, has been changed such that the Element Conservation Value (ECV) layer needs to be recalculated using the new layer.



Button functions:

OK causes the recalculation process for the ECV layer to begin.

Delay defers the recalculation process to a later time.

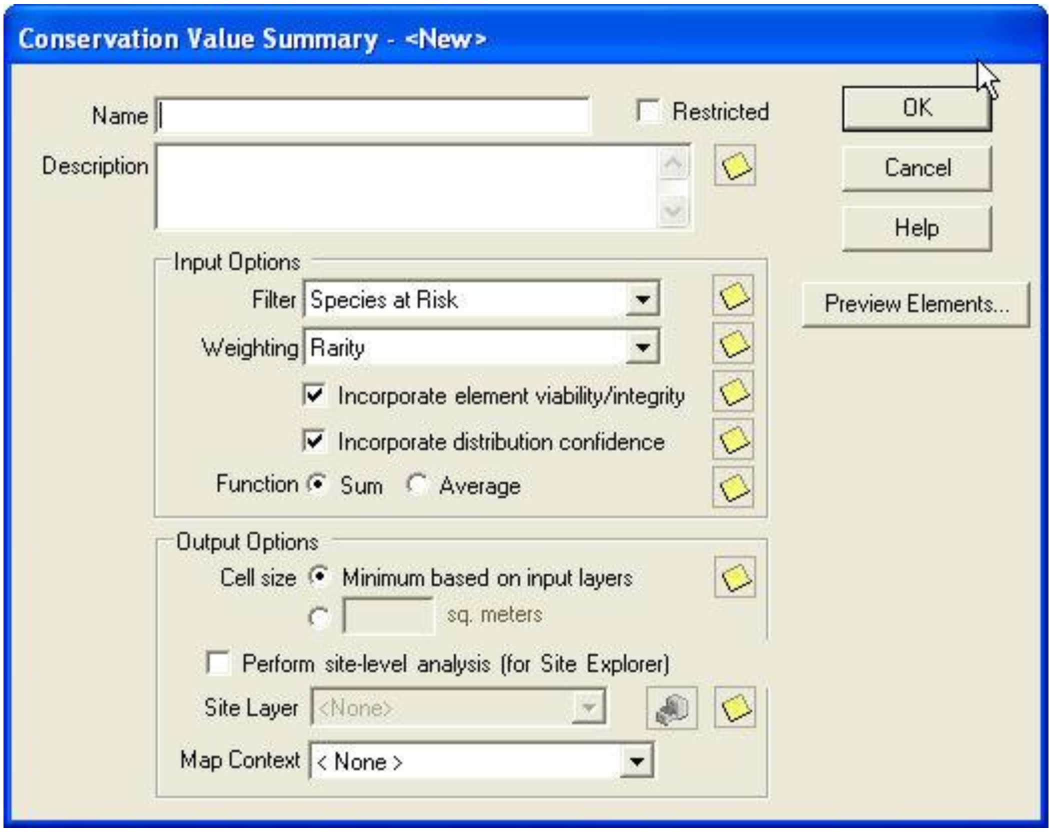
Cancel closes the window without retaining any changes.

Help opens the on-line documentation.

Conservation Value Summary Window

The **Conservation Value Summary - <New>** window is displayed by selecting **Summarize Conservation Value...** from the NatureServe Vista menu. This window is used to create Conservation Value Summaries, which indicate the conservation value of specific locations in the planning region based on attributes of elements and/or their occurrences. For more detailed information on the use of weightings, and the viability/integrity and confidence attributes in creating a Conservation Value Summary and their influence on the results, see the Different Types of Conservation Value Summaries section.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



Create a Conservation Value Summary:

1. Enter a name for the Conservation Value Summary (CVS) being created in the **Name** field. The **<New>** on the window title will change to the name of the new CVS as the entry is typed in.
2. Enter a brief description for the new CVS in the **Description** field.
3. If the ability to edit the CVS should be limited to members of the data development team, place a check in the **Restricted** checkbox.
4. Select the filter to be applied to the data set from the drop-down menu of the **Filter** field located in the *Input Options* group box, or select the **<Add New...>** value to create a new filter, or the **<Show List...>** value to display all existing filters (in order to select and modify an existing filter).
5. Select the weighting system(s) to be applied to the data set from the drop-down menu of the **Weighting** field located in the *Input Options* group box, or select the **<Add New...>** value to create a new weighting system, or the **<Show List...>** value to display all existing weighting systems (in order to select and modify an existing system).
6. Click the **Preview Elements...** button to see a Filtered Weighting System Report showing the set of elements to be included in the summary and the weightings that have been set for these elements, based on the values selected in the **Filter** and **Weighting** fields. This knowledge can be helpful prior to running the CVS. The greater the number of elements included in a

summary, the longer it will take to process; adjusting/creating a filter that will limit the CVS to just those elements that are needed will ensure the most efficient use of processing time.

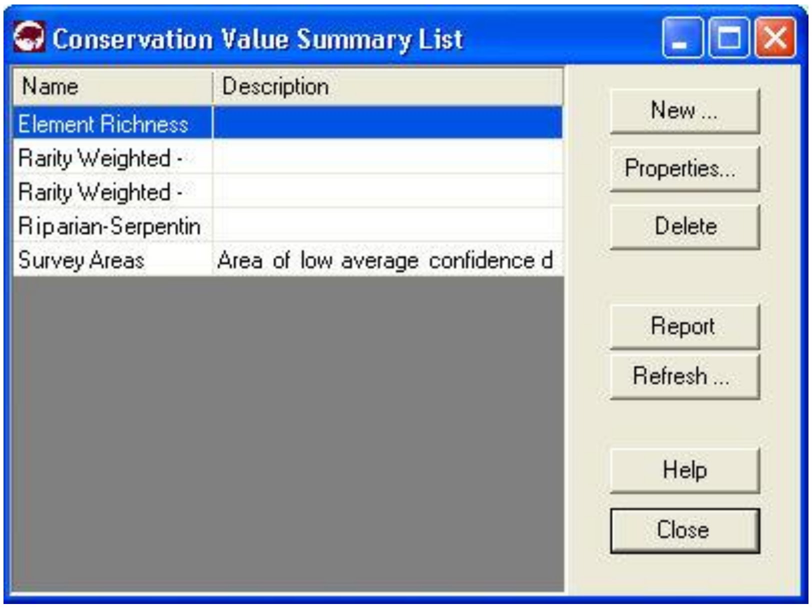
7. If element viability/integrity values are to be included in the new CVS, place a check in the **Incorporate element viability/integrity** checkbox.
8. If confidence is to be included in the new CVS, place a check in the **Incorporate distribution confidence** checkbox. The confidence attribute can be useful in determining if sufficient information exists to make conservation decisions for a particular location.
9. Indicate the function to be used in determining values for grid cells in the CVS by selecting either the **Sum** or **Average** radio button. Note that if confidence is to be incorporated in the CVS and the operation selected is **Average**, richness will not be calculated in the CVS.
10. Select the appropriate radio button to indicate whether the grid cell size in the CVS output is to be the **Minimum based on input layers**, or if the size is to be a specified area; if the latter, the system will automatically display the default cell set for the project in the Project Properties window. If an alternate cell size is desired, enter the area to be used for a grid cell. For more detailed information on cell sizes, see the Determining Grid Cell Size topic.
11. If the CVS will be used in Site Analyses, place a check in the **Perform site-level analysis (for Site Explorer)** checkbox.
12. If appropriate, specify a layer to be used in Site Analyses from the drop-down menu of the **Site Layer** field, or by using the  ArcCatalog button to browse to the layer. The land units in the layer selected will be used for detailed examination of conservation value by unit, and the contributing biodiversity elements present in those units.
13. Select a map context to be used in creating the CVS report from the **Map Context** drop-down menu, or select the **<Add New...>** value to create a new map context, or the **<Show List...>** value to display all existing map contexts (in order to select and modify an existing context).
14. Generate the CVS by clicking **OK;** otherwise press **Cancel**. Results are displayed in a CVS report. See the Conservation Value Summary Report for more detailed information.

Edit a Conservation Value Summary:

1. Select the CVS from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Conservation Value Summary Properties...** from the context window. The resulting window displays the CVS.
2. Edit the CVS using the processes described above for creating a new Conservation Value Summary as guidelines.
3. Generate the revised CVS by clicking **OK**; otherwise click **Cancel**.

Conservation Value Summary List

The **Conservation Value Summary List** window is displayed by selecting **Lists ▸Conservation Value Summary List...** from the NatureServe Vista menu. This window lists all the Conservation Value Summaries (CVS) that have been created for the project. See the Conservation Value Analyses section for more detailed information on this analysis.



Button functions:

New... displays a new Conservation Value Summary window that can be used to develop a new CVS for the project.

Properties... displays the Summarize Conservation Value window showing details and allowing edits to the CVS selected in the list.

Delete deletes the CVS selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

Report displays a report for the selected CVS that lists the settings for the summary as well as details on the individual elements that were included. See the Reports section for more details on Conservation Value Summary reports.

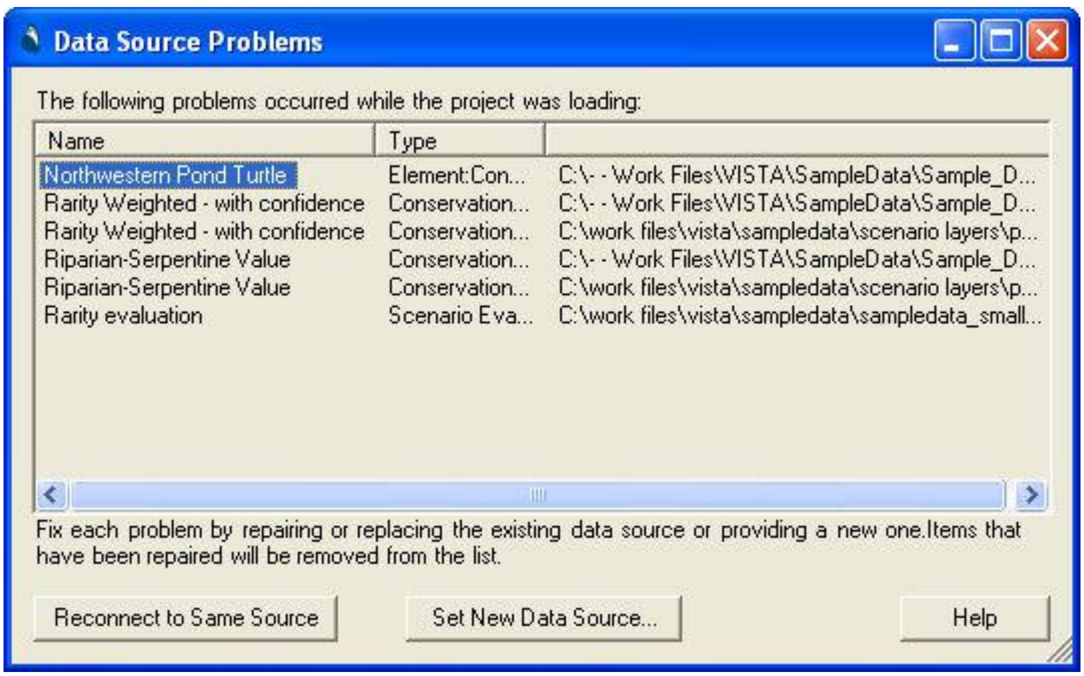
Refresh... displays the Refresh Selected Results window that can be used to refresh the data for selected CVS analyses.

Help opens the on-line documentation.

Close closes the window.

DATA SOURCE PROBLEMS WINDOW

The **Data Source Problems** window may appear when a project is opened. It indicates that there is an issue with Vista accessing one of the data layers it needs. This may be a result of files being moved on the server on which the data is held, a network problem, a deletion of data, or a possible change in drive lettering. In order for Vista to proceed without errors, the application must be redirected to find the files in question.

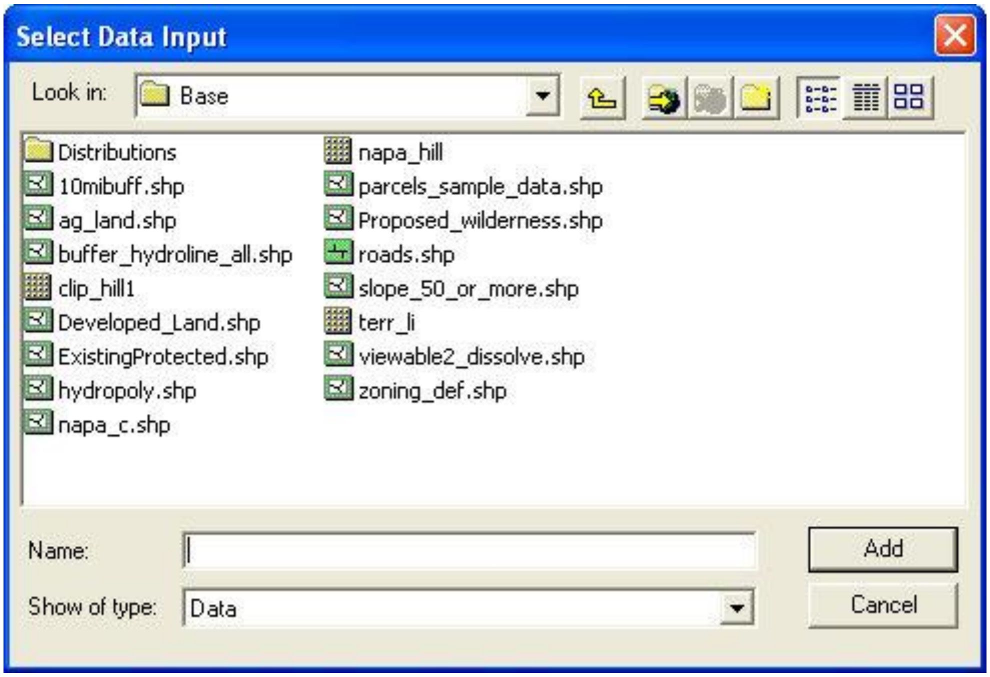


To fix a data source problem:

1. Select the name of a layer to be fixed from the list in the window. If the problem has been corrected and the application can access the file without any changes to the database (e.g., fixing a drive letter on the server), then clicking the **Reconnect to Same Source** button will allow another attempt by Vista to access the file in question.
   - If the file is found, a Repaired Datasources window will be displayed; click **OK** to close.

- However, if the file still cannot be found, an Unrepaired Datasources window will be displayed. If this happens, click **OK** to close the window and continue with step 2.

2. A change must be made in the database to allow Vista to locate the file (e.g., the file has been moved to another location on the server). Click the **Set New Data Source...** button to open up the Select Data Input window. Browse to the desired file, select, and click **Add**.



- If the new data source can be substituted for the old one, the information will be saved to the database and layer will disappear from the list in the Data Source Problem window. To resolve a datasource issue for another file, select the file and click the **Set New Data Source...** button again to continue.
- If the new data source cannot be substituted for the old one, an informational error message will appear to diagnose the problem. To resolve a datasource issue for another file, click the **Close** button on the Error window. Then press the **Set New Data Source...** button again.

3. To close the Data Source Problems window, click the **X** in the upper right corner of the window.

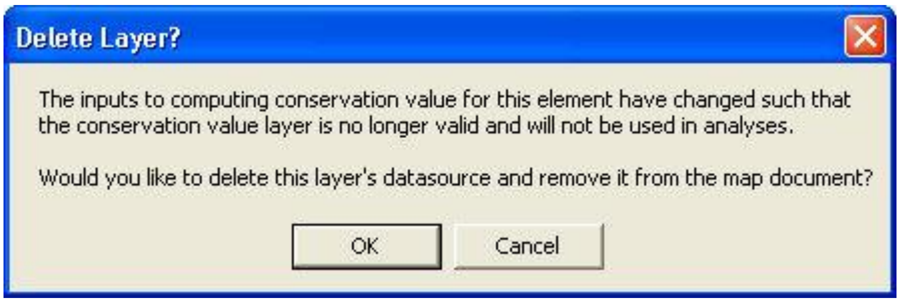
To fix a data source problem after the project has opened completely:

1. Select the layer to be fixed in the Vista Table of Contents (TOC) and right-click. A context menu will be displayed and if there is a data source problem, the **Repair Spatial Data...** option in the menu will be enabled.

2. Select the **Repair Spatial Data...** option to display the Data Source Problems window. Use the steps described above to fix the data source problem.

Delete Layer?

Message displayed by Vista when the layer used to represent an element's distribution, specified on the Spatial tab of the Element Properties window, has been changed to one that is invalid for use in calculating an Element Conservation Value layer.



Button functions:

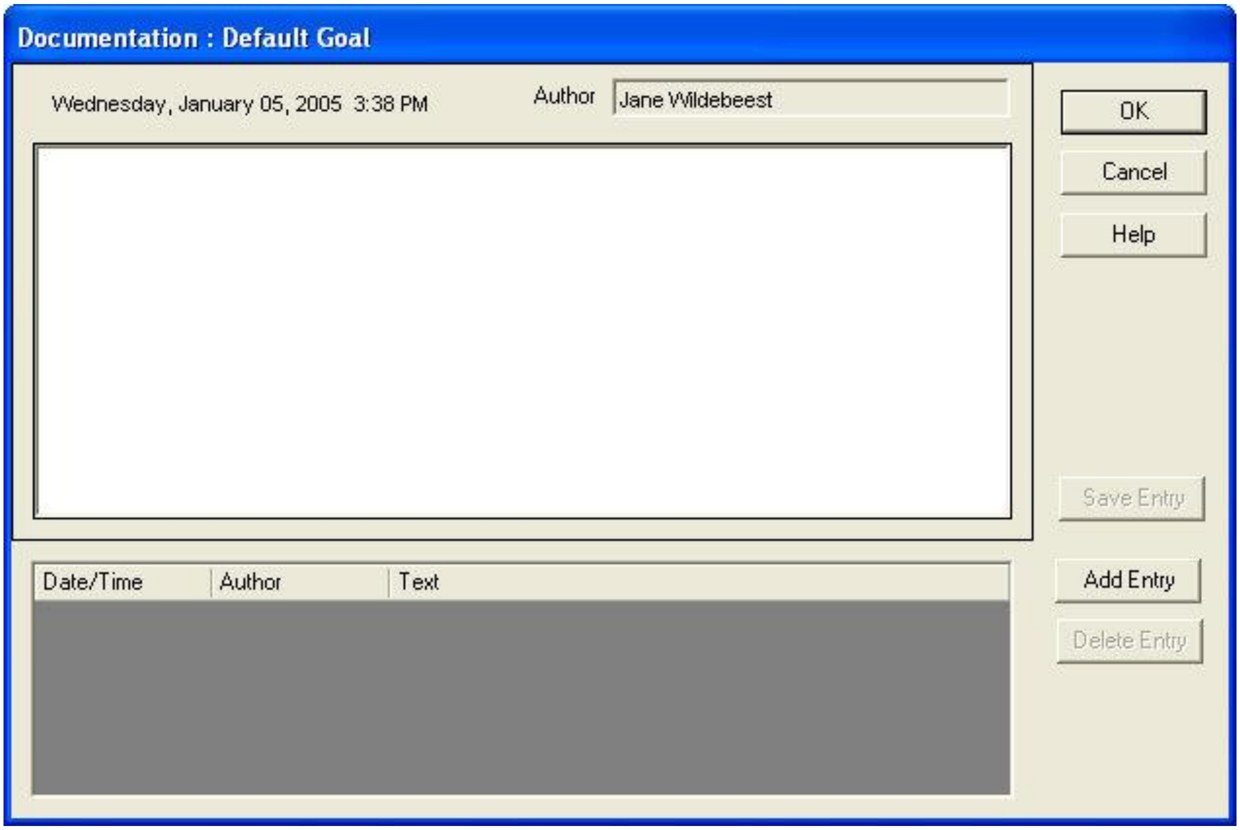
OK &endash; deletes the distribution layer associated with the element and remove it from the map document.

Cancel &endash; closes the window without retaining any changes.

Documentation Window

The Documentation window is displayed by clicking the  button located next to a data field in a window. Note that the title of the window includes the name of the associated field.

Entries in the Documentation window can be optionally included in various reports (see the topic How to Include Associated Documentation in Reports).



Documentation is entered in the upper portion of the window. As information is added to the grid in the lower half of the window, the system automatically populates the Date/Time and Author columns. In this way, documentation can be added over time as data in the project changes.

<u>Button functions</u>:

OK saves changes made to the documentation and closes the window.

Cancel closes the window without saving any documentation changes.

Help opens the on-line documentation.

Save Entry saves the documentation entered to a row in the grid below.

Add Entry saves the documentation entered to a row in the grid below.

A **Confirm** window is displayed before moving the entry to the grid.

Delete Entry deletes the selected row in the grid.

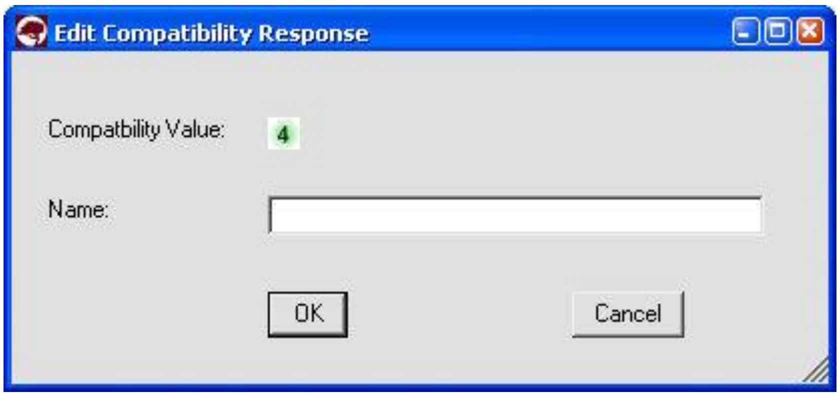
A **Confirm** window is displayed before removing the row.

After information has been saved and the window closed, the button image next to the field changes to  indicating that related documentation has been recorded.

The Documentation window may be useful for entering descriptive information related to attributes values and decisions made (see examples).

EDIT COMPATIBILITY RESPONSE WINDOW

The **Edit Compatibility Response** window is displayed by clicking the **New...** or **Properties...** buttons on the Compatibility List window, and is used to create and edit Land Use Intent (LUI) compatibility responses used for Scenario Evaluations. For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.



Create a compatibility response:

1. When the Edit Compatibility Response window opens to create a new response, the next numeric compatibility value to be associated with a compatibility response is automatically displayed. Enter the label for the new response in the **Name** field.
2. To close the window and save the new compatibility response, click **OK**; otherwise, click **Cancel**.

Edit a compatibility response:

1. Select the compatibility response to be changed on the Compatibility List window and click the **Properties...** button. The resulting edit window displays the response name and sequential numeric value.
2. Edit the label for the response as desired in the Name field.

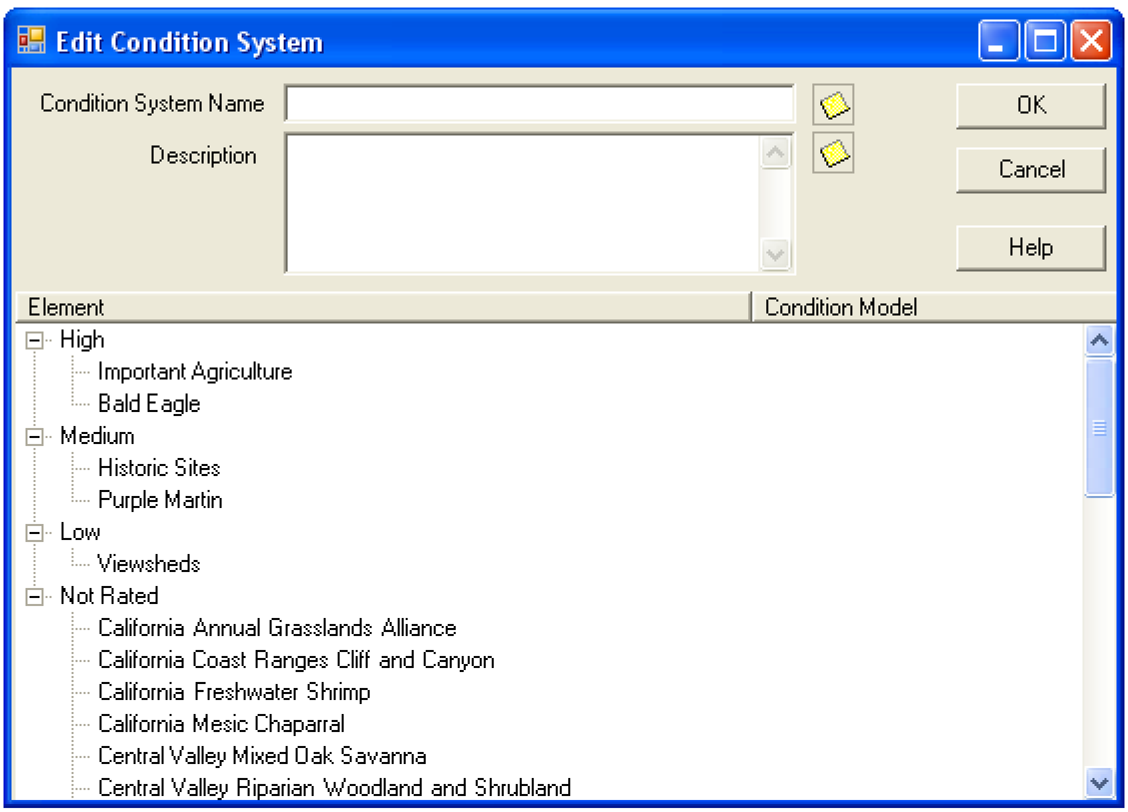
Note: The numeric compatibility value cannot be edited in this window. However, this sequential value will automatically change for a particular compatibility response by changing the order of the responses using the **Up** and **Down** buttons on the Compatibility List window.

3. To close the window and save any changes made to the compatibility response click **OK**; otherwise, click **Cancel**.

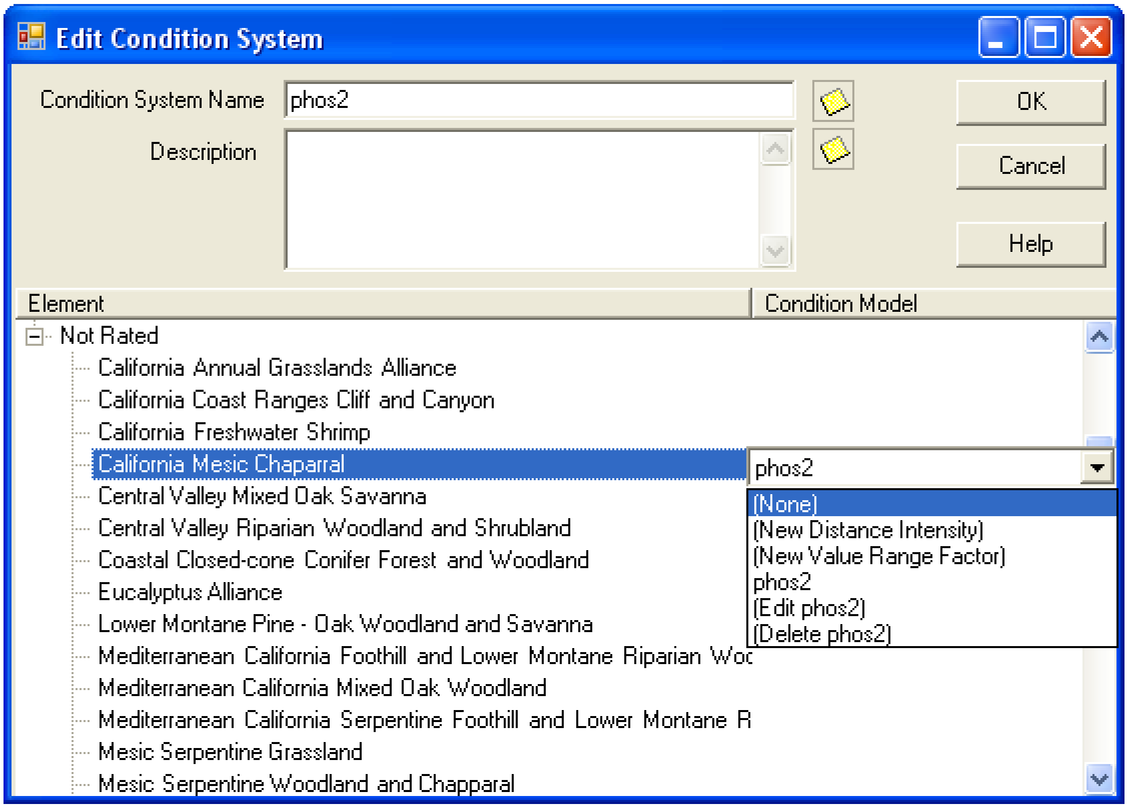
EDIT CONDITION SYSTEM WINDOW

The **Edit Condition System** window is displayed by clicking the **New...** or **Properties** buttons on the Condition System List window. This edit window is used for applying individual condition models to elements. When a new condition system is being created for the first time, Vista will ask you to select or create a default category system. Categories are assigned when creating elements and provide a system whereby elements are grouped and viewed. This can be changed later if you wish to create different condition system lists on another category type; which is defined in the Vista pulldown (Vista -> Project -> Preferences -> Default Category System). User may vary the Element display sort.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



Create or modify a condition model by clicking the blank area in the condition model to the right of an element. The user options are to select an existing condition model, new Distance Intensity, new Value Range Factor,and edit an existing model, or delete a model.

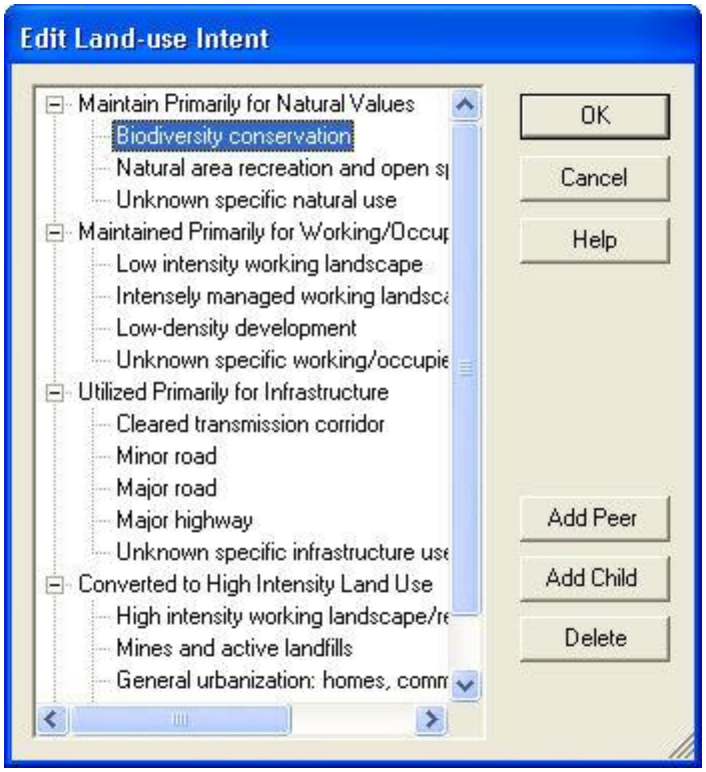


See Using the Condition Systems window for instructions on data entry for this window.

EDIT LAND-USE INTENT WINDOW

The **Edit Land-use Intent** window is displayed by selecting **Lists ▸Land Uses List...** from the NatureServe Vista menu. This window displays the default Vista land use intent (LUI) categories (described in Appendix F), which are utilized in land use and conservation Scenario Evaluations.

This window is used to customize the LUI categories in order to better capture the important conservation impacts of specific land uses and/or management practices in the planning region. LUI categories are used specifically in assigning land use compatibility for elements (described under the Compatibility tab section of the Element Properties window), and for developing translators that are used to define land use scenarios (described in the Translators section, with details on creating translators found in the Translator Properties window topic).



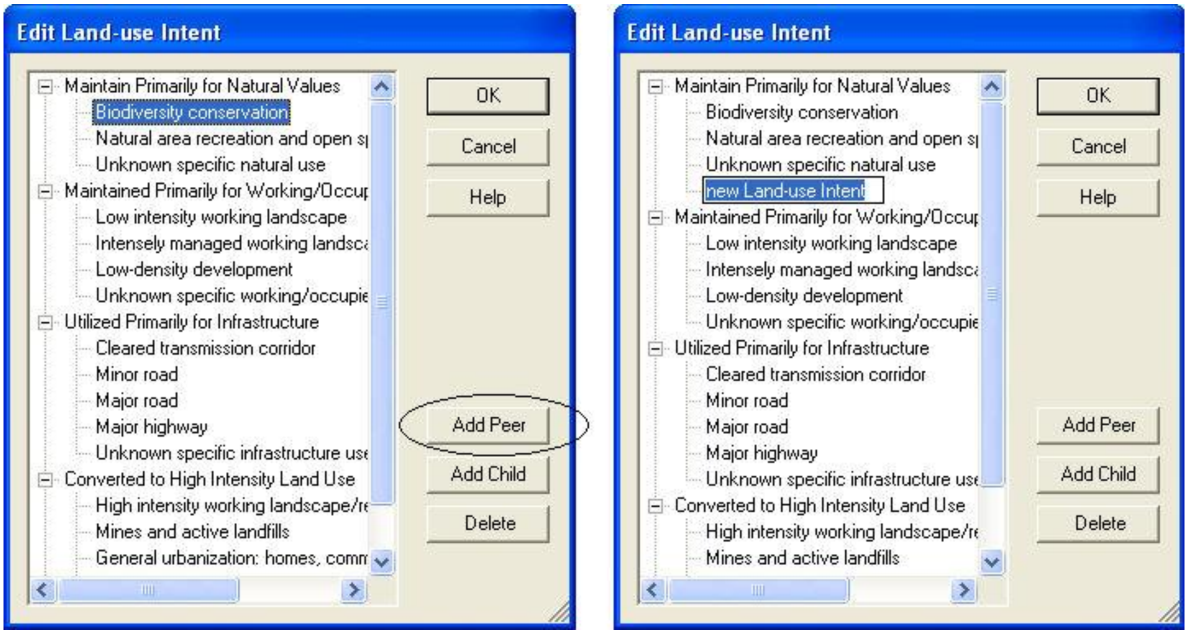
<u>Button functions</u>:

OK saves changes made to the LUI categories and closes the window.

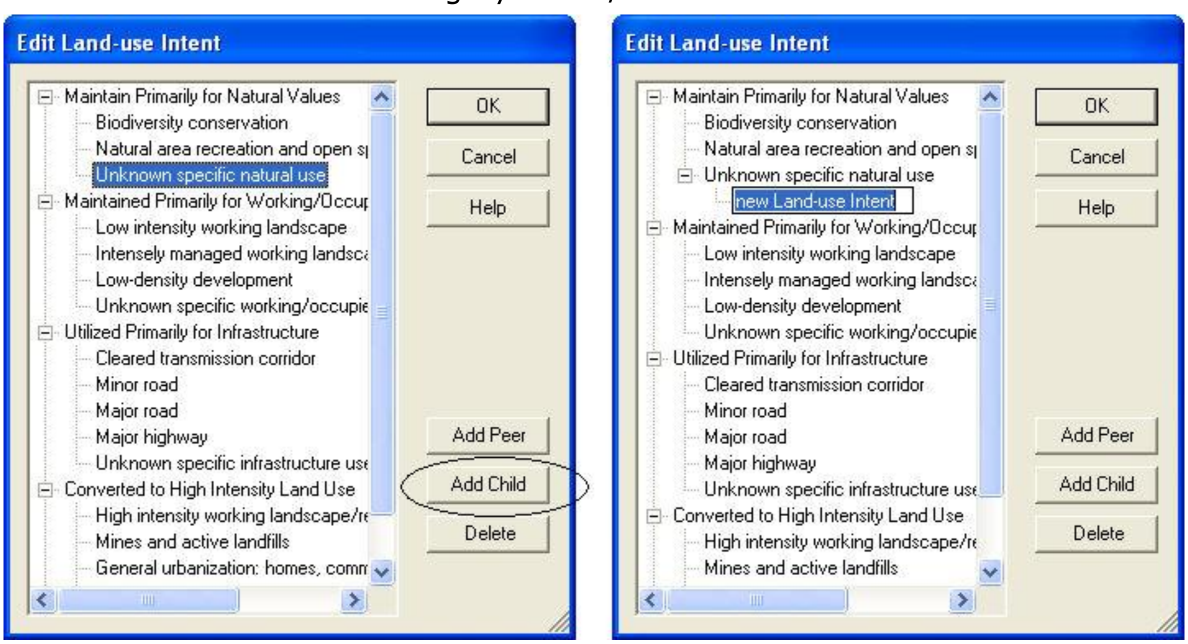
Cancel closes the window without saving any changes made to the LUI categories.

Help opens the on-line documentation.

Add Peer adds a new LUI category at the same hierarchical level as that of the selected land use. The new category will appear as a new entry at the end of existing LUI categories at that level, and can then be labeled as desired. In the following example, selecting the minor category "Biodiversity conservation" and clicking the **Add Peer** button will result in a new LUI category at the same level, added after those already existing beneath the "Maintain Primarily for Natural Values" major category to which it belongs.



Add Child adds a new LUI category within, or under, the hierarchical level of the selected land use. The new category will appear as a new entry at the end of any existing child categories beneath the selected category, and can then be labeled as desired. In the following example, selecting the LUI category "Unknown specific natural use" and clicking the **Add Child** button will result in a new child land use category within/under that selected LUI.



Delete deletes the land use category selected in the LUI hierarchy.

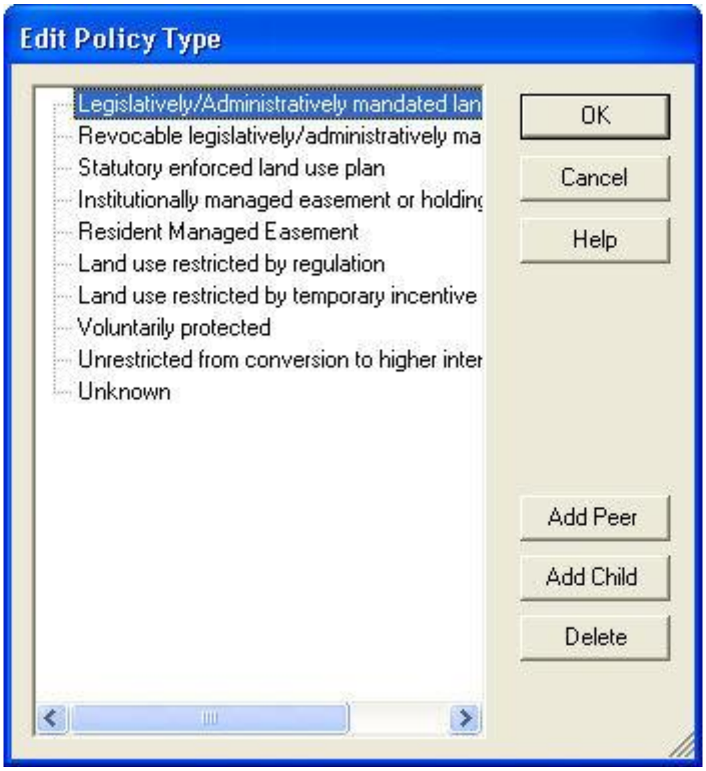
A **Confirm Delete** window is displayed before the deletion is implemented. In cases when the LUI selected for deletion contains child (minor) categories, the **Confirm Delete** window informs the user so that inadvertent deletion of these subcategories can be avoided.

A **Cannot Delete** window is displayed in cases when the LUI category is referenced by one or more items, as shown in the following example.

Edit Policy Type Window

The **Edit Policy Type** window is displayed by selecting **Lists ▸Policy Type List...** from the NatureServe Vista menu. This window displays the default Vista policy type (PT) categories (described in Appendix G), which are utilized in land use and conservation Scenario Evaluations.

This window is used to customize the PTs in order to better capture the important conservation impacts of specific policy mechanisms in the planning region. PTs are used specifically for developing translators that define policy scenarios (described in the Translators section, with details on creating translators found in the Translator Properties window topic).



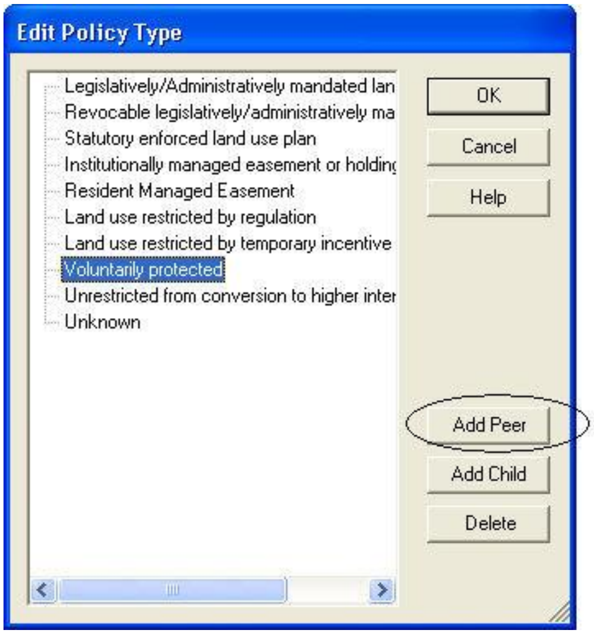
<u>Button functions</u>:

OK saves changes made to the PTs and closes the window.

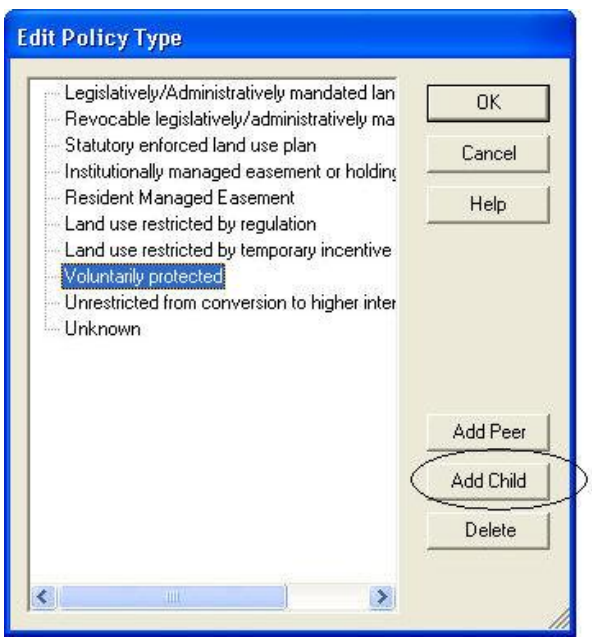
Cancel closes the window without saving any changes made to the PTs.

Help opens the on-line documentation.

Add Peer adds a new PT at the same hierarchical level as that of the selected type. The new PT will appear as a new entry at the end of existing PTs at that level, and can then be labeled as desired. In the following example, selecting the type "Voluntarily protected" and clicking the **Add Peer** button will result in a new PT at the same level, added after those already existing.



Add Child adds a new PT within, or under, the hierarchical level of the selected type. The new PT will appear as a new entry at the end of any existing child types beneath the selected PT, and can then be labeled as desired. In the following example, selecting the PT "Voluntarily protected" and clicking the **Add Child** button will result in a new child PT within/under that selected type.

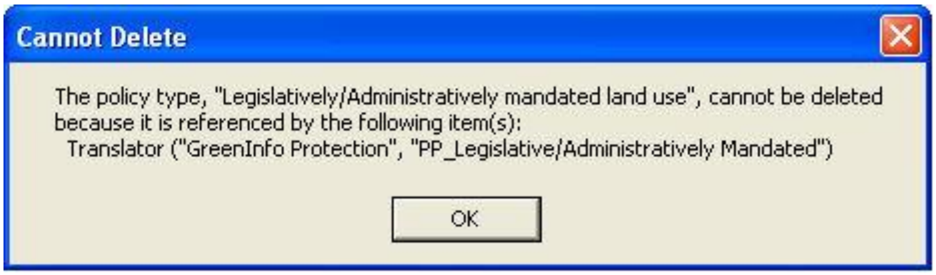


Delete deletes the PT selected.

A **Confirm Delete** window is displayed before the deletion is implemented. In cases when the PT selected for deletion contains child types, the **Confirm**

Delete window informs the user so that inadvertent deletion of these subtypes can be avoided.

A **Cannot Delete** window is displayed in cases when the PT is referenced by one or more items, as shown in the following example.



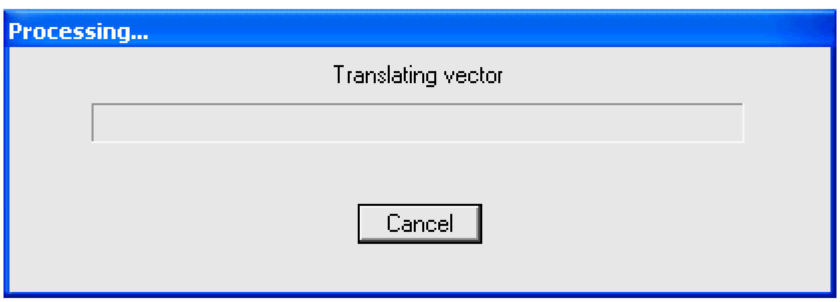
Edit Sub-Regional Goal Set Window

The **Edit Sub-Regional Goal Set** window, displayed by clicking the **Sub-goals...** button on the Goal Set List window, is used to create a new set of conservation goals for a defined group of elements in a specific area of interest within the planning region. Goal sets can be utilized in Land Use and Conservation Scenario Evaluations for comparing existing land use statuses and scenarios for future land uses, and tracking conservation progress over time. See the Goal Sets section for more detailed information on the development and use of goals in analyses.

Create a sub-goal set:

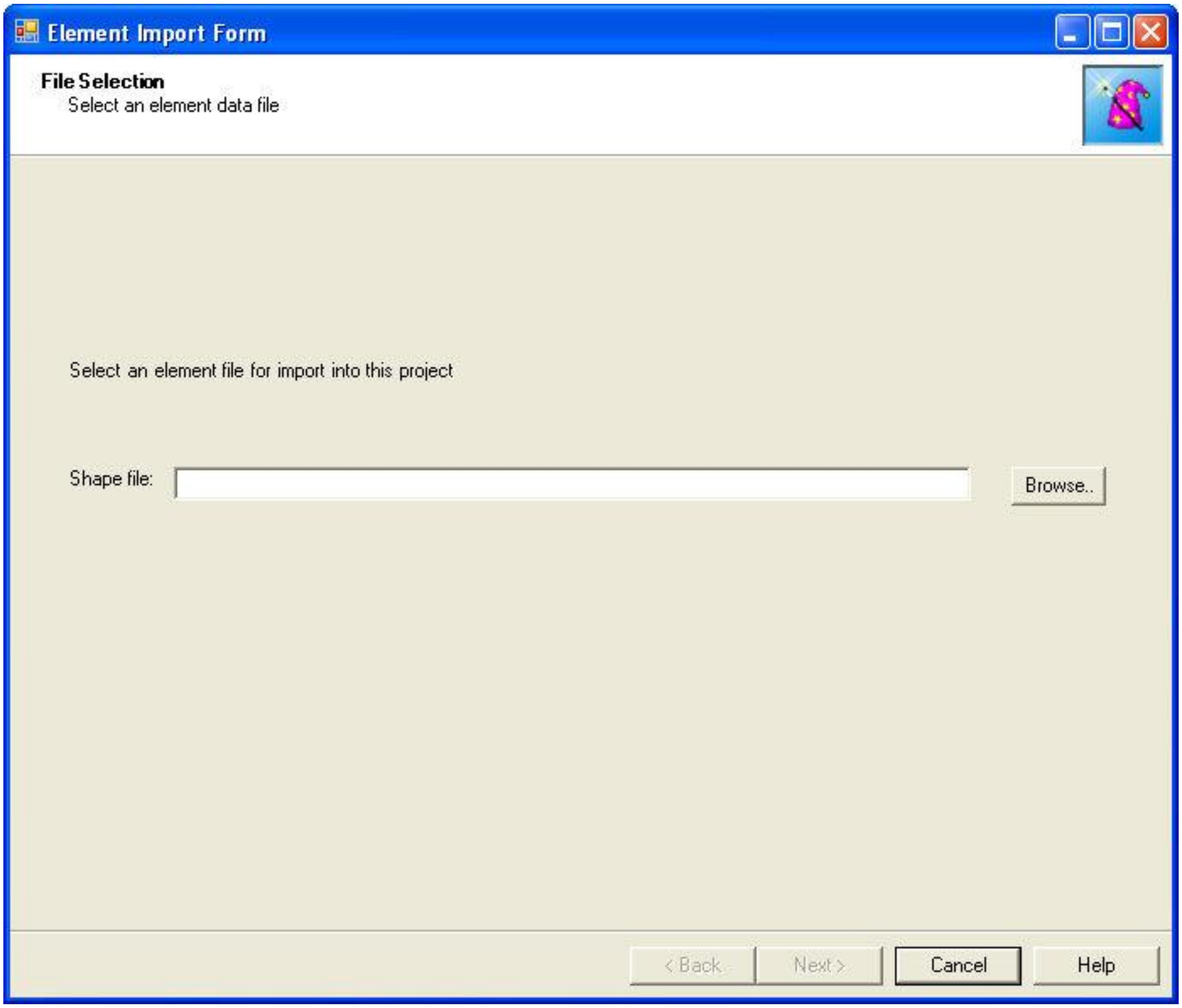
1. The value in the **Source Goal Set Name** field will default to the goal set selected in the Goal Set List window, but can be changed using the drop-down menu, which includes the option to use **< None >**, create a new goal set (**<Add New...>**), or to open the Goal Set List window displaying all existing goal sets (**<Show List...>**) in order to select and modify an existing set of goals.

2. Choose the filter to be used, if any, to define the new sub-regional goal set by changing the default value of **<Unfiltered>** to the appropriate choice from the **Source Filter** drop-down menu. The setting selected will restrict the elements that will be included in the sub-regional goal set to those permitted by that filter. The menu includes the option to create a new filter (**<Add New…>**), or to open the Filter List window displaying all existing filters (**<Show List…>**) in order to select and modify an existing filter.
3. Use the **Sub-Regional Layer** field to indicate the spatial layer to be used to define specific areas within the planning region for use in sub-regional goal sets. Although the default value in the field is **<None>**, a layer is required to create a sub-regional goal set. Select a layer from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. To add additional values to the drop-down menu, add a layer to the table of contents. Note that the layer used must contain more than one polygon feature (e.g., parcels) in order to be used to define a sub-regional goal set.
4. To close the window, saving the sub-regional goal set click **OK** to begin processing; otherwise, click **Cancel**.



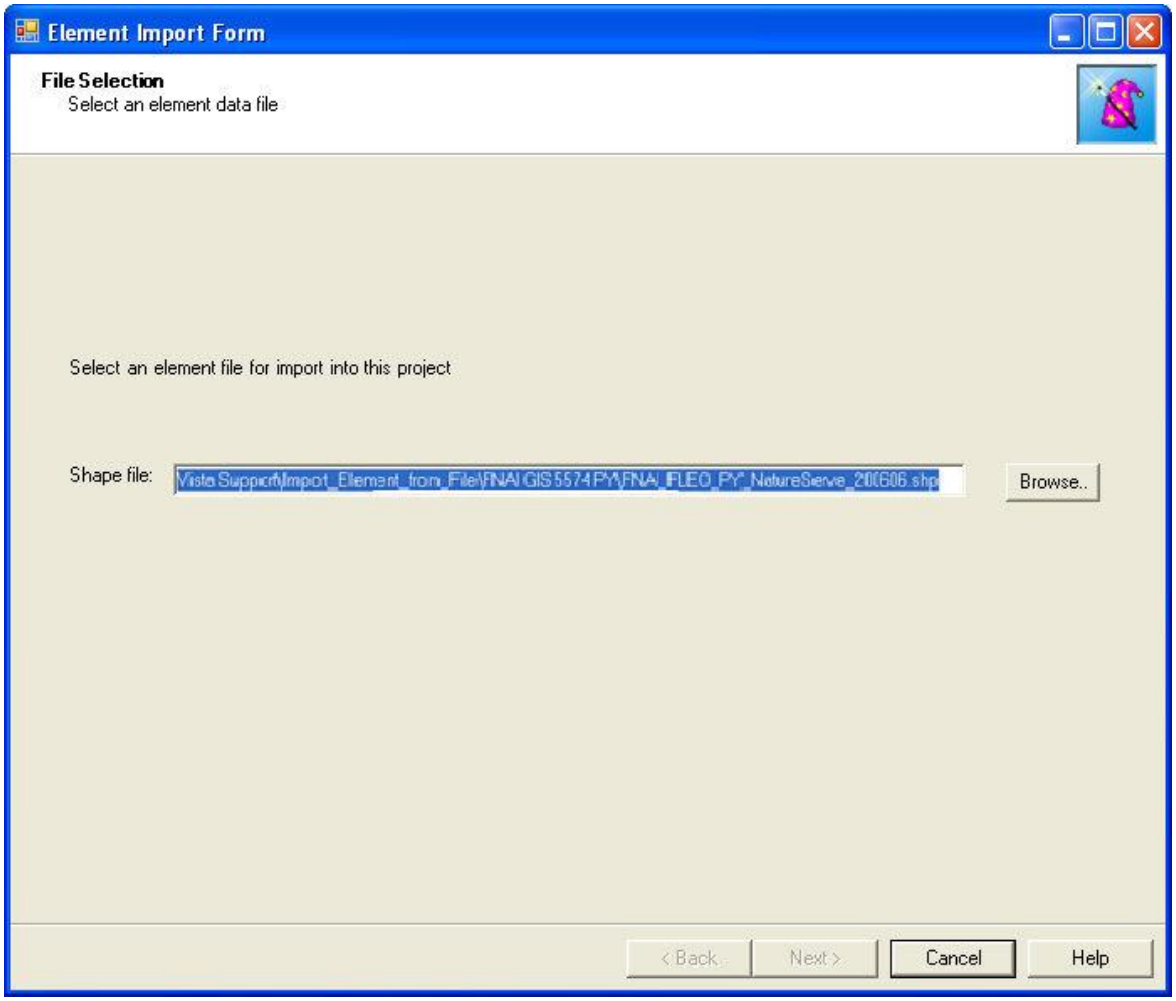
ELEMENT IMPORT FORM

The **Element Import Form** is displayed by clicking **Project ▸ Import Element Properties from File…** from the Vista menu. The form is used to import properties from multiple elements using a shapefile containing their attributes.

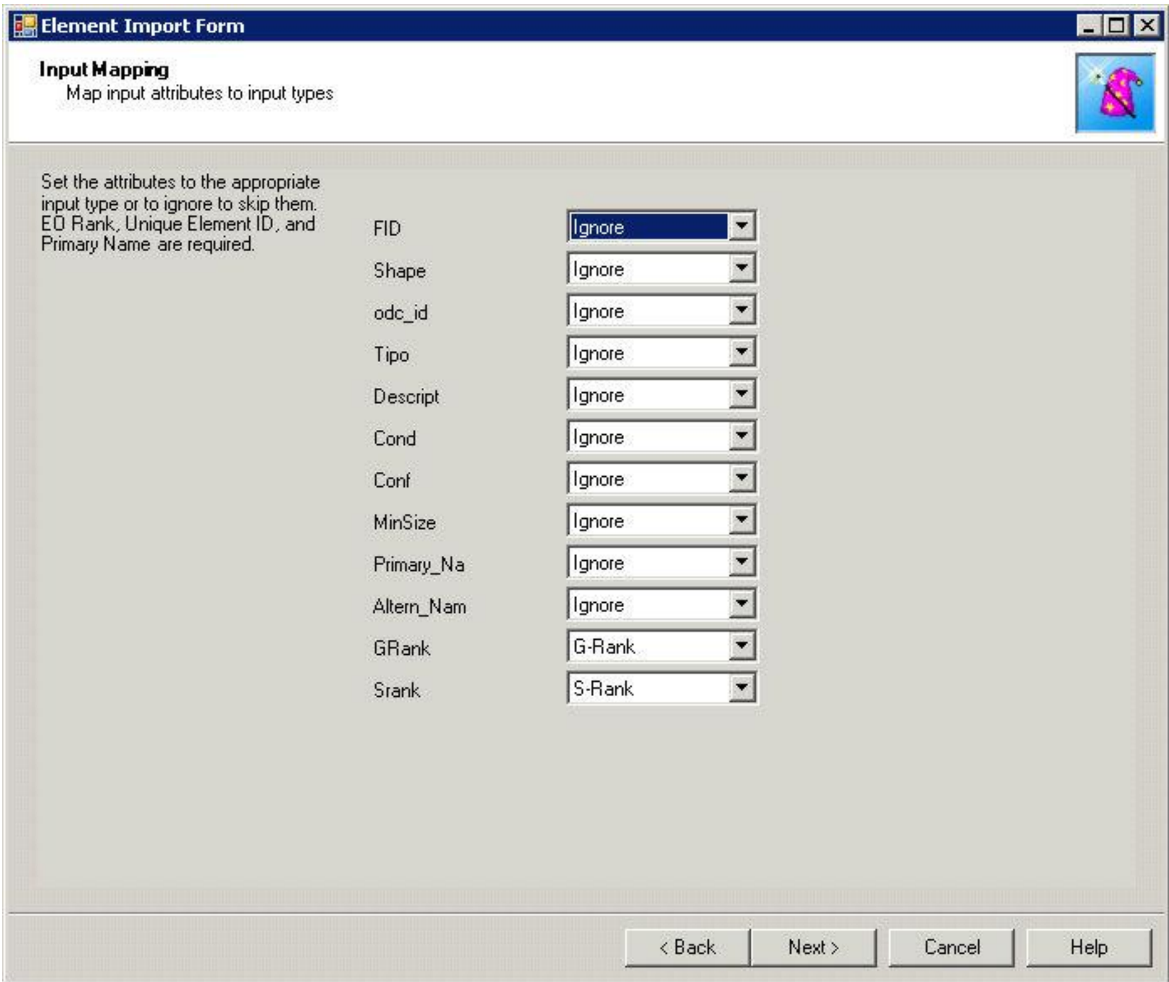


Import element properties:

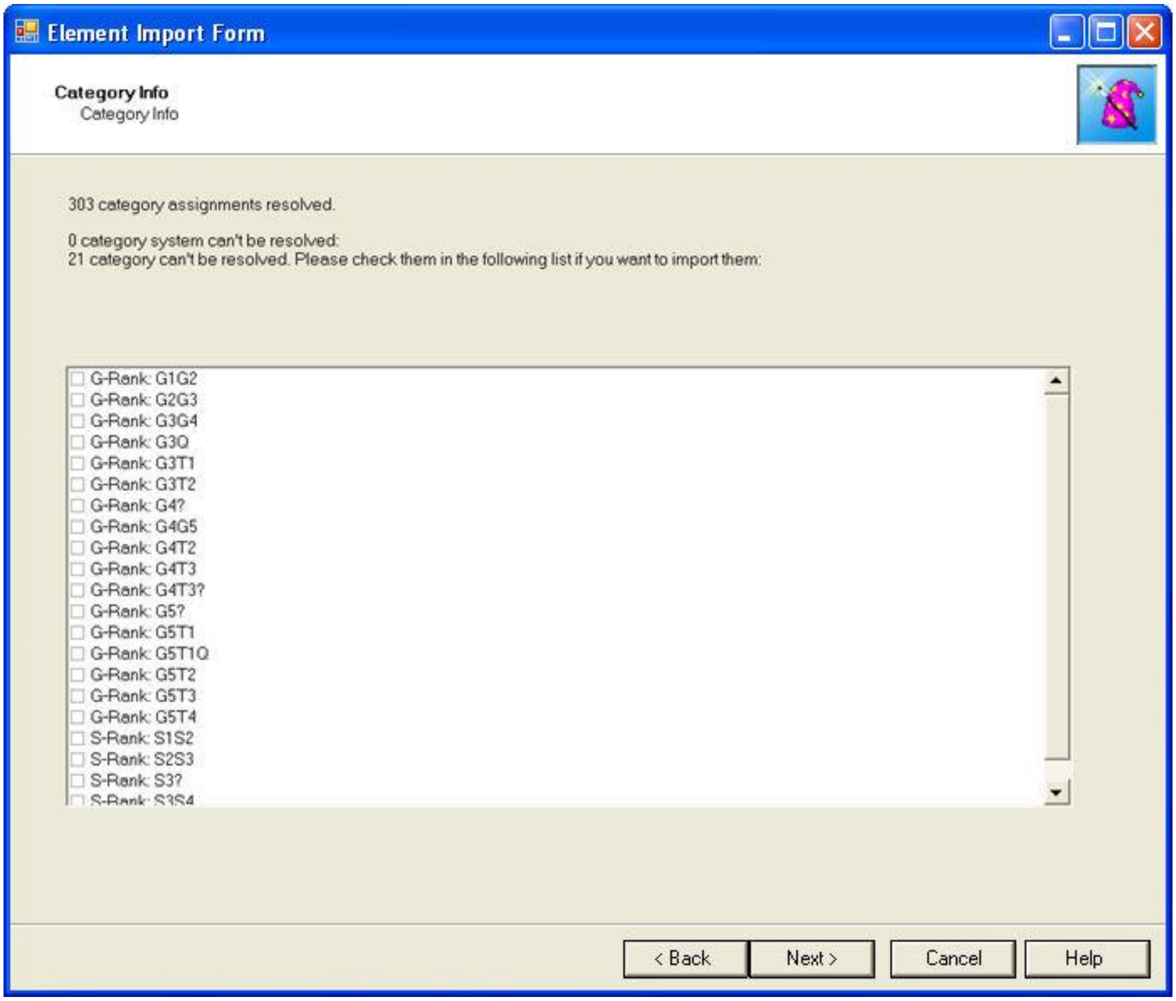
1. Click the **Browse...** button to navigate to a shapefile containing one or more element distributions, select the file, and click **Open,** or alternatively, enter the name of a shapefile directly into the **Shape File** field. Click **Next>**.



2. Edit EO rank to quality/integrity score conversions. Click **Next>**. CAM THIS IS AS FAR AS I GOT



3. Review the attributes that Vista cannot parse, and designate which to import manually. Click **Next>**.

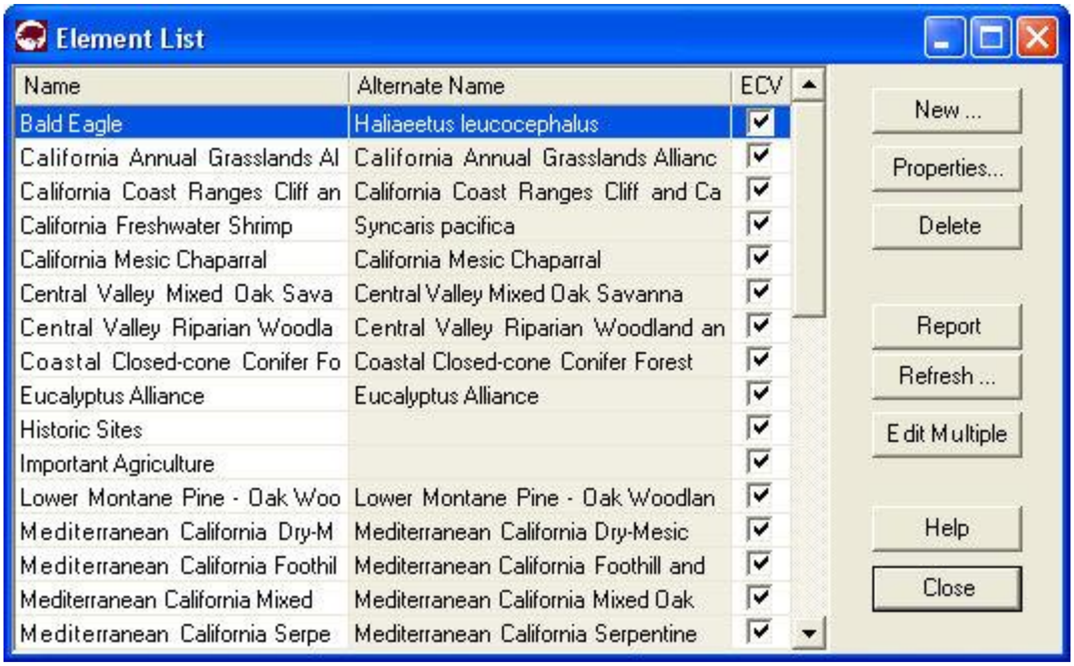


4. After the import process, separate element records will be created for each element in the shapefile. A spatial distribution layer must be specified for each element record before the element can be used in any Vista analyses. By opening the Element Properties window for each element, or by using the **Edit Multiple...** button on the Element List window, additional information can be added or edited.
5. Once the import process has completed and any related data have been entered, all of the elements must be processed by clicking the **Refresh...** button on the Element List window. See Refresh Selected Results for additional information on refreshing elements in Vista.

Element List Window

The **Element List** window is displayed by selecting either **Lists ▸Element List...** or **Manage Elements...** from the NatureServe Vista menu. This window lists all of the elements that have been entered into Vista for use in the project. See the

Element Selection section for more detailed information on elements to be included in a project.



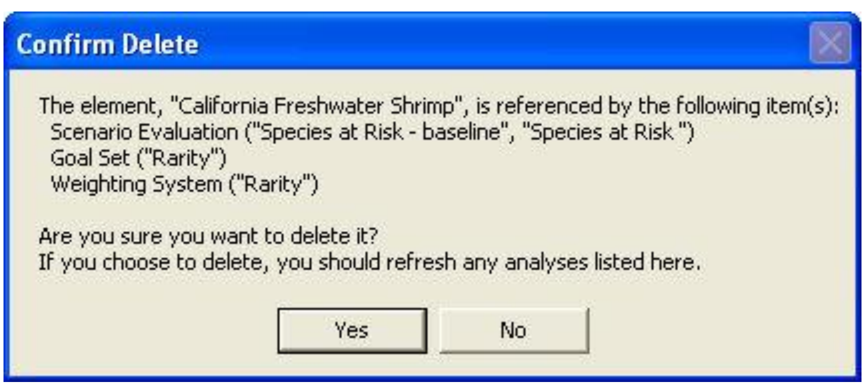
Button functions:

New... displays a new Element Properties window that can be used to add a new element to the project.

Properties... displays the Element Properties window showing details and allowing edits to the element selected in the list.

Delete deletes the element selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented, which includes information on any analytical tools and/or analyses that reference the element to be deleted, as shown in the following example.



Report displays a report for the selected element that provides data related to the element, including its spatial attributes and distribution, as well as its inclusion in category systems used in analyses. See the Reports section for more details on Element Details reports.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for selected elements.

Edit Multiple displays the Multi-Element Property Edit window that can be used to set the value for a selected property across a specified group of elements at the same time.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of an element that will be used in Vista input windows; this is typically the common name for the element.

Alternate Name - secondary name of the element, frequently the scientific name for the element.

ECV - checkbox that indicates that an Element Conservation Value layer has been created for the element.

Element Properties Window

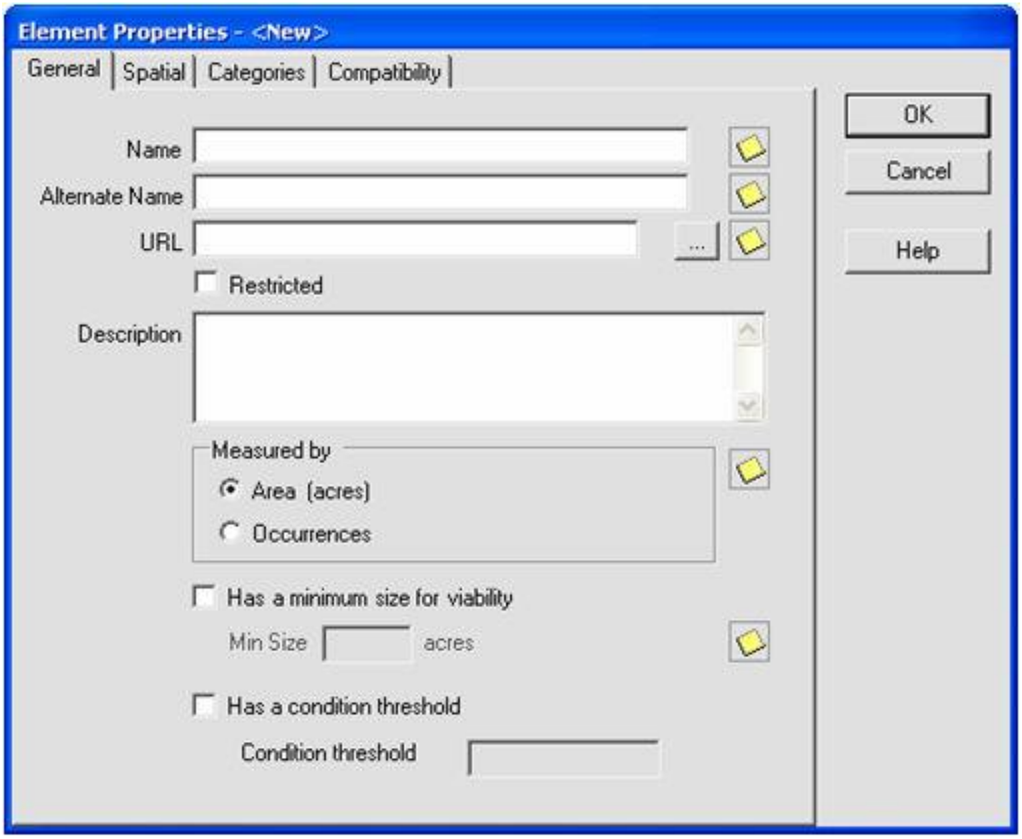
The **Element Properties - <New>** window is displayed by either clicking the **New...** button on the Element List window or choosing **Selection ▸New Element** from the NatureServe Vista menu while an element is highlighted in the Vista Table of Contents. The new properties window is used to add a new element, along with associated distribution layers and attribute data, to the project for use in analyses.

The Element Properties window consists of four tabs for recording specific types information on elements General, Spatial, Categories, and Compatibility. Depending on the analyses to be performed, different fields may be used, and data input may occur at different times. Specifically, some of the items on the General and Spatial tabs are completed for Conservation Value analyses only, while the Compatibility tab is used strictly for Land Use and Conservation Scenario Evaluations.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

Add an element:

General tab input



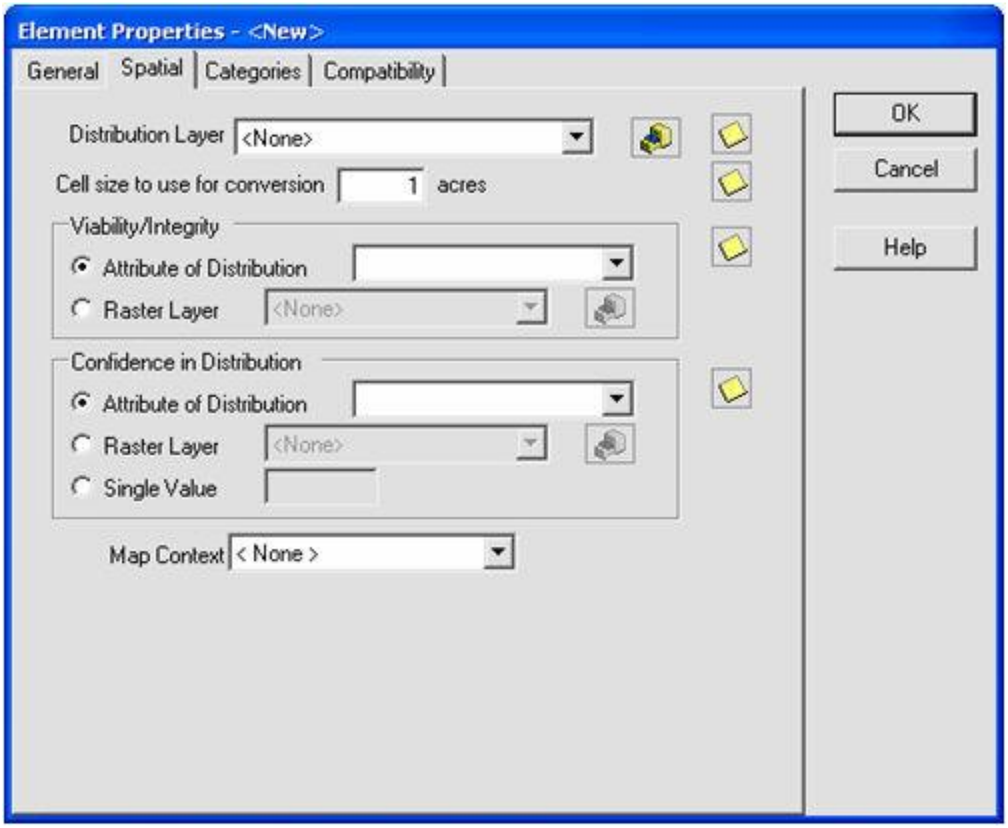
1. Specify a name for the element in the **Name** field. Typically this will be the common name used for the element. The **<New>** on the window title will change to the name of the new element as the entry is typed in.
2. Specify another name for the element in the **Alternate Name** field. Provided that the previous Name field contains the common name for the element, this field is generally used for its scientific name.
3. Enter a web address in the **URL** (Uniform Resource Locator) field that provides information related to the element (e.g., NatureServe Explorer). The  button can be used to open an explorer window that goes directly to the URL entered in the field, or if there is no address specified, the explorer default window will open.
4. If the ability to edit the element data should be limited to members of the data development team, place a check in the **Restricted** checkbox.
5. Enter a brief description of the element in the Description field, if desired.

Note: If records are being created for selected elements before additional data has been obtained/developed, data entry for the remaining fields on this tab, as well as for the Spatial tab and Compatibility tab (if needed), can be deferred until distribution layers have been developed for elements (see the process for developing distribution layers), and any attributes have been assigned (see processes for assigning viability/integrity values and confidence values). It may be a more effective use of data entry time to open each element record only once

to enter all of this information at the same time, rather than repeating the process several times to enter each of these items separately.

6. Indicate whether the distribution of the element is represented by area or by distinct occurrences using the appropriate **Area** or **Occurrences** radio button.
7. Indicate whether there is a minimum size required for viability of the element in the checkbox, and if so, enter the **Minimum Size**. This minimum size value is used to exclude occurrences (i.e., 1 occurrence = 1 record in a distribution shapefile) that do not overlap with both a "compatible" land use and a "reliable" policy in Scenario Evaluation analyses, AND that fail to meet the element's condition threshold, from the total to be compared with the minimum size. If the area of the occurrence is less than the designated minimum size, the entire occurrence is not considered to be viable and is excluded from analyses.
8. Indicate whether there is a threshold for condition of the element in the checkbox, and if so, enter a value (ranging from 0.0 to 1.0, low to high threshold, respectively) for **Condition Threshold**. The condition threshold value is used to exclude data to be included in analyses on the basis of failing to meet minimum condition requirements to be considered viable. Condition threshold values specified in this field should result from running models in the system, rather than from element quality data.
9. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

SPATIAL TAB INPUT



1. Select the distribution layer for the element from the drop-down menu of the **Distribution Layer** field, or by using the  ArcCatalog button to browse to the layer. (Layers will be displayed in the drop-down menu only if the layer is the correct feature type and is included on the Display Type tab of the Table of Contents [TOC].) See the Element Distributions section for more details on distribution layers.
2. Enter a value indicating the cell size to be used for conversion. For a discussion of optimal cell size to be used for a planning project, see the Determining Grid Cell Size topic.

   Note: If Land Use and Conservation Scenario Evaluations are to be performed, the grid cell size used to create the visualization layers generated by a Scenario Evaluation is set in this field. If this cell size differs greatly from the cell size specified for the scenario used in the evaluation (set in the Scenario Properties window), the visualization layers may not overlay the scenario correctly.

If Conservation Value analyses are to be performed, data entry for the fields contained in the *Viability/Integrity* and *Confidence in Distribution* group boxes (described in the following steps 3 and 4) can be deferred until values for these attributes have been assigned (see the sections on Viability/Integrity and Confidence for details on these attributes).

3. **If Conservation Value analyses are to be performed**, indicate whether the viability/integrity value is an **attribute of the distribution**

layer for the element, or is represented by a **raster layer** using the appropriate radio button.

If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

See the Viability/Integrity section for more details on this attribute.

4. I**f Conservation Value analyses are to be performed**, indicate whether the confidence value is an **attribute of the distribution** layer for the element, is represented by a **raster layer**, or will consist of a single assigned value for all occurrences of the element, using the appropriate radio button.

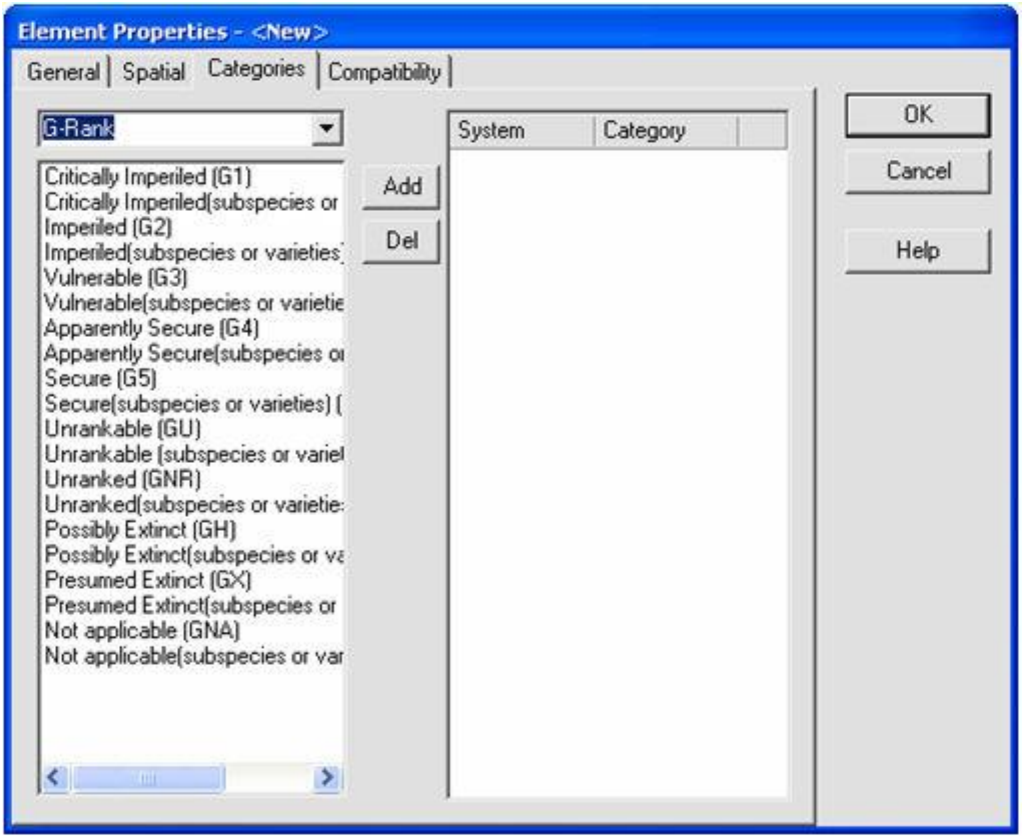
   If a raster layer is used, select the layer from the drop-down menu associated with the raster layer, or browse to the layer using the ArcCatalog button.

   If a single value for confidence is to be used, record that value in the field next to the **Single Value** radio button.

   See the Confidence section for more details on this attribute.

5. Select from the **Map Context** drop-down menu an existing context to be used in creating reports for the element, if any. If a map context needs to be created for the element, see the topic entitled Map Context Properties Window.
6. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

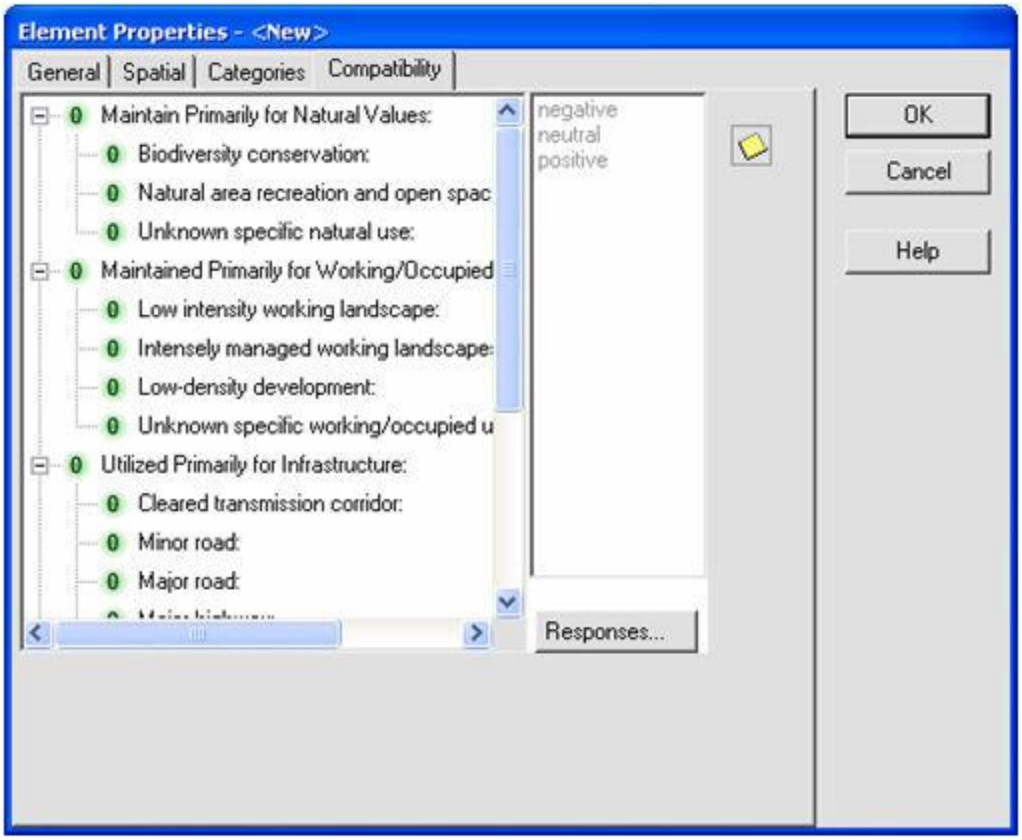
CATEGORIES TAB INPUT



Information on Category Systems to which an element belongs can be entered at any time once the element record has been created. Several default categories are provided in Vista, so it may be useful to indicate any of the default categories that apply initially, and then create additional categories and assign elements later as needed for developing Filters, conservation Goal Sets, and Weighting Systems, and performing analyses. To create a new category system, see the Category System Properties window section for details.

1. To specify a category system to which the element belongs, select the Category System from the drop-down list in the upper left of the window. A list of the categories within that system will be displayed below the system name.
2. Select the category to which the element belongs, and then click the **Add** button. The name of the system and category to which the element belongs will be displayed in the right pane of the window.
3. Repeat the system/category selection and add process to specify additional categories as needed.
4. To delete an element from a category system, select the system and category in the right pane and click the **Del** button.
5. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel.**

COMPATIBILITY TAB INPUT



An indication of the degree to which implementation of a specific Land-use Intent (LUI) category (described in Appendix F) is compatible with an element - that is, will permit the element to persist - is recorded using this window. More specifically, implementation of compatible LUIs will permit a species to remain viable or an ecological element to maintain ecological integrity. Scenario Evaluations, used to assess element compatibility with various land use scenarios in terms of meeting conservation goals, are dependent upon these compatibility assignments for accurate results, so it is strongly recommended that only experts on the element assign compatibility. Any decisions related to compatibility should be recorded (using the  button to access the associated Documentation Window) to allow peer review and/ or legal review.

For more details on compatibility, see the Land Use and Conservation Scenario Evaluations section.

1. **If Land Use and Conservation Scenario Evaluations are to be performed**, indicate the degree to which the element is compatible with each of the NatureServe Vista LUI categories by clicking on the LUI to be assigned, and selecting the appropriate compatibility response from the list in the column to the right.

   Assigning a response value to a major LUI category (e.g., "Maintain Primarily for Natural Values") will cause the system to automatically assign the entire category the same value (i.e., both the major category name and all of its associated child [minor] categories). However, assigning a compatibility response for a minor category LUI (e.g., "Biodiversity conservation") will not cause any other items in the category to be automatically designated.

2. To edit or add a new value to the list of compatibility responses, click the **Responses...** button to open the Compatibility List window.
3. To close the window and save the data entered in the element record click **OK**; otherwise, click **Cancel**.

Edit Element Information:

Element properties can be edited either individually, or for multiple elements simultaneously, as described below.

Edit an individual element:

1. Navigate to the Element Properties window populated with existing data for the element by either right-clicking the element name in the NatureServe Vista table of contents and selecting **Element Properties..**. from the resulting menu, or by clicking **Manage Elements...** from the Vista menu, selecting the element in the Element List window that opens, and clicking the **Properties...** button. The resulting properties window displays data for the element.
2. Edit element properties data using the processes described above for adding an element as guidelines. More detailed descriptions of elements and related data can be found in the Element Selection, Element Distributions, Viability/Integrity Attributes, and Confidence Attributes sections.
3. To close the window and save any changes made to the element record click **OK**; otherwise, click **Cancel**.

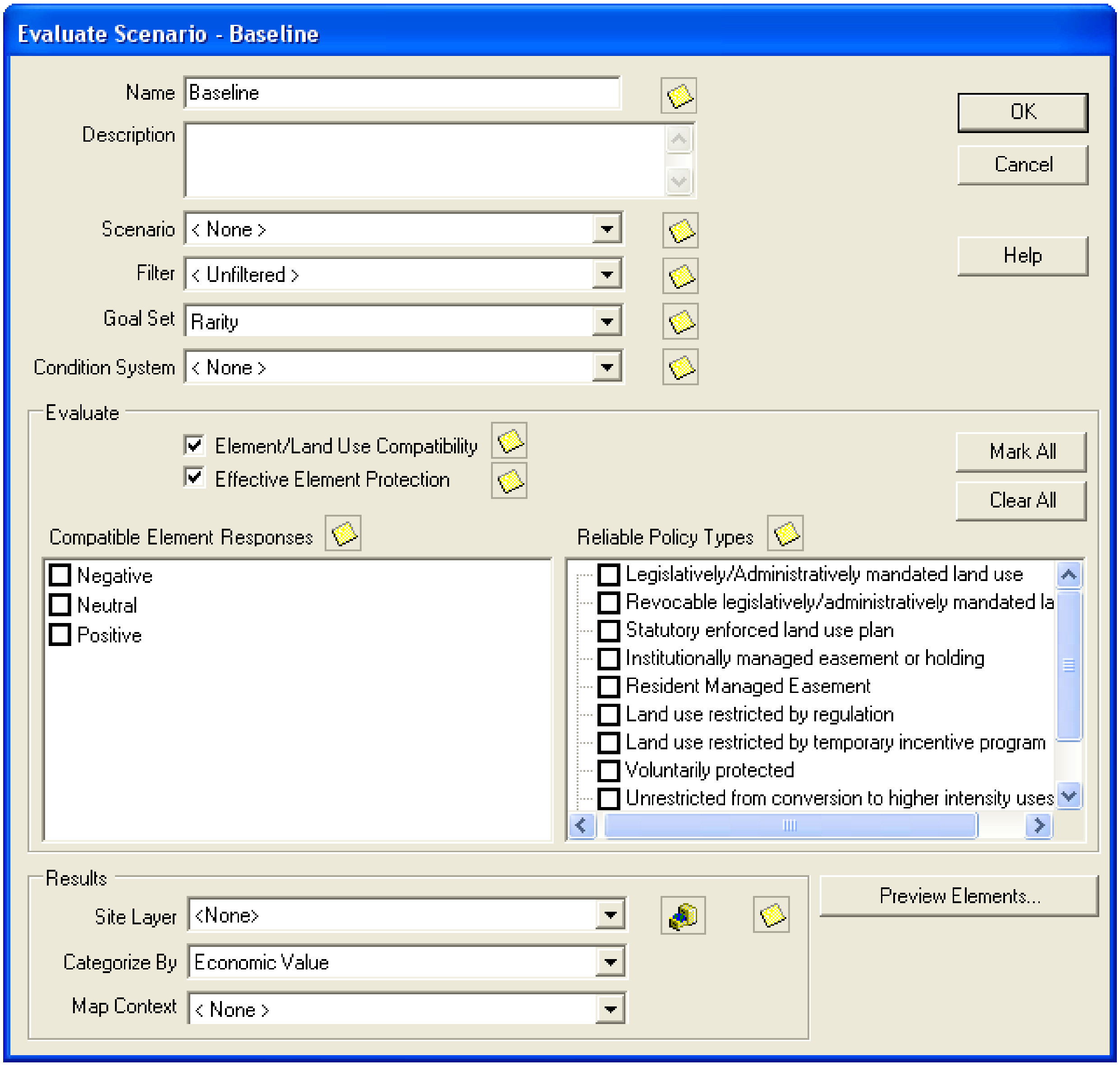
Edit multiple elements:

1. Click **Manage Elements...** from the Vista menu to open the Element List window, and click the **Edit Multiple...** button to set property values for a designated set of elements simultaneously. See the Multi-Element Property Edit window for details on the process for editing properties for a group of elements.

EVALUATE SCENARIO WINDOW

The **Evaluate Scenario- <New>** window is displayed either by selecting **Evaluate Scenario...** from the NatureServe Vista menu or clicking the **Evaluate...** button on the Scenario List window. This window is utilized for evaluating different land use and conservation scenarios (see the Scenario Evaluations section for more detailed information).

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



Evaluate a scenario:

1. Enter a name for the evaluation being performed in the **Name** field. The **<New>** on the window title will change to the name of the new scenario evaluation as the entry is typed in.
2. Enter a brief description for the new evaluation in the **Description** field.
3. Select the scenario to be evaluated from the **Scenario** drop-down list, or select the **<Add New...>** value to develop a new scenario, or the **<Show**

List...> value to display all developed scenarios (in order to select and modify an existing scenario).

4. Select the Filter (which determines the elements to be included in the evaluation) from the **Filter** drop-down list, or select the **<Add New...>** value to create a new Filter, or the **<Show List...>** value to display all existing filters (in order to select and modify an existing filter).
5. Select the Goal Set for the evaluation (which will be used to assess whether viable element occurrences are adequately conserved in different locations) from the **Goal set** drop-down list, or select the **<Add New...>** value to create a new Goal Set, or the **<Show List...>** value to display all existing goal sets (in order to select and modify an existing set of goals). Note that to evaluate multiple goal sets, a separate evaluation will need to be created for each set.
6. Click the **Preview Elements...** button to see a Filtered Goal Set Report showing the set of elements to be included in the evaluation and the goals that have been set for these elements, based on the values selected in the **Filter** and **Goal Set** fields. This knowledge can be helpful prior to running the scenario evaluation. The greater the number of elements included in an evaluation, the longer it will take to process; adjusting/creating a filter that will limit the evaluation to just those elements that are needed will ensure the most efficient use of processing time.
7. Indicate whether the scenario will be evaluated for compatibility of elements with the land uses (indicated on the Compatibility tab of the Element Properties window) and/or for protection in the region by checking one or both of the **Element/Land Use Compatibility** and **Effective Element Protection** checkboxes.
8. If element protection will be evaluated (denoted using the **Effective Element Protection** checkbox in the previous step), indicate which policy types are considered to reliably protect viable occurrences if elements in the scenario during the planning time frame by utilizing the appropriate checkboxes in the **Reliable Policy Types** section. To check all the boxes with one keystroke, click the **Mark All** button; clicking the **Clear All** button will remove any checkmarks from the boxes. At least one protection type must be selected as valid for the evaluation or an error indicator will be displayed.

This is a subjective process that separates scientific knowledge (land use intent [LUI] compatibility) from sociopolitical considerations (policy types [PT]). Whether a particular policy provides adequate protection for viable occurrences of elements is determined by judging the degree to which the policy mechanism guides the implementation of LUI designations, allowing or preventing land uses of greater intensity (that would fail to protect viable occurrences). For example, a zoning policy may be generally reliable in enforcing a particular land use but, because it can be changed with relative ease, it may not effectively insure implementation of a particular LUI over the planning time frame; thus, it may not offer adequate protection for viable occurrences from a conservation perspective. In comparison, lands held by nongovernment conservation organizations are typically managed for much less intense uses than are allowed under the local zoning regulations; such lands would, thus, offer better protection for viable occurrences than the allowable uses that would likely occur with different ownership/management.

Any assumptions made in designating specific PTs as reliable for protection should be documented (e.g., "zoning is now more strictly enforced than it was in previous years, and so was designated 'reliable' in this project"). The ability to designate different PTs as reliably providing protection can be used to test the benefits of enforcing particular policies in the planning region by creating separate evaluations for different combinations of reliable PTs and then comparing the results.

9. Specify a layer to be used in Site Analyses from the drop-down menu of the **Site Layer** field, or by using the  ArcCatalog button to browse to the layer. The land units in the layer selected will be used for detailed examination of land use/policy type and element goals by unit.
10. Indicate how the Scenario Evaluation report should be summarized by selecting a category system from the **Categorize By** drop-down list, or selecting the **<Add New...>** value to create a new system, or the **<Show List...>** value to display all existing category systems (in order to select and modify an existing system).
11. Select a map context to be used in creating the scenario evaluation report from the **Map Context** drop-down menu, or select the **<Add New...>** value to create a new map context, or the **<Show List...>** value to display all existing map contexts (in order to select and modify an existing context).
12. Generate the Scenario Evaluation by clicking **OK**; otherwise press **Cancel**. Results are displayed in a Scenario Evaluation report. See the Scenario Evaluation report for more detailed information.

Note: The grid cell size used to create the visualization layers generated by the Scenario Evaluation is set on the Spatial tab of the Element Properties window. If that cell size differs greatly from the cell size specified for the scenario used in the evaluation (set in the Scenario Properties window), the visualization layers may not overlay the scenario correctly.

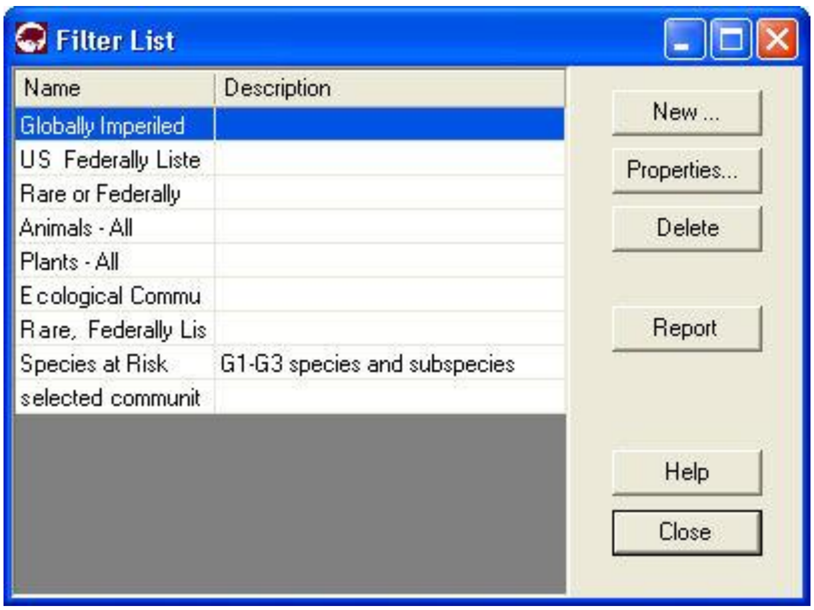
Edit a Scenario Evaluation:

1. Select the Scenario Evaluation from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Scenario Evaluation Properties...** from the context window. The resulting window displays the evaluation.

2. Edit the Scenario Evaluation using the processes described above for creating a new evaluation as guidelines.
3. Generate the revised Scenario Evaluation by clicking **OK**; otherwise press **Cancel**.

FILTER LIST WINDOW

The **Filter List** window is displayed by selecting **Lists ▸Filter List…** from the NatureServe Vista menu. This window lists all the filters that have been created for the project. See the Filters section for more detailed information on the development and use of filters in analyses.



Button functions:

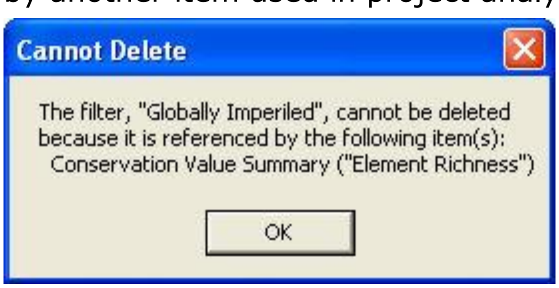
New… displays a new Filter Properties window that can be used to develop a new filter to be used in the project.

Properties… displays the Filter Properties window showing details and allowing edits to the filter selected in the list.

Delete deletes the filter selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the filter is referenced by another item used in project analyses, as shown in the following example.



Report displays a report that describes the selected filter and lists the elements that are included for analysis when the filter is applied. See the Reports section for more details on Filter reports.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

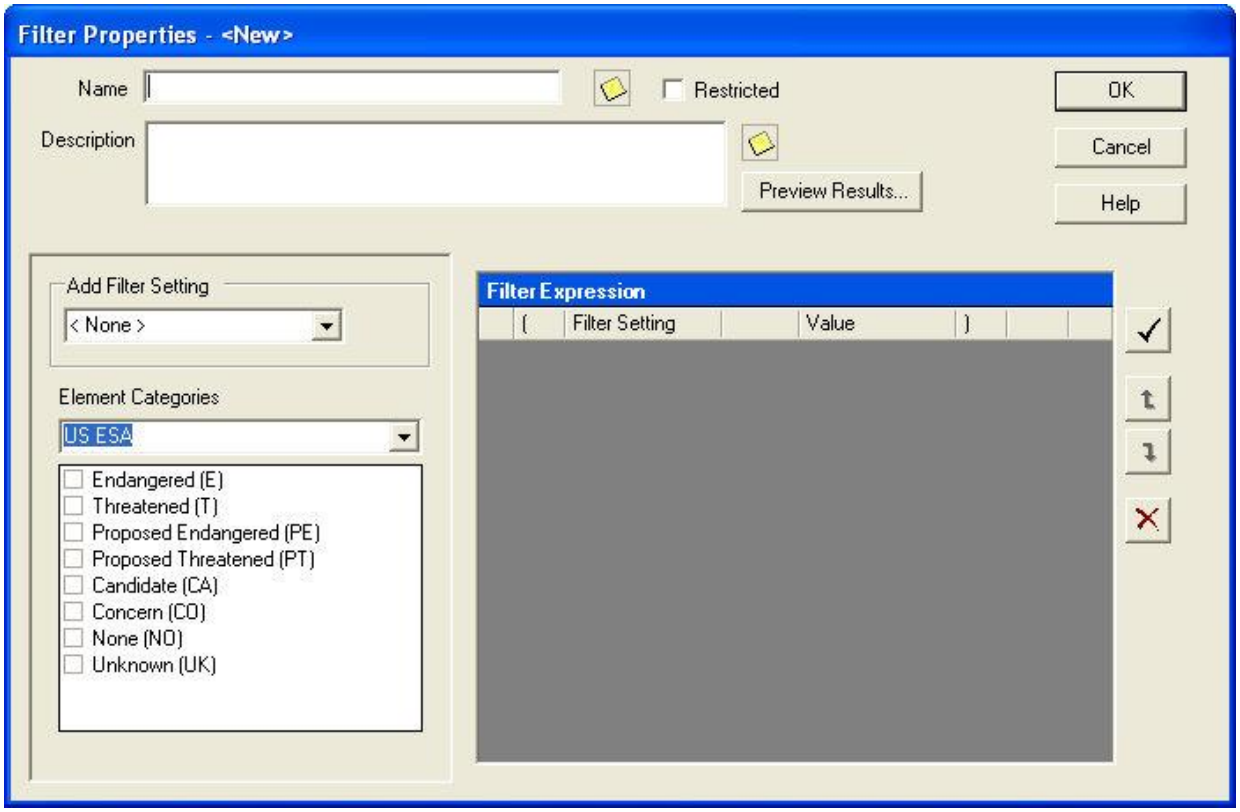
Name - name of the filter.

Description - description of the filter, if any.

FILTER PROPERTIES WINDOW

The **Filter Properties - <New>** window is displayed by clicking the **New...** button on the Filter List window. The new properties window is used to create a filter that can be used to define the set of elements to be included in analyses. See the Filters section for more detailed information on the development and use of filters in analyses.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



<u>Create a filter</u>:

1. Specify a name for the filter in the **Name** field. The **<New>** on the window title will change to the name of the new filter.
2. If the ability to edit the filter should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the filter in the **Description** field, if desired.
4. Choose the expression to be used to define the new filter by selecting the appropriate type from the **Add Filter Setting** drop-down menu. The setting selected will restrict the values that can be used to create that expression to those permitted by that filter. Available settings are as follows:
    - **Element Categories** - used to select categories of elements
    - **Individual Elements** - used to select specific elements
    - **Spatial Filter** - used to designate a specific area within which elements must be located
    - **Existing Filter** - used to select an existing filter
5. Select the appropriate value(s) to be used to define the elements and/or area to be included in an analysis. This process may differ based on the setting identified in the previous step, as follows:

Element Categories setting will cause a drop-down menu to be displayed containing all of the category systems defined in Vista. Select the category system to be used, and the categories within that system will be displayed with checkboxes. Check the box(es) for the category(ies) to be used in the expression. The categories selected will be automatically added as a row in the **Filter Expression** table. If desired, select another category system from the drop-down list and select categories from that system; another row will be added to the table.

Individual Elements setting will cause the list of elements in the Vista database to be displayed with checkboxes. Check the box(es) for the element(s) to be used in the expression, and the elements selected will be automatically added as a row in the Filter Expression table.

Spatial Filter setting will result in radio buttons that indicate the area to be used in the filter expression. The Project Boundary, or Default Boundary, is automatically included in all analyses and does not need to be selected from the spatial filter menu. To designate an area smaller than the project boundary, use the **Sub-Region** radio button to select a layer from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. Note that if a sub-region is to be specified, the layer used must contain only a single feature (e.g., the county shape), and that only one layer can be used in the filter expression. Selecting another layer will result in its substitution for the layer originally chosen for the expression. In addition, spatial filters cannot be nested or included in sub-expressions, and can only be related to other rows in the **Filter Expression** table using the **AND** operand (see step 7 for information about operands).

Existing Filter setting will cause a drop-down menu to be displayed containing all of the filters already defined in Vista. Select the filter to be used and the expressions within that filter system will be displayed, and the filter automatically added as a row in the Filter Expression table. If desired, select another filter from the drop-down list and another row will be added to the table.

6. Repeat steps 4 and 5 as needed to create additional rows in the **Filter Expression** table. In some cases, different values from the same filter setting need to be represented by separate rows in the filter expression (e.g., when different operands need to be applied). In such cases, after selecting the values to be included in a row, reset by selecting a different filter setting and then select the desired setting again. Check off the desired values, and these will be displayed in a separate row in the **Filter Expression** table.
7. Once there is more than one row in the table, relationships between criteria in the different rows should be indicated. Click on the last column to the right in the table (before the column displaying the documentation icons) and select the appropriate operand, if any, to be used for different

rows, with **AND** indicating that all criteria defined in that row and following one must be met and **OR** indicating that criteria in at least one of the two rows must be met. Note, however, that **AND**s and **OR**s cannot be mixed in the same sub-expression. Click in the appropriate **(** and **)** columns to add brackets where needed in the expression. Entire rows can be moved up and down using the arrow buttons. A selected row can be deleted using the X button.

Moving the cursor from row to row in the **Filter Expression** table will cause the categories, elements, or other filters in the row to be automatically displayed in the lower left portion of the window for editing purposes, but the setting in the Add Filter Setting box will not change from the last one used to select values.

8. Once you have completed the entries and defined relationships in the **Filter Expressions** table, validate the expression by clicking the validate button. If the expression cannot be validated, a window will be displayed indicating that the expression is not valid. Click **OK** and point to any column indicators in order to display a brief statement describing the issue with the expression that prevents its validation. Correct the expression and recheck the validation.

   If the filter expression is valid, a window will be displayed indicating that the expression is valid. Click **OK**.

9. To review the elements and/or area that will be included in analyses when the filter is applied, click the **Preview Results...** button. The resulting report will display the entire expression including brackets and operands, as well as any spatial filter used. See the Reports section for more details on Filter reports.
10. To close the window and save the expression developed for the filter click **OK**; otherwise, click **Cancel**.

Edit a filter:

1. Select the filter from the list on the **Filter List** window (e.g., Element Type) and click the **Properties...** button. The resulting properties window displays the criteria defined for the filter.
2. Edit the filter using the processes described above for creating a new filter as guidelines.
3. To close the window and save any changes made to the filter click **OK**; otherwise, click **Cancel**.

GENERATE CONSERVATION SOLUTION WINDOW

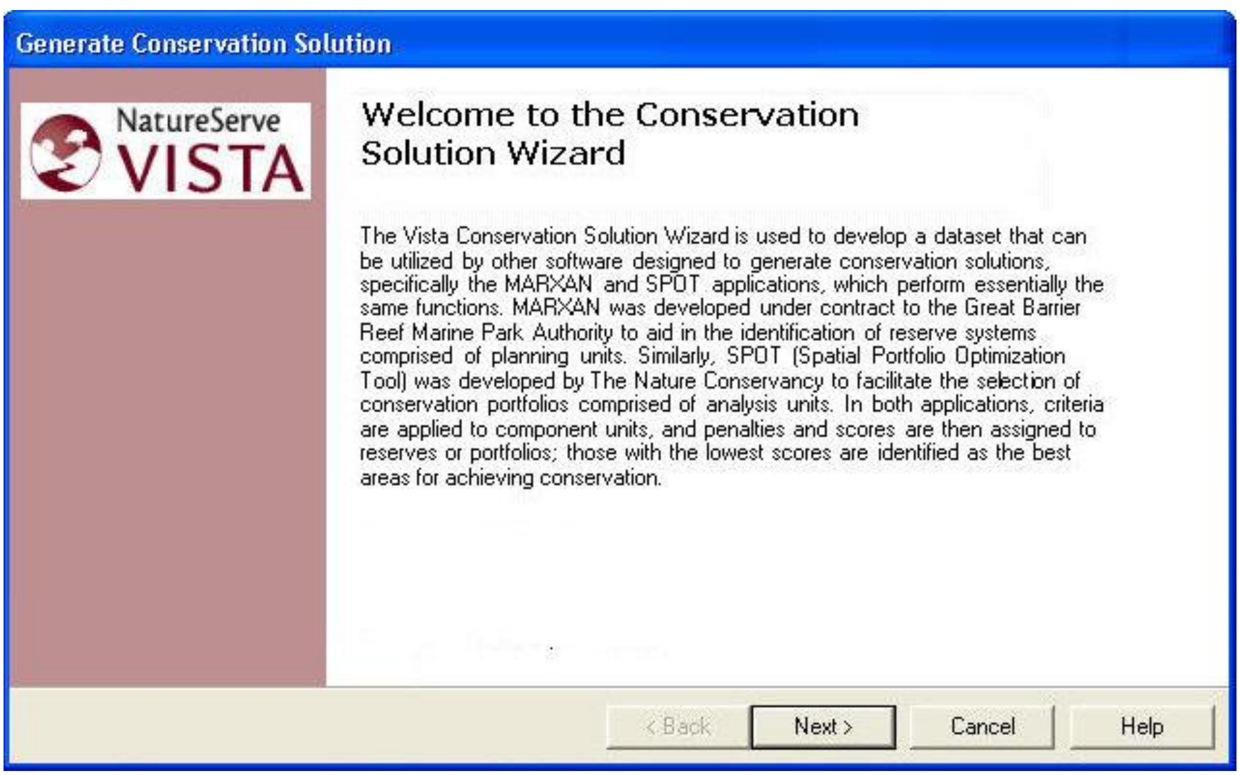
The **Generate Conservation Solution** wizard is displayed by selecting **Generate a Conservation Solution...** from the NatureServe Vista menu. This window is used to prepare the necessary input data for analysis by external conservation solution software, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool). These applications evaluate different units of land according to criteria to determine which sets, when combined into larger units (e.g., portfolios or reserve systems) result in optimal conservation solutions in terms of several factors, including cost and representation of conservation targets. Once the input data are generated by Vista, the user is walked through the process of initiating solution runs using the external application.

For more detailed information on the MARXAN and SPOT applications, see http://www.ecology.uq.edu.au/marxan.htm and http://www.conserveonline.org/workspaces/spot, respectively.

Prepare for generating a conservation solution:

Before beginning the solution generation process, two or more attribute columns must be added to the analysis unit layer (identified in step 2 below) that will be used in the process.

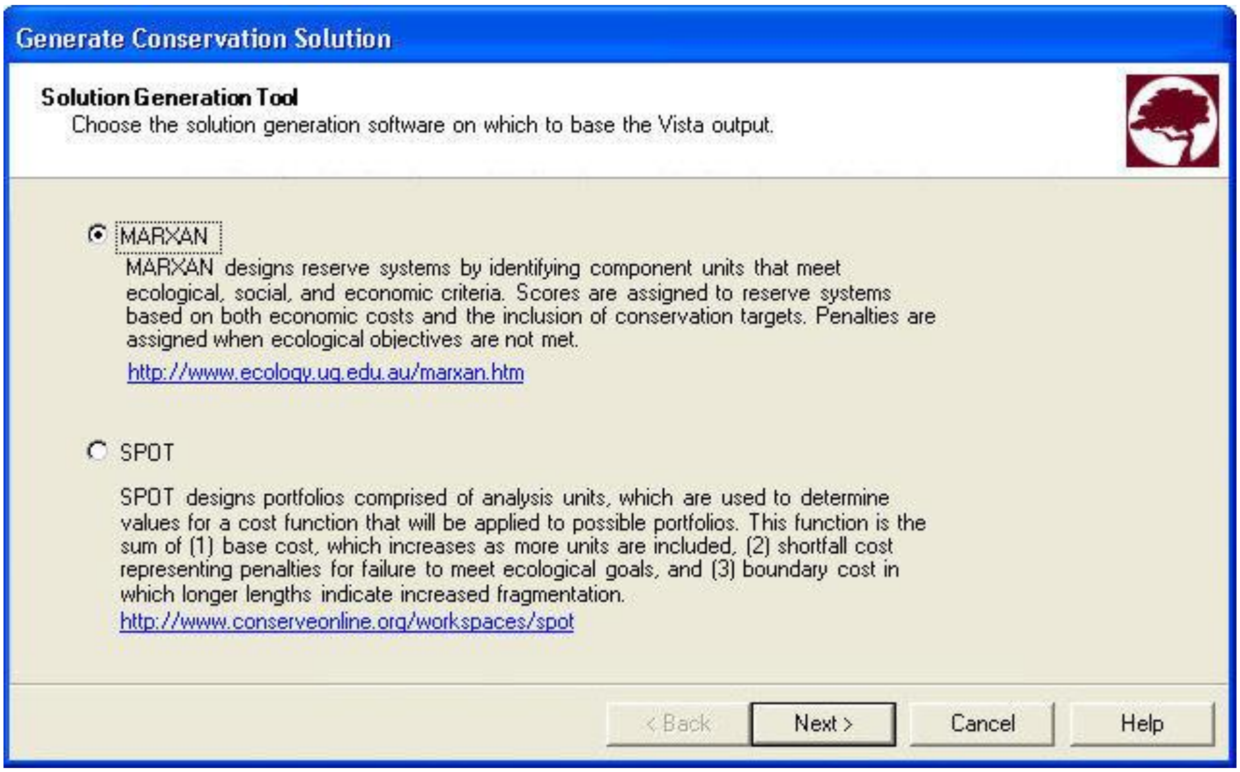
- One or more columns must be added to represent different types of costs (e.g., effort [in days], mitigation costs), with values associated with units to be considered in the solution (indicated in step 4, below).
- One column must be added to represent the attribute selection status (indicated in step 5, below); values for this attribute are limited to **Locked In**, **Locked Out**, or may be null. The selection status attribute serves to identify units to be included (Locked In) or excluded (Locked Out) when a solution is generated; null values will permit the solution generator to choose whether or not to include the unit in the solution.



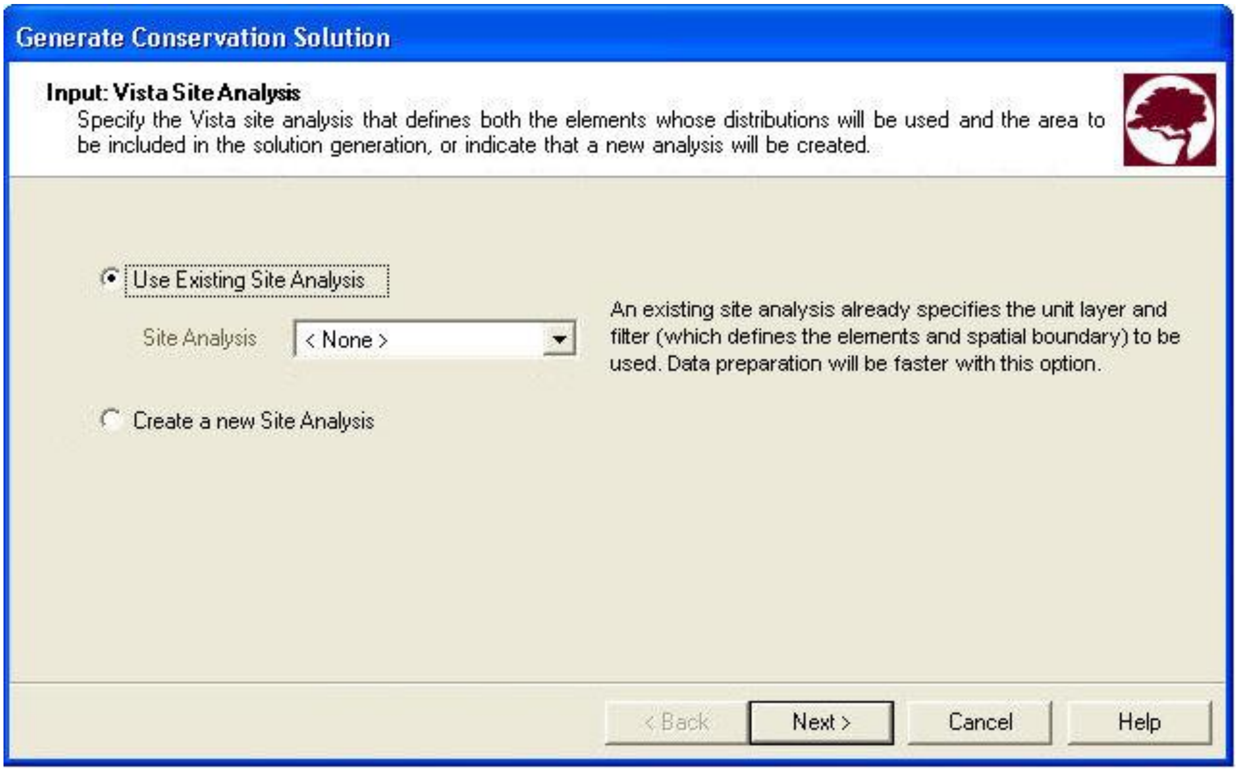
Note that at any time during the process of generating a solution, the previous step in the process can be revisited (and data changed, if desired) by clicking the **<Back** button, or the action can be canceled altogether by clicking the **Cancel** button.

Generate a conservation solution:

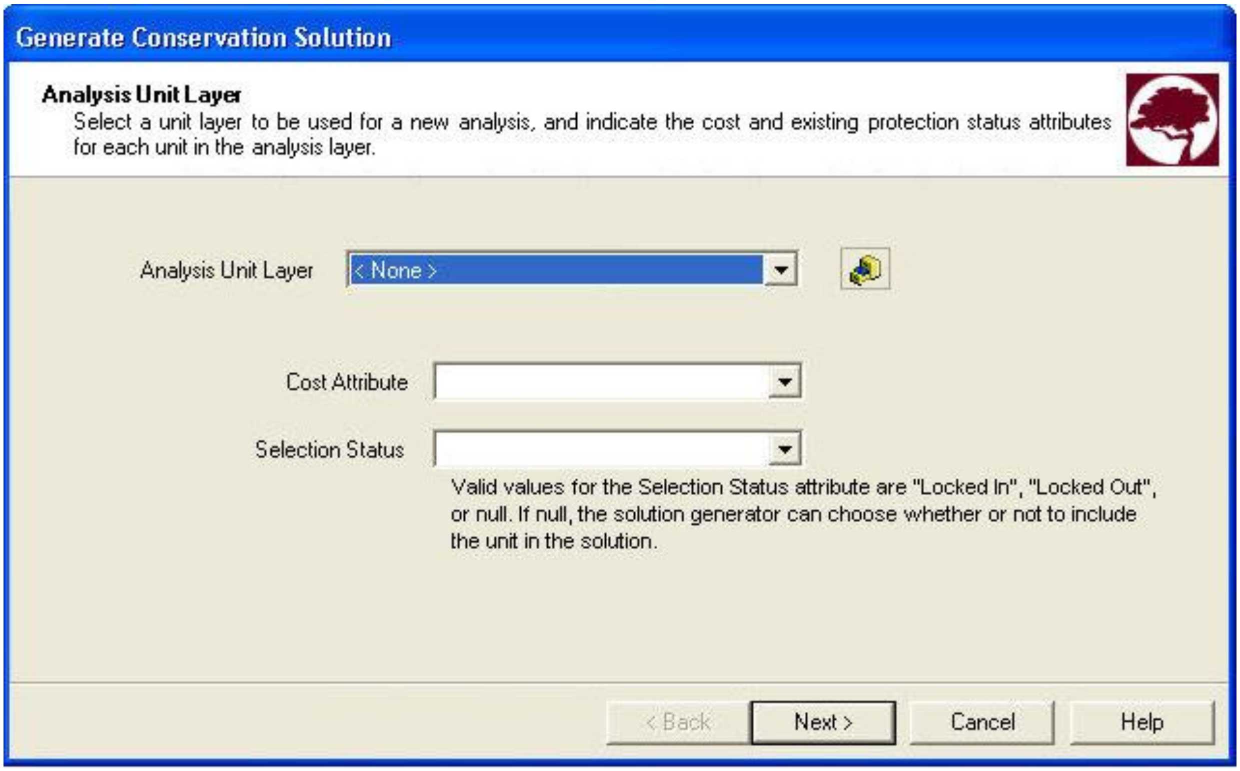
1. Indicate which application should be used as the basis for the solution to be generated by Vista using the appropriate **MARXAN** or **SPOT** radio button. Click **Next>**.



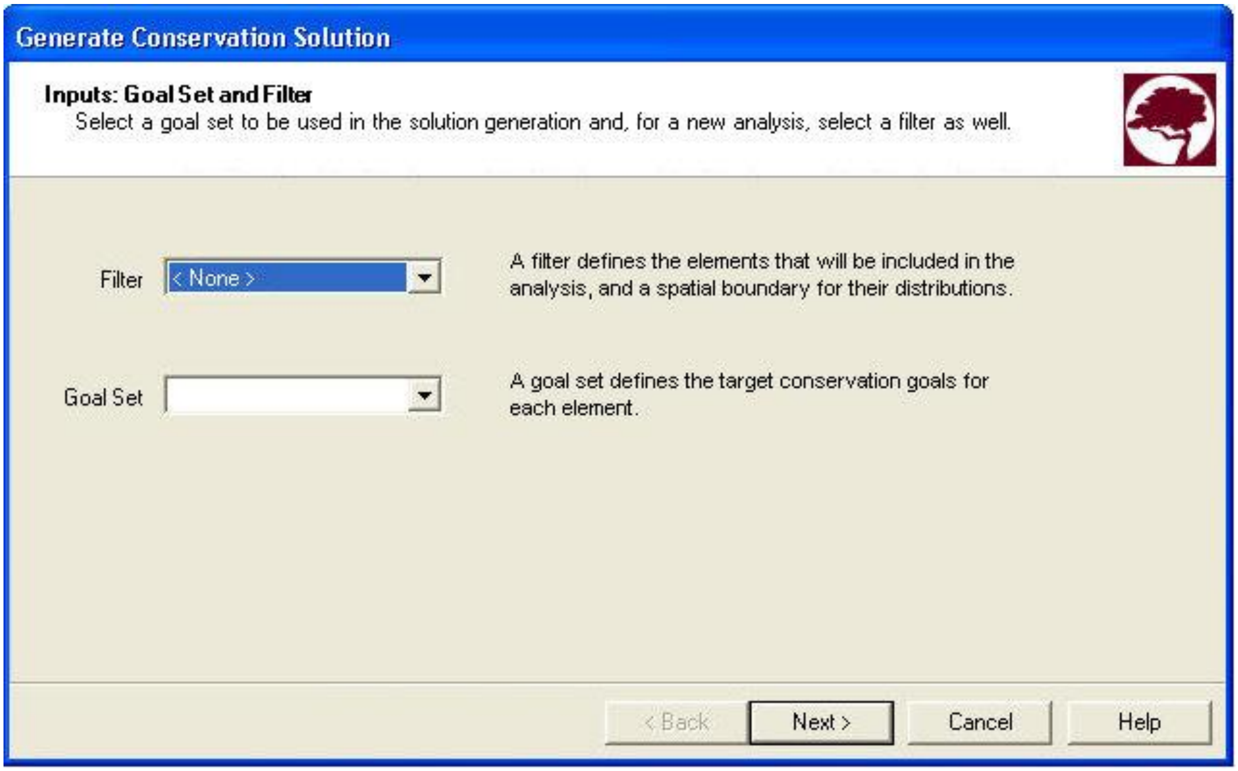
2. Indicate whether a new or existing site analysis will be used to generate the solution using the appropriate **Use Existing Site Analysis** or **Create a new Site Analysis** radio button. If an existing analysis will be used, select the analysis from the **Site Analysis** drop-down list. Click **Next>**.



3. If an existing analysis is being used for the solution, select the layer to be used from the drop-down list in the **Analysis Unit Layer** field, or by using the  ArcCatalog button.
4. Select the attribute (column) to be used to represent the costs associated with different units in the solution from the drop-down list in the **Cost Attribute** field.
5. Select the attribute (column) to be used to indicate whether units are to be included or excluded in the solution from the drop-down list in the **Selection Status** field. Click **Next>**.

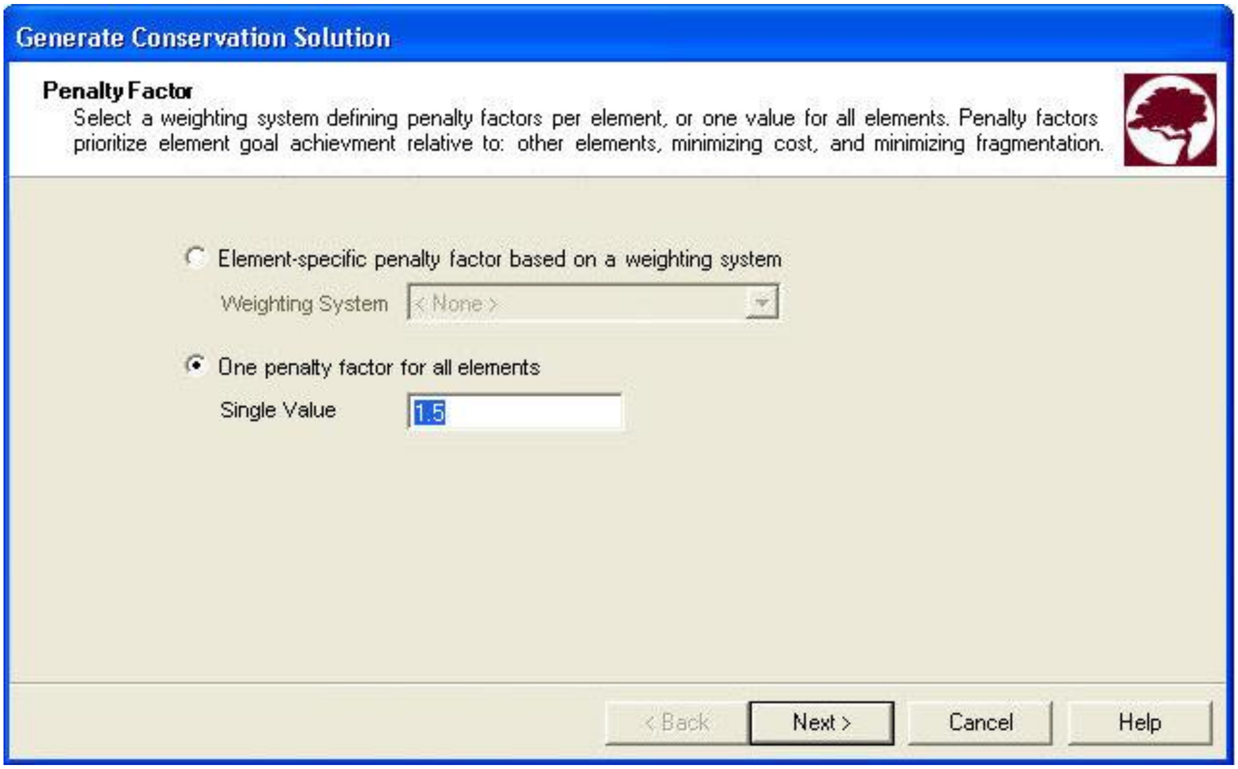


6. If a new analysis is being created for the solution, select the filter to be used in generating the solution from the drop-down list in the **Filter** field.
7. Select the element conservation goals to be used in the solution from the drop-down list in the **Goal Set** field. Click **Next>**.

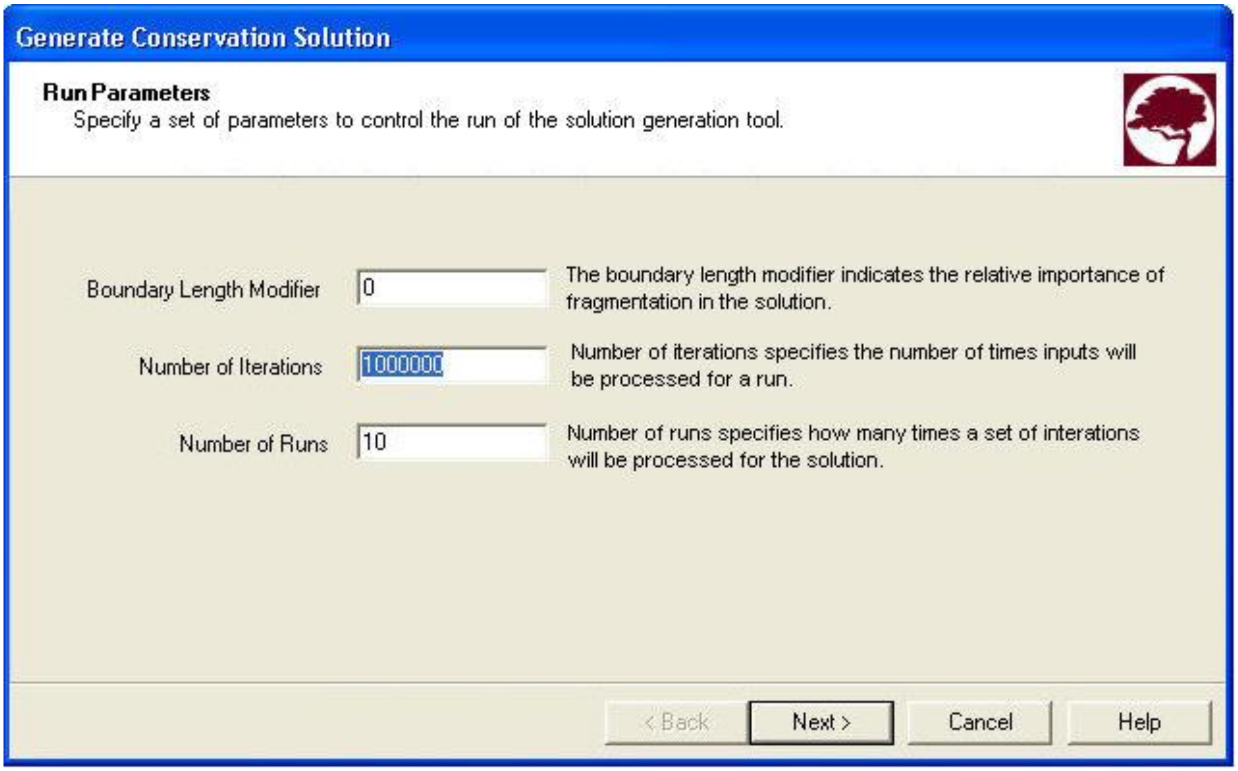


8. Indicate whether a weighting system that assigns a penalty for each element is to be used in generating the solution, or a single penalty factor should be utilized for all elements using the appropriate radio button.
   - If an element-specific penalty is to be used, select the appropriate system from the **Weighting System** drop-down list.
   - If a penalty is to be assigned to all elements in the solution, specify the value to be used in the **Single Value field**.

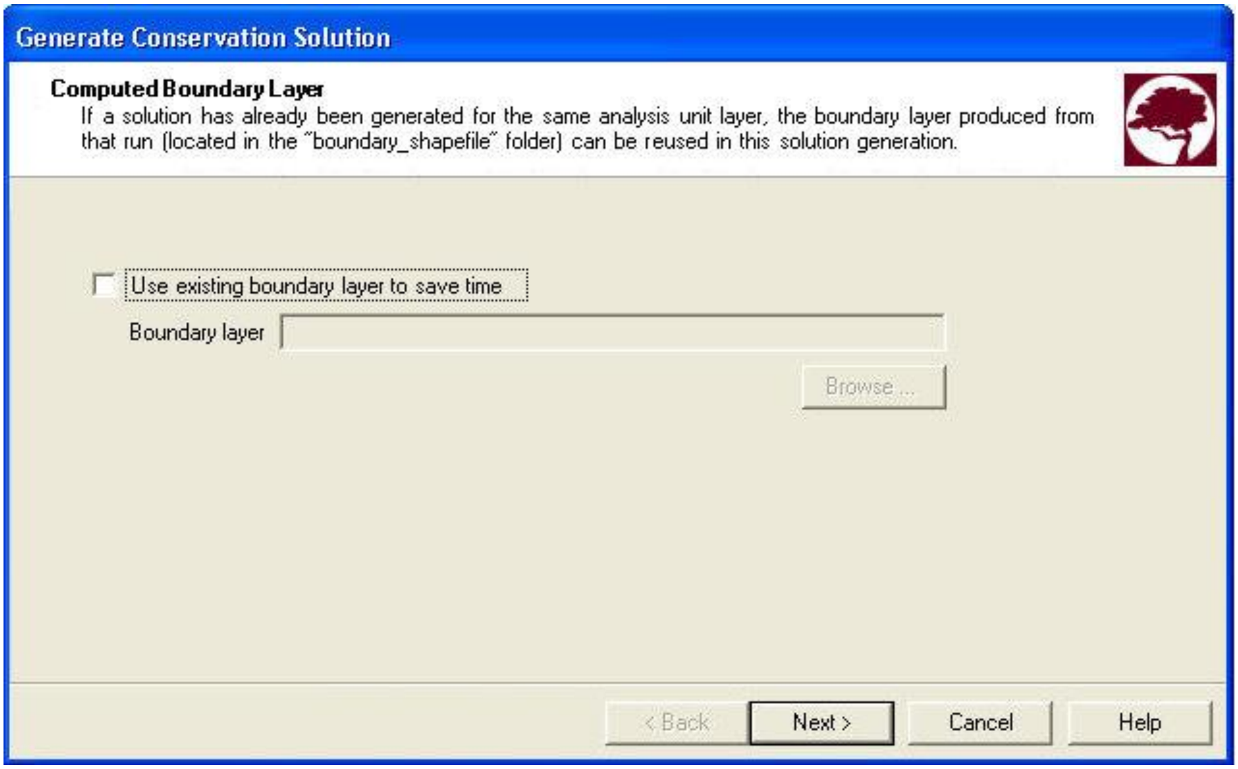
   Click **Next>**.



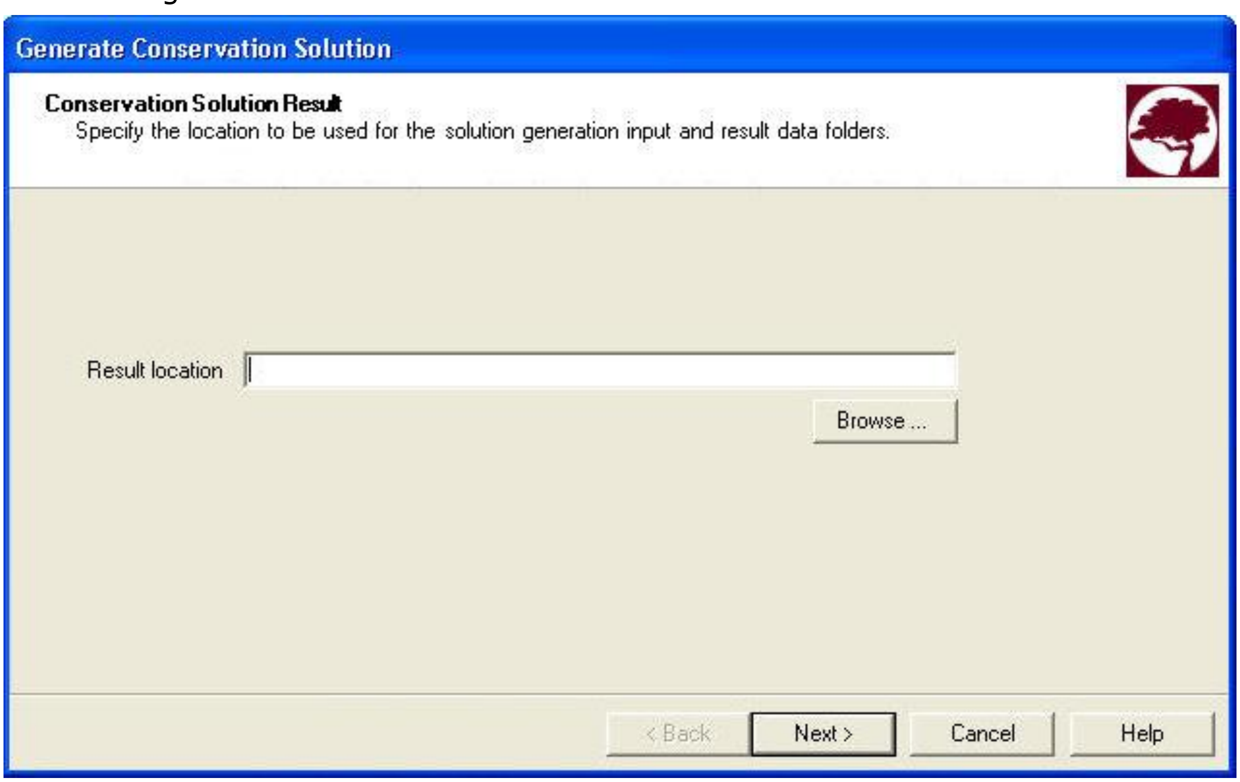
9. Specify the value to be used as the boundary length modifier in generating the solution.
10. Specify the number of iterations to be performed per run in the generation process.
11. Specify the number of runs to be performed in generating the solution. Click **Next>**.



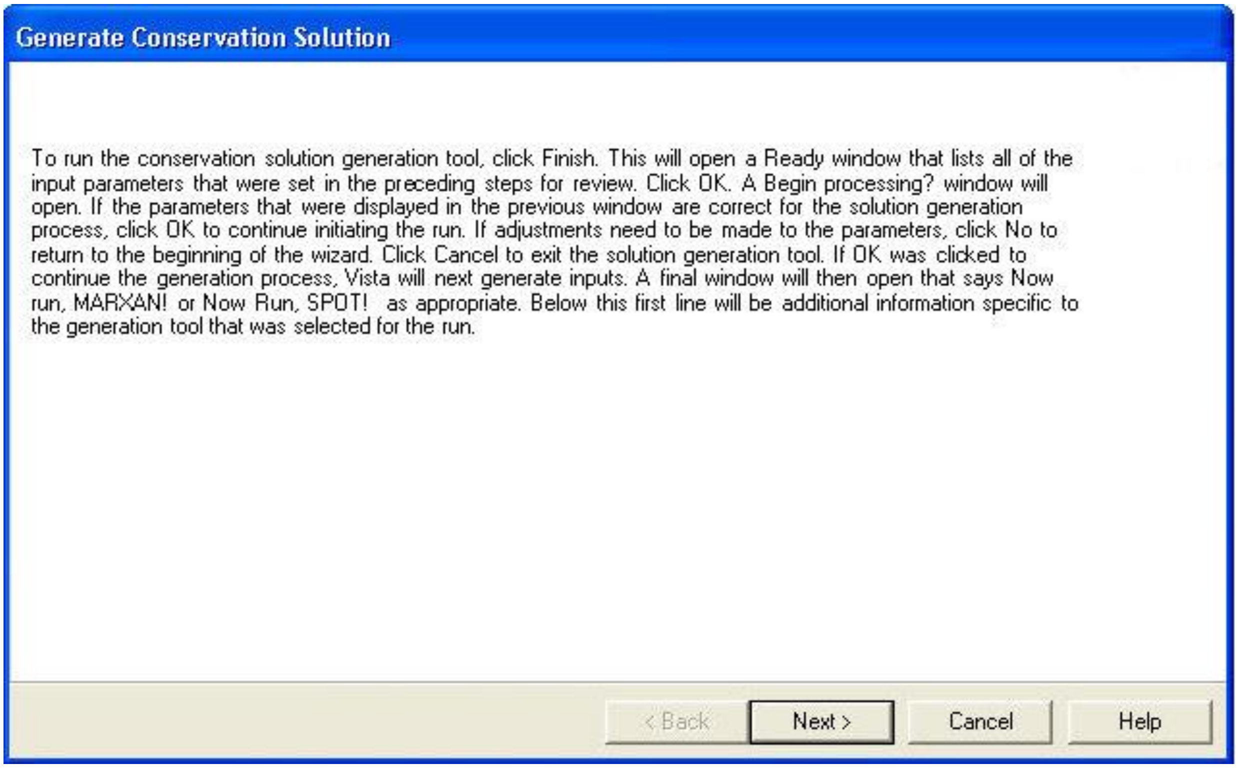
12. If a solution has already been generated using the same analysis layer as that specified for this solution, the generation time can be reduced by utilizing the boundary layer that was produced from the previous run. In such an instance, check the box to indicate that an existing layer will be used, and enter its path in the **Boundary layer** field, or click the **Browse** button to navigate to the layer (found in the ”r;boundary_shapefile” folder) and select it. Click **Next>**.



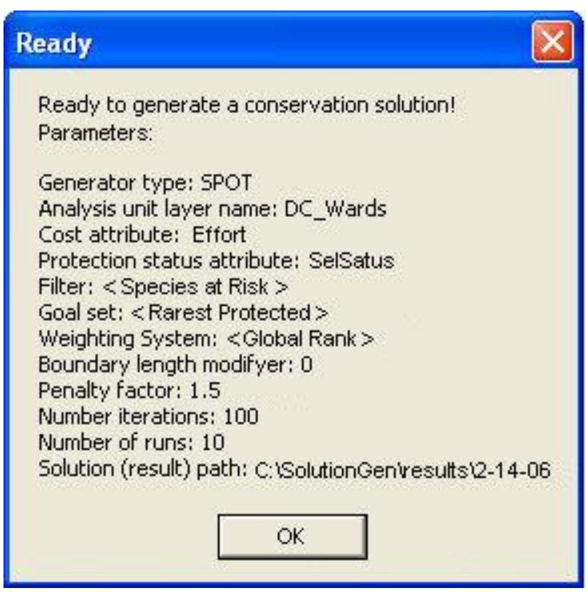
13. Specify the location to be used for folders created for the solution generation in the **Result location** field, or click the **Browse** button to navigate to the location. Click **Next>**.



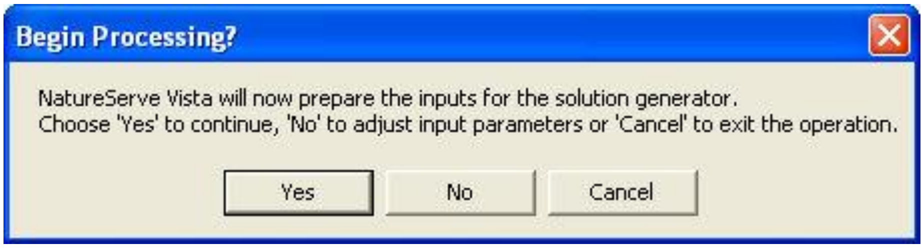
14. To begin the generation process for the solution, click **Next>**.



15. A **Ready** window will open that displays the parameters set for solution generation using the specified external solution generating application. Review the list of parameters for accuracy and click **OK**.



16. A **Begin Processing?** window will open. If the parameters that were displayed in the previous window are correct for the solution generation process, click **Yes** to continue initiating the run. If adjustments need to be made to the parameters, click **No** to return to the beginning of the wizard. Click **Cancel** to exit the solution generation tool.

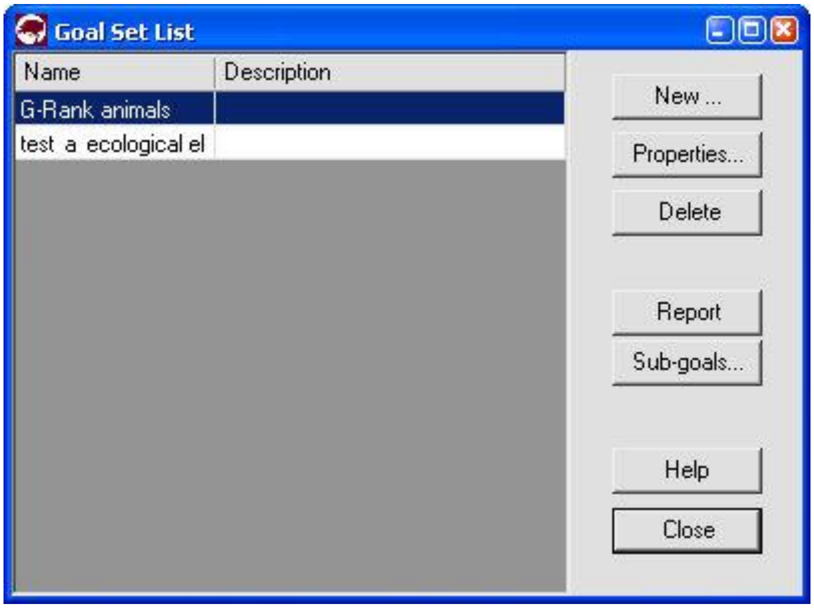


If **Yes** was clicked to continue the generation process, Vista will next generate inputs.

17. A final window will then open that says **Now run, MARXAN!** or **Now Run, SPOT!** as appropriate. Click **OK** to begin generating a solution using the designated external software application.

GOAL SET LIST WINDOW

The **Goal Set List** window is displayed by selecting **Lists ▸Goal Set List...** from the NatureServe Vista menu. This window lists all the goal sets that have been created for the project. See the Goal Sets section for more detailed information on the development and use of goal sets in analyses.



Button functions:

New... displays a new Goal Set Properties window that can be used to develop a new goal set to be used in the project.

Properties... displays the Goal Set Properties window showing details and allowing edits to the goal set selected in the list.

Delete deletes the goal set selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the goal set is referenced by another item used in project analyses, as shown in the following example.

Report displays a report that describes the selected goal set and its settings, as well as any elements with explicit goals to be included in analysis when the goal set is utilized. See the Reports section for more details on Goal Set reports.

Sub-goals... displays the Edit Sub-Regional Goal Set window that can be used to develop a new goal set to be used for a specific sub-region defined in the project.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

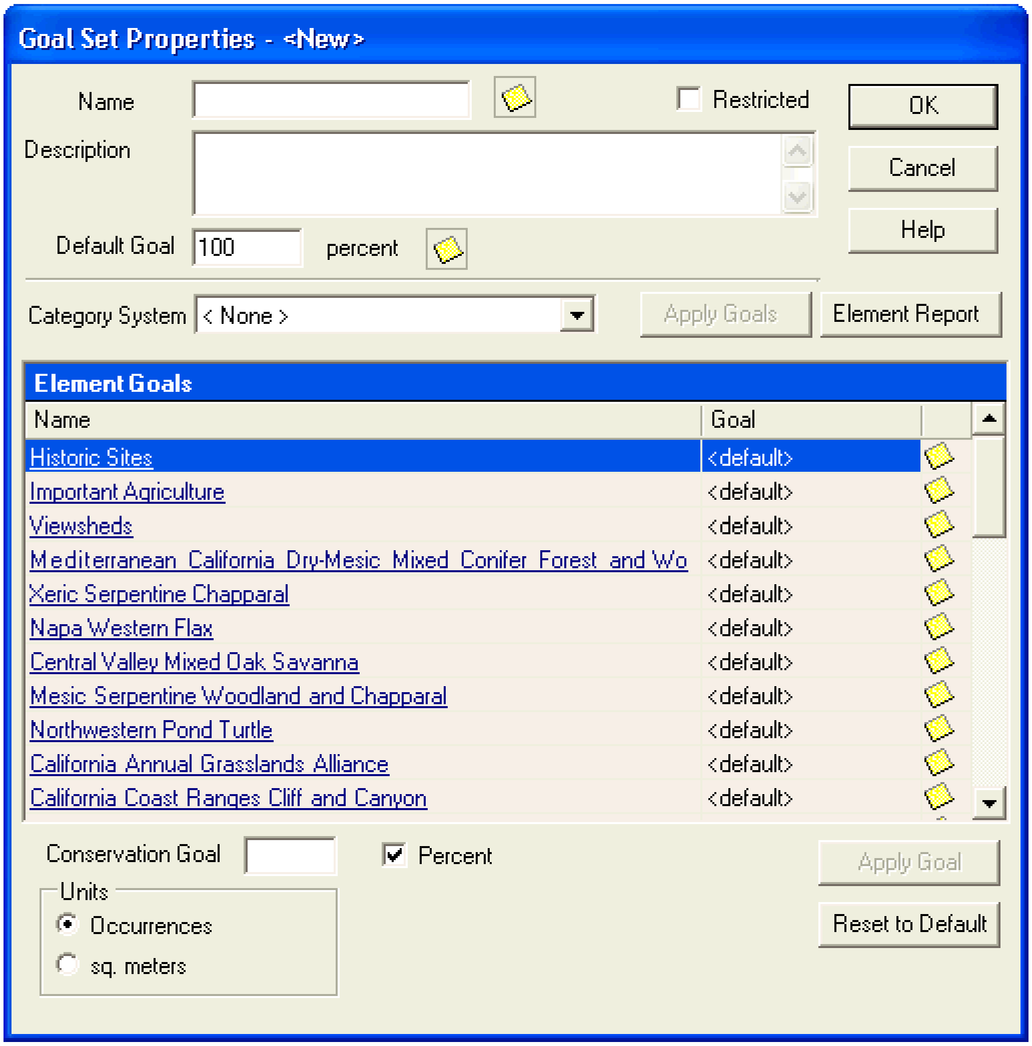
Name - name of the goal set.

Description - description of the goal set, if any.

GOAL SET PROPERTIES WINDOW

The **Goal Set Properties - <New>** window is displayed by clicking the **New...** button on the Goal Set List window. The new properties window is used to create a new set of conservation goals for elements of interest in the planning region. The goal set can be utilized in Land Use and Conservation Scenario evaluations for establishing a baseline against which both the existing land use status and scenarios for future land use can be compared, and conservation progress tracked over time. See the Goal Sets section for more detailed information on the development and use of goals in analyses.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).



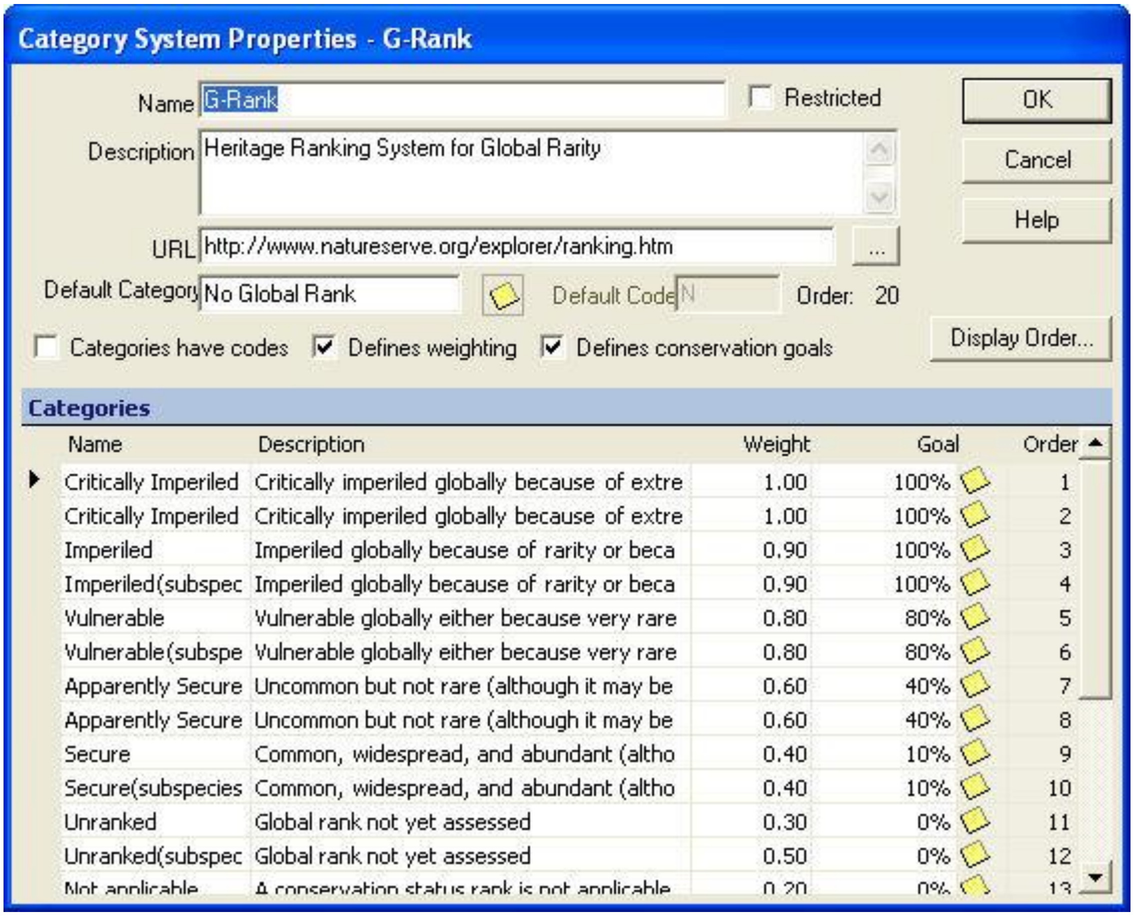
<u>Create a goal set</u>:

1. Specify a name for the goal set in the **Name** field. The **<New>** on the window title will change to the name of the new goal set as the entry is typed in.
2. If the ability to edit the goal set should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the goal set in the **Description** field, if desired.
4. Enter a value in the **Default Goal** field to be used in cases when a specific goal is not assigned to an element. The default value in this field is 100 percent.

If a category system is to be used to create the goal set, continue with step 5; if not, skip to step 7.

5. From the **Category System** drop-down menu select a category system to be used to define conservation objectives for the goal set. Only category

systems that define goals are shown in the drop-down list, such as the default "G-Rank" system displayed in the Category System Properties window below, although the option to create a new category system (**<Add New...>**) or to display all existing systems (**<Show List...>** in order to select and modify an existing system by adding goals) are included in the drop-down list.

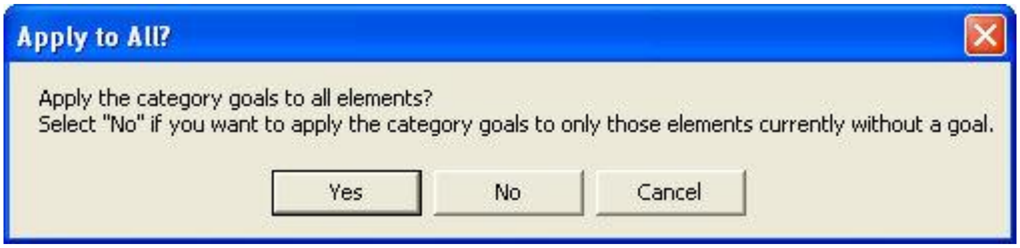


The advantage of using a category system is that goals can be assigned for groups of elements (e.g., all elements that are Critically Imperiled will have a conservation goal of 100%) instead of element by element individually (e.g., goal assigned for Burrowing Owl is 80% of viable occurrences, goal assigned for California Black Rail is 90%, etc.).

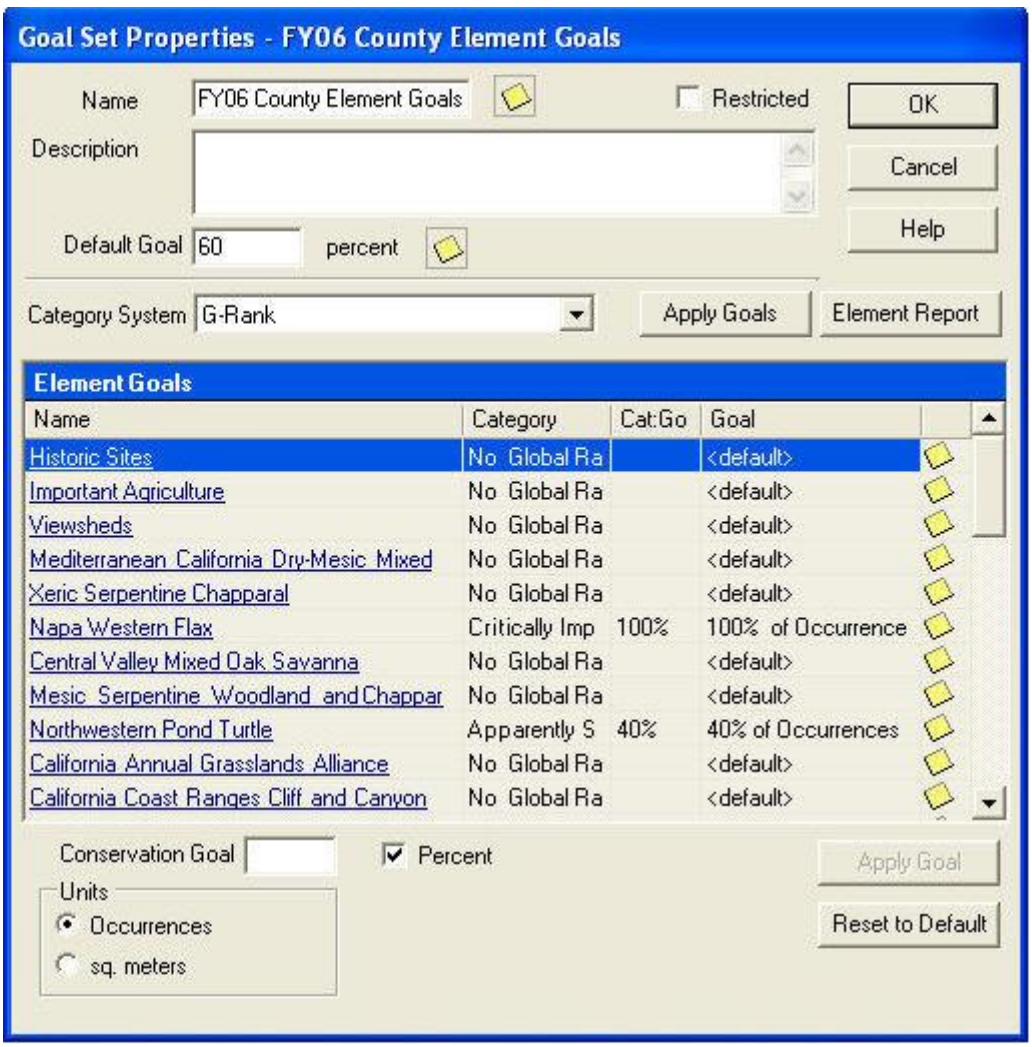
Once a category system has been selected, Category and Cat:Goal columns are displayed for elements listed in the Goal Set Properties window, and the name and conservation goal associated with the category to which each element belongs are displayed in these columns, respectively.

6. If it is preferable to begin using goals set for elements in the category system instead of just <default> values, use the **Apply Goals** button to the right of the **Category System** field to replace values in the Goal column with those displayed in the Cat.Goal column. Note that this action will result in an "Apply to All?" window that prompts the use to decide

whether to replace any new values entered in the Goal column with the pre-existing goals assigned to the category (Yes), or retain any newly-defined values for the goal set being defined (No).



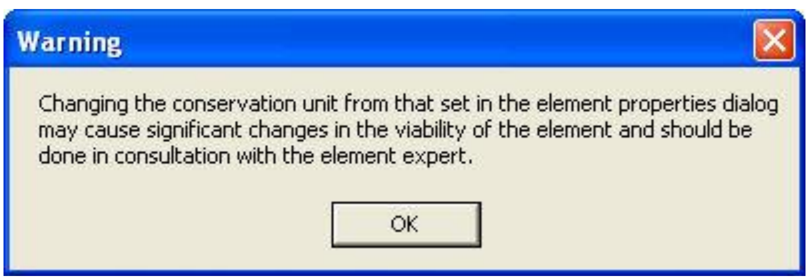
If the **Apply Goals** button is used before any specific element goals have been defined, it makes no difference whether the user chooses **Yes** or **No** since there are no new goals to be overwritten. (If specific goals have been defined, however, see step 7.) Category goal values will be displayed in the Goal column.



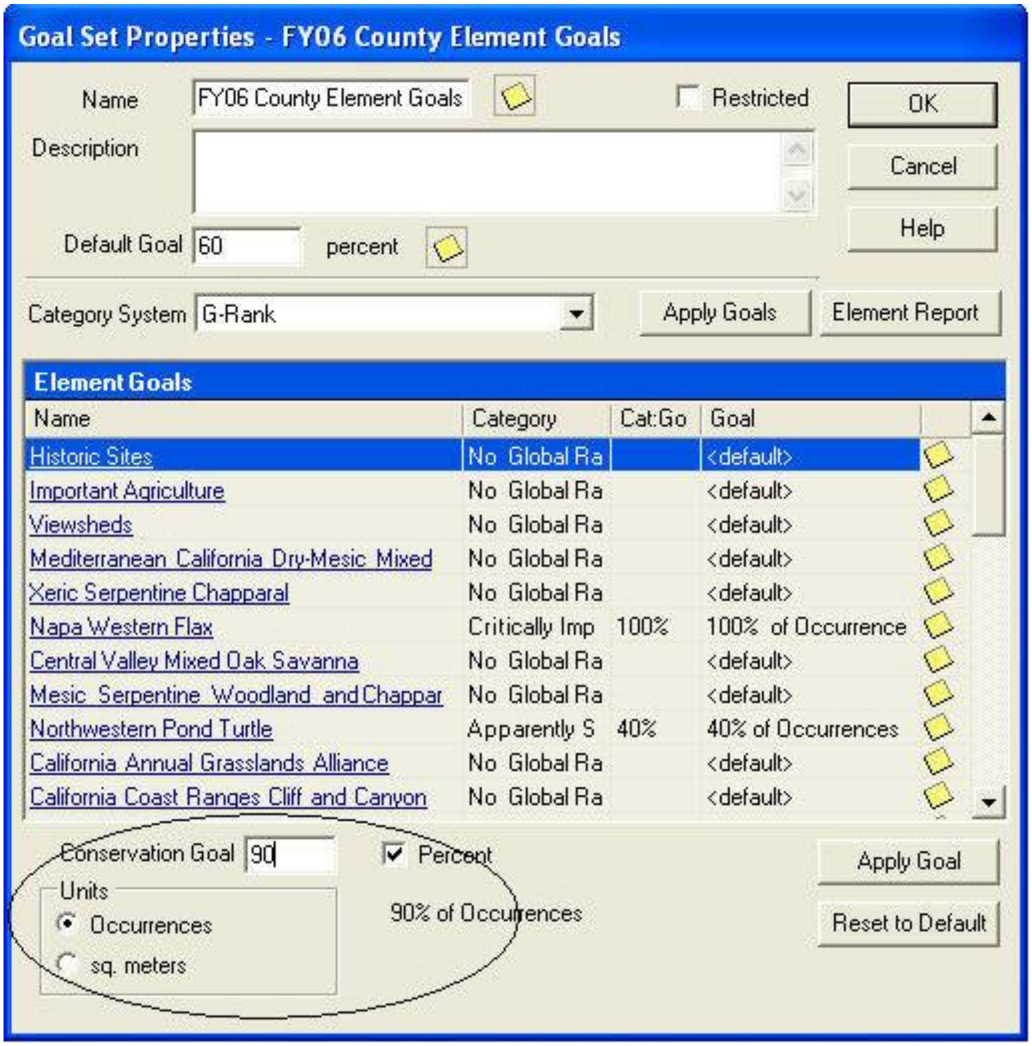
7. To assign a specific conservation goal to an element for this goal set:

- Highlight the element
- Enter (or change) the value in the **Conservation Goal** field in the lower left corner of the window. The value will be changed in cases when the Goal has been previously populated with the category value using the **Apply Goals** button, or when a value has been previously specified for the element.
- Indicate whether the goal represents viable occurrences or viable area to be conserved for the element by selecting either the **occurrences** or **area** radio button, respectively, in the Units group box in the lower left corner of the window.

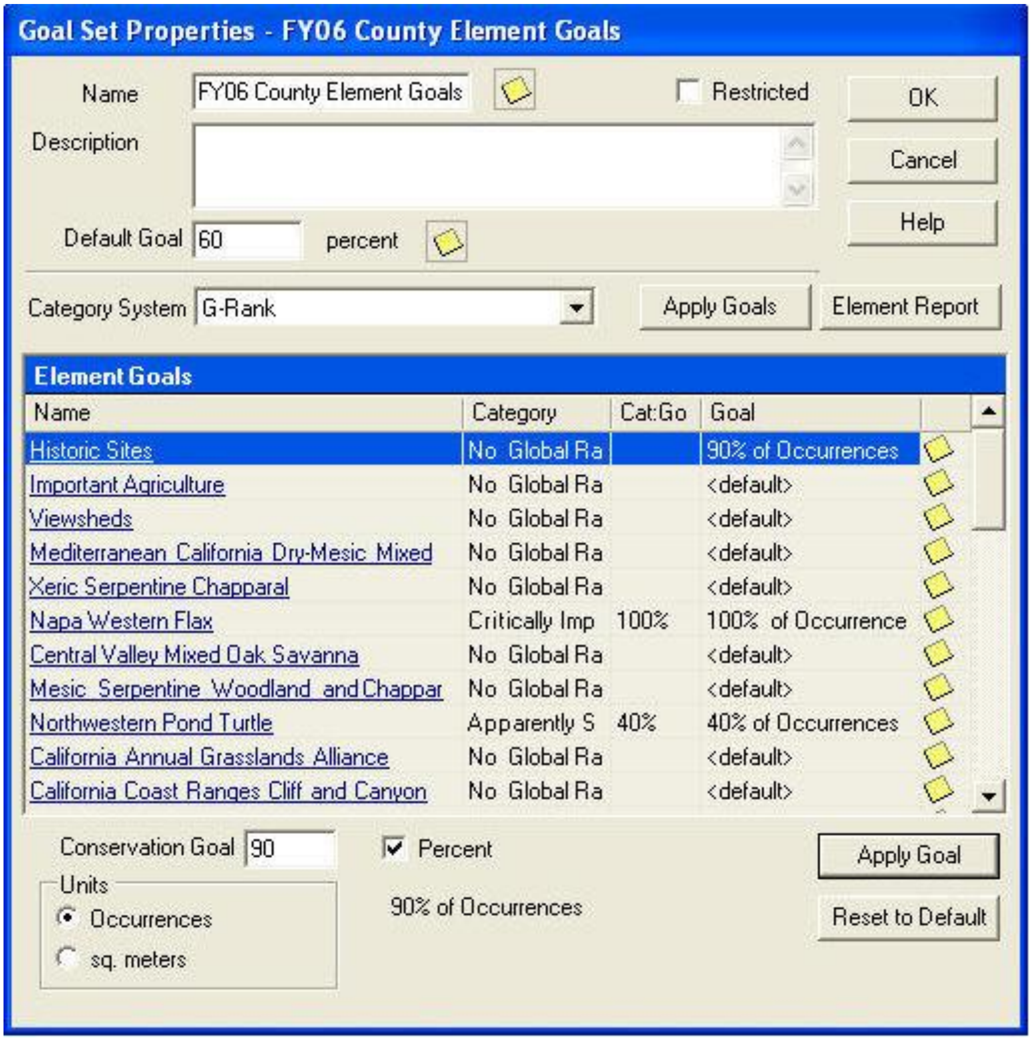
  If a category system is being used to create goals, the appropriate **occurrences** or **area** radio button in the *Units* group box will be automatically selected based on the goal in the category system. Changing this default setting may significantly impact the actual viability (or integrity, for ecological communities and systems) of an element to be conserved in the region of interest if the goal is not appropriate for the type of data associated with that element. The first time such a change is made during the process of defining the conservation goal for a specific element, the following warning message is displayed:



- If the goal is to be applied as a *percentage* of viable occurrences or viable area to be conserved rather than the *number* of viable occurrences or viable area, place a check in the **Percent** checkbox. Note that if the element has an assigned category goal, the **Percent** checkbox will be checked by default since category goals always represent a percentage, rather than a number, of occurrences or area.

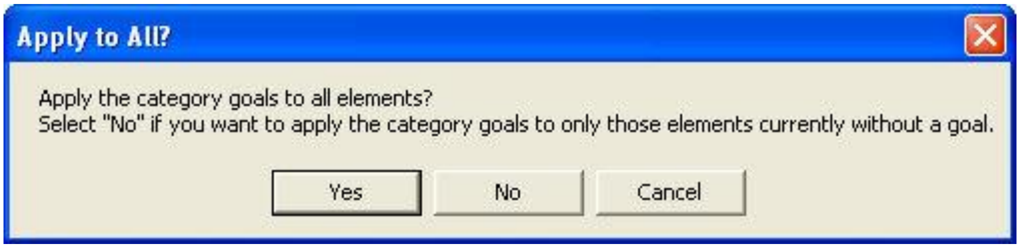


- Once these items have been completed, click the **Apply Goal** button in the lower right corner of the window to assign the conservation goal to the element. Note that a specified conservation goal for a particular element can be changed back to the original <default> value by highlighting the element and clicking the **Reset to Default** button in the lower right corner of the window.



If a category system is <u>not</u> being used to create goals, skip to [step 9](#).

8. If, after specific element goals have been defined, there are <default> values remaining in the Goal column that need to be replaced with the goal values defined for the category system instead of simply using the value in the **Default Goal** field, use the **Apply Goals** button to the right of the **Category System** field. This will replace the <default> values in the Goal column with those displayed in the Cat.Goal column. Note that this action will result in an "Apply to All?" window that prompts the user to decide whether to replace any new values entered in the Goal column with the pre-existing goals assigned to the category (**Yes**), or retain any newly-defined values for the goal set being defined (**No**).



Unless specifically defined goals should be overwritten, the user should choose **No** to replace only <default> values in the Goal column.

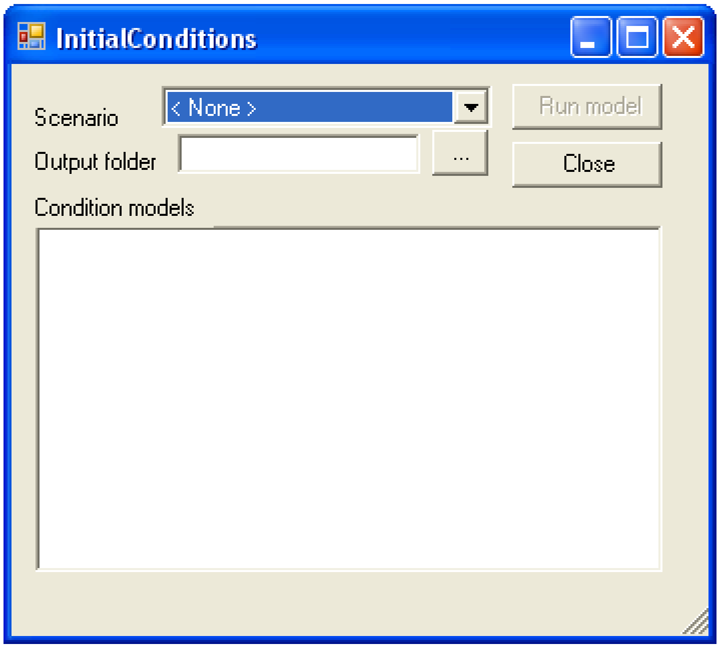
9. To view a report on a specific element, highlight the element and the **Element Report** button. See the Element Details Report for more detailed information.
10. To close the window and save the goal set click **OK**; otherwise, click **Cancel**.
11. To review details on the new (saved) goal set, open the Goal Set List window, select the set, and click the **Report** button. Settings for the goal set, as well as goals assigned to specific elements will be displayed. See the Reports section for more details on Goal Set reports.

Edit a goal set:

1. Select the goal set from the list on the Goal Set List window and click the **Properties...** button. The resulting properties window displays the goals defined for elements in the goal set.
2. Edit the goal set using the processes described above for creating a new goal set as guidelines.
3. To close the window and save any changes made to the goal set click **OK**; otherwise, click **Cancel**.

INITIAL CONDITIONS WINDOW

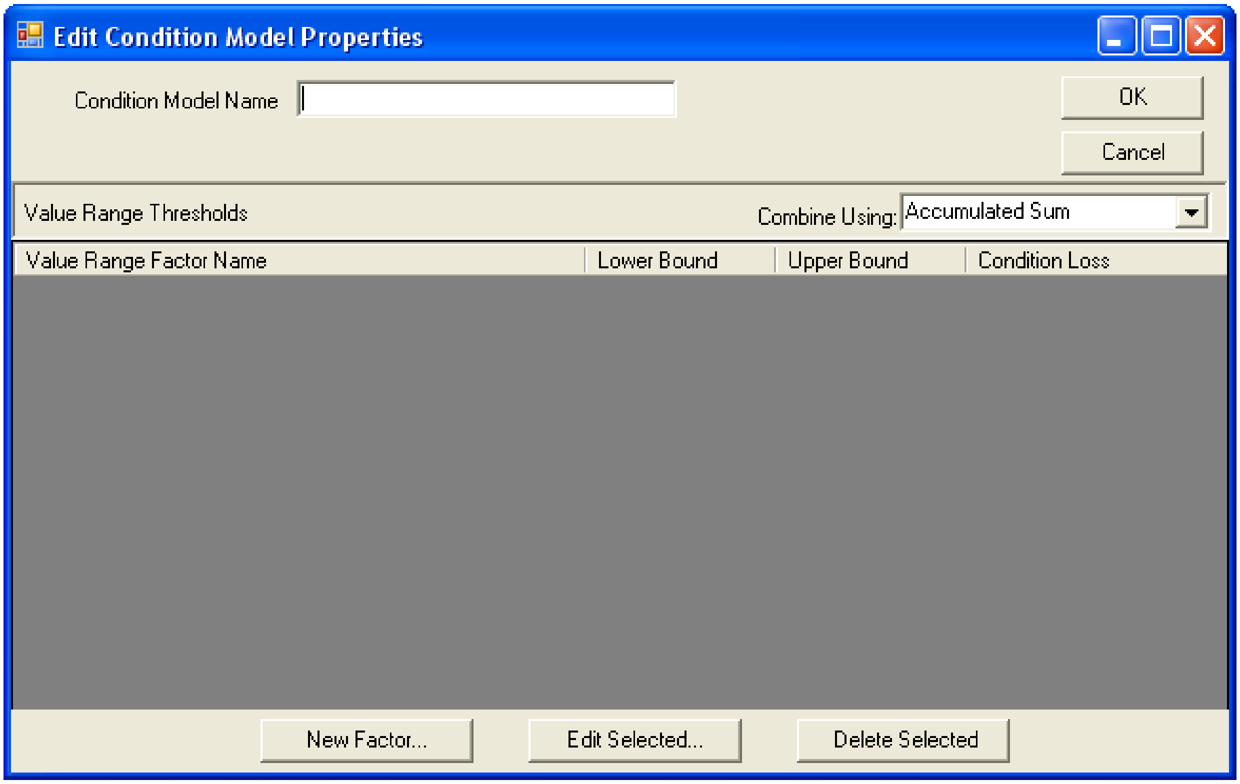
The Initial Condition Model list is accessed through the Vista main menu -> Lists -> Initial Condition Model List.



See Using the initial condition modeler for instructions on data entry for this window.

LANDSCAPE CONDITION MODEL PROPERTIES WINDOW

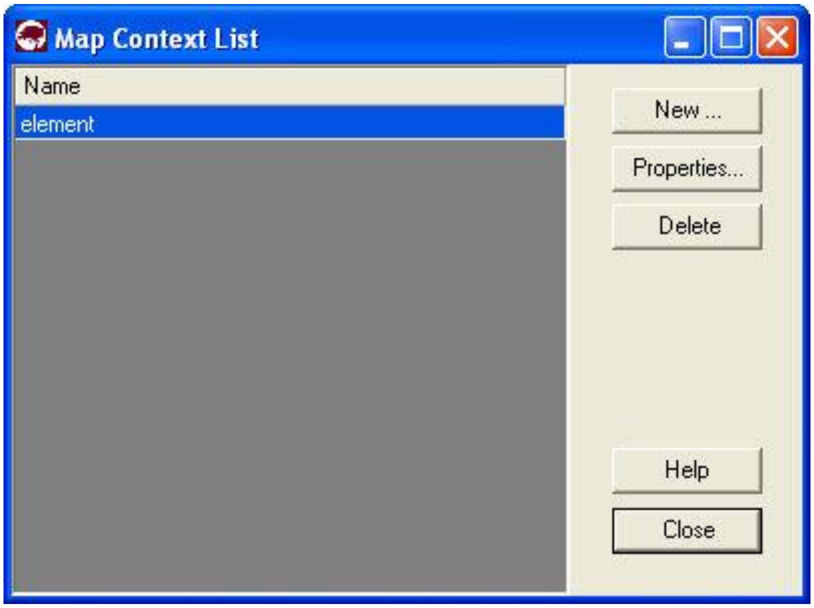
The Landscape Condition Model Properties window is accessed by clicking the blank area in the condition model next to an element and selecting new model.



See Creating distance intensity models for instructions on data entry for this window.

Map Context List Window

The **Map Context List** window is displayed by selecting either **Lists ▸Map Context List...** or **Reports▸ Map Context List...** from the NatureServe Vista menu. This window lists all the map contexts that have been created for the project to be used in creating reports, if any. A map context is a stored legend that can be used to help ensure that certain features are consistently included in specific reports. Note that Vista can apply map context individually for elements in the database. Thus, a specific map context can be defined and named for every element, if desired. For example, a map context could be created for a particular element, such as bald eagle, which would include layers that should always be displayed in a report on bald eagles (e.g., hillshade, rivers, county boundaries, watersheds).



Button functions:

New... displays a new Map Context Properties window that can be used to develop a new map context to be used in the project.

Properties... displays the Map Context Properties window showing details and allowing edits to the context selected in the list.

Delete deletes the map context selected in the list. A **Confirm Delete** window is displayed before the deletion is implemented.

Help opens the on-line documentation.

Close closes the window.

Map Context Properties Window

The **Map Context Properties - <New>** window is displayed by clicking the **New...** button on the Map Context List window. The new properties window is used to create a new map context that can be used to help ensure that certain features are consistently included in specific reports.

<u>Create a map context</u>:

1. Specify a name for the new map context in the **Name** field. The **<New>** on the window title will change to the name of the new map context as the entry is typed in.
2. Select the content layers to be displayed when the map context is applied by either selecting the layers from the drop-down menu, or by using the  ArcCatalog button to browse to the layer. (Layers will be displayed in the drop-down menu only if the layer is the correct feature type and is included on the Display Type tab of the left pane of the Vista application, referred to as the Table of Contents [TOC].)
3. Using the up and down arrow buttons, set the order in which features will draw by changing the order of the layers as needed. Click the delete button (red X) to remove any layers.
4. If the application should automatically display the full extent of the content layers selected when the map context is applied, check the **Zoom to Content Extent** checkbox.
5. To close the window and save the data entered for the map context click **OK**; otherwise, click **Cancel**.

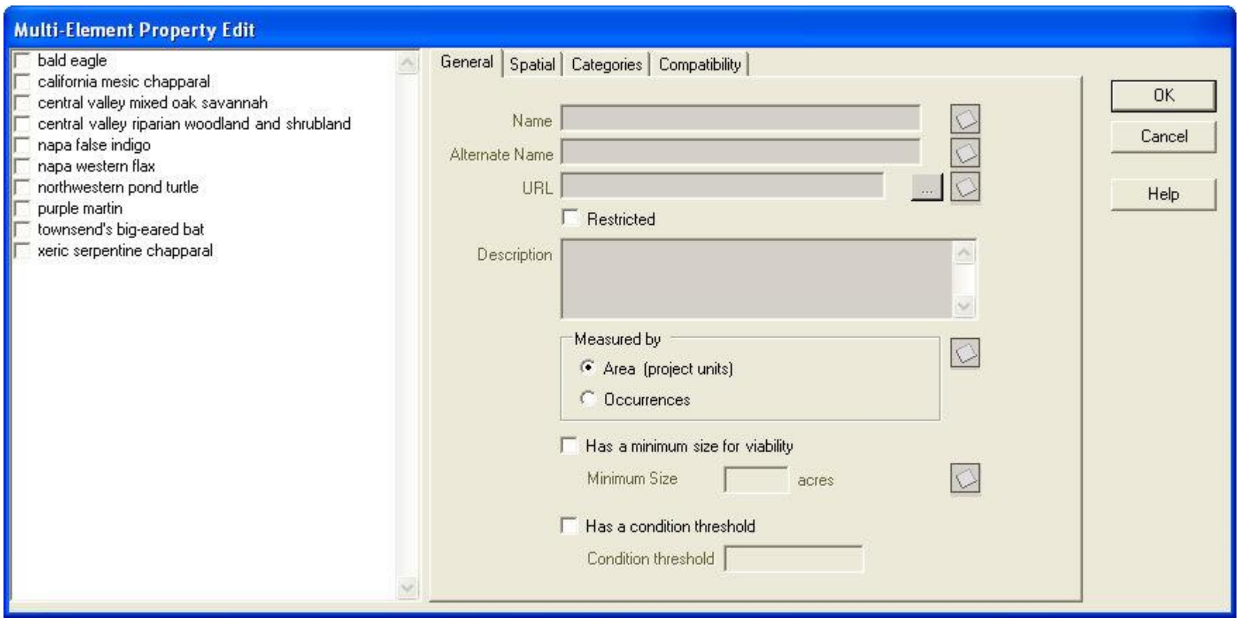
<u>Edit a map context</u>:

1. Select the map context from the list on the Map Context List window and click the **Properties...** button. The resulting properties window displays the map context.
2. Edit the map context using the processes described above for creating a new map context as guidelines.

3. To close the window and save any changes made to the map context click **OK**; otherwise, click **Cancel**.

MULTI-ELEMENT PROPERTY EDIT WINDOW

The **Multi-Element Property Edit** window, displayed by clicking the **Edit Multiple...** button on the Element List window, is used to set values for a selected group of elements simultaneously.



Edit properties for multiple elements:

1. Select the set of elements that is to be assigned the same values for specific properties by clicking either on each element to be included or on the checkbox for each of these elements.
2. Choose the appropriate tab(s) that contain properties to be changed for the designated group of elements. You will notice that the attributes that can be edited are limited, with many "grayed out" and unavailable. In addition, there are no values displayed in any of the fields that can be edited, even if the existing values for the selected elements are the same to begin with. Properties that can be edited for the designated set of elements simultaneously are as follows:

   On the **GENERAL** tab, can edit:

   Measured by Area or Occurrences

   Has a minimum size for viability

   Minimum Size

   Has a condition threshold

   Condition threshold

On the **SPATIAL** tab, can edit:

Viability/Integrity - Attribute of Distribution or Raster Layer

Map Context

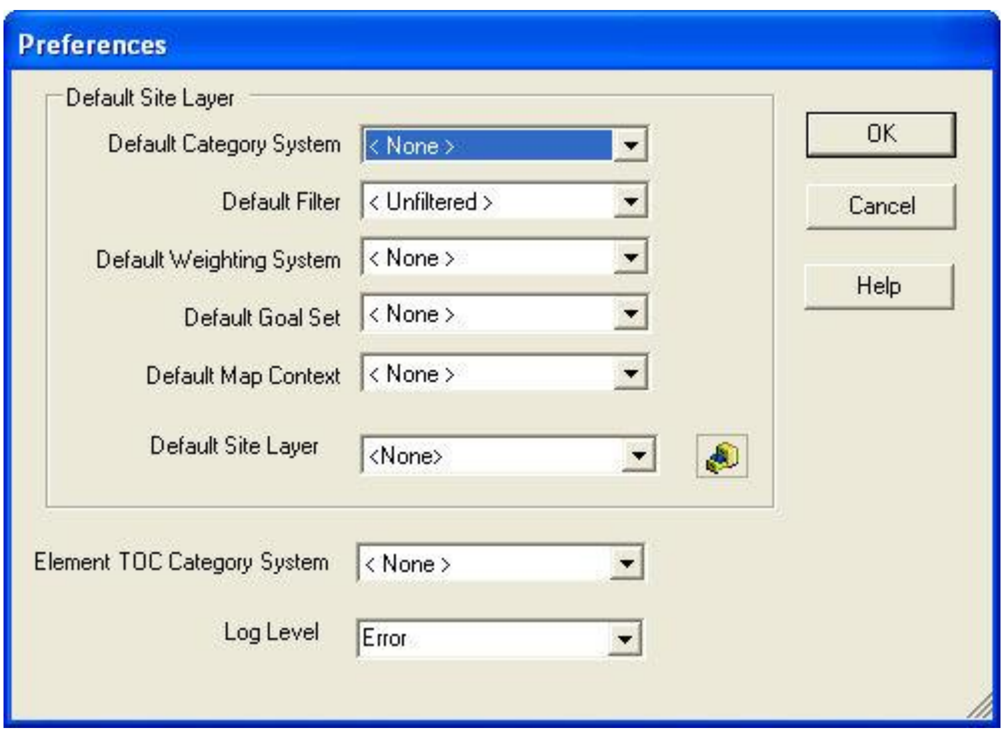
On the **CATEGORIES** tab all Category Systems can be edited

On the **COMPATIBILITY** tab element compatibility can be edited

3. Edit properties in the records of the selected elements simultaneously by clicking the appropriate radio buttons or checkboxes, entering values, and/or choosing values from drop-down menus for any properties that are to be set to a single value for these elements. Guidance for editing elements is provided in the processes described for adding new elements using the Element Properties window.
4. To close the window and save the edits made in the records of each of the selected elements simultaneously, click **OK**; otherwise, click **Cancel**.

Preferences Window

The **Preferences** window is displayed by selecting **Project▸ Preferences...** from the NatureServe Vista menu. This window lists the default behavior of commonly used fields in the project. Setting these preferences can save time during data entry.



Set project preferences:

1. Select the category system to be used as the project default from the **Default Category System** drop-down list. The selected category system will be the default displayed on the Categories tab of the Element Properties window when creating a new element, on the Filter Properties window when creating a new filter, and as the value in the Summarize Report By field on the Evaluate Scenario window when creating a new evaluation report.
2. Select the filter to be used as the project default from the **Default Filter** drop-down list. The selected filter will be the default displayed on the Summarize Conservation Value window and the Evaluate Scenario window.
3. Select the weighting system to be used as the project default from the **Default Weighting System** drop-down list. The selected system will be the default displayed on the Summarize Conservation Value window.
4. Select the goal set to be used as the project default from the **Default Goal Set** drop-down list. The selected goal set will be the default displayed on the Evaluate Scenario window.
5. Select the map context to be used as the project default from the **Default Map Context** drop-down list. The selected context will be the default displayed on the Spatial tab of the Element Properties window when creating a new element, on the Summarize Conservation Value window, and on the Evaluate Scenario window.
6. Select the layer to be used as the project default from the **Default Site Layer** drop-down list, or use the  ArcCatalog button to browse to the a layer to be used as the default site layer for Site Analyses, displayed on the Summarize Conservation Value window and on the Evaluate Scenario window.
7. Select the category system to be used as the default for the project Table of Contents (TOC) from the **Element TOC Category System** drop-down list. The selected category system will be the grouping used for the elements listed in the TOC. This setting can be altered by selecting the **Elements** header in the TOC, right-clicking, selecting **Element Properties...** from the context menu, choosing the Group tab from the resulting Group Layer Properties window, and then manually altering the list of elements displayed.
8. Select the level of detail to be used for information logged for errors, stored in the <project location>\Logs\Vista.log file from the **Log Level** drop-down list, specifically Error, Warning, Info, and Verbose. The values indicate an increasing level of detail to be logged, with the Error level logging only error messages and the Verbose level logging everything. The log file is created to help identify the cause of any errors.

Edit project preferences:

1. Select **Project▸ Preferences...** from the NatureServe Vista menu. The resulting window displays the current preferences for the Vista project.

2. Edit the project preferences using the parameters described above for setting preferences.
3. To close the window and save any changes made to the values click **OK**; otherwise, click **Cancel**.

Project Properties Window

The **Project Properties-Untitled** window is displayed by selecting **Project▸ New...** from the NatureServe Vista menu. The properties window contains information that is used to help insure that the project database and associated files are set up properly.

Before creating a NatureServe Vista project, one or more spatial data layers must be added to the Display tab of the Table of Contents.

Note that all the fields in the Project Properties window must be completed before the Vista project can be created.

<u>Set properties for a new project</u>:

1. Specify a name for the project in the **Project Name** field.
2. Select the unit of area that is to be used for the project from the **Project Area Unit** drop-down list. The value selected determines how all areas are calculated in the database and is fixed once the project has been created. After this value is saved, all windows in the project will reflect the unit type selected.

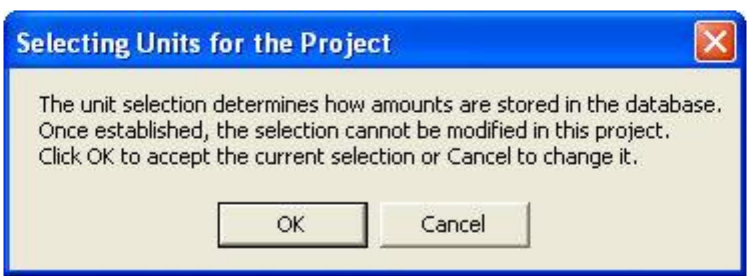
Note that once a unit has been selected for a project and saved, IT CANNOT BE CHANGED.

3. Enter a value in the **Default Cell Size** field. This is a time-saving device used when layers are created in Vista. The value entered in this field will be displayed as the default cell size in all Vista windows used to produce layers; the default value can then be changed in any of those windows to

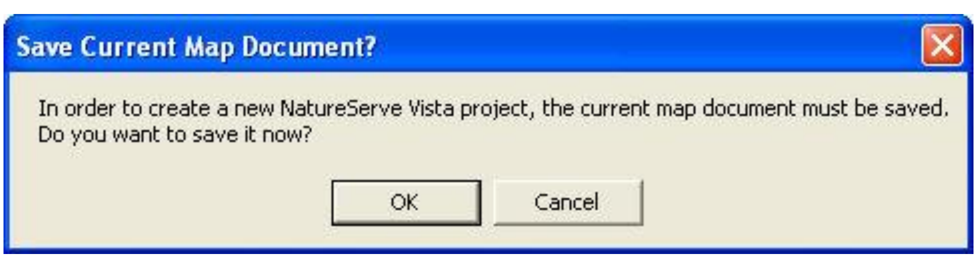
a size more appropriate for a particular analysis. See the Determining Grid Cell Size topic for more information on selecting cell sizes.

4. Select a value from the **Snap Raster** drop-down list that displays the layers already in the Table of Contents (TOC), or use the ArcCatalog button to browse to the a layer to be used as the project snap raster. See the Snap Raster topic for more information on selecting the appropriate snap raster for the project.
5. All of the derived layers in Vista must be loaded into the same ArcMap data frame. Select the appropriate value from the **Data Frame** drop-down list. The default value for an ArcMap data frame in a new project is **Layers**.
6. Select a value from the **Project Boundary** drop-down list that displays the layers already in the Table of Contents (TOC), or use the ArcCatalog button to browse to the layer to be used to define the boundary of the project area. The layer to be used as the project boundary can only contain one feature. Note that this selection cannot be later replaced by a smaller boundary layer or one that is offset from the original boundary layer selected. In cases when the boundary for a project is uncertain, it is recommended that this selection be conservative initially since a larger encompassing layer can be utilized later if needed.
7. To close the window and save the properties data entered for the project click **OK**; otherwise, click **Cancel**.

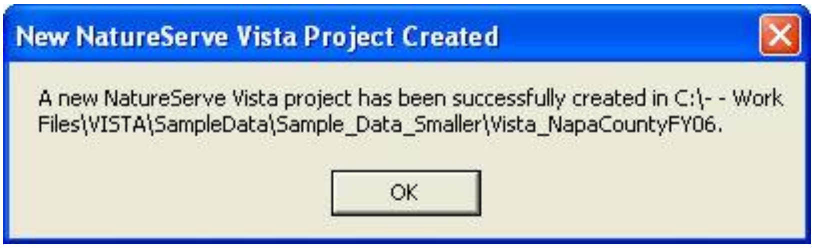
Clicking **OK** will result in the following units confirmation window:



Accepting the unit selection (clicking **OK**) will be followed by:

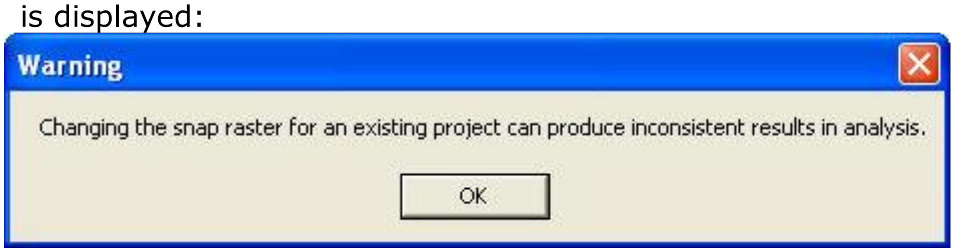


Clicking **OK** will result in creation of a new NatureServe Vista project, indicated by a confirmation window:



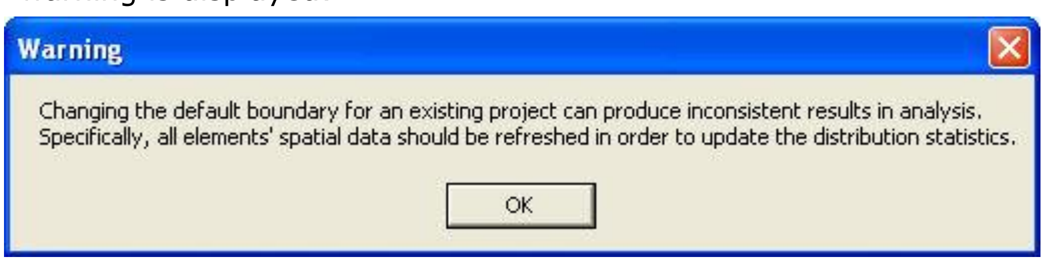
<u>Edit existing project properties</u>:

1. Select **Project ▸ Properties...** from the NatureServe Vista menu. The resulting window displays the current properties settings for the Vista project.
2. Edit the project properties using the information on appropriate alternate values for the fields described above.
   - **The Project Area Units field in an existing project cannot be altered.**
   - If the value in the **Snap Raster** field is edited, the following warning is displayed:

     To continue, click **OK**.

   - If the value in the **Project Boundary** field is edited, the following warning is displayed:

     To continue, click **OK**.

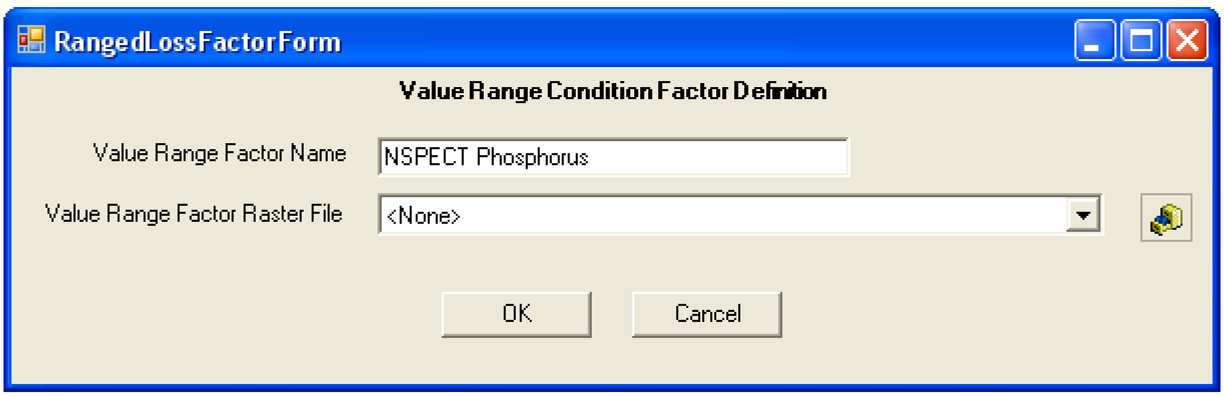
     If the new project boundary layer selected is smaller or offset from the original boundary layer, a warning indicator will be displayed with the message: "Once established in the project, the project boundary can only be increased. It cannot be decreased or shifted" and the disallowed layer must be replaced by another valid selection in order to continue.

If the new project boundary layer selected contains more than one feature, a warning indicator will be displayed with the message: "Spatial filter layer must contain exactly one feature (this layer may not be selection-based). Parameter name: "and the disallowed layer must be replaced by another valid selection in order to continue.

3. To close the window saving any changes made to the properties click **OK**; otherwise, click **Cancel**.

RANGEDLOSS FACTOR FORM

This window is accessed by Selecting New Value Range Factor from the Value Range Factor form.



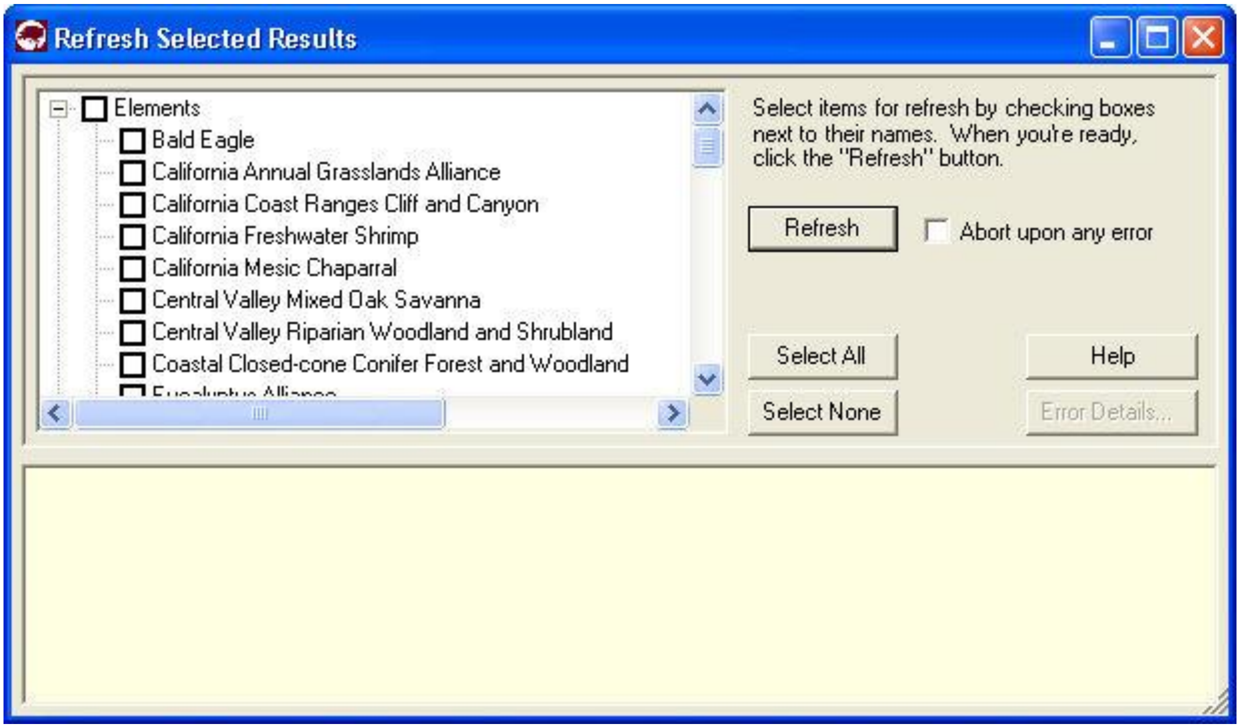
See Creating value range factors for instructions on data entry for this window.

REFRESH SELECTED RESULTS WINDOW

The **Refresh Selected Results** window can be opened several ways, depending on the item(s) to be refreshed.

- To display the Refresh Selected Results window listing all items that can be refreshed in the project (that is, elements, Conservation Value Summaries (CVS), and Scenario Evaluations, seen by scrolling down the list), click **Refresh Results...** from the NatureServe Vista menu.
- To display the Refresh Selected Results window listing only elements in the project to be refreshed, click the **Refresh...** button on the Element List window, or right-click on the major heading "Elements" on the NatureServe Vista tab in the Table of Contents (TOC) and choose **Refresh Results...** from the context window.

- To display the Refresh Selected Results window listing only CVS in the project to be refreshed, click the **Refresh...** button on the Conservation Value Summary List window.
- To display the Refresh Selected Results window listing only scenarios and Scenario Evaluations in the project to be refreshed, click the **Refresh...** button on the Scenario List window or the Scenario Evaluation List window, or right-click on the major heading "Evaluations" on the NatureServe Vista tab in the TOC and choose **Refresh Results...** from the context window.



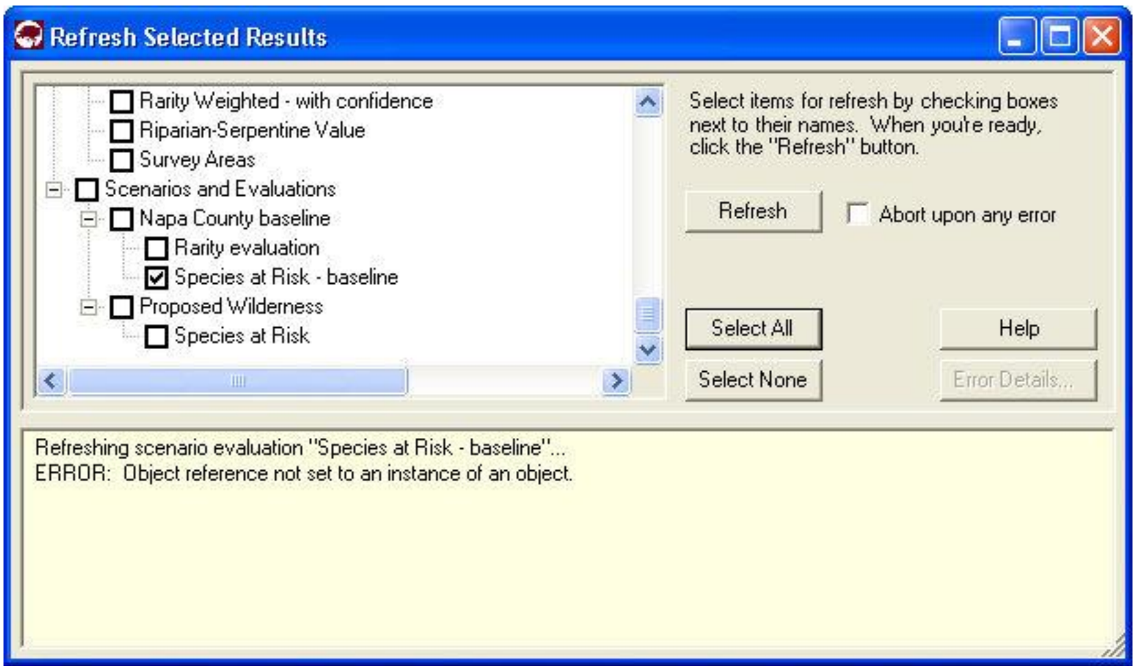
Refresh data:

1. Indicate which data are to be refreshed by using the check-box(es) associated with the element(s) and/or project analyses. The **Select All** button can be used to select the entire list of items; using the **Select None** button will de-select any items that have been selected.
2. Indicate whether the refresh process should be cancelled if an error should occur using the **Abort upon any error** checkbox.
3. Click the **Refresh** button to begin the data refresh process.

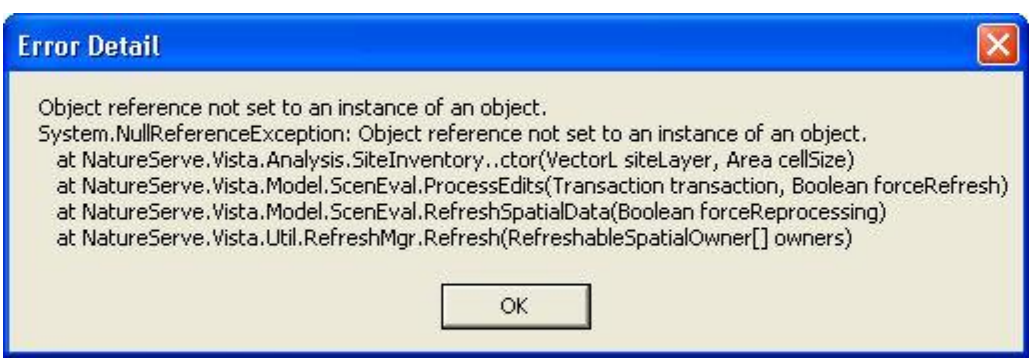
If the refresh process completes without errors, the following message is displayed:

If an error occurs during the refresh, the following message will be displayed

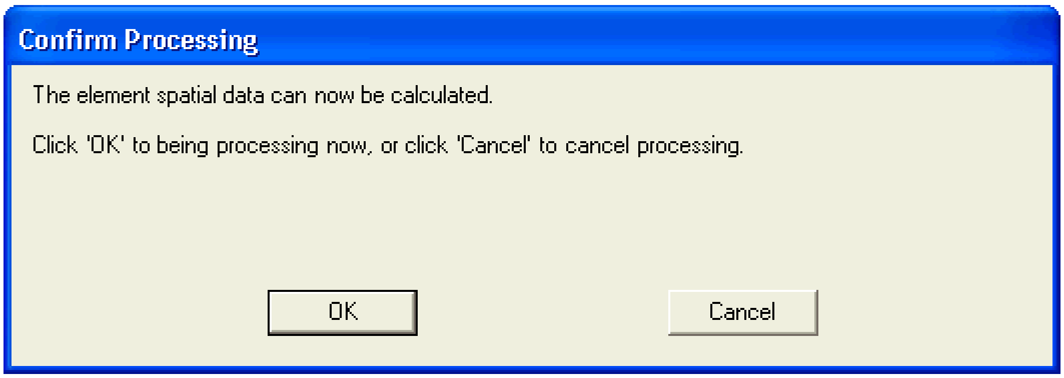
and an error log will be displayed in the lower half of the Refresh Selected Results window.



If more detailed information on the error(s) encountered is desired, click on the error log and then click the **Error Details...** button to display an Error Detail window.

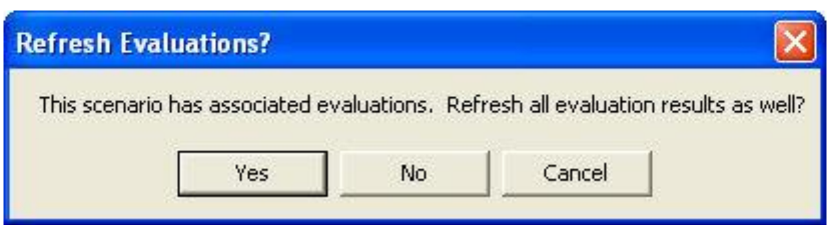


Note that elements, CVS, and Scenario Evaluations in the project can be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single element or analysis on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Confirm Processing window will be displayed.



Click **OK** to continue with the refresh process; otherwise, click **Cancel**.

Scenarios in the project can also be refreshed *without* opening the Refresh Selected Results window. To accomplish this, right-click on a single scenario on the NatureServe Vista tab of the Table of Contents and select **Refresh Result** from the context menu. A Refresh Evaluations? window will be displayed.

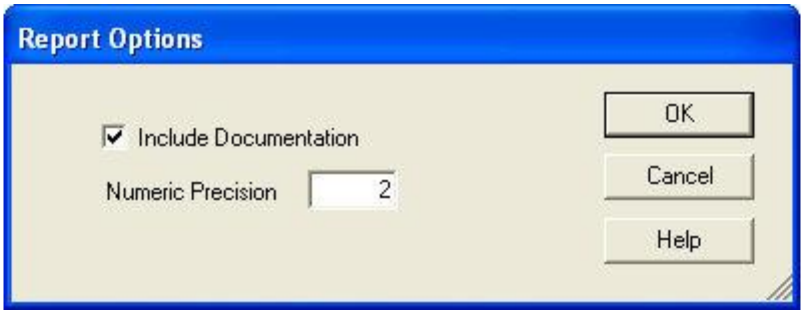


Click **Yes** to refresh both the scenario as well as any Scenario Evaluations that utilize the scenario; click **No** to refresh only the scenario; otherwise, click **Cancel**.

REPORT OPTIONS WINDOW

The **Report Options** window is displayed by clicking the 

button on the toolbar displayed in a report. This window provides the ability to set options for data to be included in a report.

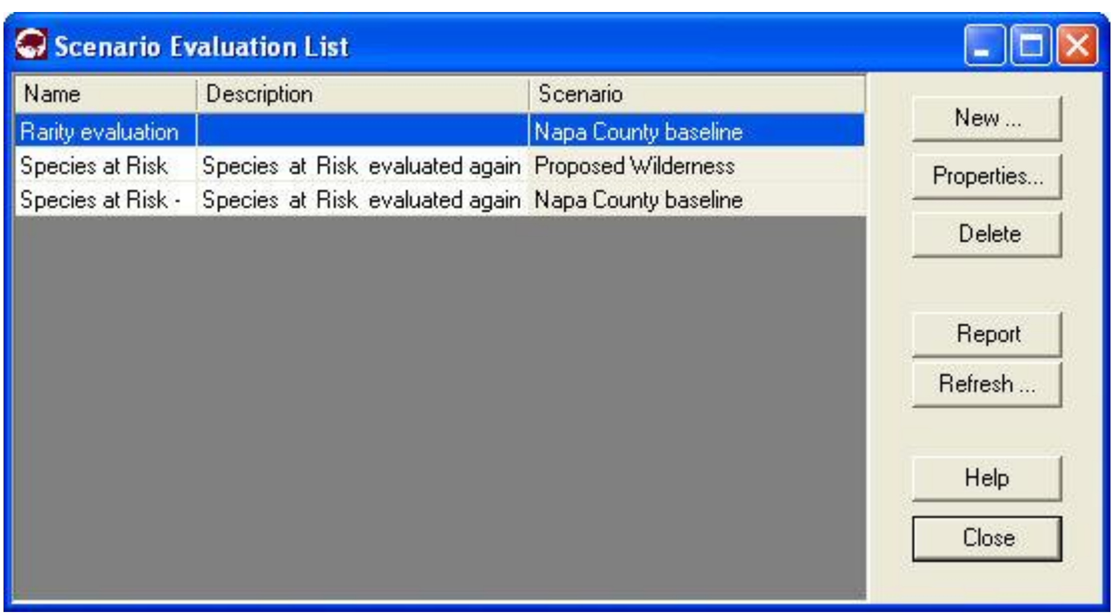


Set report options:

1. Indicate that documentation is to be included in the report by checking the **Include Documentation** checkbox. The term "documentation" refers specifically to any information entered in a Documentation window associated with data included in the report.
2. Enter a number in the **Numeric Precision** field that indicates the digits to be displayed to the right of the decimal point for numeric values in the report.
3. To close the window, saving any changes made to the options click **OK**; otherwise, click **Cancel**.

Scenario Evaluation List Window

The **Scenario Evaluation List** window is displayed by selecting **Lists ▸Scenaria Evaluation List...** from the NatureServe Vista menu. This window lists all the Scenario Evaluations that have been created for the project. See the Conservation and Land Use Scenarios section for more detailed information on this analysis.



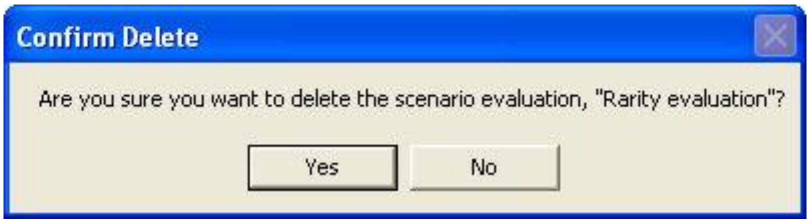
Button functions:

New... displays a new Evaluate Scenario window that can be used to develop a new evaluation for the project.

Properties... displays the Evaluate Scenario window showing details and allowing edits to the analysis selected in the list.

Delete deletes the Scenario Evaluation selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.



Report displays a report for the selected Scenario Evaluation that displays the land use or policy scenario that was evaluated in terms of element goals. See the Reports section for more details on Scenario Evaluation reports.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for selected Scenario Evaluation.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

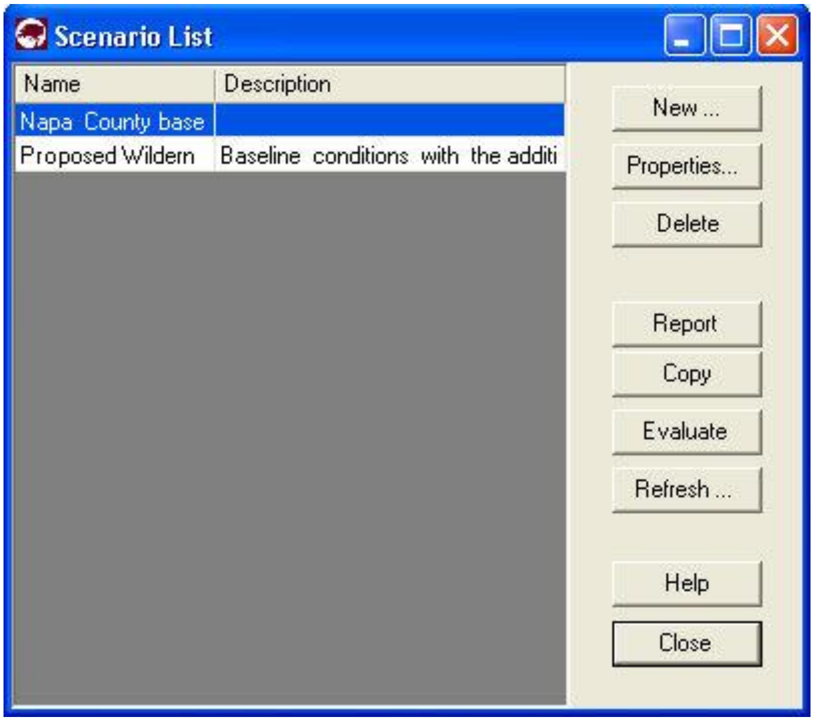
Name - name of the Scenario Evaluation.

Description - description of the evaluation, if any.

Scenario - name of the scenario used in the evaluation.

SCENARIO LIST WINDOW

The **Scenario List** window is displayed by selecting **Lists ▸Scenario List** from the NatureServe Vista menu. This window lists all the scenarios that have been imported into the project. See the Land Use and Conservation Scenario Evaluations section for more detailed information on defining and using scenarios.



Button functions:

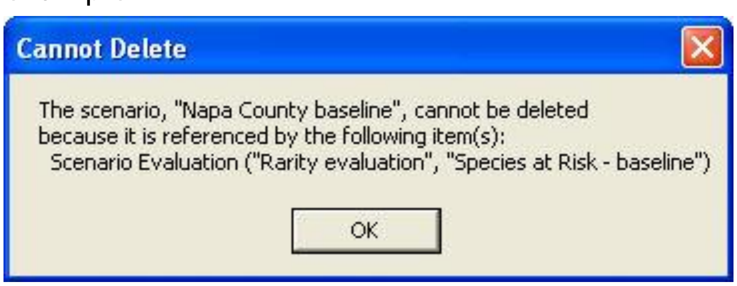
New… displays a new Scenario Properties window that can be used to define a new scenario to be imported into the project.

Properties… displays the Scenario Properties window showing details and allowing edits to the scenario selected in the list.

Delete deletes the scenario selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the scenario is referenced by one or more Scenario Evaluations, as shown in the following example.



Report displays a report for the selected Scenario that displays the settings used to create the scenario. See Reports section for more details on Scenario reports.

Copy creates a copy of the scenario selected in the list, which can then be edited to create a new scenario for import.

Evaluate opens a new Evaluate Scenario window that uses the scenario selected in the list.

Refresh... displays the Refresh Selected Results window that can be used to refresh the data for the selected scenario.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of the scenario.

Description - description of the scenario, if any.

Scenario Properties Window

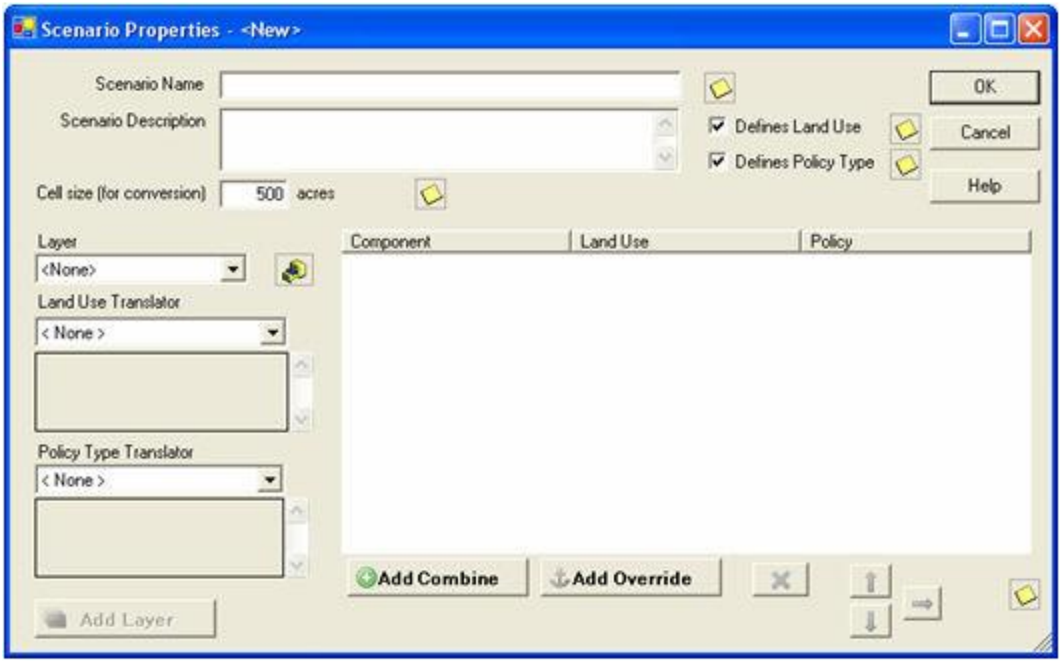
The **Scenario Properties - <New>** window is displayed by either clicking the **New...** button on the Scenario List window or choosing **Define Scenario...** from the NatureServe Vista menu. The new properties window is used to define new scenarios that can be utilized in Land Use and Conservation Scenario Evaluations. Note that typically a baseline scenario (representing current conditions in the planning region) will be defined first. See the section on Scenarios for more detailed information on defining and using scenarios in analyses.

New scenarios can be defined using scenarios that have already been developed in Vista. The process for defining a new scenario based on an existing one involves first copying the existing scenario using the **Copy** button on the Scenario List window, and then renaming and modifying the copy in the Scenario Properties window before defining it as a new scenario (see the section below on editing a scenario for more details).

Override nodes function in order of precedence. If layers are stacked in an Override node and there are instances of overlap between the layers, whichever layer is higher in the scenario list, will override, or trump the one below it.

Combine nodes function as additive features. Any number of land uses can exist in one place if they are stacked in a Combine node. Element compatibility and response to multiple land uses is discussed in the Scenario Evaluations section of this manual.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

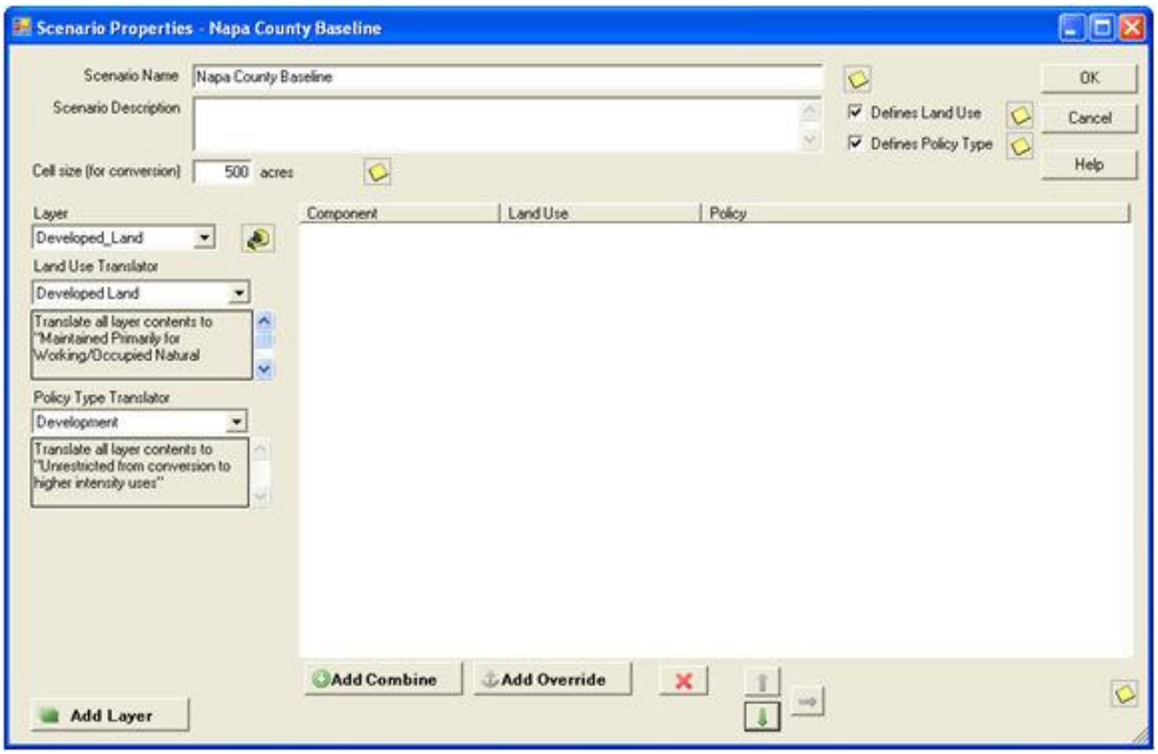


<u>Define a scenario</u>:

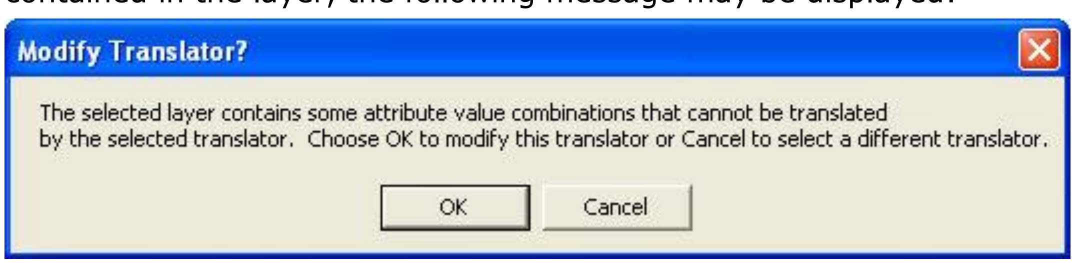
1. Specify a name for the new scenario in the **Name** field. The **<New>** on the window title will change to the name of the new scenario as the entry is typed in.
2. Enter a brief description of the scenario in the **Description** field, if desired.
3. Indicate whether both land use and policy type evaluations will be performed using the scenario (the default), or only a single type of evaluation will be performed, by using the **Defines Land Use** and/or **Defines Policy Type** checkboxes.
4. If desired, edit the value in the **Cell size (for conversion)** field, which displays the default grid cell size specified for the project in the Project Properties window. Note that if this cell size differs greatly from the cell size used to create the visualization layers generated by a Scenario Evaluation (which are set in the Spatial tab of the Element Properties window), the visualization layers may not overlay the scenario correctly. For a discussion of optimal cell size to be used for a planning project, see the Determining Grid Cell Size topic.
5. Select a layer to be added to the scenario from the drop-down list in the **Layer** field, or by using the  ArcCatalog button. Values in the drop-down list are determined by what is in the Table of Contents (TOC), or a subset thereof (by layer type). If the ArcCatalog button is used, a Select Polygon or Raster Input window is displayed; browse to the appropriate layer, select, and click the **Add** button.

6. Select the translator(s) to be applied to the selected layer for this scenario.
    - If land use evaluations will be performed using the scenario, select the land use translator to be applied to the layer from the **Land Use Translator** drop-down list, or select the **<Add New...>** value to create a new translator, or the **<Show List...>** value to display all existing translators (in order to select and modify an existing translator).
    - If policy type evaluations will be performed using the scenario, select the policy translator to be applied to the layer from the **Policy Type Translator** drop-down list, or choose the **<Add New...>** or **<Show List...>** values as described above.

The box below the drop-down list will display information on the selected translator.

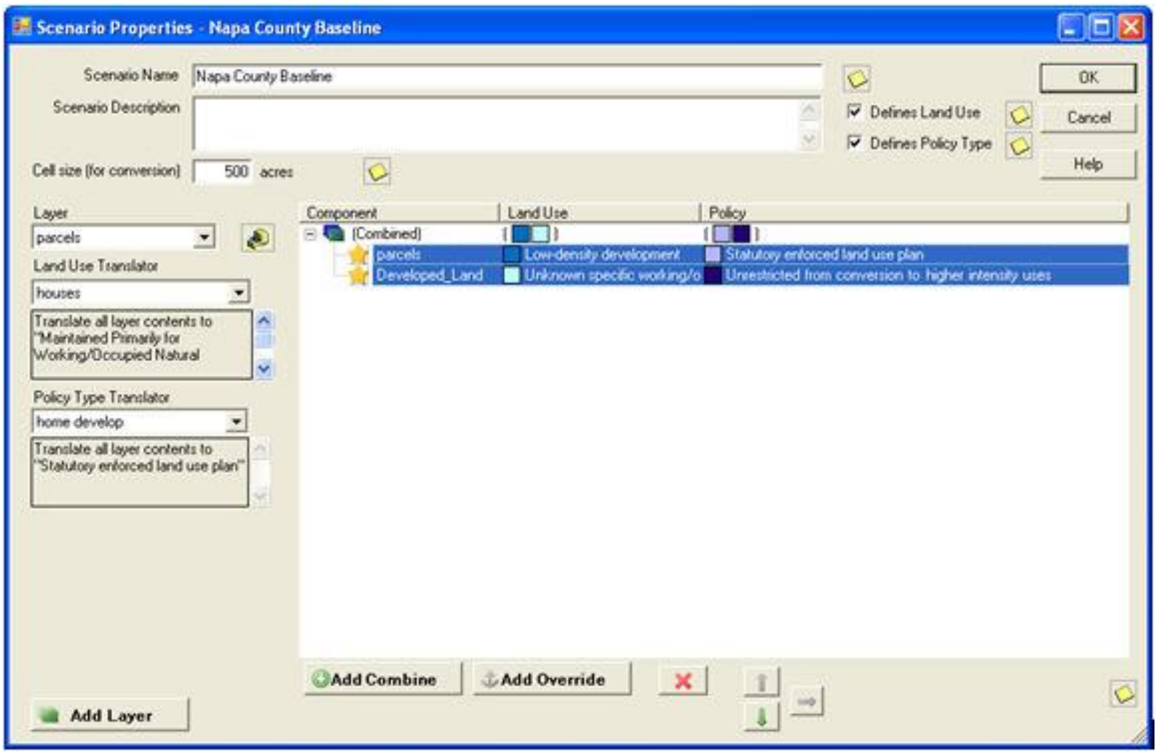


If a selected translator was defined on the basis of attributes that are not contained in the layer, the following message may be displayed:



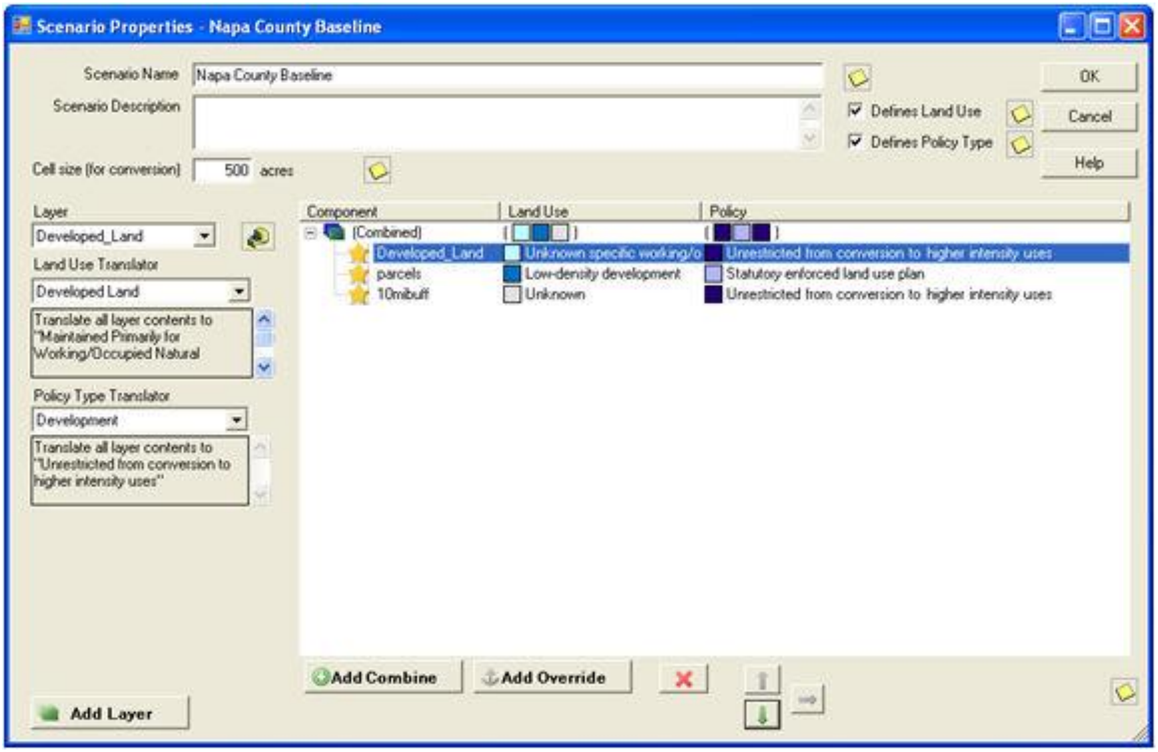
Click **OK** to edit the translator to add translations for the attributes that are lacking; otherwise, click **Cancel** to choose another translator.

7. When the selection of either or both translators for the layer has been completed, decide whether the land use layer overrides other land uses or whether it is a co-occuring land use using the Add Override or Add Combine buttons respectively (See [Define scenarios using Vista combine and override functionality]() for more information). Click the Add Layer button to add the layer, along with the selected translator(s), to the Scenario Layers grid.



8. Continue the process of selecting layers, specifying translator(s) for them, and then adding them to the grid as desired for the scenario. Note that the same layer can be reused in the scenario, as long as the associated translator(s) are different each time. Similarly, the same translator can be reused in the scenario, as long as the layer(s) to which it is applied are different each time.

Note: It is important to include the boundary layer specified for the project in every scenario, with all features of both the Land Use and Policy Type attributes translated to the single value "Unknown." If such translators have not yet been created, use the **<Add New...>** value in both the Land Use and Policy Type Translator drop-down lists to create new translators to accomplish this (as described in step 6 above). Including the project boundary layer with these translations in all scenarios will insure that no area within the project boundary will fall out as "unspecified" in a [Scenario Evaluation]().



9. Use the up and down arrow buttons to change the order of layers in the grid as needed to ensure that LUI and/or PT attributes for overlapping areas are obtained from the layer representing the dominant policy. Because data is processed beginning with the first layer in the list, then the second, third, and so forth, each layer takes precedence over (i.e., modifies) the layer directly below it. Thus, layers should be sequenced so that those representing dominant policies (or those that are not subject to such policies) are placed higher than subordinate layers. In almost all cases, the dominant layer in a planning region should be a converted lands layer, since changes in policy will rarely result in making such lands immediately compatible with biodiversity.

Note: The project boundary layer in which all features are translated to LUI and PT values of "Unknown" should always be positioned at the bottom of the list, that is, as the "base" layer.

10. To delete a selected layer, use the **X** button.
11. To close the window and save the developed scenario click **OK**; otherwise, click **Cancel**.

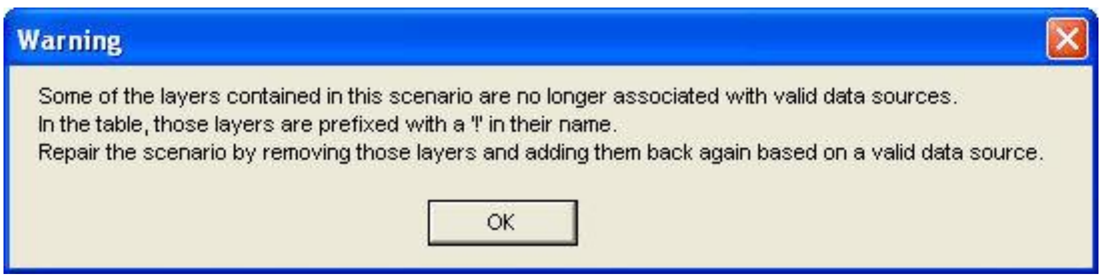
The Scenario Properties window can be used to edit existing scenarios, for example, in cases when data sources have been changed in the project after scenarios were first defined. This window can also be used to define a new scenario using an existing one (e.g., the baseline scenario). However, the existing scenario must first be copied using the **Copy** button on the Scenario List window before being renamed and modified in the Scenario Properties window. Making changes to the name and other information for an existing scenario rather than to a copy will result in actual modifications to the original scenario instead of a separate, new scenario.

Typically the baseline scenario is first defined, next copied, and then the copy modified (as described below) to define other scenarios, although any scenario can be used as the basis for a new one.

Edit an existing scenario:

1. Select the scenario to be edited, or the copy of a scenario to be used for defining a new one, from the list on the Scenario List window and click the **Properties...** button, or select the scenario from the NatureServe Vista Table of Contents (TOC), right-click, and choose **Scenario Properties...** from the context window. The resulting properties window displays the scenario.

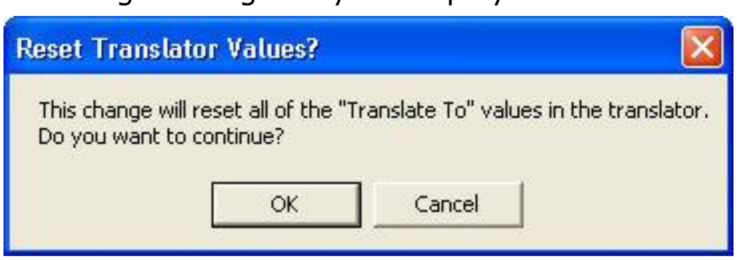
   In cases when data sources have been changed in the project after the scenario was originally defined, the following message may be displayed:

   In such cases, click **OK**; edit the scenario by removing the layers lacking data sources and then redefining the scenario so that the layers utilized have valid sources.

2. Edit the scenario using the processes described above for defining a new scenario as guidelines.

   If the type of translator (i.e., land use or policy type) is changed, the following message may be displayed:

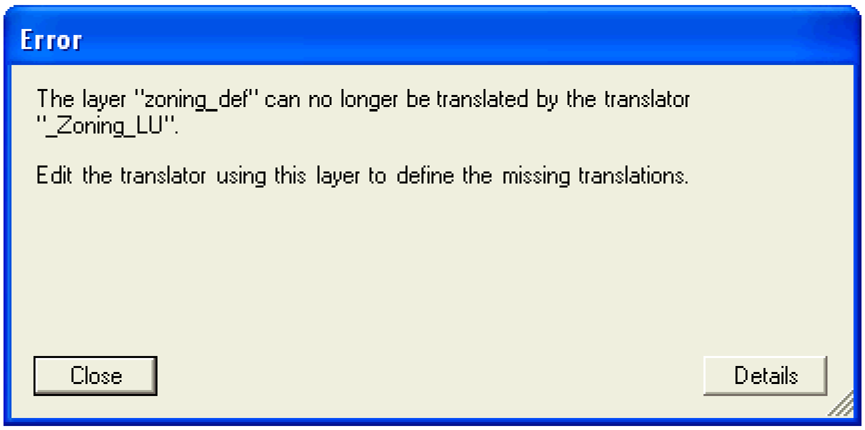
   

   Click **OK** to continue with the revision and the previously assigned values for attributes will be deleted; otherwise, click **Cancel**.

   In cases when the newly specified layer is lacking attributes previously defined for the translator, the following message may be displayed:

Click **OK** to continue with the revision and the previously assigned values for attributes will be deleted; otherwise, click **Cancel**.

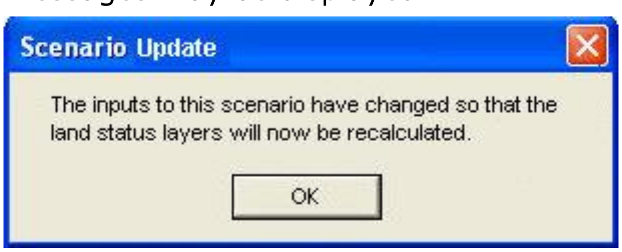
In cases when a translator cannot translate all of the attributes in the newly specified layer, the following message may be displayed:



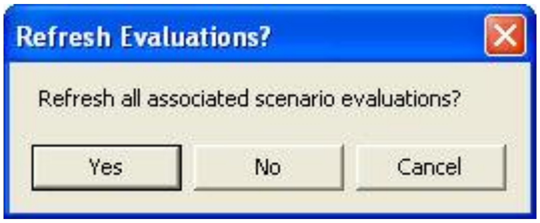
In such cases, click **Close** to cancel the process, or **Details** to view information on the error.

3. To close the window and save the edited scenario click **OK**; otherwise, click **Cancel**.

If **OK** was clicked to save the revised scenario, one of the following messages may be displayed:



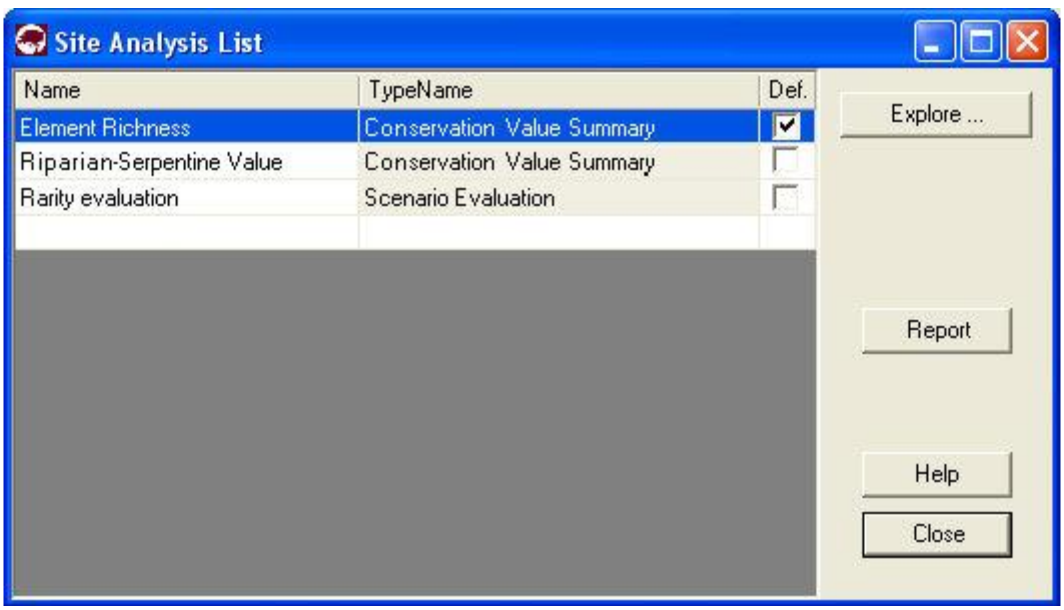
Click **OK** to continue with the revision, and layers in the scenario will be recalculated; otherwise, click **Cancel**.



Click **OK** to refresh the Scenario Evaluations that utilize the scenario; **No** if evaluations should not be refreshed; otherwise, click **Cancel**.

SITE ANALYSIS LIST WINDOW

The **Site Analysis List** window is displayed by selecting **Lists ▸Site Analysis List** from the NatureServe Vista menu. This window lists all of the analyses in the project, specifically Conservation Value Summaries and/or Scenario Evaluations, that can be examined in detail using the Site Explorer tool. In order to be included in this list, a site layer must be specified for the analyses. See the Site Analyses section for more detailed information on the use of Site Explorer.



Button functions:

Explore... displays the Site Explorer window with data from the analysis that is selected.

Report displays the report for the selected analysis. See the Reports section for more details on Conservation Value Summary and Scenario Evaluation reports.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

Name - name of an analysis that can be evaluated using Site Explorer tool.

TypeName - type of analysis, specifically Conservation Value Summary or Scenario Evaluation.

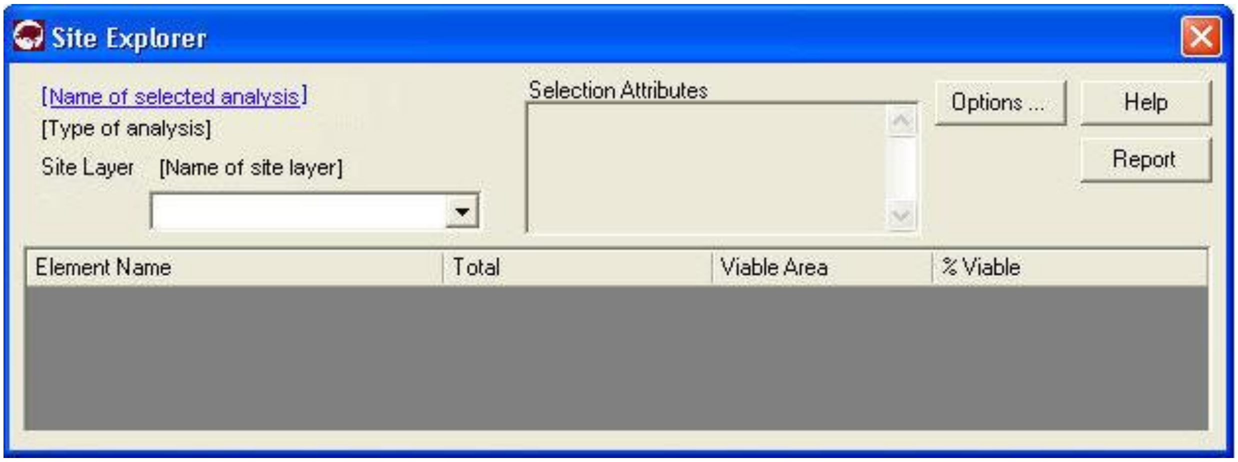
Def. (Default) - checkbox used to designate an analysis as the default displayed in the Site Explorer window.

SITE EXPLORER WINDOW

The **Site Explorer** window is used to evaluate the conservation properties of a specified site or set of sites that are of interest, with functionality and results that differ depending on the type of Vista analysis that is examined, specifically a Conservation Value Summary (CVS) or Scenario Evaluation). When used for a CVS, the Site Explorer window displays details on the conservation value for the site selection, along with information on the contributing biodiversity elements present on the selection. For a Scenario Evaluation, the Site Explorer tool provides data on the land use and/or policy types for the site selection along with detailed information on elements occurring on the selection in terms of conservation goals achieved, and enables the user to examine the effects on goal achievement if alternative land statuses are used.

The Site Explorer window can be opened several ways:

- Clicking the **Explore...** button on the Site Analysis List window will display the Site Explorer window with data from the analysis (CVS or Scenario Evaluation) that is selected.
- Right-clicking on a CVS or Scenario Evaluation displayed on the NatureServe Vista tab of the Table of Contents and selecting **Site Explorer...** from the resulting menu will display the Site Explorer window with data for that analysis.
- Selecting **Explore Sites...** from the NatureServe Vista menu will display the Site Explorer window with data for the analysis marked as the default in the Site Analysis List window.
- Clicking the  button on the NatureServe Vista toolbar will open the Site Explorer window with data for the analysis marked as the default in the Site Analysis List window.



Button functions:

Options... displays the Site Explorer Options window to set the attributes (columns of data) to be displayed for elements and the site selection.

Help opens the on-line documentation.

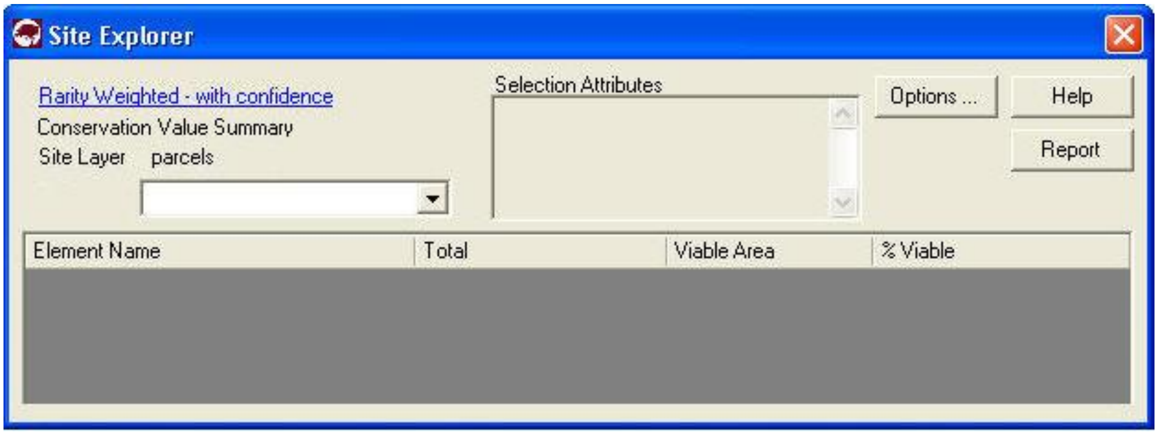
Report displays the report for the attribute data resulting from the exploration. See the Reports section for more details on Site Selection reports.

Explore sites related to a Vista analysis:

The basic process for exploring sites related to a CVS and a Scenario Evaluation is the same. Additional functionality is provided when evaluations are explored, permitting the user to examine the effects on element goals caused by altering land uses and/or policy types for the site selection, and then save the results as new scenarios for use in Scenario Evaluations.

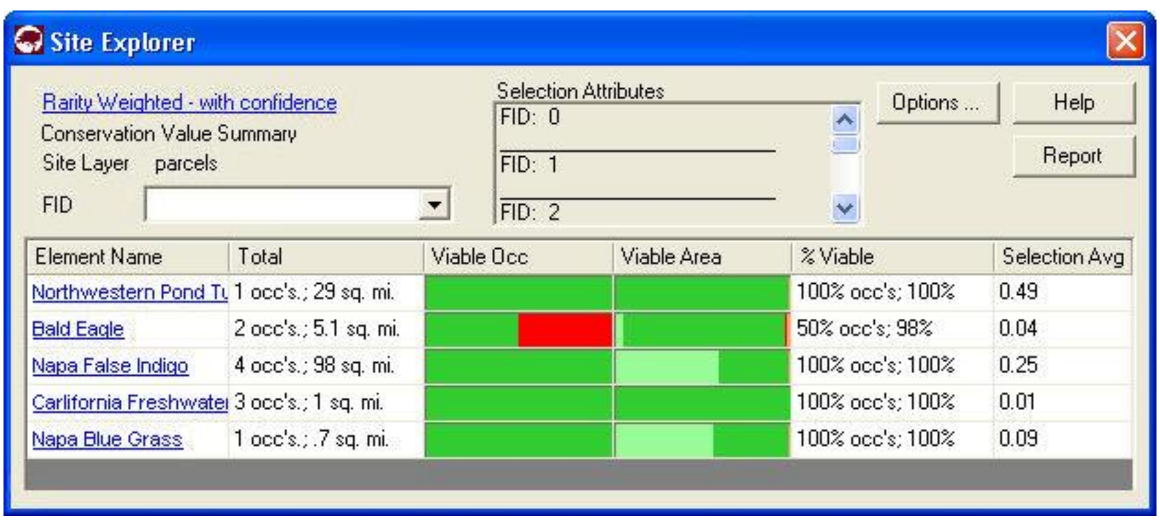
The process for exploring either a CVS or a Scenario Evaluation is described below. Following the process steps that are common to both types of analyses is a description of how to evaluate alternative land statuses for a Scenario Evaluation.

1. Open the Site Explorer window for the desired analysis using one of the methods described above.



2. Click the **Options...** button to set the attributes to be displayed for elements and the site selection in the Site Explorer window for the analysis. See the Site Explorer Options window for details on the process for selecting element attributes.
3. Using the  Site Explorer pointer, select one or more land units in the site layer (parcels in this example) to be examined, or choose the desired site from the Site Layer drop-down menu (populated only if a site attribute has been specified on the Site Explorer Options window). Holding the button while selecting sites with the pointer will permit multiple sites to be considered together. The pointer can also be dragged to define a rectangle to indicate multiple sites to be examined as a set. To deselect units, click outside of the area included in the analysis, or select one or more different sites to be explored.

Data for the identified site selection will be displayed in the Site Explorer window.



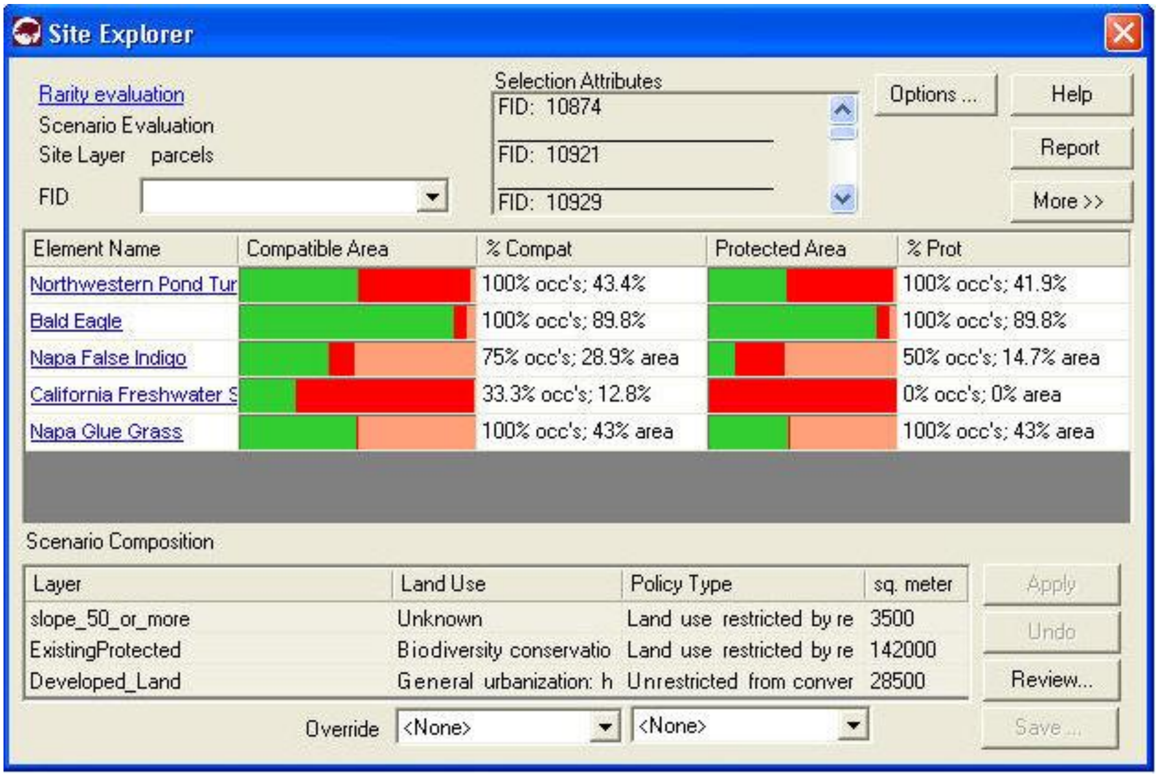
Attribute definitions that will describe briefly what the column data represent can be found in the topics Element Inventory Data for a CVS Exploration and Element Inventory Data for a Scenario Evaluation.

Back to process steps above

Evaluate alternative land statuses and their effects on element goals:

Once the Site Explorer window has been opened and sites selected for a Scenario Evaluation, the functionality related to evaluation of alternative land uses and policy types can be utilized, as described below.

Click the **More>>** button to expand the window to display composition details for the scenario used for the evaluation, including the land status(es) assigned to the layer(s) that comprise that scenario.



Button functions for the Scenario Composition portion of the Site Explorer window:

Apply changes land use statuses to those selected in the **Override** fields.

Undo returns any land statuses changed by "Override" values back to their original statuses.

Review... opens a Site Change List window used to modify statuses for individual layers.

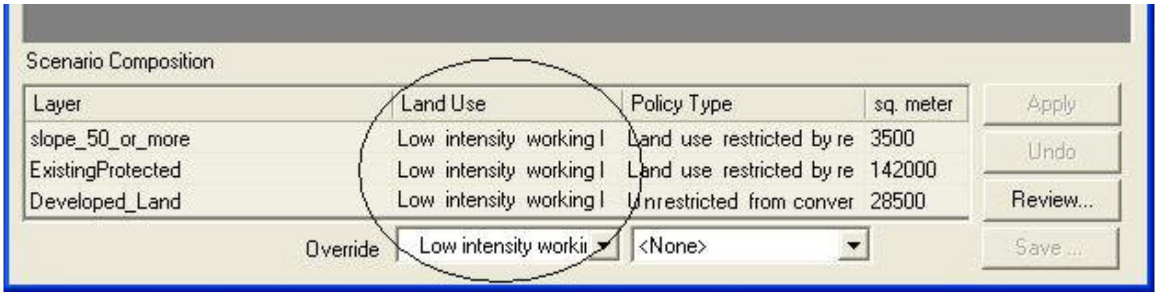
Save opens a Save Changes to Shape File window to capture the modified layers and land statuses as a shape file.

Response attribute functionality:

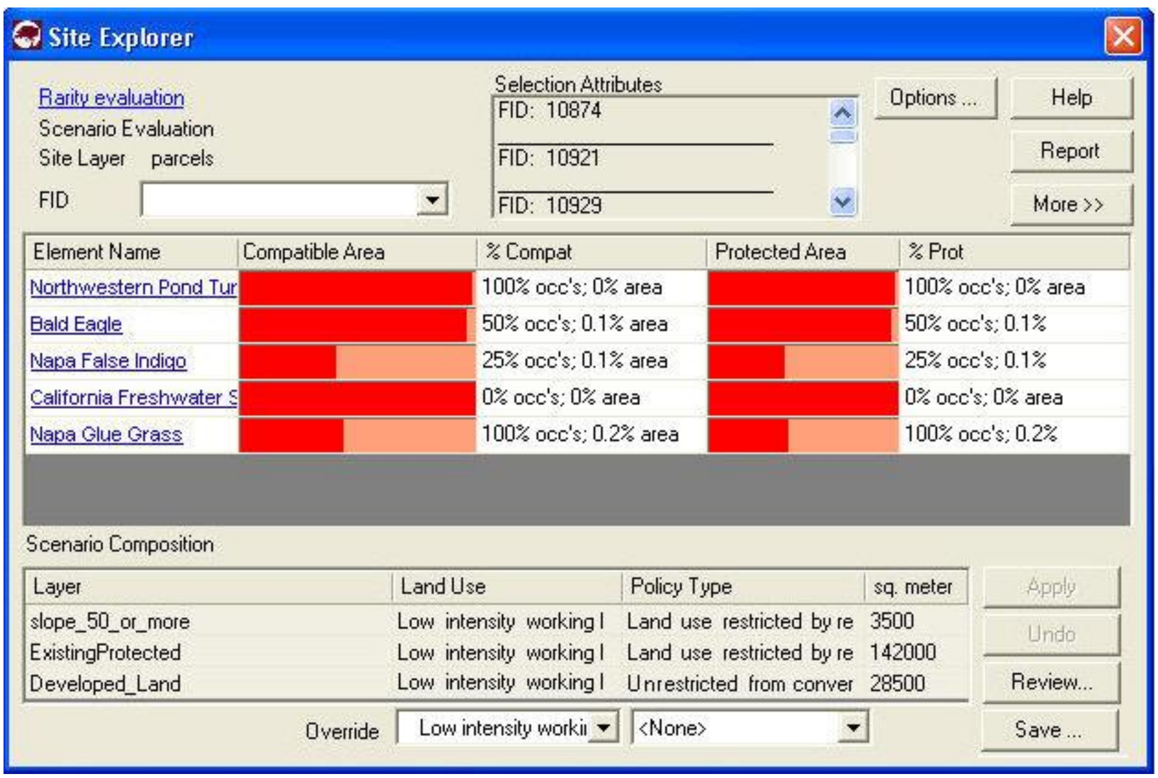
Provided the **Response** attribute is included in the site exploration and displayed as a column, selecting a single row in the Scenario Composition portion of the Site Explorer window will display each element's specific response to the land use in that row.

1. Change land use status(es)

Using the Scenario Composition portion of the Site Explorer window, select a different land use and/or policy type to be applied to scenario layers by selecting value(s) from the appropriate **Override** drop-down list(s) and clicking **Apply**.



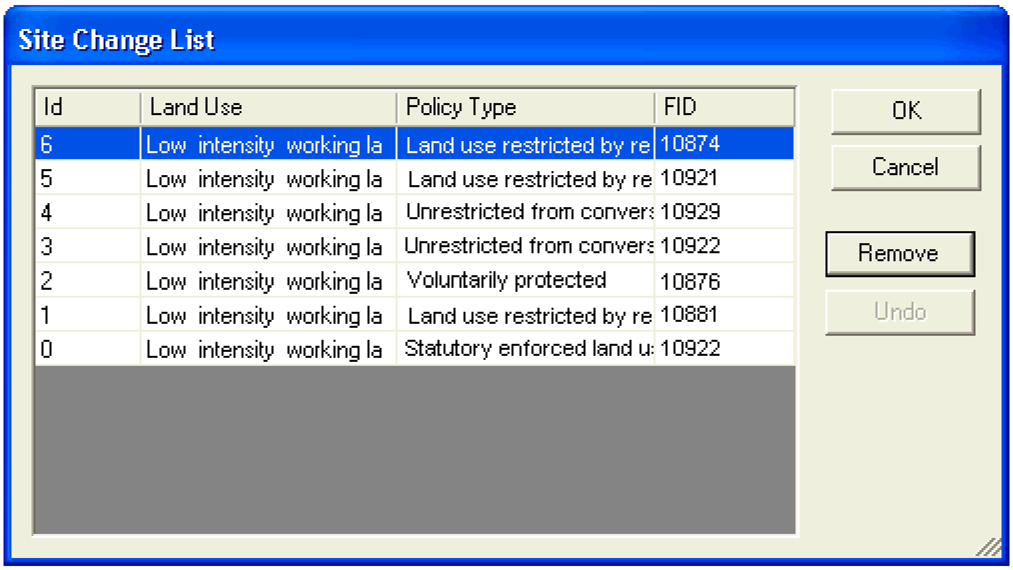
The land status value(s) selected in the **Override** field(s) will be applied to the layers that comprise the scenario used for the Scenario Evaluation. Any resulting changes to the element attribute data for the site exploration will change accordingly, as shown in the example below (compared with the initial results, above).



2. Review land status changes

Click **Report** to display the Site Selection report showing the effects of the alternative land status(es) on element attributes and goal achievement. See the Reports section for more details on Site Selection reports.

If desired, click **Review...** on the Site Explorer window to display the Site Change List window, which lists all layers that have modified land status(s) resulting from any override values selected in the Site Explorer window. Modify the change list if desired using the buttons provided on the window, described below.



Button functions for the Site Change List window:

OK saves any revisions to the list of land use status changes.

Cancel closes the window without retaining any revisions made to the land status change list.

Remove removes a selected layer (row) with modified land status values from the list. As a result, this layer will now be displayed in the Scenario Composition part of the Site Explorer window with its original land status(es); that is, the land status(es) in effect before any override values were specified.

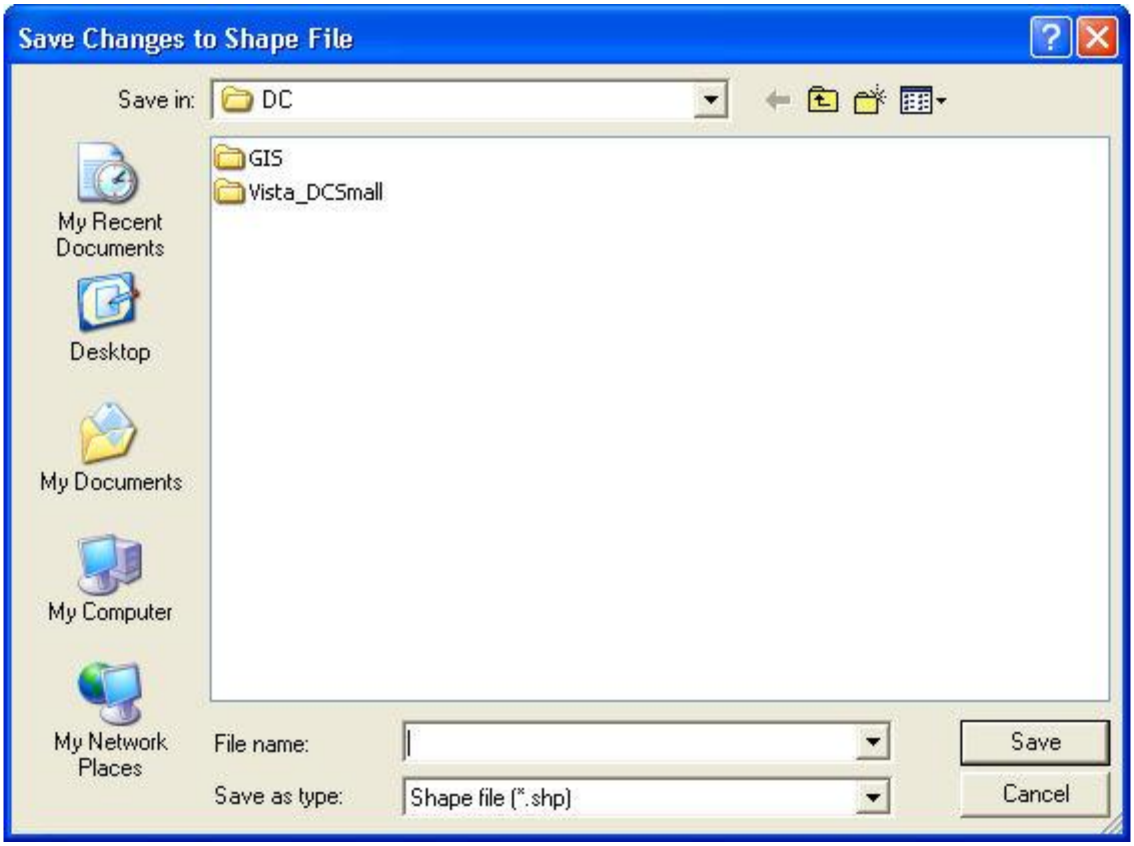
Undo restores a layer removed from the Site Change List window back to the list, again with the land status modified by override values.

3. Determine optimal land statuses

Repeat the process of selecting new land status(s) for the layers in the site exploration by changing override value(s), and reviewing and accepting any values (steps 1 and 2, above) that result in desirable changes to element goal achievement.

4. Save alternative scenario layers

Once a combination of land statuses in the site exploration is deemed to be acceptable/useful, use the **Save...** button in the Scenario Composition portion of the window to display the **Save Changes to Shape File** window. Designate a folder and file name for the location of the saved data, and click **Save**.



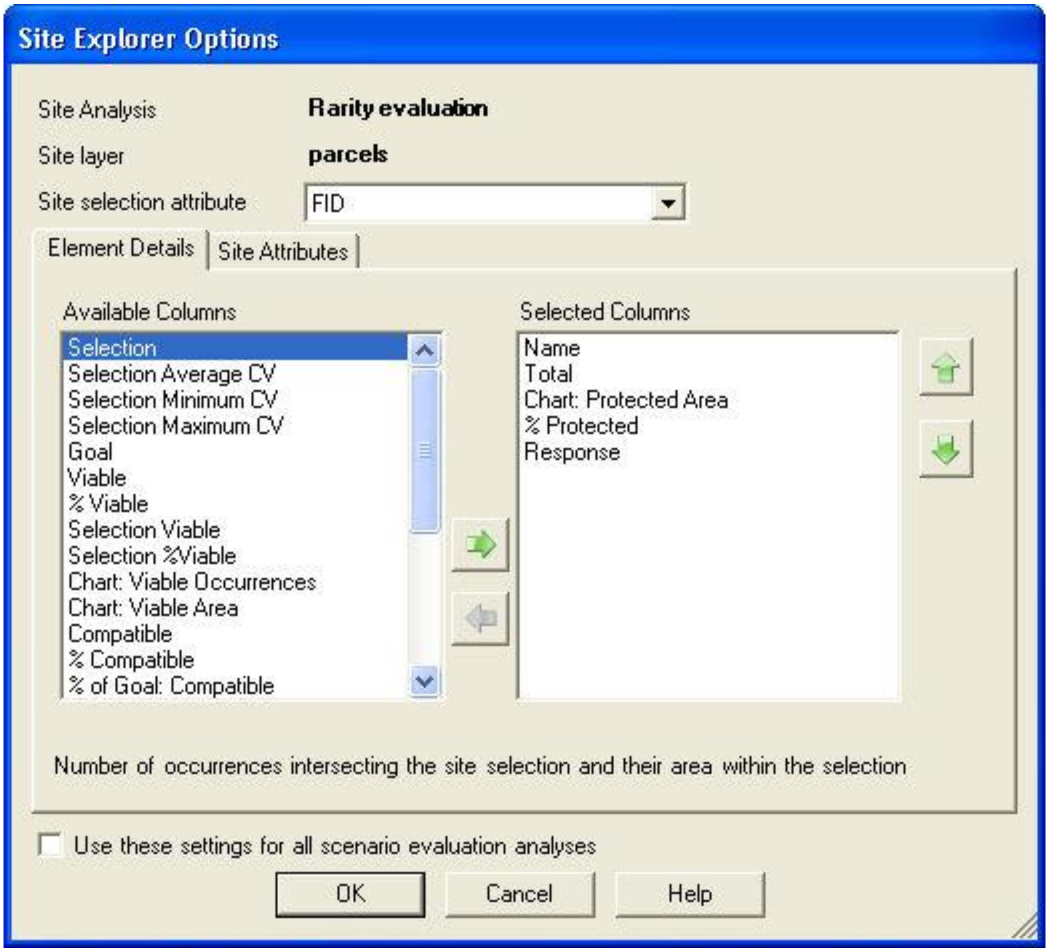
The saved shape file and associated land status data can then be used to define new scenarios for use in Scenario Evaluations.

Site Explorer Options Window

The **Site Explorer Options** window is displayed by clicking the **Options** button on the Site Explorer window, and is used to set attributes related to the element and site information displayed for a particular analysis (i.e., a Conservation Value Summary (CVS) or Scenario Evaluation).

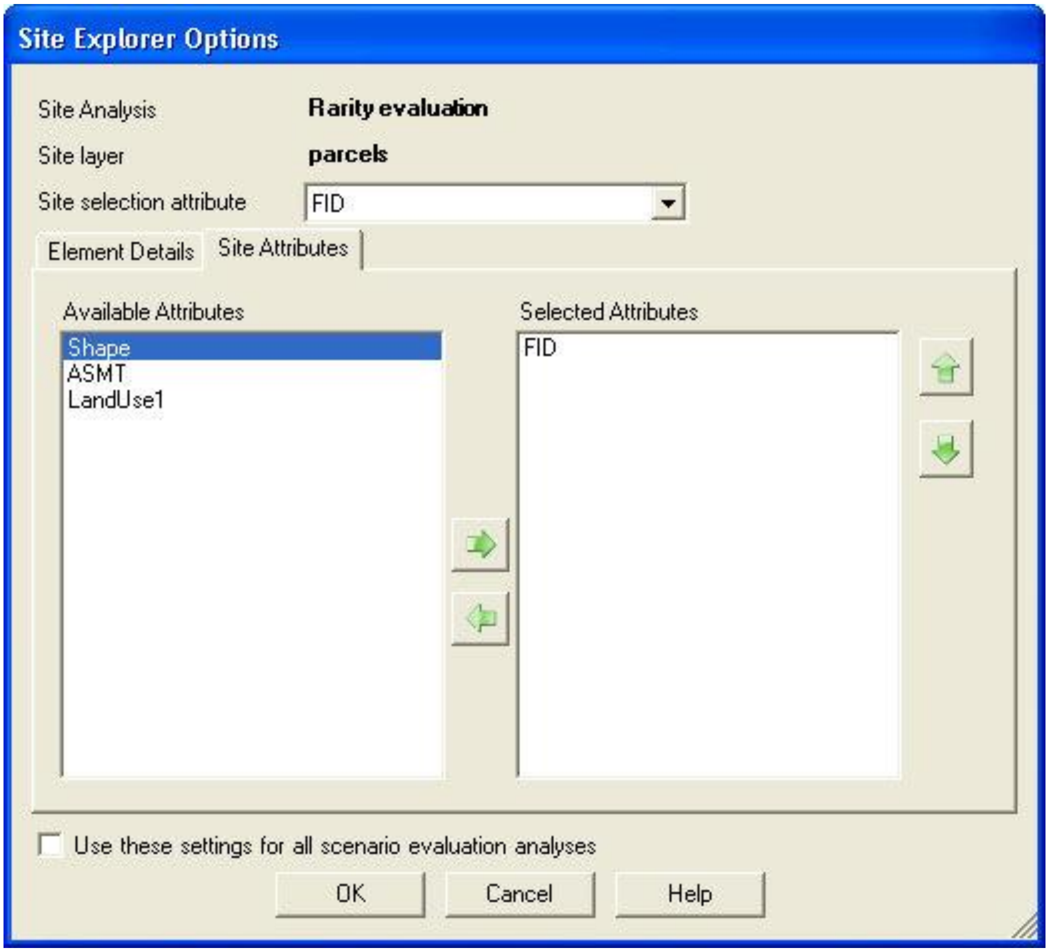
Set options:

Element Details tab input



1. Indicate the attributes (i.e., columns) of data to be displayed for elements that occur in the site selection, using the right arrow button to move one or more highlighted attributes from the **Available Columns** list to the **Selected Columns** list, and the left arrow to remove attribute(s) from the set to be displayed. The up and down arrow buttons can be used to set the order for the attributes to be displayed in the Site Explorer window. While an attribute is selected, a brief description for the attribute is displayed near the bottom of the tab. A complete list of attributes and their definitions can be found in the topics Element Inventory Data for a CVS Exploration and Element Inventory Data for a Scenario Evaluation Exploration.

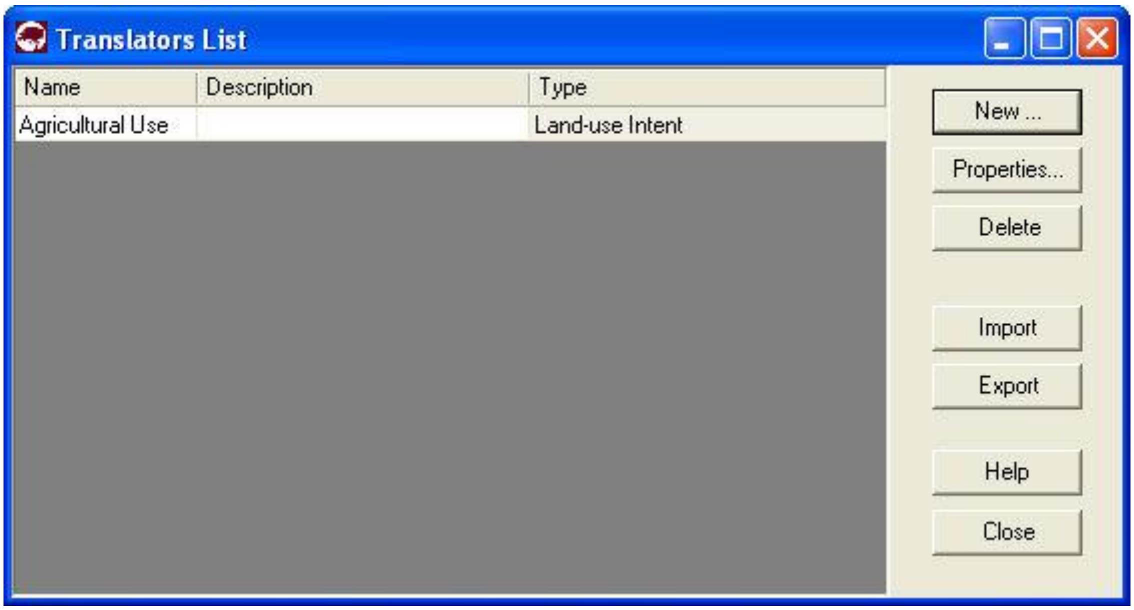
SITE ATTRIBUTES TAB INPUT



2. Select an attribute from the **Site selection attribute** drop-down list near the top of the window to be used to select land units for Site Explorer. The values for this attribute will then be displayed in the Site Layer drop-down list on the Site Explorer window.
3. Indicate the attribute(s) to be displayed for the site(s) selected in the **Selection Attributes** box, using the right arrow button to move one or more highlighted attributes from the **Available Attributes** list to the **Selected Attributes** list, and the left arrow to remove attribute(s) from the set to be displayed. The up and down arrow buttons can be used to set the order for the attributes to be displayed in the Site Explorer window.
4. To use the set of attributes specified on both the Element Details and Site Attributes tabs as the default for all site explorations of Conservation Value Summaries or Scenario Evaluations, indicate so using the checkbox near the bottom of the window.
5. To close the window and save any changes made to the attribute lists click **OK**; otherwise, click **Cancel**.

Translator List Window

The **Translator List** window is displayed by selecting **Lists ▸Translator List** from the NatureServe Vista menu. This window lists all the translators that have been created for land use and protection layers in the project, which are used for Scenario Evaluations.



Button functions:

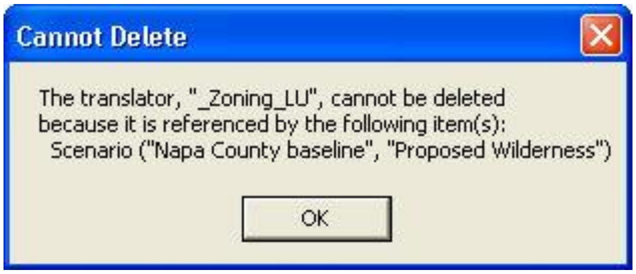
New... displays a new Translator Properties window that can be used to develop a new translator for a land use or protection layer to be imported into the project.

Properties... displays the Translator Properties window showing details and allowing edits to the translator selected in the list.

Delete deletes the translator selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the translator is referenced by another item used in scenario evaluations, as shown in the following example.



Import... opens a browse window to locate a translator (developed in another project) to be imported into this project.

Export... opens a browse window to find the desired location to place a copy of the selected translator so that it can be imported into another project.

Help opens the on-line documentation.

Close closes the window.

Columns displayed:

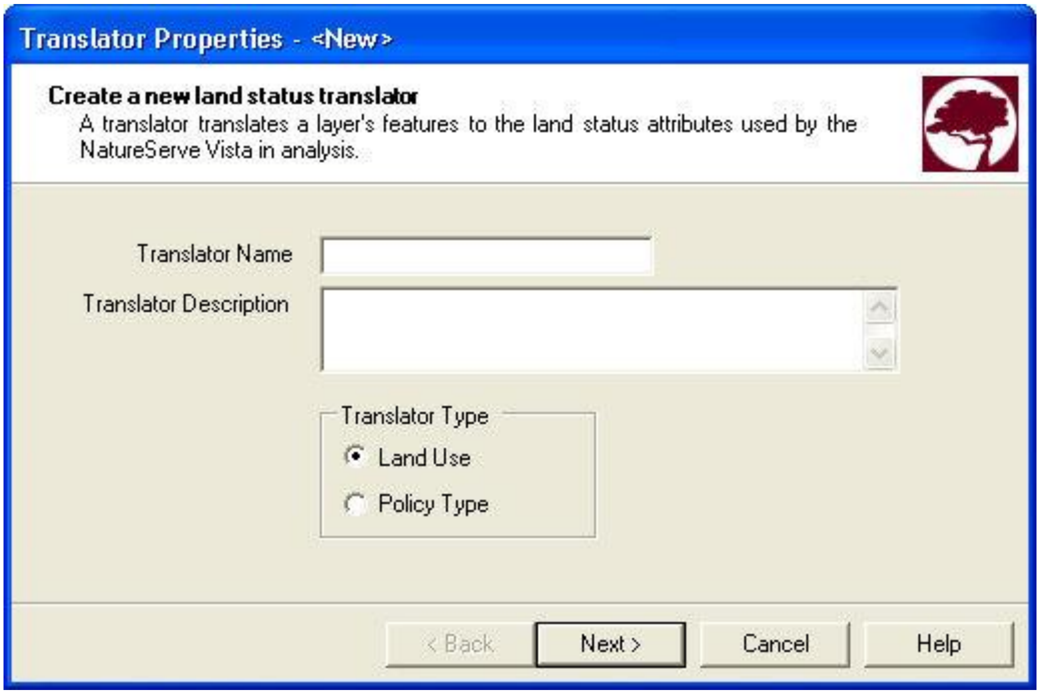
Name - name of the translator.

Description - description of the translator, if any.

Type - type of translator, Land-use Intent or Policy Type.

Translator Properties Window

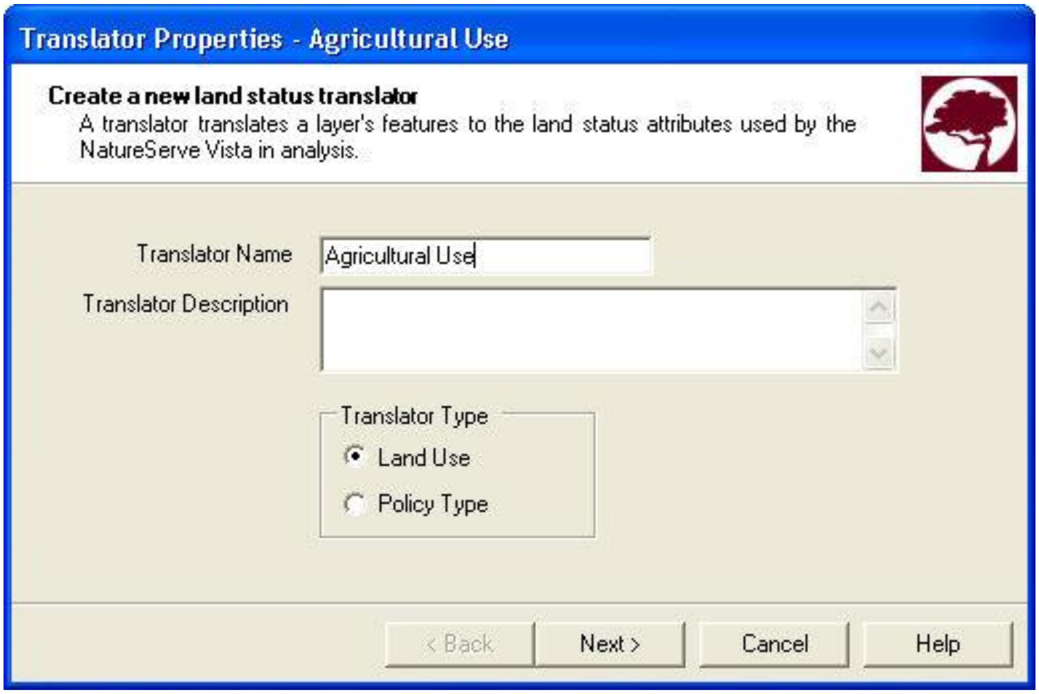
The **Translator Properties - <New>** wizard is displayed by clicking the **New...** button on the Translator List window. The new properties wizard is used to create a translator used to translate land use/management or policy practices layer into land status types, specifically land use intent (LUI) categories or policy types (PTs) utilized by Vista in Land Use and Conservation Scenario Evaluations. See the Creating Translators section for more detailed information on the development and use of translators for importing scenarios. For detailed descriptions of Vista land use statuses, see Appendix F for LUI categories, and Appendix G for PT. The Translator Properties wizard consists of a series of screens for recording specific information that defines the new translator.



Note that at any time during the process of creating a new translator, the previous step in the process can be revisited (and data changed, if desired) by clicking the **<Back** button, or the action can be canceled altogether by clicking the **Cancel** button.

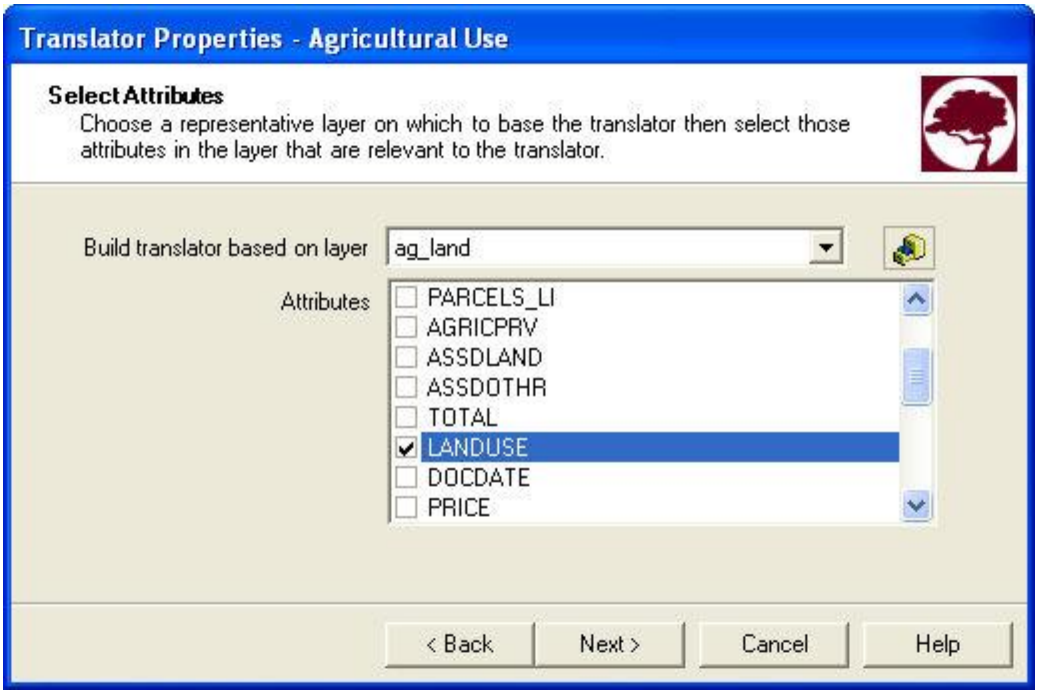
Create a translator:

1. Specify a name for the new translator in the **Translator Name** field. The **<New>** on the window title will change to the name of the new translator as the entry is typed in.
2. Enter a brief description of the translator in the **Translator Description** field, if desired.
3. Indicate whether the translator will assign land use or policy types using the appropriate **Land Use** (the default) or **Policy Type** radio button. Click **Next>**.

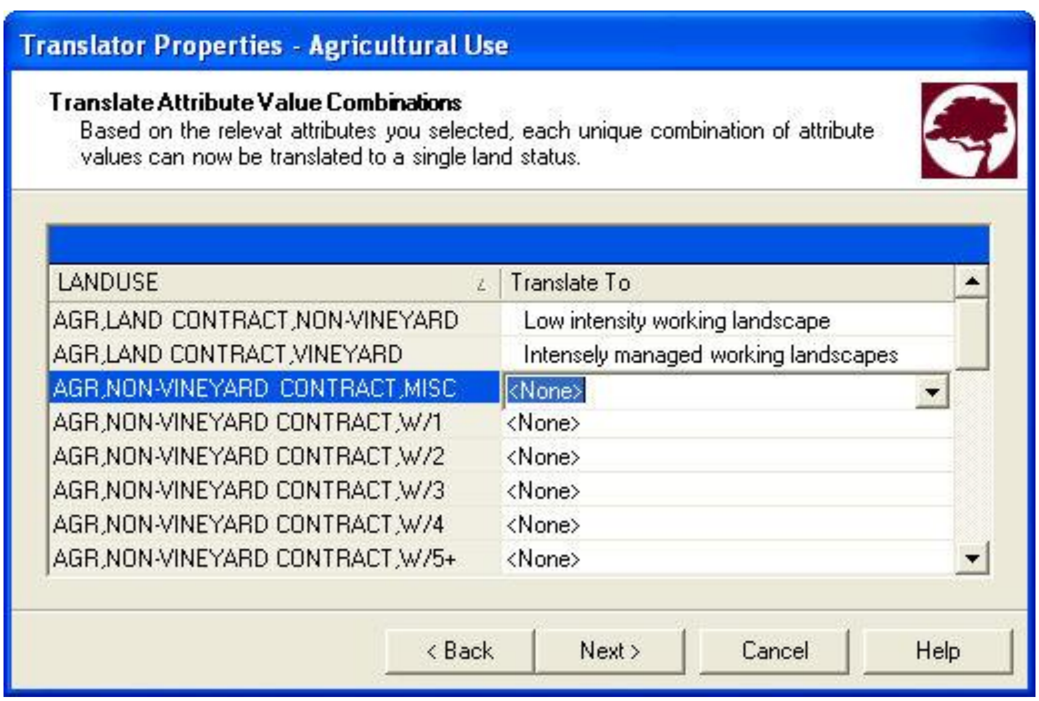


4. Indicate, using the appropriate radio button, whether the translator will 1) assign a **single Vista land status** (i.e., LUI or PT) for the entire group of land use categories or policy types in that layer (the default), or 2) assign an individual Vista type for each of the different land use categories or policy types (i.e., **translate all features based on attribute values**). Generally, option 1 is most useful for single purpose layers (such as a stream setback regulation), while option 2 is useful for general land use and zoning layers that have different land uses and perhaps policies for specific areas/zones within the layer.
5. If the **Translate all features to a single land status** radio button was chosen, select the appropriate land status type to be used for all features. The most sensitive elements should be used to determine the single value to be assigned for this option. However, this has the effect of reducing the precision of the compatibility assessment for less-sensitive elements. Element-specific response requires greater information but increases the precision of the analysis and flexibility for the client to meet element conservation goals in a variety of land use types. Click **Next>**, and then **Finish** to complete the new translator. Disregard the remaining steps in the process.
6. If the **Translate features based on attribute values** radio button was chosen, click **Next>**.
7. Select the layer to be used for developing the translator from the drop-down list in the **Build translator based on layer** field, or by using the  ArcCatalog button. Values in the drop-down list are determined by what is in the Table of Contents (TOC), or a subset thereof (by layer type). If the ArcCatalog button is used, a Select Polygon Input window is

displayed; browse to the appropriate layer, select, and click the **Add** button.



8. A list of attributes for features in the selected layer is displayed in the **Attributes** box. Indicate the feature attribute(s) to be used to create the translator, i.e., those that are most relevant to land use/management or policy practices, by placing a check in checkbox next to the attribute(s). Click **Next>**.



9. For each type or combination of types listed in the attribute column (in the above example, **LANDUSE**), select a single translated status from the drop-down menu provided in the **Translate To** column. Status types displayed in the drop-down menu are determined on the basis of the kind of translator indicated in step 3 above (i.e., LUI or PT), and consist of a single entry for each different type of the attribute/attribute combination selected in the previous step. Every attribute/combination must have a land status selected in order to complete the translator; land status types that are unchanged from the default <None> entry will be flagged as needing an assigned LUI or PT. Any specific interpretations employed for assigning a particular LUI or PT should be documented.

   LUI translators: Select the Vista type that best describes the unique land use for each attribute or attribute combination. Note, however, that the selected LUI type must be from the lowest (i.e., minor category) level; selection of a major category type will be flagged as an invalid entry. Assigning the major category "Unknown" will result in the assumption of "incompatible" in analyses that utilize LUI compatibility information.

   PT translators: Select the Vista type that identifies the appropriate policy practice for each attribute or attribute combination. The assigned PT indicates the mechanism that guides the implementation of an LUI designation, including processes that prevent or allow land uses of greater intensity. Because some of the policy types are fairly dynamic (e.g., zoning), a conservative approach should be used in assessing whether a PT category is likely to permit LUI changes. Assigning the category "Unknown" will result in the assumption of "unprotected" in analyses that utilize PT information.

   Keystrokes that can be used to navigate through the list of land status types for data entry include the following:

   - Clicking on an entry in the Translate To column will display a drop-down menu
   - Clicking <Tab> twice will move the cursor to the next item and highlight it
   - Clicking <Shift><Tab> will move the cursor to the previous item
   - The down and up arrow keys can be used to move down or up, respectively, the list of types in the drop-down menu

10. Once every attribute has an assigned Vista type, click **Next>**, and then **Finish** to complete the new translator.

Note: It is important to create both a LUI translator and a PT translator that translate all features to the single value "Unknown." These will be used to translate the boundary layer for the project, which should be included in all scenarios to insure that no area within the project boundary will fall out as "unspecified" in a Scenario Evaluation.

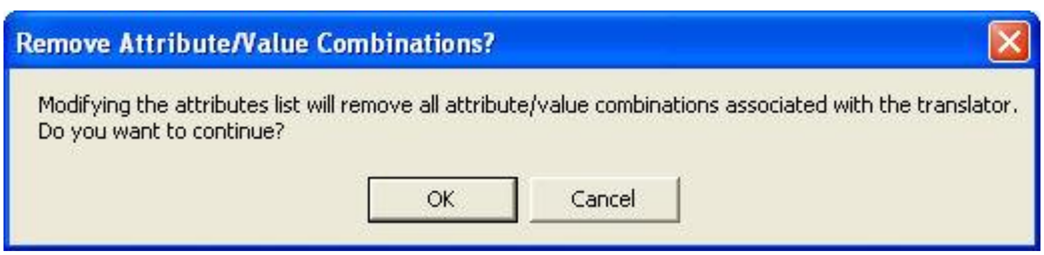
Edit a translator:

1. Select the translator from the list on the Translator List window and click the **Properties...** button. The resulting properties wizard displays the translator.
2. Edit the translator using the processes described above for creating a new translator as guidelines.
3. To close the window and save any changes made to the translator click **OK**; otherwise, click **Cancel**.

Note that if the translator type, that is **Land Use** or **Policy Type** (originally selected in step 3 of the creation process) is changed, the following message will be displayed:

Clicking **OK** will continue with the change, and an entirely new set of land status types will need to be selected for the attributes (as described in step 9 above); clicking **Cancel** will leave the translator type unchanged.

Note also that if the set of attributes associated with the translator is changed, the following message will be displayed:



Clicking **OK** will continue with the change, and an entirely new set of land status types will need to be selected for the attributes (as described in step 9 above); clicking **Cancel** will leave the attributes used for the translator unchanged.

Note also that if the layer to be used for the translator, selected in the **Build translator based on layer** field (step 7, above) is edited, the following message to confirm the change may be displayed:

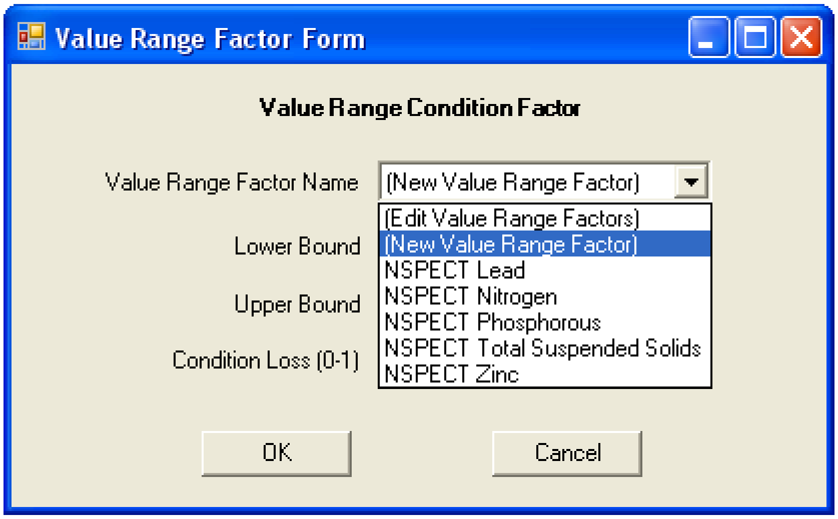
Clicking **OK** will continue with the edit, and an entirely new set of land status types will need to be selected for the new attributes (as described in step 9 above); clicking **Cancel** will leave the original layer, along with the status types assigned to its attributes, unchanged.

Note also that if the translator is edited such that the full set of attributes previously addressed by the translator will no longer be handled, the following message will be displayed:

Clicking **OK** will continue with the edit, and scenarios that were defined using the translator will need to be modified; clicking **Cancel** will leave the set of attributes associated with the translation unchanged.

VALUE RANGE FACTOR FORM

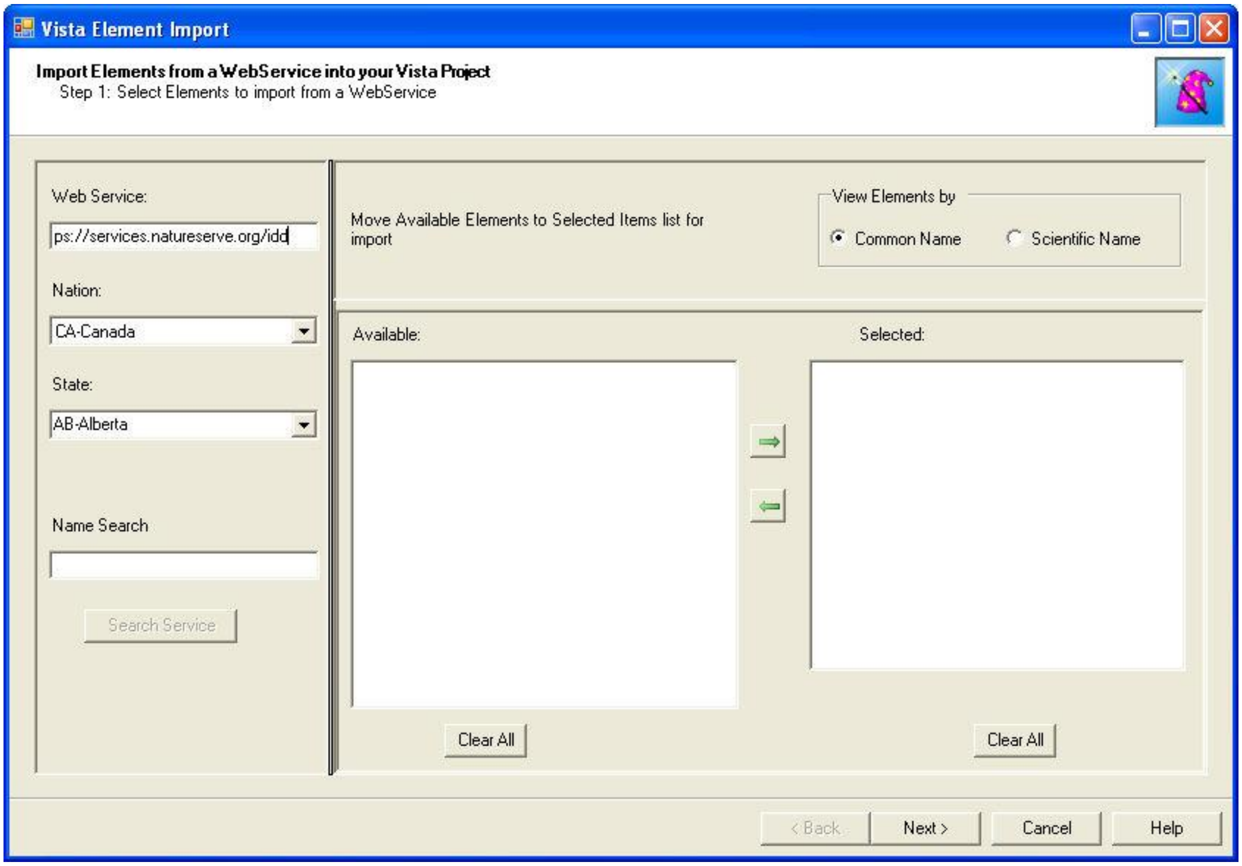
This window is accessed by clicking New Factor... from the Edit Condition Model Properties window.



See Creating value range factors for instructions on data entry for this window.

Vista Element Import Window

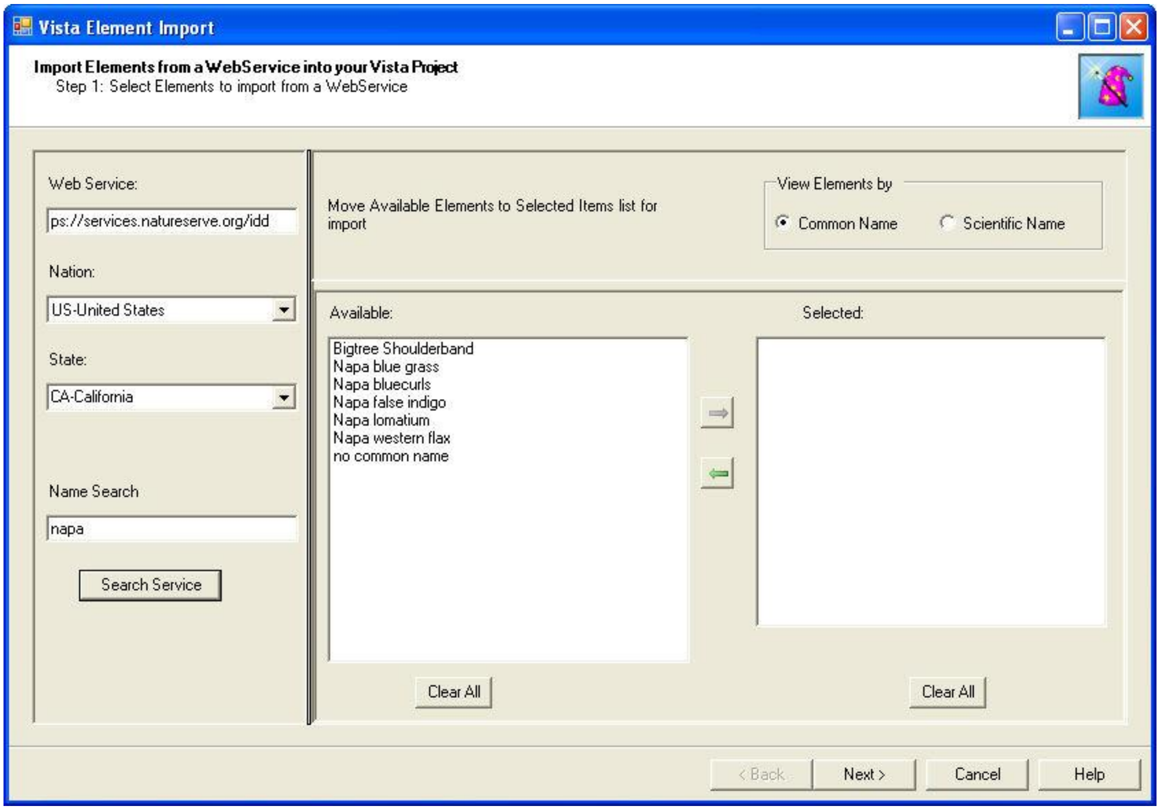
The **Vista Element Import** window is displayed by clicking **Project ▸ Import Element Properties from Web Service...** from the Vista menu, and is used to import properties from multiple elements using NatureServe Web Services.



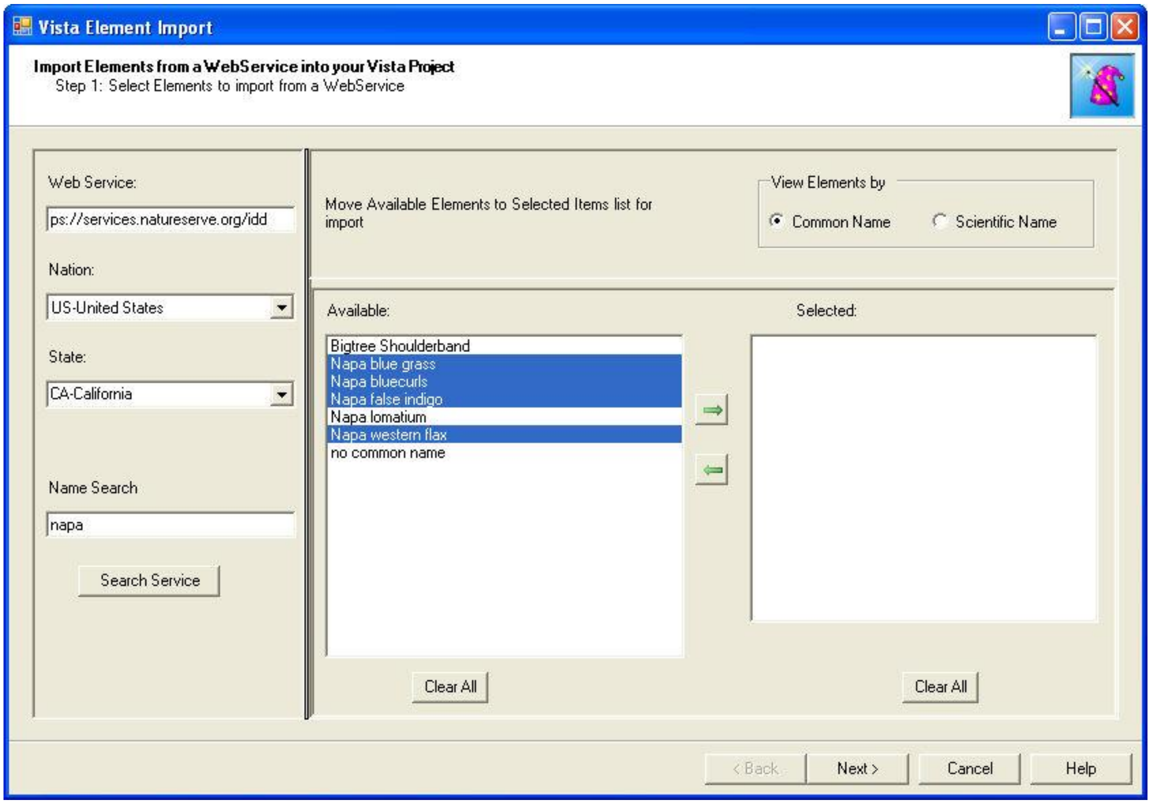
<u>Import element properties using a web service</u>:

1. If the web service location is not populated automatically, enter: https://services.natureserve.org/idd
2. Select the desired values from the Nation and State drop-down menus.
3. Using the Name Search field, enter the name or part of the name of an element whose properties are to be imported, and click **Search Service**. Note that either common or scientific names can be used in the search. Note also that the wildcard "r;*" is permitted for searches, but caution is recommended as its use may result in a longer search time before results are returned.

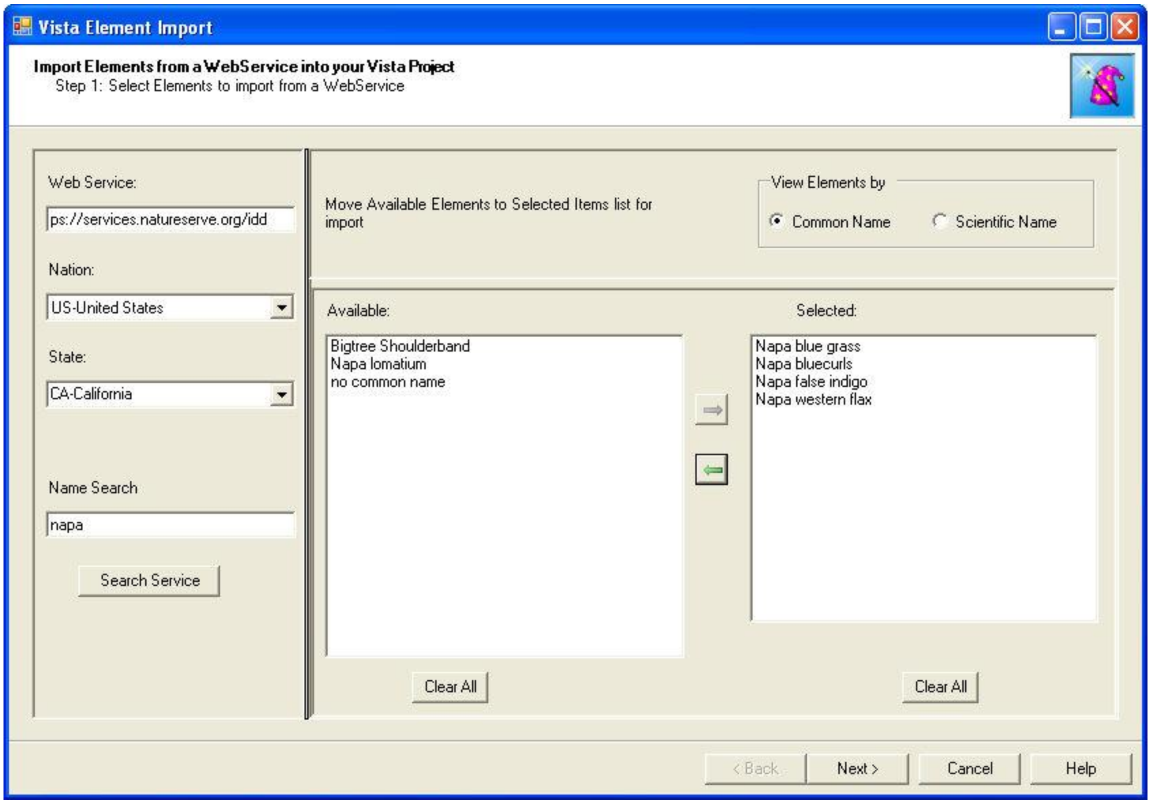
When the search has completed, the results will be displayed as a list of species in the **Available:** field. The listed species can be displayed by using **Common Name** or by **Scientific Name** by selecting the appropriate radio button in the **View Elements By** area.



4. Select one or more elements to be imported, and click the  button. Multiple elements can be selected together using <Control>-Click, and a range by using <Shift>-Click.



Elements selected for import will be displayed in the **Selected:** list.

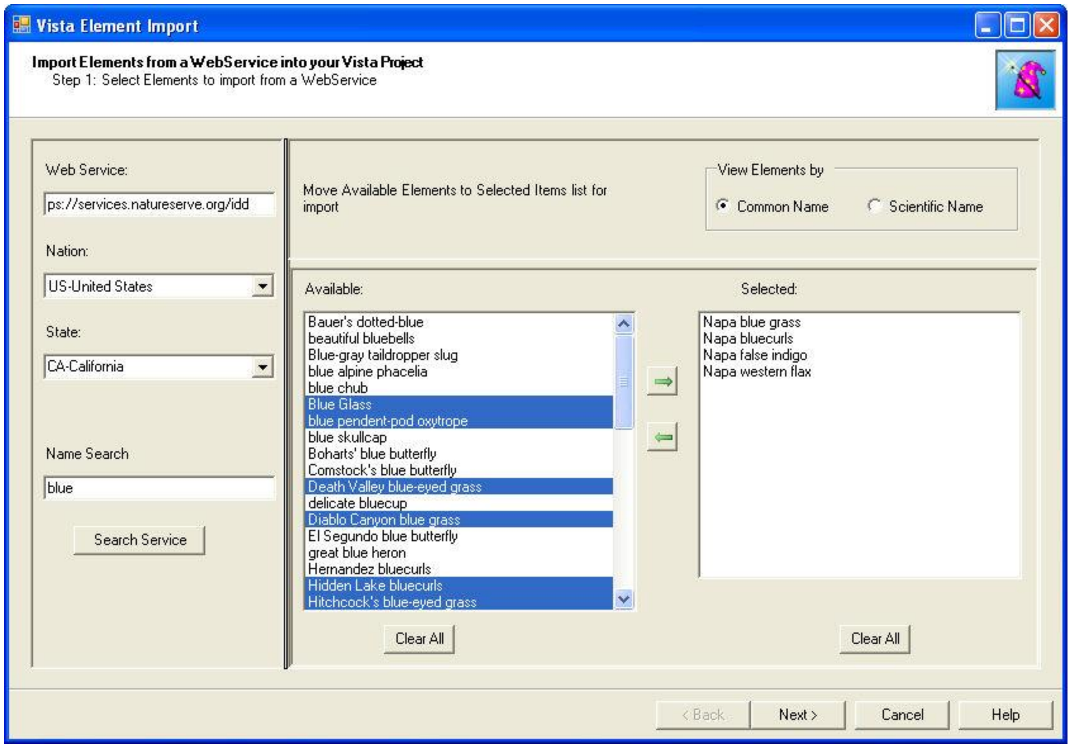


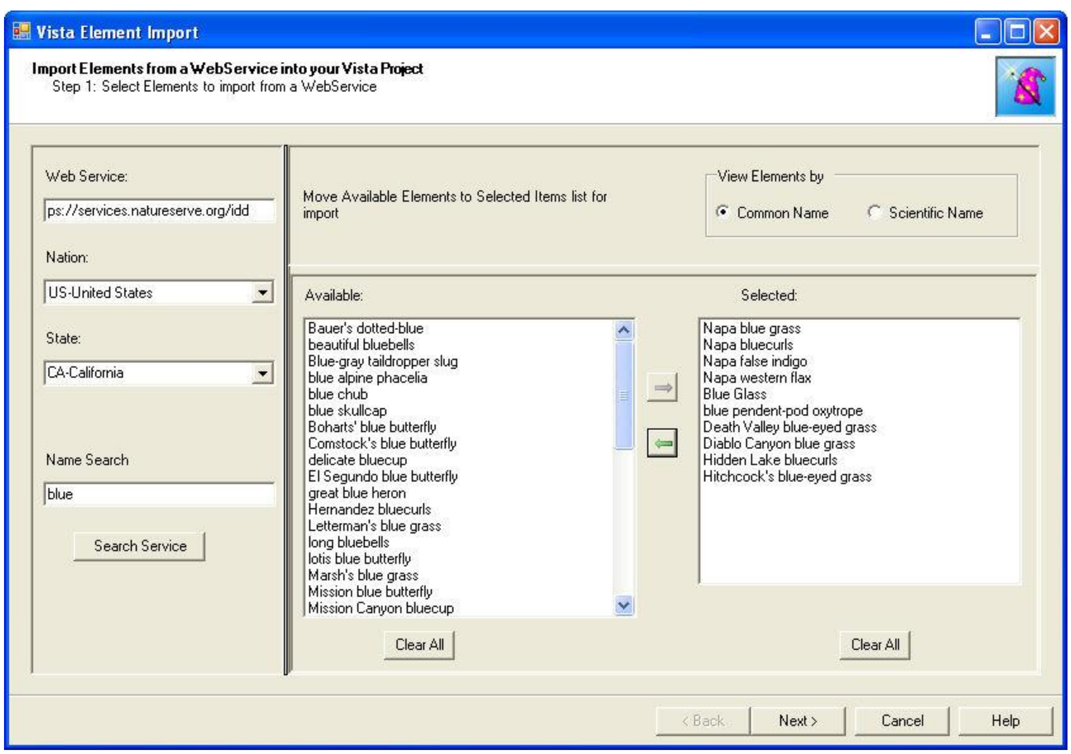
5. Repeat the process from step 4 until all the elements in the **Available:** list that are to be imported have been moved to the **Selected:** list.

   To de-select an element from the list to be imported, click on the element in the **Selected:** list and use the  button to move the element back to the **Available:** list.

   To re-start the selection process over at any point, click the **Clear All** button under the **Selected:** list.

6. To begin a new search for available elements, click the **Clear All** button under the **Available:** list. Repeat the search process from step 3 and then the selection process in step 4.

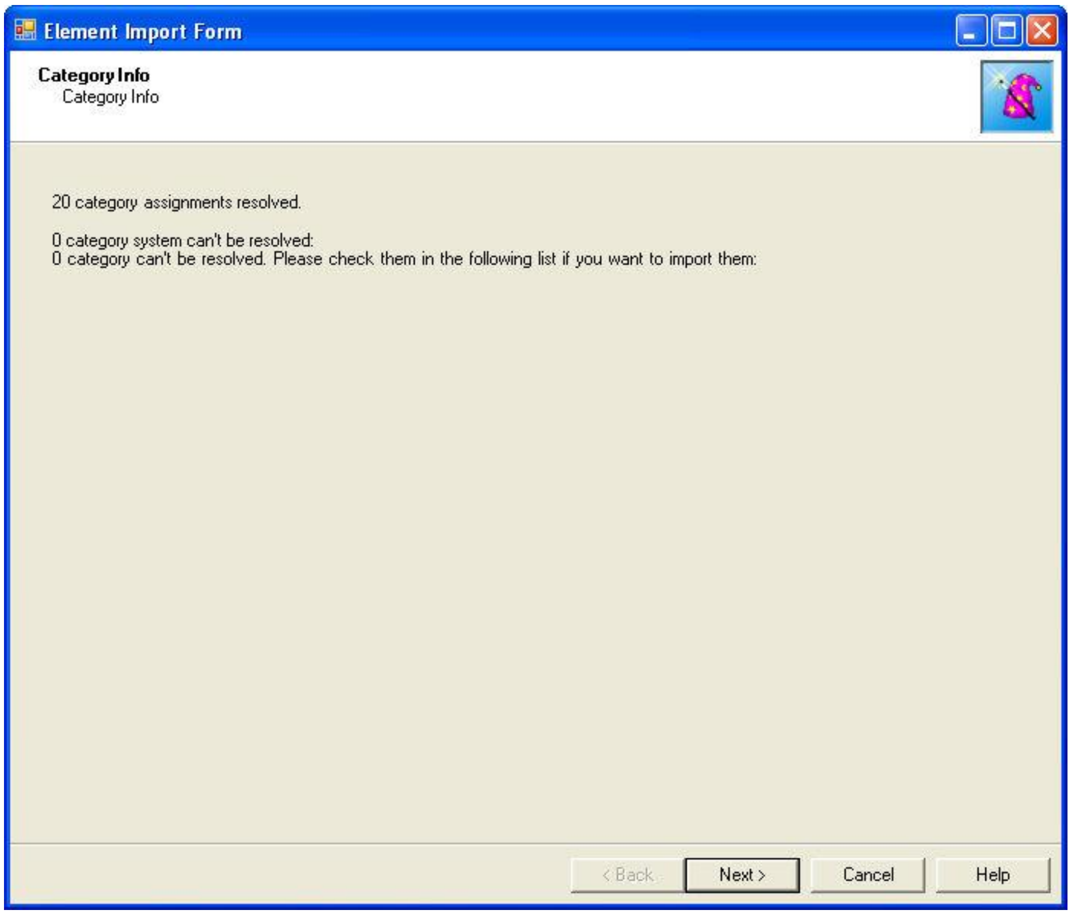




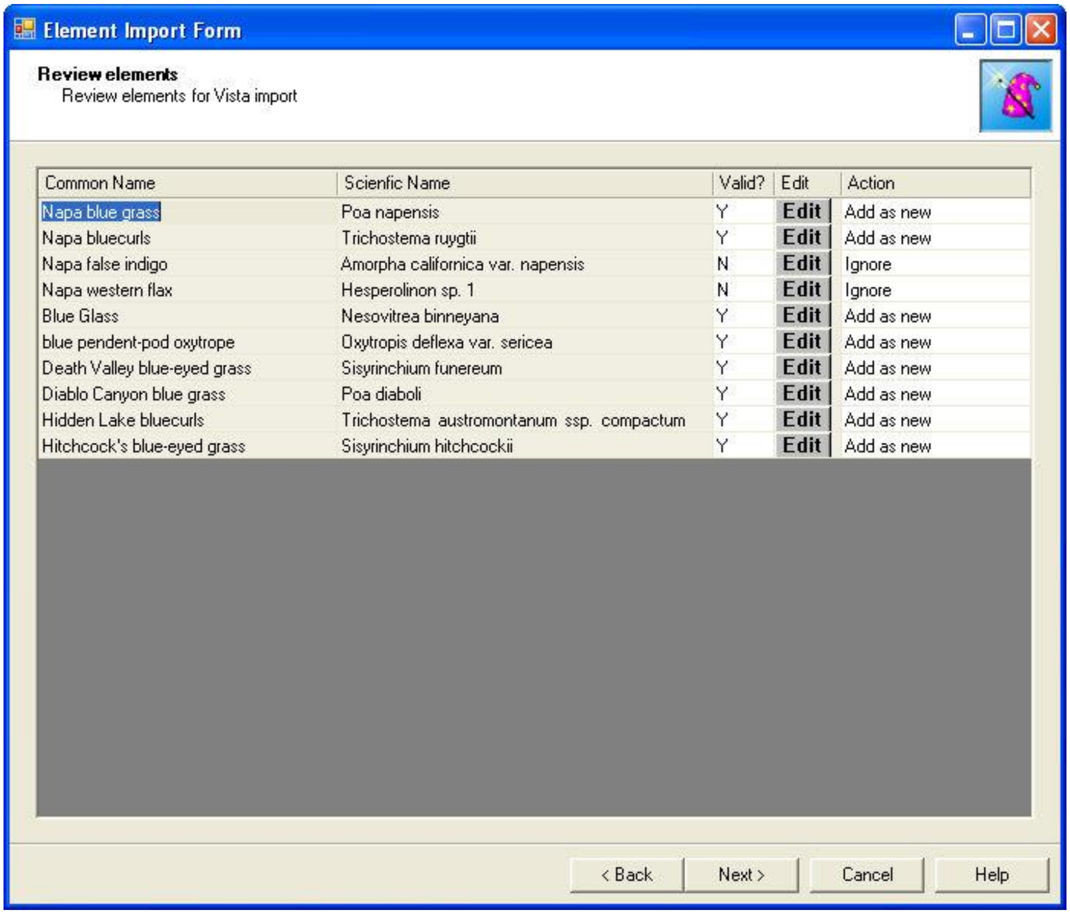
7. When the **Selected:** list contains all of the elements to be included for the properties import, click **Next>**. The data for these elements will be transferred from the web service, and a Category Info report

displayed in an Element Import Form, which provides the status of assignments to Category Systems, specifically whether both the Element Type category and G-Rank category systems have been resolved and assigned for each of the elements.

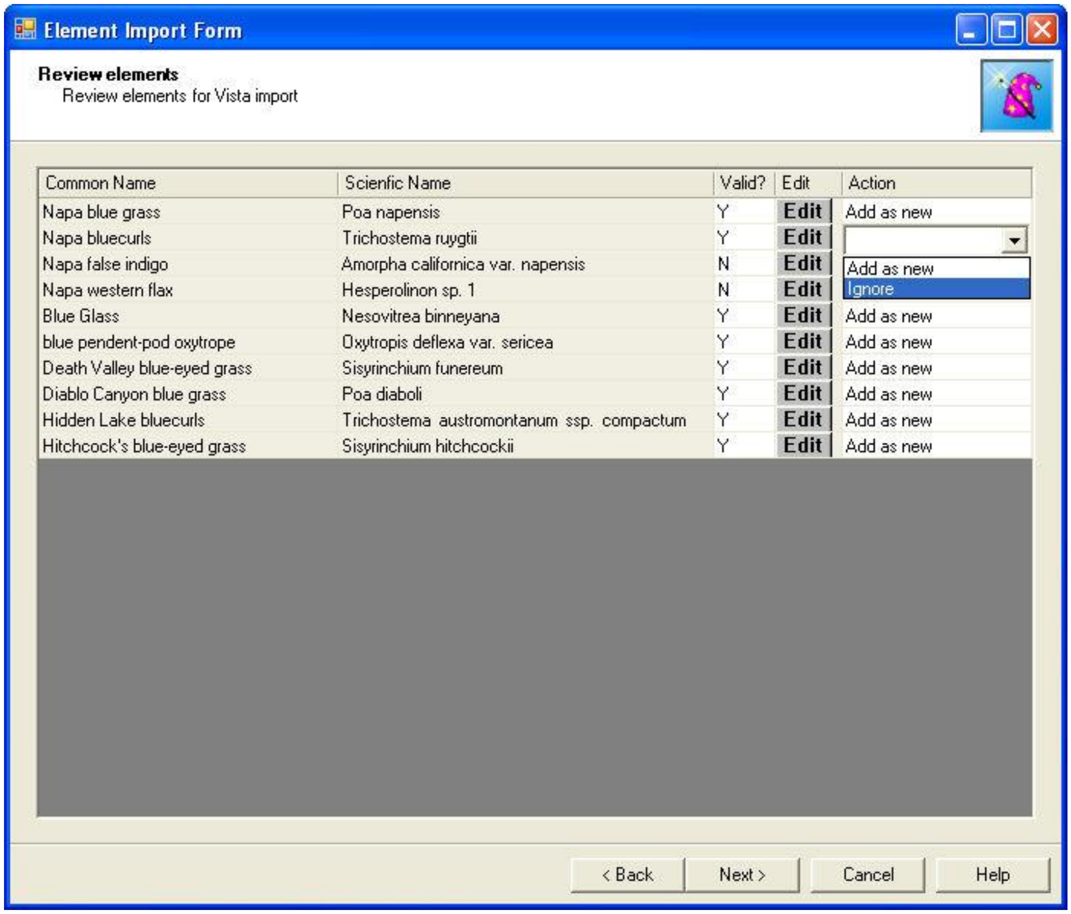
Note: This Vista Element Import window has changed at this point in the process to one labeled with the same name as the Element Import Form utilized in Vista to import element properties using a shapefile rather than a web service.



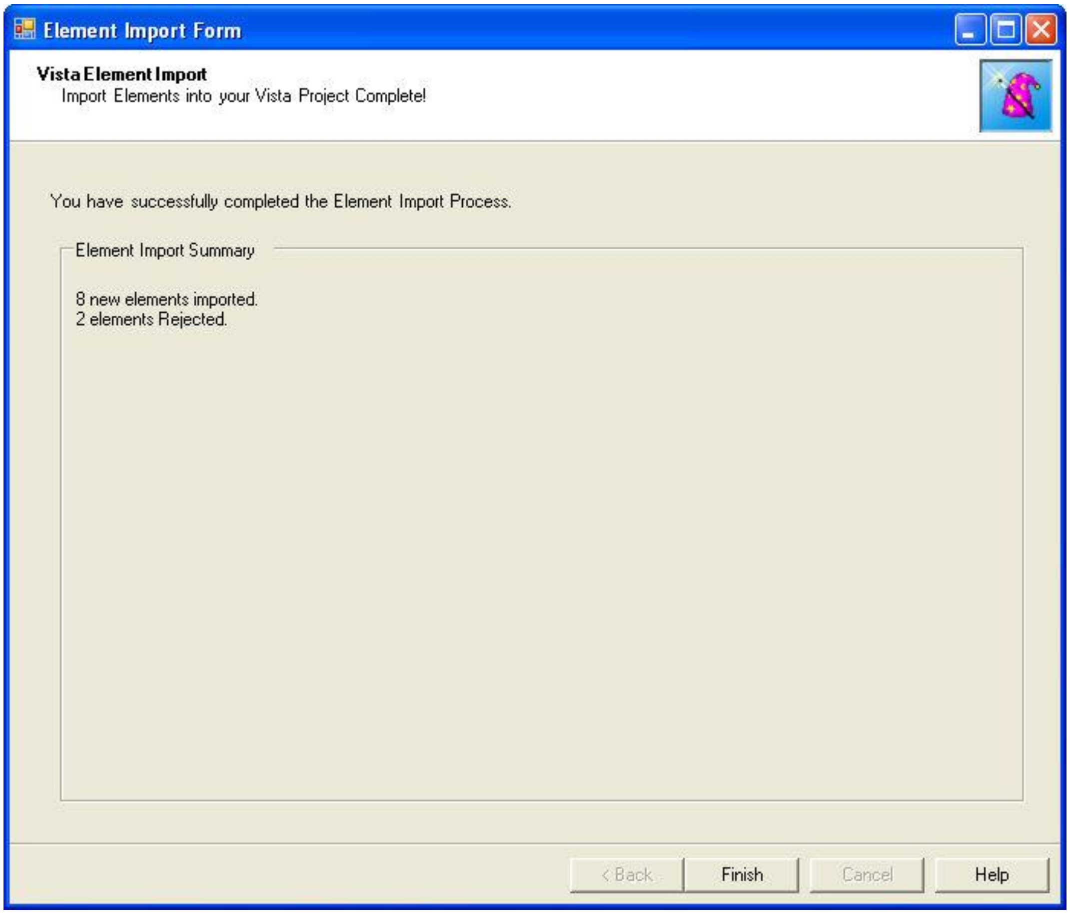
8. Click **Next >**. The system will display a list of the elements transferred.



9. Review the elements and attributes that were transferred, and, if desired, perform either or both of the following:
    - For any element transferred that lacks an associated valid category, specify or modify a category system by clicking **Edit** and making changes on the Categories tab of the Element Properties window that opens;
    - Change the displayed value in the **Action** column using the drop-down menu property in the element list, if appropriate, as follows:
        - **Add as new** will import the element (not previously existing) and associated properties as a new element in the project;
        - **Ignore** will cause the element and associated properties to not be imported into the project;
        - Only in cases when the Action initially displayed is **Ignore**, selecting the additional option to **Overwrite existing element** will result in replacement of that element and associated attributes already existing in the project with the imported element and properties data.



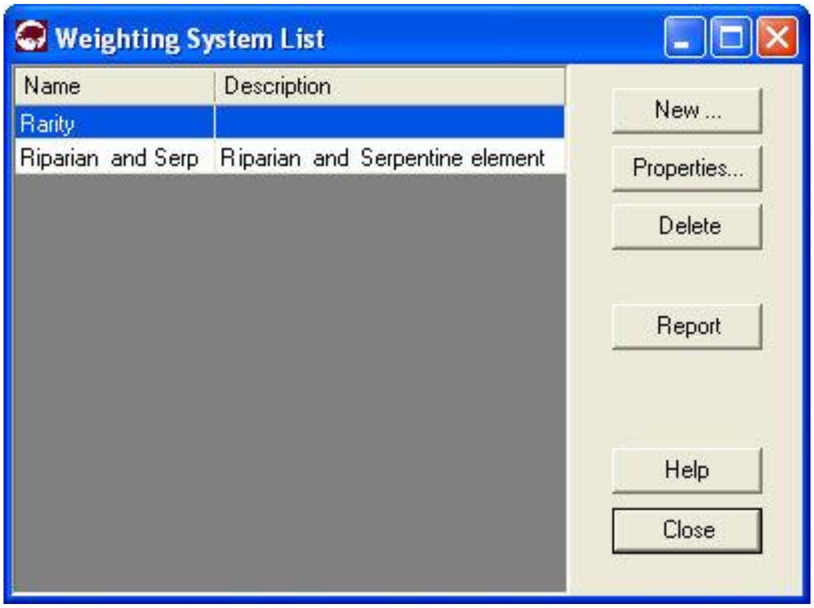
10.Once all desired changes to the elements have been made, click **Next>** to complete the element properties import process. The designated elements and associated properties will be imported into the Element Properties window and a final status report of the import will be shown. (In the example below, 2 of the 10 elements selected for properties import had an Action value of **Ignore**, and the remaining 8 were labeled with the **Add as new a**ction.)



11.Click **Finish** to close the import window.

WEIGHTING SYSTEM LIST WINDOW

The **Weighting System List** window is displayed by selecting **Lists ▸Weighting System List…** from the NatureServe Vista menu. This window lists all the weighting systems that have been created for the project. See the Weighting Systems section for more detailed information on the development and use of weighting systems in analyses.



Button functions:

New... displays a new [Weighting System Properties window] that can be used to develop a new weighting system to be used in the project.

Properties... displays the Weighting System Properties window showing details and allowing edits to the weighting selected in the list.

Delete deletes the weighting system selected in the list.

A **Confirm Delete** window is displayed before the deletion is implemented.

A **Cannot Delete** window is displayed in cases when the weighting system is referenced by another item used in project analyses, as shown in the following example.

Report displays a report that describes the selected weighting system and its settings. See the Reports section for more details on Weighting System reports.

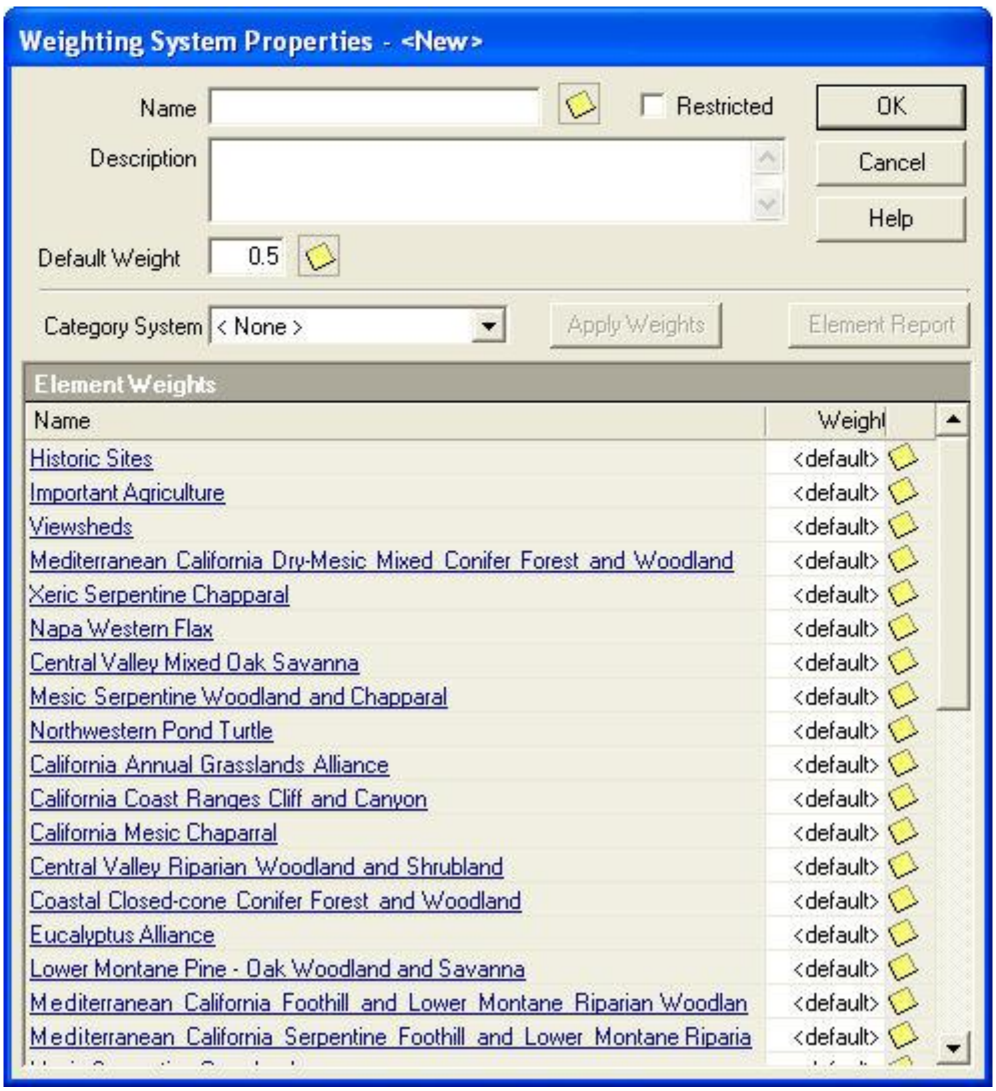
Help opens the on-line documentation.

Close closes the window.

Weighting System Properties Window

The **Weighting System Properties - <New>** window is displayed by clicking the **New...** button on the Weighting System List window. The new properties window is used to create a new weighting system that can be utilized for prioritizing elements in Conservation Value analyses. See the Weighting Systems section for more detailed information on the development and use of weightings in analyses.

Note that the  button located next to an item can be used to record additional information related to that item (see the Documentation Window topic for more details).

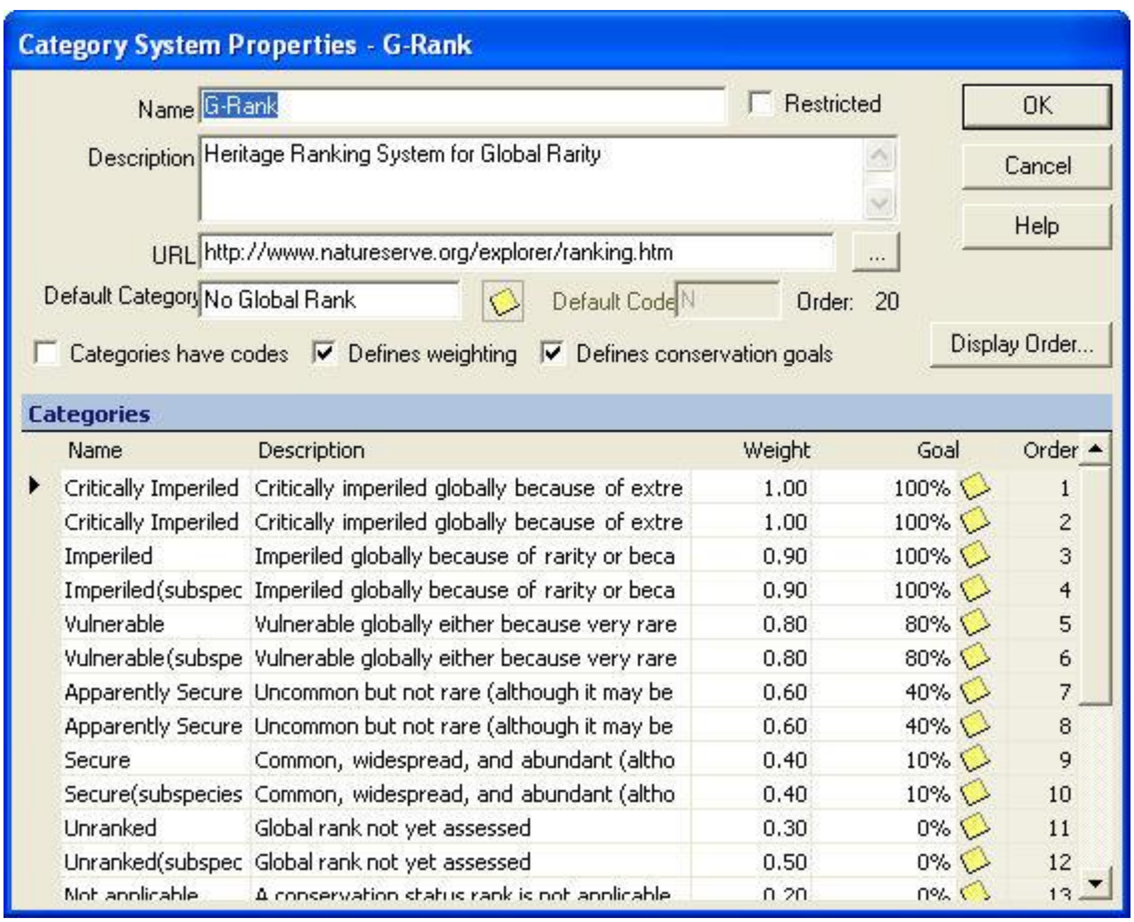


Create a weighting system:

1. Specify a name for the weighting system in the **Name** field. The **<New>** on the window title will change to the name of the new weighting system as the entry is typed in.
2. If the ability to edit the weighting system should be limited to members of the data development team, place a check in the **Restricted** checkbox.
3. Enter a brief description of the weighting system in the **Description** field, if desired.
4. Enter a value in the **Default Weight** field to be used in cases when a specific weight is not assigned to an element. The default value in this field is 0.5.

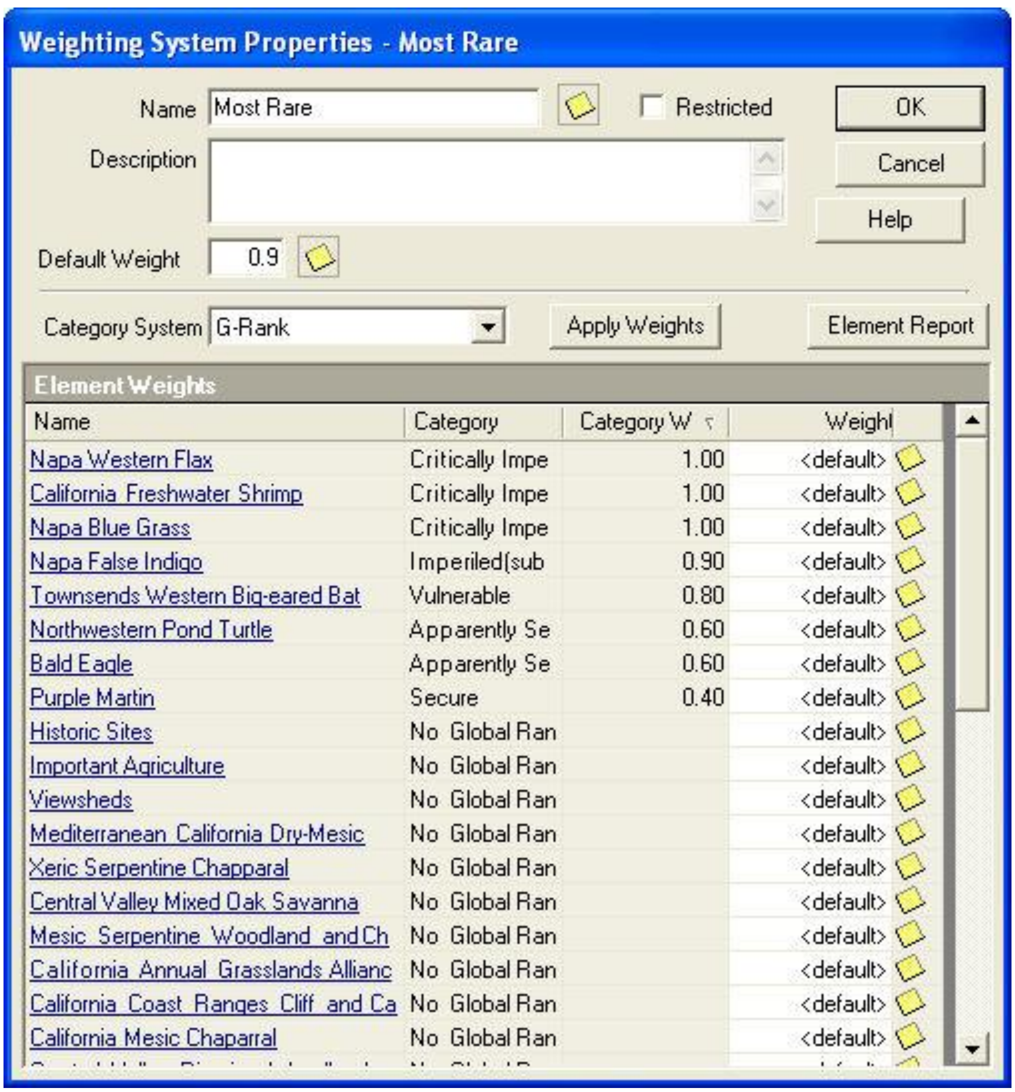
If a category system is to be used to create the weighting system, continue with step 5; if not, skip to step 8.

5. From the **Category System** drop-down menu of existing systems, select a category system to be used in developing the weighting system. Only category systems that define weights are shown in the drop-down list, such as the default "G-Rank" system displayed in the Category System Properties window below, although the option to create a new category system (**<Add New...>**) or to display all existing systems (**<Show List...>** in order to select and modify an existing system by adding weights) are included in the drop-down list.



The advantage of using a category system is that weights can be assigned for groups of elements (e.g., all elements that are Critically Imperiled will have an assigned weight of 1.0) instead of element by element individually (e.g., weight assigned for Burrowing Owl is 0.5, weight assigned for California Black Rail is 1.0, etc.). Note, however, that regardless of whether weights are assigned to categories of elements or to individual elements, Vista applies the weightings to each element individually during analyses.

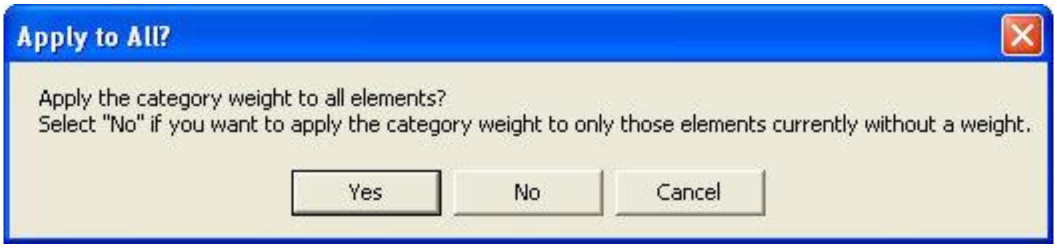
Once a category system has been selected, Category and Category Wt. columns are displayed for elements listed in the Weighting System Properties window, and the name and weight associated with the category to which each element belongs are displayed in these columns, respectively.



6. Determine if the weight assigned for the category system is appropriate for each element. If an alternate weight is preferred for an element, assign a specific value from 0.0 to 1.0 in the Weight column, replacing the

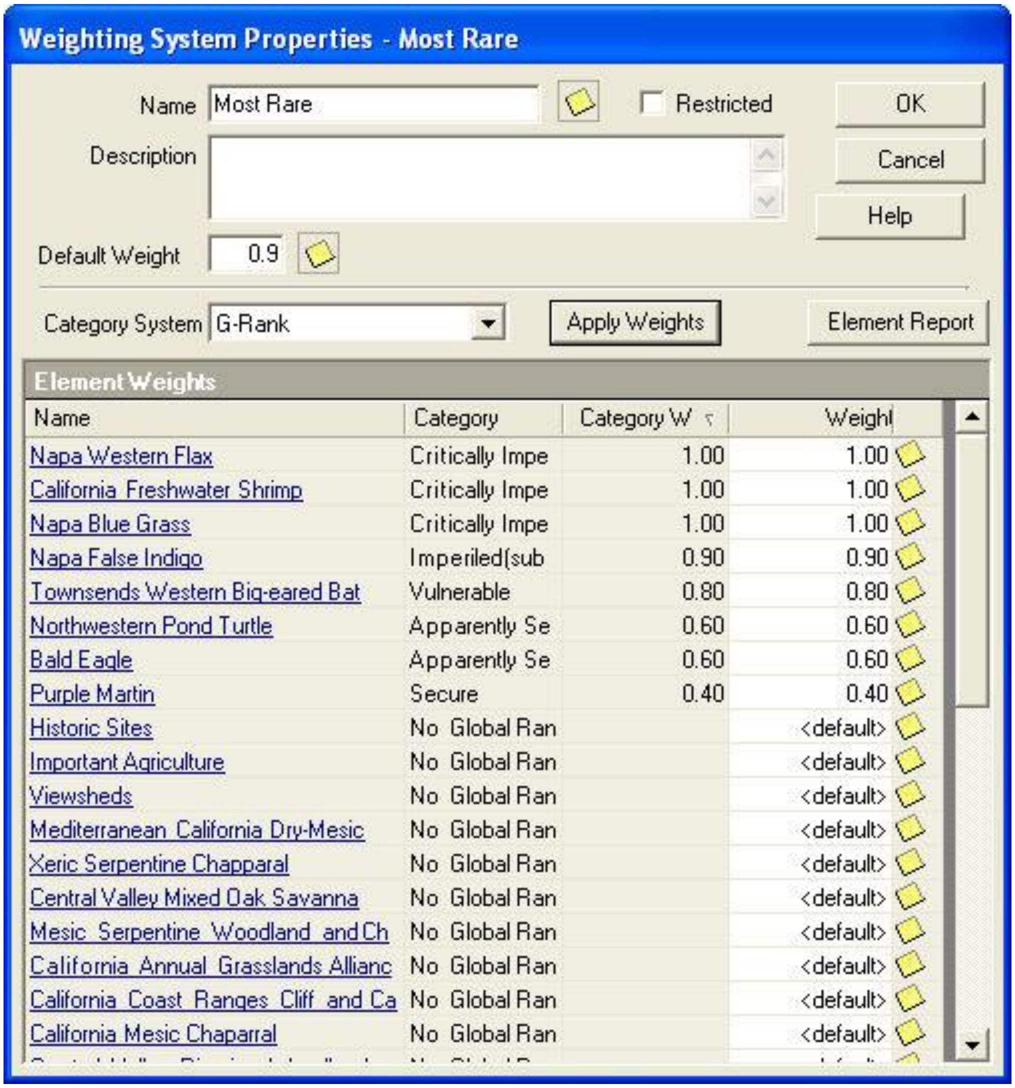
< default>. Clicking on an element name opens its element report, which can aid in setting weights. It may be useful to record the reason(s) for specifying a certain weight by using the associated button to access the Documentation window.

7. After any specific weights have been entered for elements, click the **Apply Weights** button.



The resulting "Apply to All?" window prompts the user to decide whether to replace newly entered values in the Weights column with the pre-existing weight values previously assigned to the category (**Yes**), or retain the new weight values and use existing category weights only for <default> values in the Weight column (**No**).

Skip to step 9.



To create the weighting system without using a category system:

8. Replace the <default> value in the Weight column with a value from 0.0 to 1.0 for any element that should be weighted differently than the value specified in the **Default Weight** field (in step 4 above). Clicking on an element name and clicking the **Element Report** button opens its Element Details Report, which can aid in setting weights. It may be useful to record the reason(s) for specifying a certain weight by using the associated  button to access the Documentation window.
9. If needed, reset to <default> any weight values for elements that should be weighted using the entry in the **Default Value** field (see step 4 above) instead by selecting the value to be changed in the Weight column and clicking either the **Delete** or **Backspace** button to remove the value. Moving to another row (using either **Enter** or the arrow buttons) will cause the now missing value to be replaced with <default>.

10. To save the data entered for the weighting system click **OK**; otherwise, click **Cancel**. Any elements with a <default> weight value will be automatically weighted according to the value entered in the **Default Weight** field (in step 4 above) in any analyses.
11. To review details on the new weighting system, select the system on the Weighting System List window and click the **Report** button. Settings for the weighting system, as well as weights assigned to specific elements will be displayed. See the Reports section for more details on Weighting System reports.

Edit a weighting system:

1. Select the weighting system from the list on the Weighting System List window and click the **Properties...** button. The resulting properties window displays the weights defined for elements in the weighting system.
2. Edit the weighting system using the processes described above for creating a new weighting system as guidelines.
3. To close the window and save any changes made to the weighting system click **OK**; otherwise, click **Cancel**.

LIMITATIONS

LIMITATIONS OF THE VISTA APPLICATION

Limitations Related to the Selection of Elements:

The initial selection of elements for consideration is a complex task that requires scientific knowledge, but must also incorporate the social values of the planning region. It should not be done hastily without education about the role the planning region plays in conserving some elements, especially the "non-glamorous" species that might otherwise be ignored. Scientific knowledge is also very incomplete, especially when it comes to less-conspicuous elements and the classification of some types of communities and ecosystems. New elements or new range extensions of elements will likely be discovered in the planning region periodically. Therefore, the act of element selection should be considered a dynamic activity that should be revisited frequently. The methods described in this section for selecting the subset of elements should be considered guidelines to be modified by local experts.

Limitations Related to Element Distributions:

Note that element distribution data will rarely satisfy all criteria for completeness, accuracy, currentness, and/or precision. Therefore, the user must evaluate which criteria need to be met in order for distribution data to be categorized as acceptable for use in Vista. (See the Confidence section for further details on the types and levels of confidence associated with distributions).

Note also that in rapidly changing environments it is difficult to keep distribution data current. It is strongly advised that a system be instituted to better capture onsite observations of elements to increase the precision of the distribution database.

Limitations Related to Viability/Integrity:

The methods described here for attributing viability or ecological integrity are meant to provide a measure that indicates whether occurrences have relatively high or low viability/integrity to be used in Conservation Value analyses. This process is not a substitute for population viability analysis (PVA) or field surveys to determine probabilities of population persistence or actual ecological quality of occurrences. The user should establish criteria that define 0.0-1.0 viability/integrity values; they may be used as relative values (as suggested in this section), or defined as probabilities of persistence calculated from a PVA.

Limitations Related to Confidence:

Vista currently uses only a single net attribute of confidence per occurrence polygon or raster grid cell. Retaining all of the attributes used to calculate a net confidence value may be valuable; the confidence attributes can be accessed directly through the Environmental Systems Research Institute (ESRI) ArcView application when decisions need to be made on issues that may be sensitive to confidence type (e.g., locational precision versus assumed extirpated versus age of observation, etc.).

When the confidence attributes of elements are included in Conservation Value analyses, they have the effect of lowering the conservation values of grid cells in proportion to the confidence scores of all elements selected and occurring at any particular location. However, low confidence does not necessarily mean that the elements observed or predicted for that location are not present, but rather that characteristics of the data (e.g., age of the observation, scale of the input maps) and/or changes that have occurred at the location reduce certainty that the element is present. It is recommended that different types of Conservation Value Summaries be developed - both with and without confidence in order to evaluate its effect of lowering the value of areas that are otherwise indicated by the data to be of conservation importance. It is important to prioritize areas for near-term conservation action based on confidence in the data, however, the optimal solution for low certainty is to increase the confidence of element observations/predictions (e.g., by obtaining more current data, by using finer resolution maps).

There is inherent uncertainty based on the size of the grid cell used for mapping element occurrences (observed or modeled) in a raster format. This uncertainty is also present in the processing of raster maps for Conservation Value analyses. The larger the cell size used for mapping and processing, the less confidence there is in making decisions for management units at a finer resolution (e.g., parcels from a legal town map). Vista uses the original confidence attributes of the elements and does not recalculate confidence when analytical cell sizes are changed. See the topic Determining Grid Cell Size for further information on the effects of cell size on analyses.

Confidence values are based on locations where elements have been observed or predicted; there are no confidence values assigned to locations where elements are not known or predicted to occur. In other words, Vista currently does not utilize a value for confidence that a location does *not* contain an occurrence of a particular element. While such knowledge would be very useful, the guiding assumption is that predictive distributions should be employed where existing occurrence information is known to be incomplete (most cases); using only existing data would lead to large errors of omission in element distribution. Errors of commission, that is, mapping elements as present where they are not, is a common result of predictive distribution modeling, which is designed to utilize precautionary principles in predicting element presence. Therefore, when employing predictive distribution maps, there may be higher confidence that areas depicted as lacking elements are truly lacking conservation value, than the opposite and more dangerous case (i.e., low confidence that areas that show the presence of elements have conservation value).

Limitations Related to Category Systems:

To make category systems useful, it is important that they be updated routinely to reflect systems that are the most useful for grouping elements. The system update process should include review and any needed revisions to both the description of each category within a system (in case any categories have changed), and the assignment of elements to those categories. While most category systems tend to be very stable, element assignments may be dynamic. For example, the legal status of an element may change over time; failure to review and adjust the category assigned to such an element could have serious ramifications to results of analyses if the legal status assignment is obsolete.

Limitations Related to Filters:

A current limitation of this version of Vista is that a spatial filter can only be developed based on the default project boundaries or on a sub-region derived from a layer that contains a single feature (e.g., the county shape). In addition, spatial filters cannot be nested or included in sub-expressions. Another limitation is that the expressions used to create a filter are limited to the operands AND and OR; however, ANDs and ORs cannot be mixed in the same sub-expression. More complex queries that would utilize other operands such as IF, BUT NOT, etc. are not supported by this version.

Limitations Related to Weighting Systems:

To ensure the most accurate results in Conservation Value analyses, it is important that weighting systems be updated routinely to reflect any changes in the importance of particular elements relative to others. Policies and priorities for conservation in the planning region may change for various stakeholders over time, and so assigned element weights may be dynamic. The process for updating a weighting system should include review and any needed revisions to the weightings assigned for groups of elements and/or individual elements.

Limitations Related to Goal Sets:

To ensure the most accurate results in analyses (e.g., Scenario Evaluations), it is important that goal sets be updated routinely to reflect any changes in conservation goals for the planning region. Since specific objectives for target elements are frequently defined on the basis of incomplete knowledge and/or data, and ecosystems that support targeted elements change over time, careful documentation and long-term monitoring are necessary to ensure that goals remain current.

Limitations Related to Element Conservation Value:

ECV layers are created by rasterizing vector element distribution layers. This process results in a loss of precision.

Limitations Related to Conservation Value Summaries:

The CVS is an index and should be used as such - a general indicator of areas with relatively high and low conservation value based on user inputs and options. A large amount of data about individual elements and their occurrences is aggregated to a single value in this process, which necessarily results in a loss of precision and information to achieve the summary or averaged value. In addition, precision is lost as the data is re-sampled during the process of creating a CVS. Re-sampling occurs when the Element Conservation Value (ECV) layers used to create the CVS are overlaid on top of one another; their cell boundaries may not line up so their values are ”r;re-sampled” into the grid cells in the CVS which closely correspond with (but are not always identical to) the cell locations they came from. Note that the results of a CVS display all occurrences of elements included in the analysis coded according to conservation value; the analysis does not exclude any occurrences from the results on the basis of minimum viable size.

It is also important to realize that the CVS does not automatically incorporate other important considerations of conservation planning, such as the degree to which elements are already protected at a location, how irreplaceable any one occurrence is in terms of meeting conservation goals, or the degree to which any particular occurrence is threatened. Such information can, however, be obtained using Scenario Evaluation analyses.

Limitations Related to Landscape Condition Modeling:

The concept of landscape condition modeling is highly simplified in Vista resulting in relative indices of condition that take into account a fairly narrow set of considerations especially relative to animal species. Although experts building and documenting the model may consider a number of factors in assigning site and distance intensity weights, the Vista model does not explicitly address issues such as impacts on species mobility, demographics, habitat connectivity among multiple resources, etc. Much more detailed modeling tools exist to consider these issues when knowledge, time, and funding exist to address them. Over time we anticipate adding the ability of Vista to incorporate outputs of such models to allow greater precision while integrating results into the broad Vista planning framework.

Limitations Related to Translators:

Vista translators serve to convert the many land use/management and policy types used in different jurisdictions to a circumscribed set of "standard" LUI categories and PT that can be utilized effectively in analyses. While the default LUI and PT descriptions attempt to capture the range of conditions on a land unit that may affect ecological compatibility, they are very limited in their ability to address more complex conditions that typically occur (e.g., the multiple effects of land use, management practices, disturbances, and invasions of exotic species). Thus, the default

LUI and PT are offered as a useful generic categorization, but they may not be entirely suited to any particular planning region or project. Vista provides the flexibility to permit users (working with NatureServe Vista support staff) to substitute custom LUI and PT lists comprised of types that better capture the important conservation impacts of specific land uses, management practices, and/or supporting policies in the planning region.

Limitations Related to Scenarios:

The scenario definition process in Vista is used to create layers that represent LUI and PT conditions for the planning region, which can then be used in Scenario Evaluations. However, because Vista will convert all data to raster format before conducting the analysis, there is a danger of losing information if the cell size is too great. This risk is of greater concern for thin linear features such as streams, rivers, or roads. See discussion in the Determining Grid Cell Size topic for additional details related to the rasterization of features.

Limitations Related to Scenario Evaluations:

Scenario Evaluation in Vista is intended to provide an indication of the degree to which conditions represented by a scenario support conservation goals for elements. It should not be used as a substitute for ground surveys, specific site design review, or expert opinion when element viability/ecological integrity must be ensured because:

- It makes use of simplified and generalized assumptions about compatibility between land uses and element viability/ecological integrity, and
- It may not incorporate specific and current information on species demographics or the viability/ecological integrity of elements.

Vista currently lacks the ability to calculate two important measures in conservation, specifically:

- Irreplaceability of land units to meet goals, which relates to how many options exist for achieving goals. A land unit containing an occurrence of an element with a conservation goal of 100% is essential for meeting that goal, and would be ranked 100% irreplaceable. As the options for achieving goals increase, irreplaceability values decrease.
- Complementarity of land units to contribute to goals, which refers to the degree to which a unit can represent elements not already conserved elsewhere in the planning region. A land unit that can be used to conserve occurrences of five elements for which goals are not already met, when compared with another unit that contains three such occurrences, will have a higher complementarity value.

Irreplaceability and complementarity are currently very difficult to infer with no direct processes for calculating them. However, some expert tools exist that can be used to derive values for these conservation measures. NatureServe Vista support staff can provide services that utilize such tools to obtain values, and then integrate the results with Vista output.

The freedom to determine what combinations of land use compatibility and policy types define protection for elements in a Vista project is an important advantage over other regional, state, and national conservation projects, which typically do not allow any consideration of local policies. However, it is also an enormous responsibility on the part of the user to create a realistic definition of protection and to be conservative about the true nature of land use/management practices and policies in the planning region. A conservative approach will, at worst, demonstrate less protection than currently exists, and can be easily corrected. However, a less moderate approach that validates policies which are, in practice, unreliable for protecting elements may indicate that conservation goals have been achieved while elements are actually at serious and permanent risk.

Limitations of Site Analysis:

Limitations described for data inputs and dependent Vista analyses, specifically for Conservation Value Summaries and Scenario Evaluations, are carried forward as limitations of Site Explorer. Additional limitations that are specific to Site Explorer include:

- When evaluating alternative land uses and/or policy types for the site selection, the alternative land status(es) must be applied to the entire selection. This suggests that care be taken to use a planning unit of sufficiently small size to reflect the scale of most land use patterns.

APPENDICES

APPENDIX A: NatureServe Conservation Status Definitions

The global (G) conservation status (rank) of a species or ecological community is assigned by NatureServe based on the *range-wide* status of that species or ecological community. The rank is regularly reviewed and updated by experts, and takes into account such factors as number and quality/condition of occurrences, population size, range of distribution, population trends, protection status, and fragility. The definitions of these ranks, which are not to be interpreted as legal designations, are as follows:

Global Conservation Status Ranks

GX Presumed Extinct (species): Not located despite intensive searches and virtually no likelihood of rediscovery

Extinct (ecological communities and systems): Eliminated throughout its range, with no restoration potential.

GH Possibly Extinct: Known only from historical occurrences but still some hope of rediscovery

G1 Critically Imperiled: At very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors.

G2 Imperiled: At high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors.

G3 Vulnerable: At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

G4 Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 Secure: Common; widespread and abundant.

G(#)**T**(#) Trinomial (T) rank applies to subspecies or varieties; these taxa are T-ranked using the same definitions as the G-ranks above.

Variant Global Status Ranks

G#G# Range Rank: A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a species or community. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4).

GU Unrankable: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3)should be used to delineate the limits (range) of uncertainty.

GNR Unranked: Global rank not yet assessed.

GNA Not Applicable: A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities (e.g., a hybrid without conservation value, of domestic origin, an agricultural field).

Rank Qualifiers

? Inexact Numeric Rank: Denotes inexact numeric rank.

Q Questionable taxonomy that may reduce conservation priority: Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon/type having a lower-priority (numerically higher) conservation status rank.

C Captive or Cultivated: Taxon at present is extinct in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population not yet established.

APPENDIX B: Element Occurrence Ranks

Basic EO Ranks

Rank	Definition
A	**Excellent estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have an excellent probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. **Excellent ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have an excellent probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes).
B	**Good estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a good probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. **Good ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a good probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes).
C	**Fair estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. **Fair ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes).
D	**Poor estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. **Poor ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is believed to have a poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes).
E	**Verified Extant** (species) – EO has been recently verified as still existing, but sufficient information on the factors used to estimate viability of the occurrence has not yet been obtained. **Verified Extant** (communities) – EO has been recently verified as still existing, but sufficient information on the factors used to estimate ecological integrity of the occurrence has not yet been obtained. Use of the **E** rank should be reserved for those situations where the occurrence is thought to be extant, but an **A**, **B**, **C**, **D**, or range rank (see table below) cannot be assigned.
H	**Historical** (species) – There is a lack of recent[2] field information verifying the continued existence of the EO, such as when the occurrence is based only on historical collections data, or when the occurrence was ranked **A**, **B**, **C**, **D**, or **E** at one time and is later, without field survey work, considered to be possibly extirpated due to general habitat loss or degradation of the environment in the area. **Historical** (communities) – There is a lack of recent[2] field information verifying the continued existence of the EO, such as when the occurrence was ranked **A**, **B**, **C**, **D**, or **E** at one time and is later, without field survey work, considered to be possibly extirpated due to general habitat loss or degradation of the environment in the area.
F	**Failed to find** – EO has not been found despite a search by an experienced observer at a time and under conditions appropriate for the Element at a location where it was previously reported, but that still might be confirmed to exist at that location with additional field survey efforts. For EOs with vague locational information, the search must include areas of appropriate habitat within the range of locational uncertainty[3]. An **F** rank, when applicable, supersedes an **A**, **B**, **C**, **D**, **E**, or **H** rank.
X	**Extirpated** – There is documented destruction of the habitat or environment of the EO, or persuasive evidence of its eradication based on adequate survey (i.e., thorough or repeated survey efforts by one or more experienced observers at times and under conditions appropriate for the Element at that location).
U	**Unrankable** – An EO rank cannot be assigned due to lack of sufficient information on the occurrence.
NR	**Not Ranked** – An EO rank has not yet been assigned to the occurrence.

EO Rank Qualifier

Rank	Definition
?	**Inexact basic EO rank or origin subrank** – There is uncertainty distributed about the basic rank or origin subrank assigned to the EO.

EO Range Ranks

Rank	Definition
AB	**Excellent to good estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have at least a good probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. This range rank is assigned when further information indicating the degree of viability (i.e., **A** or **B** differentiation) is lacking. **Excellent to good ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have at least a good probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes). This range rank is assigned when further information indicating the degree of ecological integrity (i.e., **A** or **B** differentiation) is lacking.
AC	**Excellent to fair estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have at least a fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. This range rank is assigned when further information indicating the degree of viability (i.e., **A**, **B** , or **C** differentiation) is lacking. **Excellent to fair ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have at least a fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes). This range rank is assigned when further information indicating the degree of ecological integrity (i.e., **A**, **B**, or **C** differentiation) is lacking.
BC	**Good to fair estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a good to fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. This range rank is assigned when further information indicating the degree of viability (i.e., **B** or **C** differentiation) is lacking. **Good to fair ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a good to fair probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes). This range rank is assigned when further information indicating the degree of ecological integrity (i.e., **B** or **C** differentiation) is lacking.
BD	**Good to poor estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a good to poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. This range rank is assigned when further information indicating the degree of viability (i.e., **B**, **C**, or **D** differentiation) is lacking. **Good to poor ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a good to poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes). This range rank is assigned when further information indicating the degree of ecological integrity (i.e., **B**, **C**, or **D** differentiation) is lacking.
CD	**Fair to poor estimated viability** (species) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a fair to poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years. This range rank is assigned when further information indicating the degree of viability (i.e., **C** or **D** differentiation) is lacking. **Fair to poor ecological integrity** (communities) – Based on current information on EO rank factors[1] (i.e., condition, size, and landscape context) for the EO, it is deemed to have a fair to poor probability of persisting, if current conditions prevail, for a defined period of time, typically 20-100 years (within the bounds of natural disturbance regimes). This range rank is assigned when further information indicating the degree of ecological integrity (i.e., **C** or **D** differentiation) differentiation) is lacking.

Origin Subranks

Rank	Definition
i	**Introduced** – Used to indicate that the EO resulted from the introduction of the Element to areas outside of the presently or historically occupied portions of its native range. EOs that are assigned an origin status subrank of **i** are neither native nor natural in origin.
r	**Reintroduced** (species) – Used to indicate that all or a majority of the individuals in the EO have been anthropogenically translocated to that location, which must be within a presently or historically occupied portion of the native range of the Element. A reintroduction could include a transplant from elsewhere; it could also include a transplant of some or all of the individuals in an EO to a location within the separation distance[1] surrounding the original occurrence. In such situations, the **r** subrank should be used for the occurrence when greater than 50% of the population has been reintroduced. Removing individuals and returning them and/or their progeny to the original location does not constitute a restoration. Used to indicate the EO is retained over time unless there is evidence of significant gene flow from naturally dispersing individuals into that occurrence. Similarly, a new EO thought to be established directly or indirectly through dispersal of individuals from a reintroduced occurrence should also be treated as a reintroduced occurrence unless there is evidence of significant gene flow from other individuals dispersing from natural populations into that EO. **Reintroduced** (communities)– Used for rare community EOs that have been re-established in areas where they are believed to have previously existed (i.e., de novo restorations). Both species and community EOs that are assigned an **r** origin status subrank are native, but not natural, in origin, having been established by anthropogenic means.

APPENDIX C: Scale-of-Occurrence Classes for Terrestrial Ecological Elements

Scale-of-Occurrence Classes ("Patch Types") for Terrestrial Ecological Systems and Communities.

Geographic Scale (Patch Type)	Definition
Coarse (Matrix-forming)	Communities or systems that form extensive and contiguous cover, occur on the most extensive landforms, and typically have wide ecological tolerances. Disturbance patches typically occupy a relatively small percentage (e.g. <5%) of the total occurrence. In undisturbed conditions, typical occurrences range in size from 2,000 to 100,000 ha.
Intermediate (Large Patch)	Communities or systems that form large areas of interrupted cover and typically have narrower ranges of ecological tolerances than matrix types. Individual disturbance events tend to occupy patches that can encompass a large proportion of the overall occurrence (e.g. >20%). In undisturbed conditions, typical occurrences range from 50-2,000 ha.
Intermediate (*Linear*)	Communities or systems that occur as linear strips and are often ecotonal between terrestrial and aquatic ecosystems. In undisturbed conditions, typical occurrences range in linear distance from 0.5 to 100 km.
Local (Small Patch)	Communities or systems that form small, discrete areas of vegetation cover typically limited in distribution by localized

	environmental features. In undisturbed conditions, typical occurrences range from 1-50 ha.

APPENDIX D: Land Use Intent Categories

NatureServe Vista includes a mechanism that facilitates the merger of land use data into one common classification. This allows the user to incorporate multiple land uses and "crosswalk" them to a common land use classification. While the common land use classification can be customized, the *IUCN-CMP Unified Classifications of Direct Threats* are included with this package. The *Unified Classifications* are a standardized classification of anthropogenic activities or processes which currently or could potentially damage species, natural communities or ecosystems (IUCN-CMP 2006). See http://conservationmeasures.org/CMP/IUCN/Site_Page.cfm for more information.

Land use data often originates from various sources. An important step is assimilating the data into a common land use classification. Characterizing the diverse land use types by their potential effects will simplify the overall analysis, sometimes dissimilar layers into new categories. In doing so, planning team members will need to assess each land use in terms of its impacts to the environment and grouping land uses in terms of their *destruction, degradation and/or impairment of biodiversity and natural processes*. (IUCN-CMP 2006). Good classifications are simple and intuitive; an audience of professionals should be able to clearly understand how and why certain layers were grouped together. A consistent approach to classifying will aid this process immensely. The classification should allow new land use layers to be incorporated as they are identified or changed depending on expert input. As we mentioned above, the IUCN-CMP Unified Classifications are standard, globalized classifications. You should not be restricted to these classifications if they do not suit your project or will be difficult for the experts and/or stakeholders to understand. Feel free to create your own standard classification that reflects the direct threats to your project and your audience. Split the IUCN-CNP classifications to provide additional detail or create entirely new classes by adding a new row. NatureServe Vista is flexible enough to incorporate customized land use classifications. For example, you may wish to add a second Housing and Urban Areas class to accommodate several densities of housing development.

Classification	Definition
Residential & Commercial Development	**Threats from human settlements or other non-agricultural land uses with a substantial footprint**
Housing and Urban Areas	Human cities, towns, and settlements including non-housing development typically integrated with housing
Commercial & Industrial Areas	Factories and other commercial

	centers
Tourism & Recreation Areas Development	Tourism and recreation sites with a substantial footprint
Agricultural and Aquaculture	**Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture**
Annual & Perennial Non-Timber Crops	Crops planted for food, fodder, fiber, fuel, or other uses
Wood & Pulp Plantations	Stands of trees planted for timber or fiber outside of natural forests, often with non-native species
Livestock Farming & Ranching	Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)
Marine & Freshwater Aquaculture	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild
Energy Production and Mining	**Threats from production of non-biological resources**
Oil & Gas Drilling	Exploring for, developing, and producing petroleum and other liquid hydrocarbons
Mining & Quarrying	Exploring for, developing, and producing minerals and rocks
Renewable Energy	Exploring, developing, and producing renewable energy
Transportation and Service Corridors	**Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality**
Roads & Railroads	Surface transport on roadways and dedicated tracks
Utility & Service Lines	Transport of energy & resources
Shipping Lanes	Transport on and in freshwater and

	ocean waterways
Flight Paths	Air and space transport
Biological Resource Use	**Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species**
Hunting & Collecting Terrestrial Animals	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
Gathering Terrestrial Plants	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons
Logging & Wood Harvesting	Harvesting trees and other woody vegetation for timber, fiber, or fuel
Fishing & Harvesting Aquatic Resources	Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
Human Intrusions and Disturbance	**Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources**
Recreation Activities	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons
War, Civil Unrest, and Military Exercises	Actions by formal or paramilitary forces without a permanent footprint
Work and Other Activities	People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research

Natural System Modifications	**Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare**
Fire & Fire Suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation
Dams & Water Management / Use	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities
Other Ecosystem Modifications	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare
Invasive and Other Problematic Species and Genes	**Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance**
Invasive Non-Native / Alien Species	Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities
Problematic Native Species	Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become "out-of-balance" or "released" directly or indirectly due to human activities
Introduced Genetic Material	Human altered or transported organisms or genes
Pollution	**Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources**
Household Sewage & Urban Water	Water-borne sewage and non-point

Waste	runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments
Industrial & Military Effluents	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments
Agricultural & Forestry Effluents	Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied
Garbage & Solid Waste	Rubbish and other solid materials including those that entangle wildlife
Air-Borne Pollutants	Atmospheric pollutants from point and nonpoint sources
Excess Energy	Inputs of heat, sound, or light that disturb wildlife or ecosystems
Geologic Events	**Threats from catastrophic geological events**
Volcanos	Volcanic events
Earthquakes / Tsunamis	Earthquakes and associated events
Avalanches / Landslides	Avalanches or landslides
Climate Change and Severe Weather	**Threats from long-term climatic changes which may be linked to global warming and other severe climatic/weather events that are outside of the natural range of variation, or potentially can wipe out a vulnerable species or habitat**
Habitat Shifting & Alteration	Major changes in habitat composition and location
Droughts	Periods in which rainfall falls below the normal range of variation
Temperature Extremes	Periods in which temperatures

	exceed or go below the normal range of variation
Storms & Flooding	Extreme precipitation and/or wind events
Land and Water Protection	**Actions to identify, establish or expand parks and other legally protected areas**
Site / Area Protection	Establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN Categories I-VI
Resource & Habitat Protection	Establishing protection or easements of some specific aspect of the resource on public or private lands outside of IUCN Categories I-VI
Land / Water Management	**Actions directed at conserving or restoring sites, habitats and the wider environment**
Site / Area Management	Management of protected areas and other resource lands for conservation
Invasive / Problematic Species Control	Controlling and/or preventing invasive and/or other problematic plants, animals, and pathogens
Habitat & Natural Process Restoration	Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution
Species Management	**Actions directed at managing or restoring species, focused on the species of concern itself**
Species Management	Managing specific plant and animal populations of concern
Species Recovery	Manipulating, enhancing or restoring specific plant and animal populations, vaccination programs
Species Re-Introduction	Re-introducing species to places where they formally occurred or benign introductions
Ex-Situ Conservation	Protecting biodiversity out of its native habitats

Land use intent (LUI) is a hierarchical classification ordered by intensity of land use. The term "land use" applies to any intentional actions on the land including management practices. Intensity is the degree to which land use negatively impacts biological elements through alterations to natural land cover, the presence of anthropogenic structures, and the introduction of people into the landscape (e.g., Crist et al. 2000).

LUI is described by a class name, and has both major and minor classes. Major classes describe general land uses, such as "working landscapes," "development," and "converted." These categories are refined by minor classes that describe the level of land use intensity within the major class, if known. Virtually all zoning plans permit more than one LUI for a tract.

When the minor class within a major cannot be identified, the "Unknown" category under the major class is generally utilized. However, the use of "Unknown" is strongly discouraged at the major class level as it will reduce precision of the results of analyses that utilize LUI. Specifically, if a tract has a major intent class of "Unknown," analyses will utilized a conservative approach, considering it "incompatible" based on the assumption that the land has been converted until proven otherwise.

LUI categories are utilized in Vista to 1) indicate which land uses are compatible with elements individually (assigned on the Compatibility tab of the Element Properties window), and 2) cross-walk land use/management types in a planning region to "standard" types (assigned during the process of creating translators using the Translator Properties wizard). Both of these uses for LUI (assigning compatibility and creating translators) are utilized in Land Use and Conservation Scenario Evaluations. Vista provides the capability for users to customize LUI categories (using the Edit Land Use Intent window) in order to better capture the important conservation impacts of specific land uses and/or management practices in the planning region.

APPENDIX E: Policy Types

Policy types (PTs) are categories describing the mechanism that guides the implementation of a land use intent (LUI) designation (described in Appendix F), including processes that prevent or allow land uses of greater intensity. In other words, PT provides an indication of the likelihood that the actual land use will be no more intense than the stated LUI. For example, a "working landscape" area can be permanently designated for this use by land trust easement or by zoning, which is a temporary regulation. In this case, the easement would be considered a reliable PT, that is, it would more reliably enforce the designated land use or prevent a use of greater intensity than the zoning regulation, which can be changed with relative ease.

PT are utilized in Vista to 1) cross-walk policy practices in a planning region to "standard" types (assigned during the process of creating translators using the Translator Properties wizard), and 2) indicate which policy types are considered to reliably enforce the implementation of a compatible LUI and prevent a use of greater intensity, which may provide adequate protection for elements (assigned on the Evaluate Scenario window). Both of these uses for PT (creating translators and assessing validity) are utilized in Land Use and Conservation Scenario Evaluations. Vista provides the capability for users to customize PTs (using the Edit Policy Type window) in order to better capture the important conservation impacts of specific policy mechanisms in the planning region.

POLICY TYPES

Note that the term "land use" applies to any intentional actions on the land, including management practices.

Legislatively/administratively mandated land use

Type that applies to tracts where the land use has been mandated by a legislative body (e.g., state/provincial government, national legislative body), such as designated "wilderness areas." This type can also include administrative designations that are intended to be permanent (e.g., national monuments). These designations are considered irrevocable during the planning time frame.

Revocable legislatively/administratively mandated land use

Type that applies to tracts where the land use has been mandated by a legislative or administrative body, but the designation may be relatively simple to revoke during the planning time frame.

Statutory enforced land use plan

Type that includes land use plans produced under statutory requirements, which provide strict mechanisms of control and resources for implementation for specified periods of time (e.g., federal land management plans). The breadth of allowable land uses for this type is typically narrow, and the assumption is made that land use will not be more intense than that specified for the planning time frame. However, there are mechanisms to change such plans under certain circumstances.

Institutionally managed easement or holding

Type that includes tracts held and managed by a conservation institution (e.g., land trust, mitigation bank). Examples of this type include fee-simple ownership, purchased and donated easements, and purchased or transferred development rights. Legal arrangements irrevocably remove the rights to develop or utilize the land more intensely than specified by the land use. This policy type requires that the institution actively manage or routinely enforce any easement, and that it has adequate resources to do so during the planning time frame.

Resident managed easement

Type that includes purchased and donated easements, and purchased or transferred development rights, which are held by an institution. Legal arrangements irrevocably remove the rights to develop or utilize the land more intensely than specified by the land use. However, the resident of the property is allowed to manage the easement under this type, and there is a lack of routine enforcement by the institution and/or institutional resources to do so during the planning time frame.

Land use restricted by regulation

Type that includes land use plans and regulations imposed on land owners that differ from those of the regulating body, and typically cover a broad scope of land uses. Variances to the plan or regulation are allowed at any time by petition of land owners or others (e.g., local government zoning board); thus, changing the regulations is a relatively simple process.

Land use restricted by temporary incentive program

Type that includes tracts where the land use is maintained at a less intense level than regulations, if any, allow through the use of payments, tax incentives, or other assistance to the land owner (e.g., U.S. Department of Agriculture Farm Bill incentives). These programs are voluntary, of limited duration, and are relatively simple to revoke. More permanent arrangements under such programs should be described as "easements."

Voluntarily protected

Type that includes tracts where the land owner voluntarily maintains the land in a less intense land use than regulations, if any, allow. The land use is not backed by any incentive payments or easements, and may be changed at any time by the land owner.

Unrestricted from conversion to higher intensity uses

This type is used for all tracts not categorized as any other policy type (including "Unknown"). Regulations (e.g., zoning) or other mechanisms are known to be lacking for these tracts, and/or "by-right" land uses are permitted.

Unknown

Policy type cannot be determined because of inadequate information. Note that assigning the PT category "Unknown" will result in the assumption of "unprotected" in analyses that utilize PT information.

GLOSSARY

- A -

- B -

Biological and Conservation Data system (BCD): Database developed in 1988 by The Nature Conservancy for recording and maintaining information on elements of biodiversity, including locations, viability/ecological integrity, trends, and references.

Biotic communities: Assemblage of populations of species that live in a prescribed area or physical habitat.

Biotics:Application developed by NatureServe for storing and managing information on Elements, Element Occurrences (EOs), Sites, and Managed Areas.

- C -

Communities: (terrestrial and aquatic at least)

Compatibility: An indication whether a specific land use intent (LUI) category (described in Appendix F) will permit elements to remain *viable* (species) or maintain *ecological integrity* (ecological elements). A LUI that is compatible will allow the continued persistence of an element at locations with that use.

Compatibility map:

Converted area/land: Area that has been changed from its original form or use, typically to agricultural or developed land. For example, an area that was formerly tallgrass prairie but is currently agricultural cropland is a converted area.

- D -

Degradation index:

Distance effect:

- E -

Ecological integrity: The maintenance of structure, species composition, and the rate of ecological processes and functions of an ecological system or community within the bounds of normal disturbance regimes. Occurrences with ecological integrity must meet minimum size requirements defined for the element on the Element Properties window in Vista.

Ecological systems: Assemblages of biotic communities that occupy similar environments and that function under common ecological processes. Terrestrial ecological systems are typically identified using vegetation structure and composition, but their concepts also include various abiotic components. Analogous broad-scale units in the aquatic realm, aquatic ecological systems, are based on environmental or physical features that shape key ecosystem processes (hydrology, water chemistry, sediment transport), and that influence the distribution and composition of biological assemblages.

Element Occurrence (EO): An area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species Elements, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., long distance dispersers) or a group of nearby populations (e.g., metapopulation). For ecological Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

EO rank: Status based on an assessment of the likelihood that if current conditions continue, an *Element Occurrence* (EO) will persist for a defined period of time (e.g., 100 years). EO ranks are assigned on the basis of data obtained from field surveys and are based on *EO rank specifications*. See Appendix E for a list of EO ranks and their definitions.

EO rank specifications: Criteria that are used for making a succinct assessment (i.e., of estimated *viability* (species), or ecological *integrity* (ecological elements), or probability of persistence, of an *Element Occurrence* (EO), which is recorded as an *EO rank*. These criteria are based on size, condition, and landscape context factors. *EO rank specifications* are developed in a global context, such that the best occurrence of an element in a particular jurisdiction or geographic area may not be highly ranked.

EO record: A data management tool that has both spatial and tabular components including a mapable feature and its supporting database. *Element Occurrences* (EOs) are typically represented by bounded, mapped areas of land and/or water. EO records are most commonly created for current or historically known occurrences of natural communities or native species of conservation interest. They may also be created, in some cases, for extirpated occurrences or occurrences of invasive nonindigenous species.

EO specifications: Criteria that are used to delineate and differentiate *Element Occurrences* (EOs). In other words, EO specifications define precisely what evidence constitutes a valid EO (i.e., the minimum size, quality, or persistence required), and what distances or factors separate one principal EO from another.

- F -

- G -

- H -

- I -

Inferred extent (IE) is a buffer distance applied to ensure that *Element Occurrences* (EOs) mapped as points or small polygons are brought up to a size that corresponds with the spatial minimum spatial requirements of the element, typically an animal with significant spatial requirements. This distance is equal to the home range or the distance from an initial location (in any direction) that would encompass the ultimate destination of 75-90% of the dispersing adult individuals. This distance is standardized across the NatureServe network, but can be adjusted if the spatial requirements of the species are consistently different in a particular area.

Integrity: The maintenance of structure, species composition, and the rate of ecological processes and functions of an ecological system or community within the bounds of normal disturbance regimes. Occurrences with ecological integrity must meet minimum size requirements defined for the element on the Element Properties window in Vista. [also referred to as *Ecological Integrity* and *Landscape Integrity*]

- J -

- K -

- L -

Landscape integrity: An integrated measure of key ecological attributes that are thought to support a suite of specified conservation elements on a specified land/waterscape, and the degree to which these attributes occur within expected ranges of natural variation. [*also referred to as* Integrity]

Land use intent: Intentional actions on the land, including management practices. Described by a class name, land use intent has both major and minor classes. Major categories describe general land uses, such as "working landscapes," "development," and "converted," and are refined by minor classes that describe the level of land use intensity within the major class (i.e., the degree to which land use negatively impacts biological elements).

Locational uncertainty:

Locational uncertainty distances:

LUI: Land use intent.

- M -

Minimum mapping unit:

- N -

NatureServe conservation status:

- O -

- P -

Policy type: Mechanism that guides the implementation of a land use, including processes that prevent or reliably enforce the land use designated for the area operating under that policy, and/or prevent a land use of greater intensity than that currently in effect.

Precision is a term that was used to indicate mapping uncertainty in the legacy Biological and Conservation Database (BCD) system developed by The Nature Conservancy, which served as a foundation for NatureServe Biotics.

Protection: A term indicating that an element will continue to persist at a location due to land use intent (LUI) categories (described in Appendix F) that are *compatible* with the element at that location, along with a *policy type* (described in Appendix G) in effect that will reliably enforce the designated land use and/or prevent land uses of greater intensity (which would likely negatively impact element persistence).

Protected areas map:

PT: Policy type.

- Q -

- R -

Raster

Representation Accuracy (RA) is a rating that indicates the relative amount of an EO polygon that is estimated to be occupied by the Element (i.e., not attributable to uncertainty). An estimated RA should be provided for all Eos to provide a common index for the consistent comparison of EO polygons, thus helping to ensure that data are correctly analyzed and interpreted.

- S -

Scenario component layer:

Source Feature

- T -

- U -

- V -

Viability: A statement of the relative quality and/or health of a specified population of individuals that indicates a set of key ecological attributes, including a minimum size and a threshold of condition, that are thought to support the population on-site; and suggests a probability of its persistence over a specified time period given relatively constant conditions. Viable occurrences must meet minimum size requirements defined for the element on the Element Properties window in Vista.

Vector

- W -

- X -

- Y -

- Z -

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