

SPATIAL METHODOLOGY INTRODUCTION



NatureServe

A Network Connecting Science With Conservation

Why Now ?

- NatureServe's Spatial Methodology for Element Occurrences established nearly a decade ago
- Incorporated in to Biotics 3 , tested and piloted (NY, MI, BC, others) then put into broad use with release of Biotics 4.0 in 2003
- Minor modification made following Biotics 4 release but no focused effort to evaluate methodology in practice
- 2006 – Observation Standards published to network
- 2008 – Recommendations of Biological Mapping Approaches Team (BMAT) completed.

No formal effort to re-evaluate spatial methodology, and identify ways to incorporate observation standards and BMAT findings

Why Now ?

- During the intervening years observations, as separate features, have grown in importance for many programs and for NatureServe
 - Local inventory work
 - Range maps
 - Predictive modeling
 - Vista
- BMAT recommendations
- Kestrel and Handheld project represent a substantial investment on the part of NatureServe and its partners in developing tools that capture and manage observation data
- Lessons learned: Many years of practical experience applying the spatial methodology

Why is it so important?

- **One** - to recognize the long standing need on the part of the network to manage this type of data and improve the process by which they can be used for the creation of Element Occurrences and other standard data products
- **Two** – leverage the work on Kestrel, handheld and other tools and data development efforts throughout the network that utilize observation data in order to establish a systematic and standard approach for integrating observation data into the member program data workflow
- **Three** – Help us establish critical requirements that will ensure we end up building the right tools for the network
- ***Four – Because you told us it was important!***

Approach

- Categorize current practices
 - Dissect methodology into basic components and identify different implementation pathways and resulting products
 - Identify challenges to implementation
- Identify;
 - Practical levels of implementation that programs could follow
 - Different products that result from each level and how they can be used
 - Streamlined process for developing and managing spatial data that uses these implementation levels

Approach (continued)

- Spatial methodology workshop at SE Region Conference *April*
 - Obtain input/confirm different implementation levels
 - Identify data products that result
 - Obtain feedback on potential process changes that could simplify methodology
- Use information previously gathered from network along with workshop findings to develop proposed solution based on levels of implementation (Project team) *May*
- Use SharePoint and scheduled webinars to review findings with member programs *May-June*
- Incorporate comments and release final recommendations *June - July*

Project Team

Project Lead
Jennifer Nichols

- Larry Master
- Jay Cordeiro
- Don Faber-Langendoen
- Pat Comer
- Kat Maybury
- Jason McNeas
- Shara Howie

New York Heritage – Tim Howard, Shelley Cooke

Others

Rob Solomon, Donna Reynolds, Whitney Weber, Todd Parks

SPATIAL METHODOLOGY INITIATIVE



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Outline

- Goals, challenges, and benefits
- Key tasks and participants
- BMAT findings review
- EO and observation survey results
- Definitions of EOs and observations
- Introduction to map surfaces
- Needs identification and discussion

Goals

- Streamline spatial methodology
- Integrate observation data
- Identify role of map surfaces in the spatial methodology
- Address critical path upgrades for Biotics

Challenges

- Complexity of EO methodology results in data entry backlogs
- No specific guidelines for managing observation data or map surfaces
- Proliferation of non-uniform methods resulting in inconsistent network data products

Key Tasks

Baseline Assessment

- Review conclusions of BMAT and “Program Data Management: EOs and Observations” survey
- Dissect methodology into basic components
- Workshop at Southeast Heritage Conference
- Identify different implementation levels
- Characterize data products used by NatureServe and programs
- Identify key components missing from model

Key Tasks (continued)

- Determine, based on research:
 - Practical levels of implementation and products that result from each
 - Streamlined process for developing & managing spatial data using implementation levels
- Review findings and recommendations with network programs
- Identify possible pilots to implement and test
- Provide input to development of requirements for Biotics critical path upgrades.

Biological Mapping Approaches Team

- Work initiated in 2006 to identify priority mapping approaches for NatureServe
- Team of NatureServe central and network staff from different regions and disciplines
- Criteria used to evaluate approaches:
 - Importance of approach to conservation and resource management
 - How well the network is currently utilizing the approach

BMAT Findings

Species

- Observations are most basic spatial unit
- Element Occurrences are central to work

Ecology

- Spatial data are observations and maps
- Ability to map full landscapes important for representing common communities

Crossover between species and community data, e.g. mapping habitat quality requires community composition and structure maps

Matrix with Identified Priorities

Biological Type	Biological Level	Attribute of Question	Importance to conservation and/or management?	Done efficiently and accurately by network now?	Good methods currently available in network?	Methods consistently implemented across network?
SPECIES	POPULATION, DEME, or other group of ecologically interacting individuals	Location	HIGH	SUFFICIENT	YES	YES
		Extent	HIGH	SUFFICIENT	YES / NO	Mobile - YES / NO Nonmobile - YES
		Condition	HIGH	POORLY / NOT AT ALL	YES / NO	NO
	ENTIRE TAXON	Location	MEDIUM	SUFFICIENT	YES	Mobile - NO Nonmobile - YES
		Extent	HIGH	SUFFICIENT	YES	Zoology - YES Botany - NO
		Condition	HIGH	SUFFICIENT	YES / NO	IMPROVING

Matrix with Identified Priorities

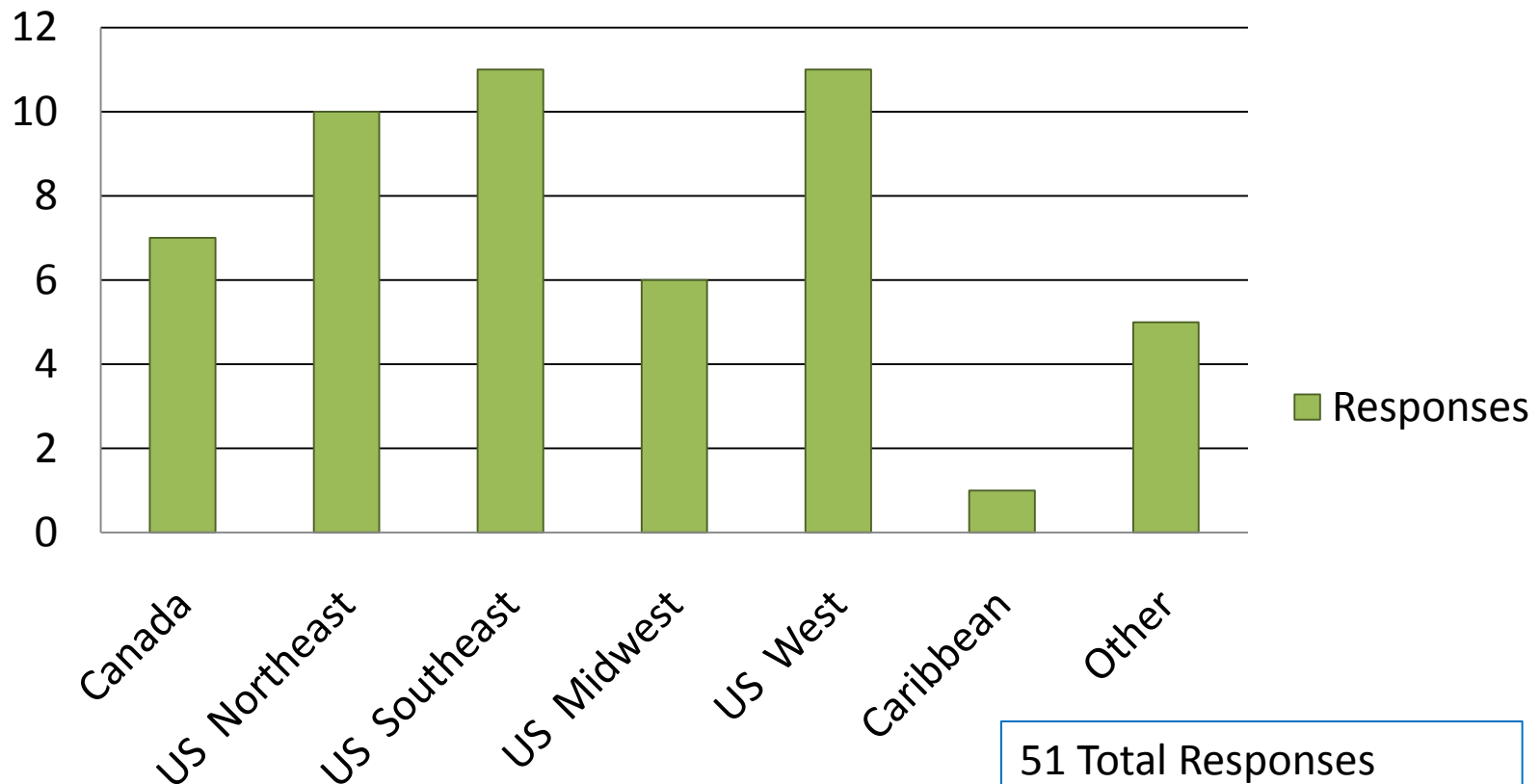
Biological Type	Biological Level	Attribute of Question	Importance to conservation and/or management?	Done efficiently and accurately by network now?	Good methods currently available in network?	Methods consistently implemented across network?
ECOLOGY	PATCH (ecological assemblage)	Location	HIGH	WELL	Terrestrial - YES Freshwater - YES Marine - YES / NO	NO
		Extent	HIGH	SUFFICIENT	Terrestrial - YES Freshwater - YES Marine - YES / NO	NO
		Condition	HIGH	UNEVEN; MANY POORLY, MANY/MOST NOT AT ALL	Terrestrial - YES Freshwater - YES / NO Marine - YES / NO	NO
	RANGEWIDE DISTRIBUTION (ecological assemblage)	Location	MEDIUM	SUFFICIENT	YES	YES / NO
		Extent	HIGH	MOST NOT DONE	YES	YES / NO
		Condition	HIGH	MOST NOT DONE	YES / NO	NO

BMAT Recommendations

- Need to map and manage observations as they are the fundamental spatial unit for developing data products
- Need to define relationships between observations, element occurrences, and map surfaces
- Need to improve ability to utilize many different data inputs for developing priority data products

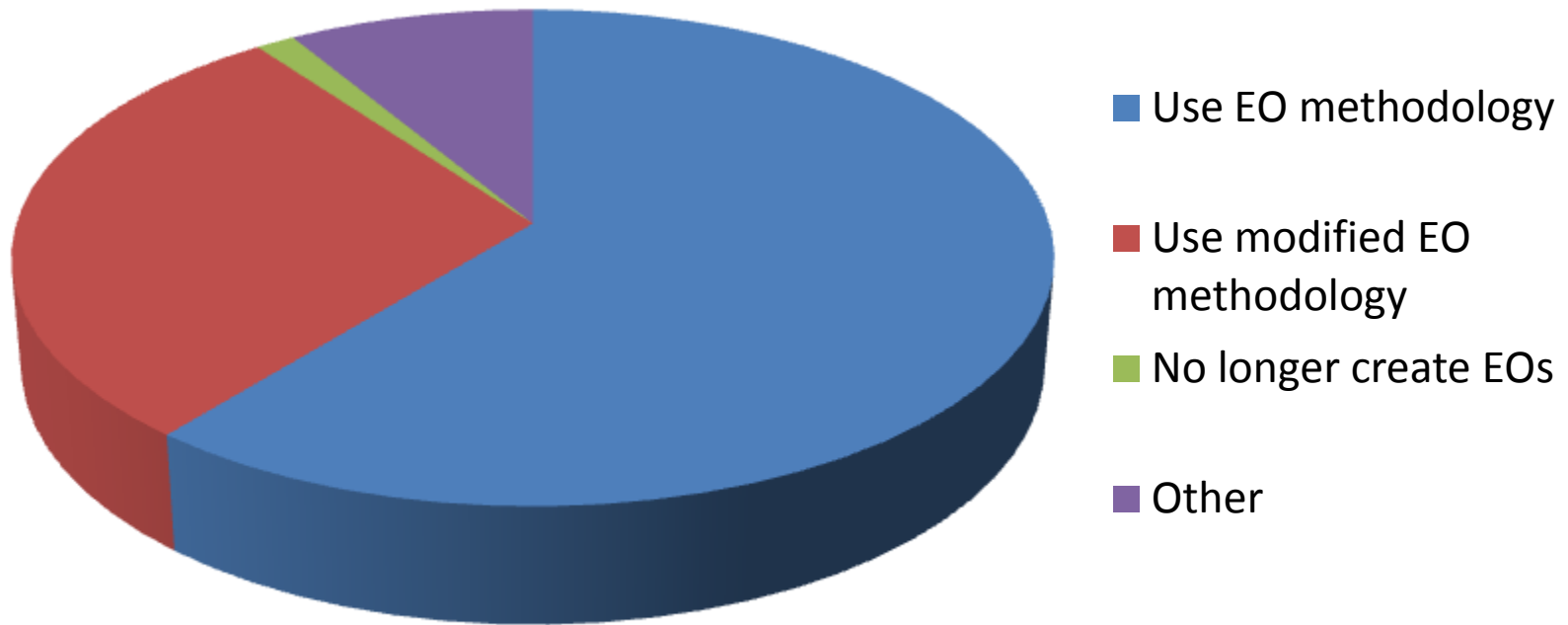
Program Data Management: EOs and Observations Survey

Number of Responses by Region

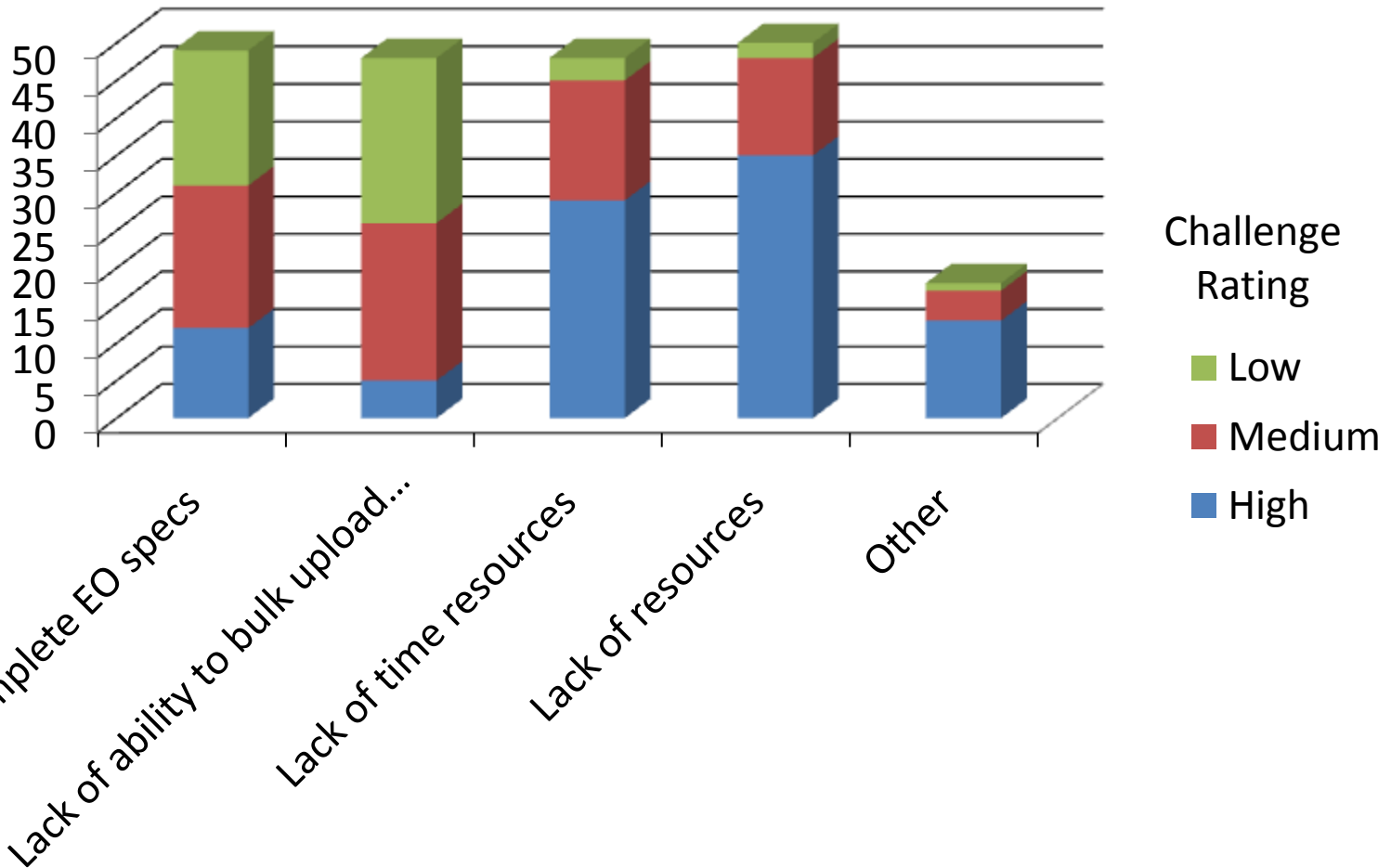


51 Total Responses
46 Programs Represented

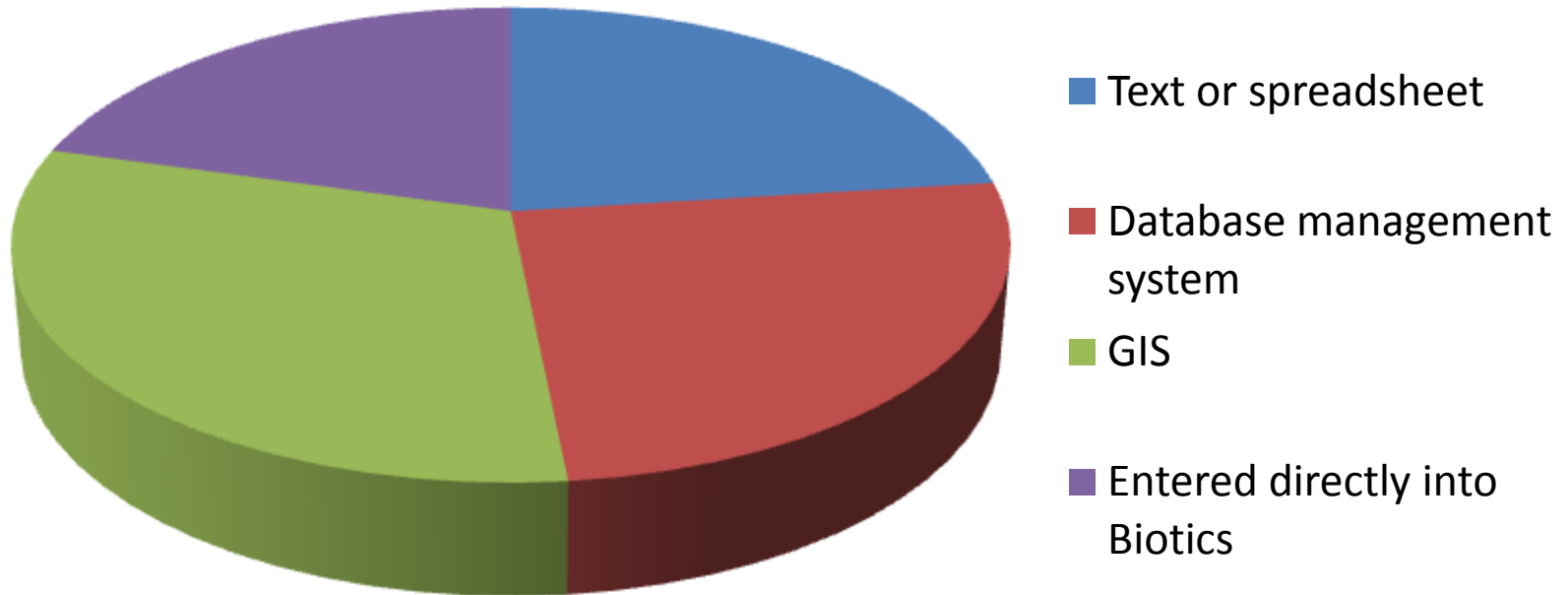
How are EOs created/managed in your program?



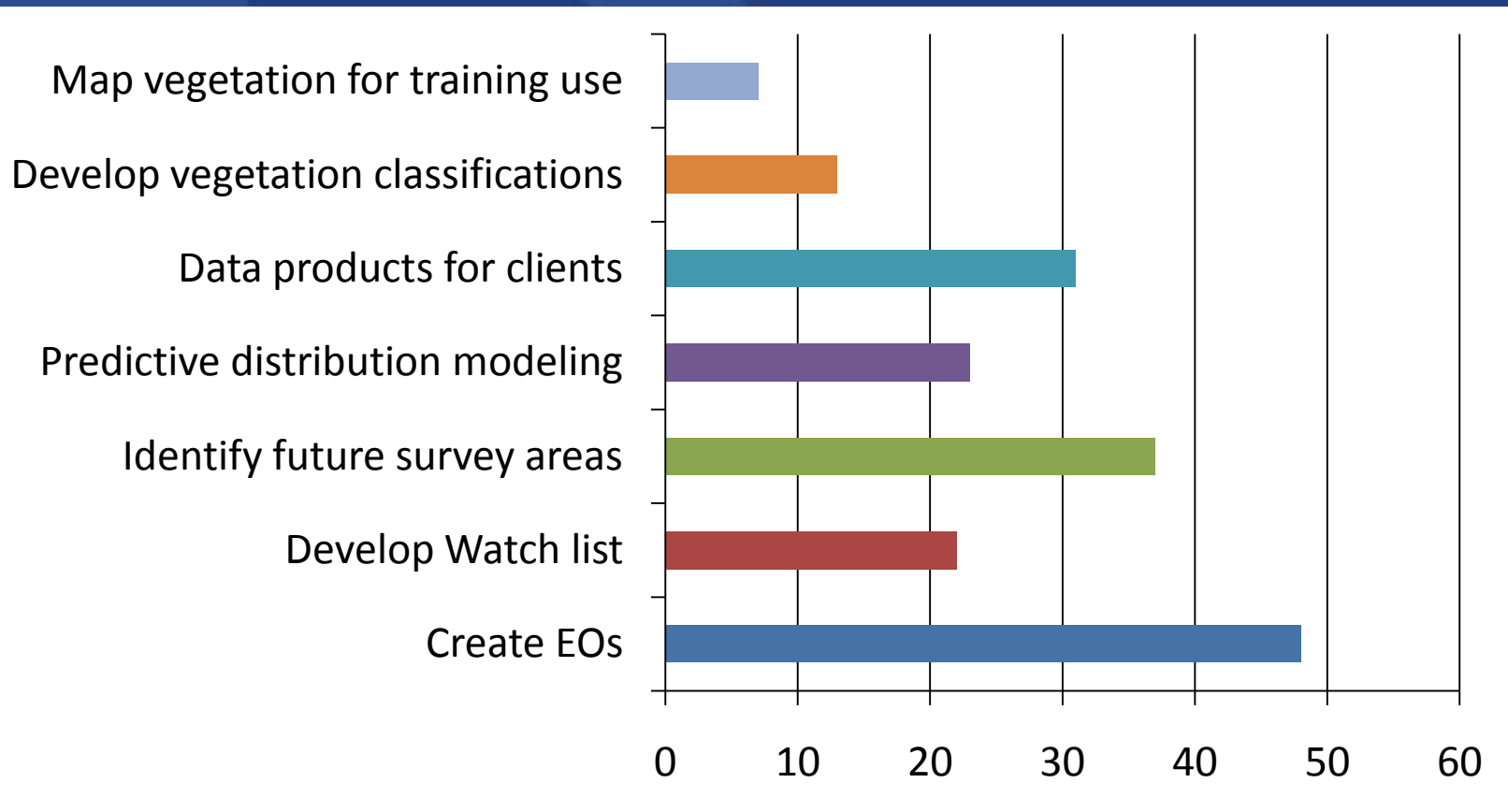
What are the challenges faced creating EOs?



How are observation data stored and managed by your program?



How are observation data used by your program?



What is an Observation?

Detection of

ACTION

a given taxon

OBJECT

by a particular observer (s)

SUBJECT

at a specific location

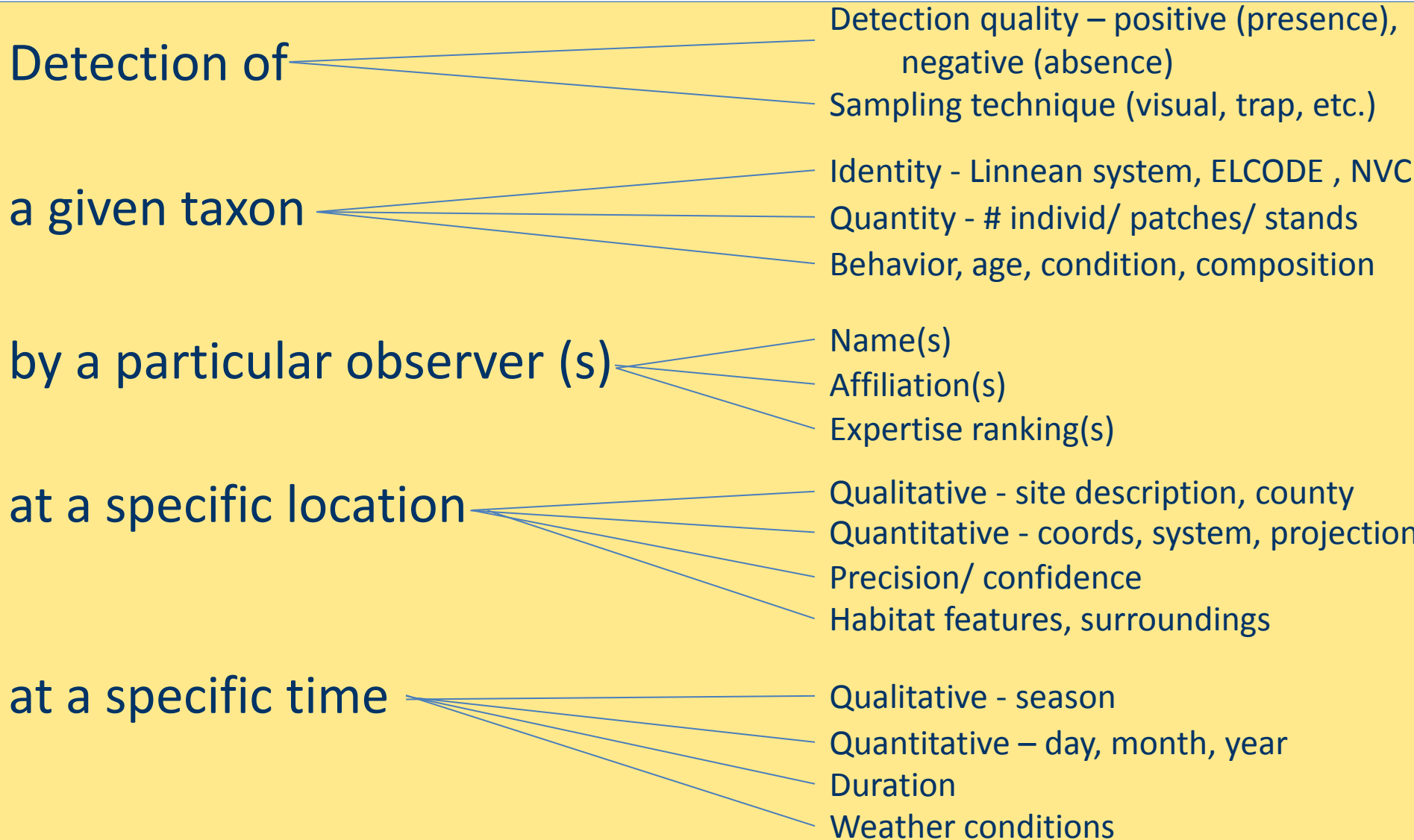
SPATIAL

at a specific time

TEMPORAL

If you can define each of these, then you have an observation... and you can express it as a database record

Fields within an observation record



WISDOM

KNOWLEDGE

INFORMATION

DATA



Interpreted data; models, syntheses, predictions, trend lines. E.g., EO's, predictive distribution models, PVA's, pop. trends, seral trajectories, landcover maps. *Variation smoothed over to gain generalize-able results.*

Species point observations, veg plot msrmts... "raw facts", indivisible quanta of data. *Variation apparent and unaltered.*

INFORMATION

Element
occurrence

Predictive
distn. map

Landcover
map

+More observations

+Ancillary data layers

+Analytical algorithms
(e.g., EO specs; stat
routines; image
classification)

Animal point
observation

Plant stand
observation

Vegetation
plot msrmts.

DATA

Element Occurrence

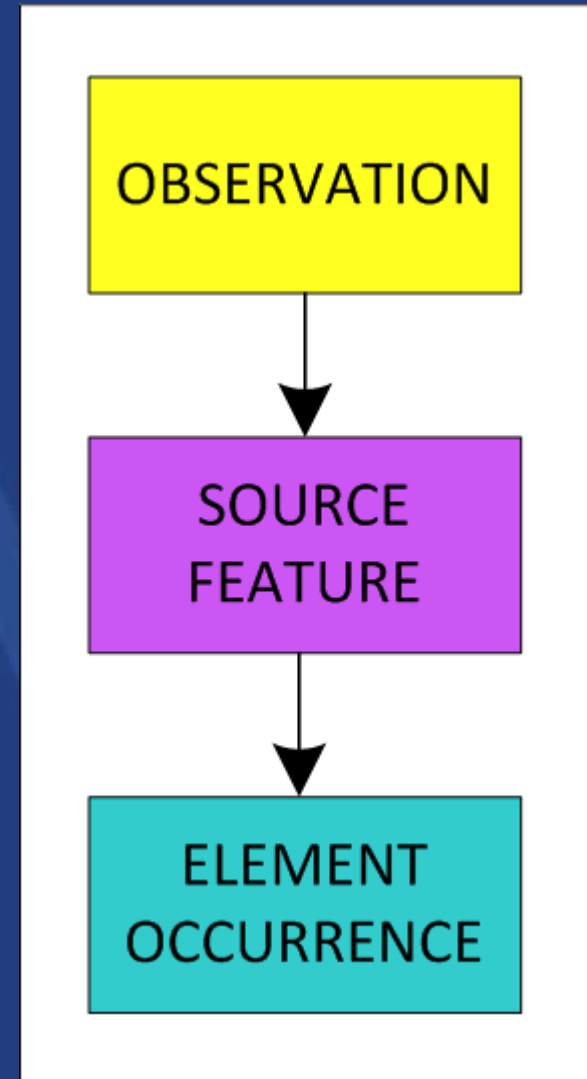
- Area where a species or natural community is, or was, present
- Defined by standards and detailed methodology codified in Biotics
- Value-added product: a practical unit for conservation action
- Mapped as one or more polygons
- Developed from source features

Summary Comparison

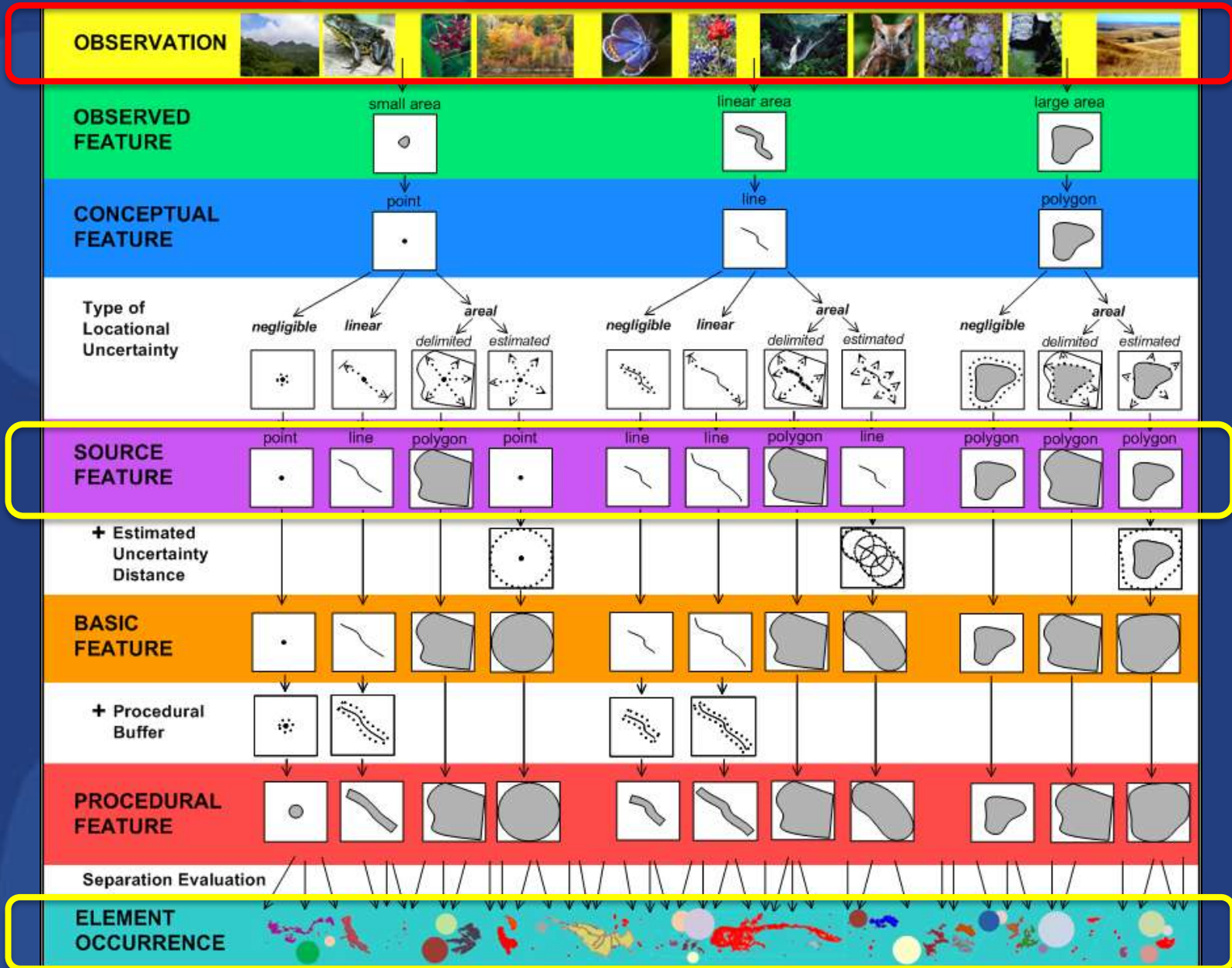
Observation	Element Occurrence
Presence and lack of detection	Presence only
Use of various taxonomies	Use of standard taxonomy
Persistence not considered	Must have potential to persist
Standards not consistently used	Developed using standards
Often minimal data	Requires large amount of data
Raw data	Data product
Mapped as point, line or polygon	Mapped as one or more polygons
Basis for source features	Created from source features

Spatial Relationships

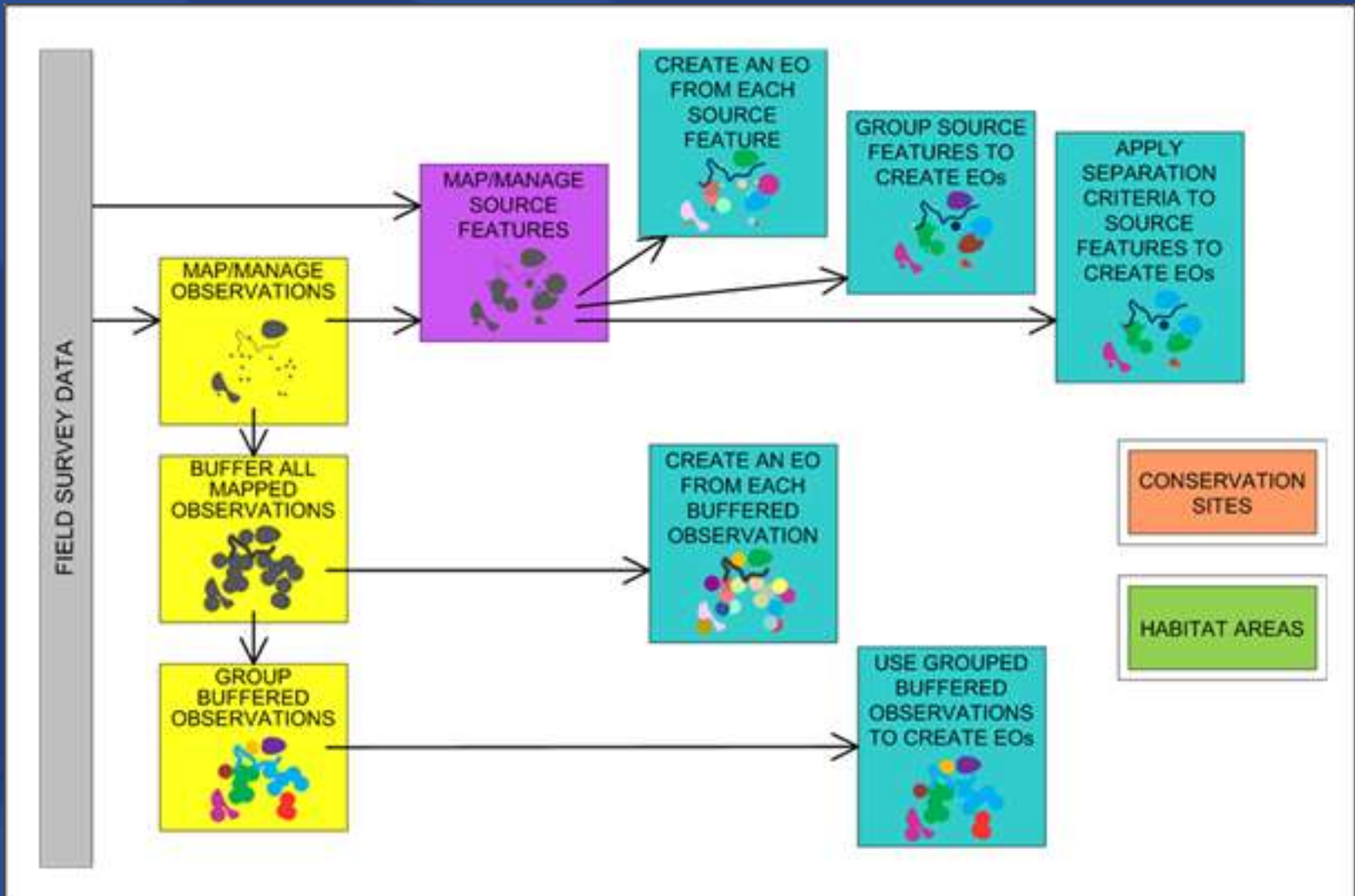
- Observations serve as the basis for source features
- Source features can be used to develop Element Occurrences
- Observations are not mapped or managed as discrete features



Spatial Methodology Process Flow



Spatial Data Management Pathways

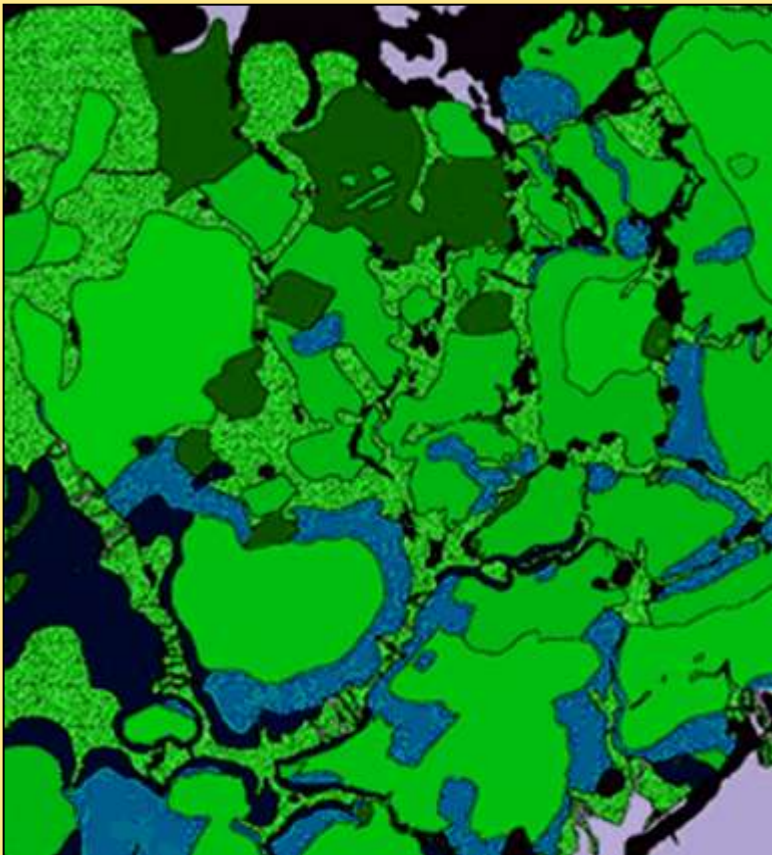


Map Surfaces

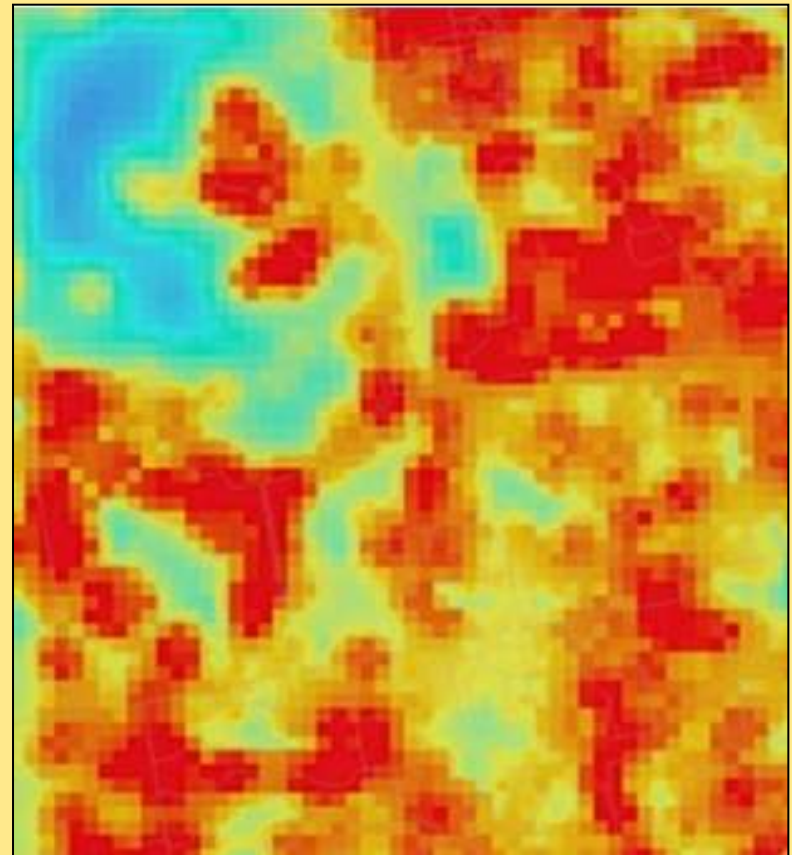
- Have become increasingly important for making conservation decisions
- Enable decisions at large scales (e.g., at landscape and ecosystem levels)
- Can be combined with other spatial layers to obtain better representation of interactions and impacts (e.g., land use, transportation, natural resources, energy)

Map Surfaces

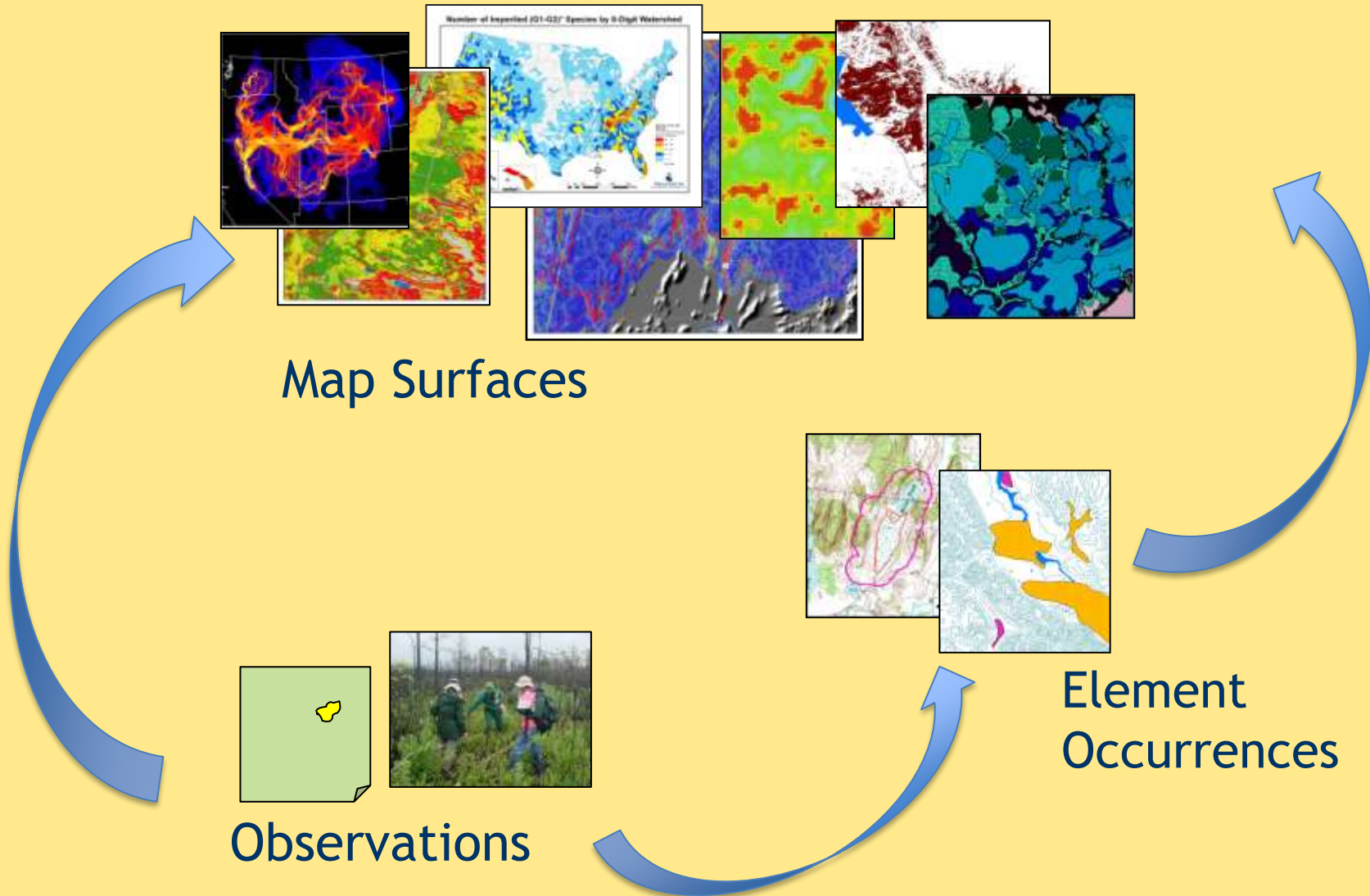
Vector data



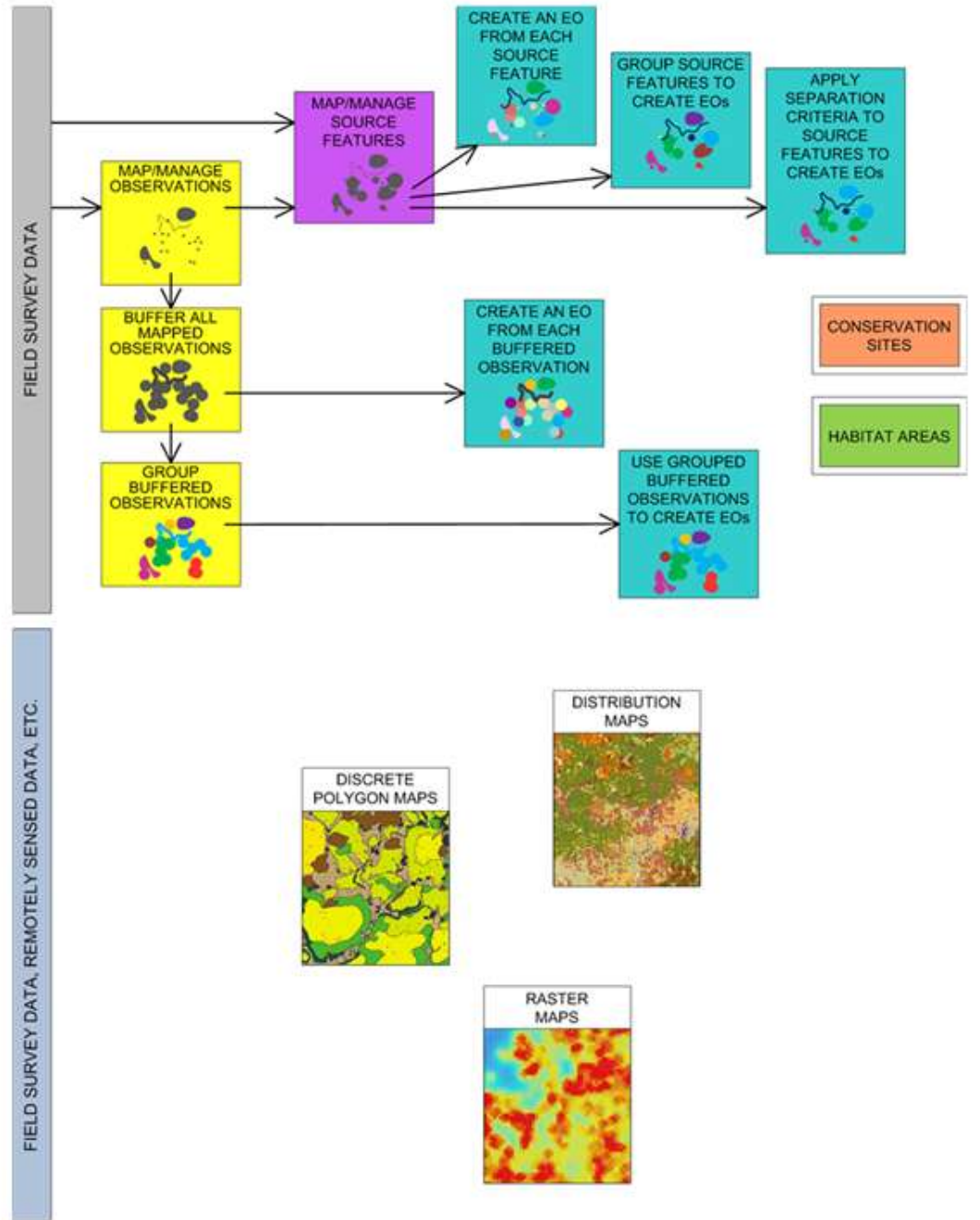
Raster data



Levels of Spatial Data



Spatial Data Management Pathways



USER STORIES AND DISCUSSION

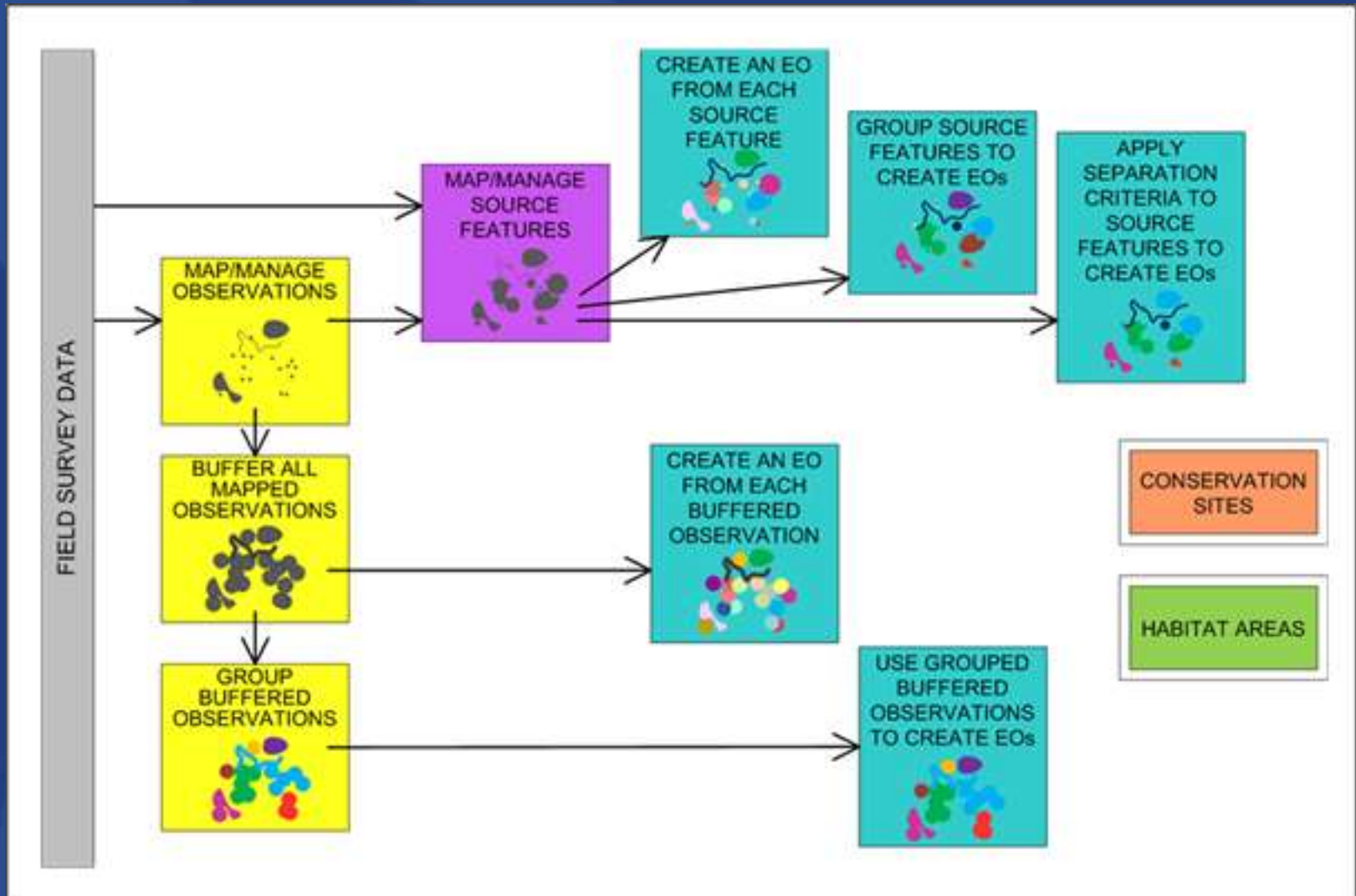


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Needs Identification

- Identify data request products typically provided
- Describe how current methodology supports these products
- Identify and describe other steps or methods required to generate data request products

Spatial Data Management Pathways



Discussion

- What data products do you produce?
- What processes do you use to product these products?
- Why do you use these processes?
- Are there other products you need?