

MONITORING ECOLOGICAL COMMUNITIES ON NPS LANDS: AN ECOSYSTEM BASED APPROACH

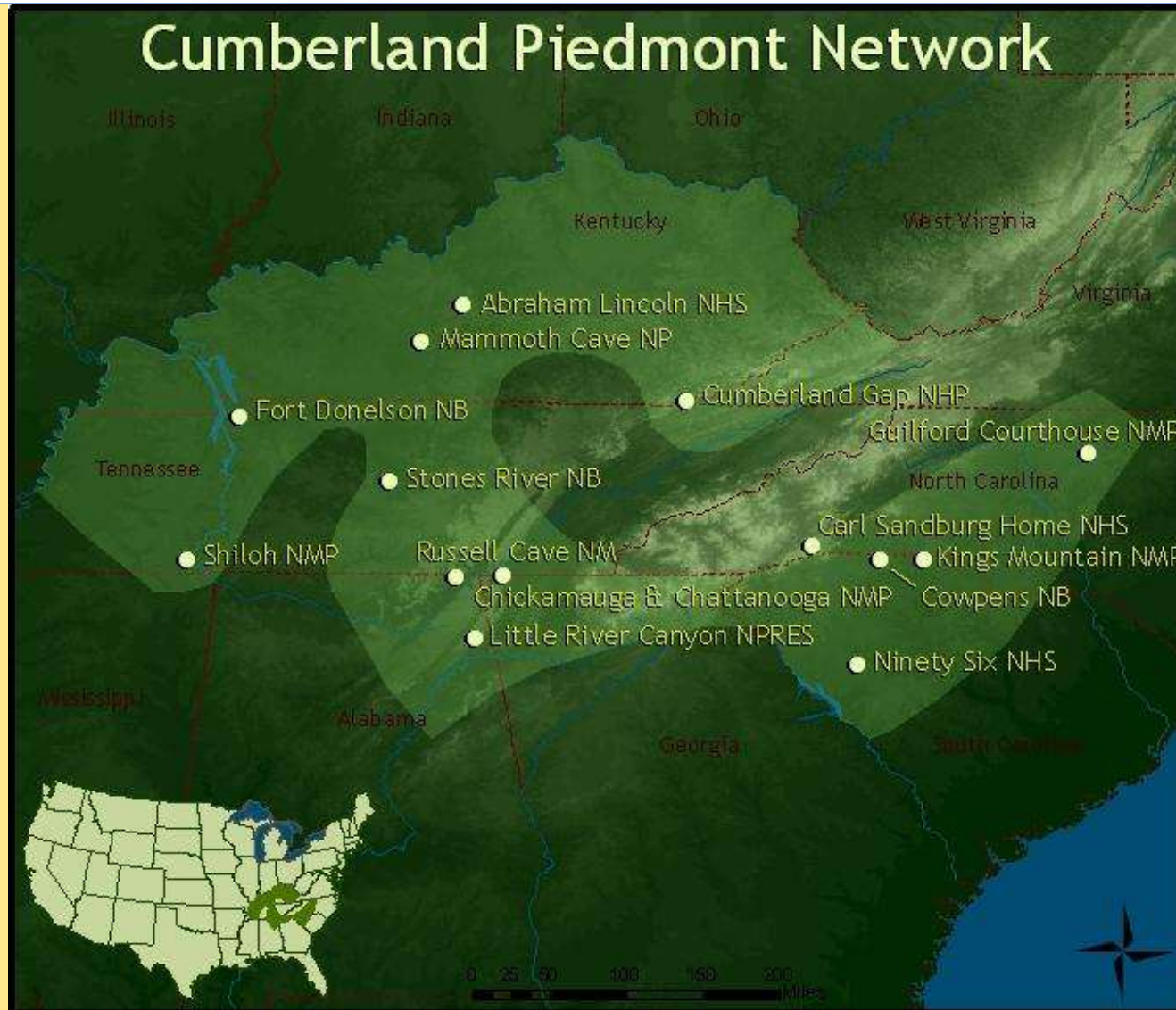


NatureServe
A Network Connecting Science With Conservation

Vital Signs

“A subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values”

Cumberland Piedmont Network Intro



Vital Signs at Cumberland Piedmont Network (CUPN)

- **Vegetation communities**
- Water Quality and Quantity
- Rare Plants
- Ozone and Foliar Injury
- Landscape Dynamics
- Invasive Plants
- Forest Pests
- Cave Meteorology
- Cave Crickets
- Cave Bats
- Cave Aquatics
- Allegheny Woodrats

Vegetation Monitoring Goals and Monitoring Objectives

Assess status and trends.

- Detect meaningful changes park-wide and correlations to stresses.
 - Detailed plot data and repeated visits
- Determine ecological integrity scores of key vegetation communities
 - Ecological integrity criteria approach

Ecological Integrity Assessment

- **Level 1:** Remote - uses remotely sensed imagery and data in a Geographic Information System
- **Level 2:** Rapid - uses rapid, on the ground, field assessment. This is NatureServe's project focus.
- **Level 3:** Intensive - uses more complete, mostly quantitative data from an on the ground field assessment.

Types of Plots

- Intensively sampled plots
 - Can apply “Level 3” metrics
 - Quantitative detailed data to answer monitoring objective 1
- Less intensively sampled plots
 - Can apply “Level 2” metrics
 - Helps us answer monitoring objective 2

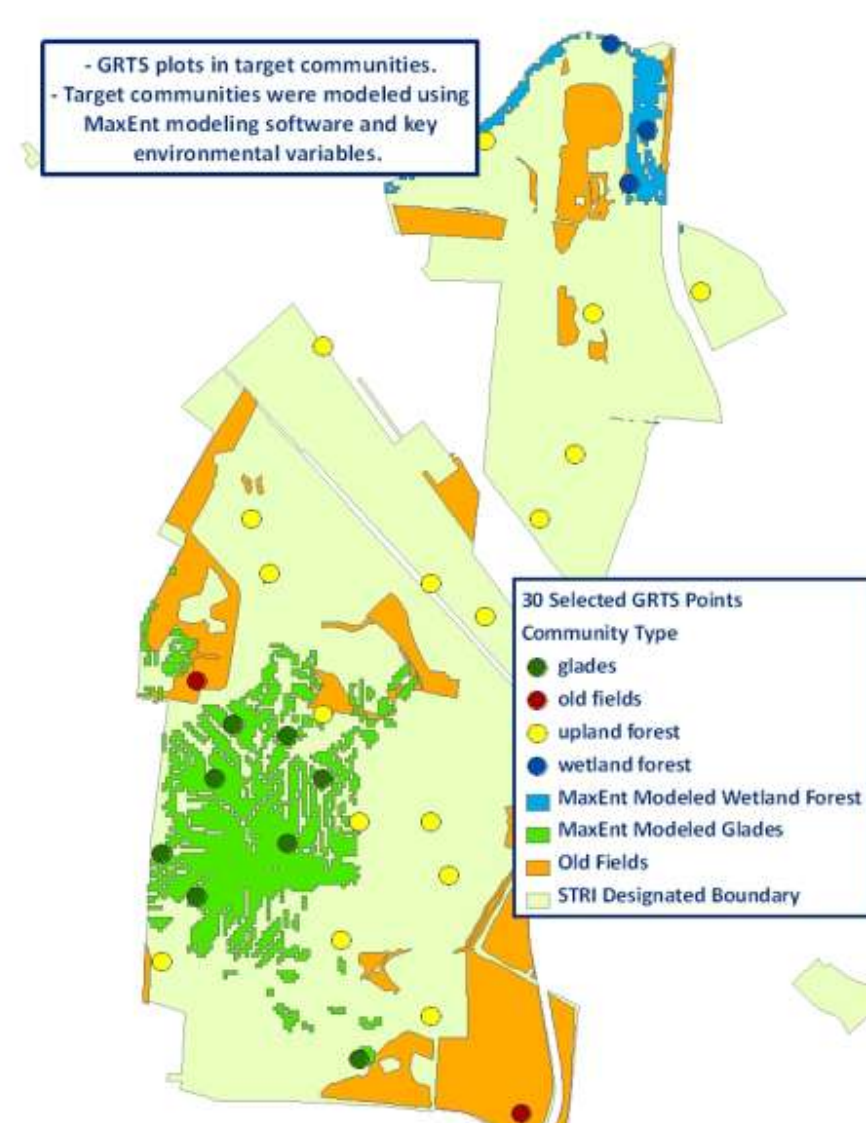
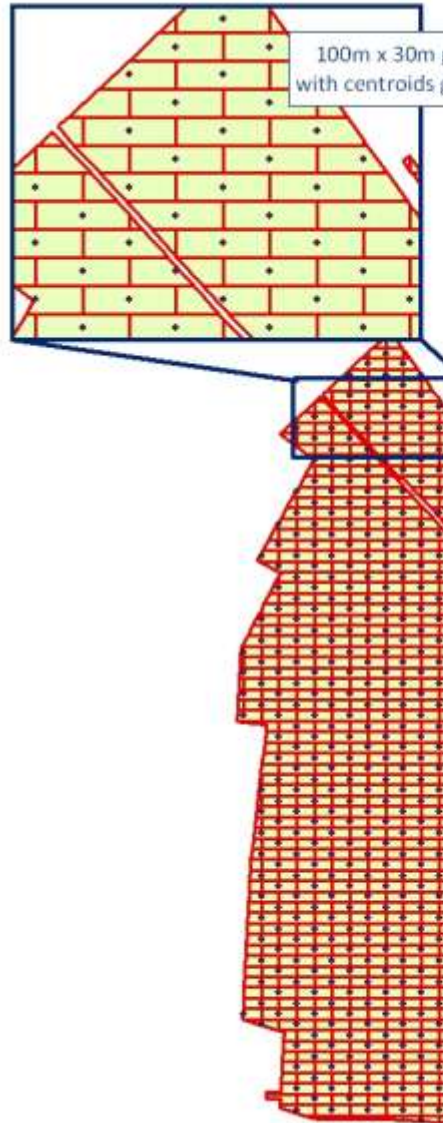
Other Federal Partners

- Northeast Temperate Network
- Eastern Rivers and Mountains
Network Vegetation Community
Monitoring
- EPA
- US Forest Service

GRTS

- Generalized Random-Tessellation Stratified (GRTS) Design.
- Similar in concept to simple random sample but eliminates the “clumpiness” often exhibited in SRS.
- Emphasizes spatial balance.
- Probability sample-allows for unbiased inferences.

Methodology: Plot Stratification

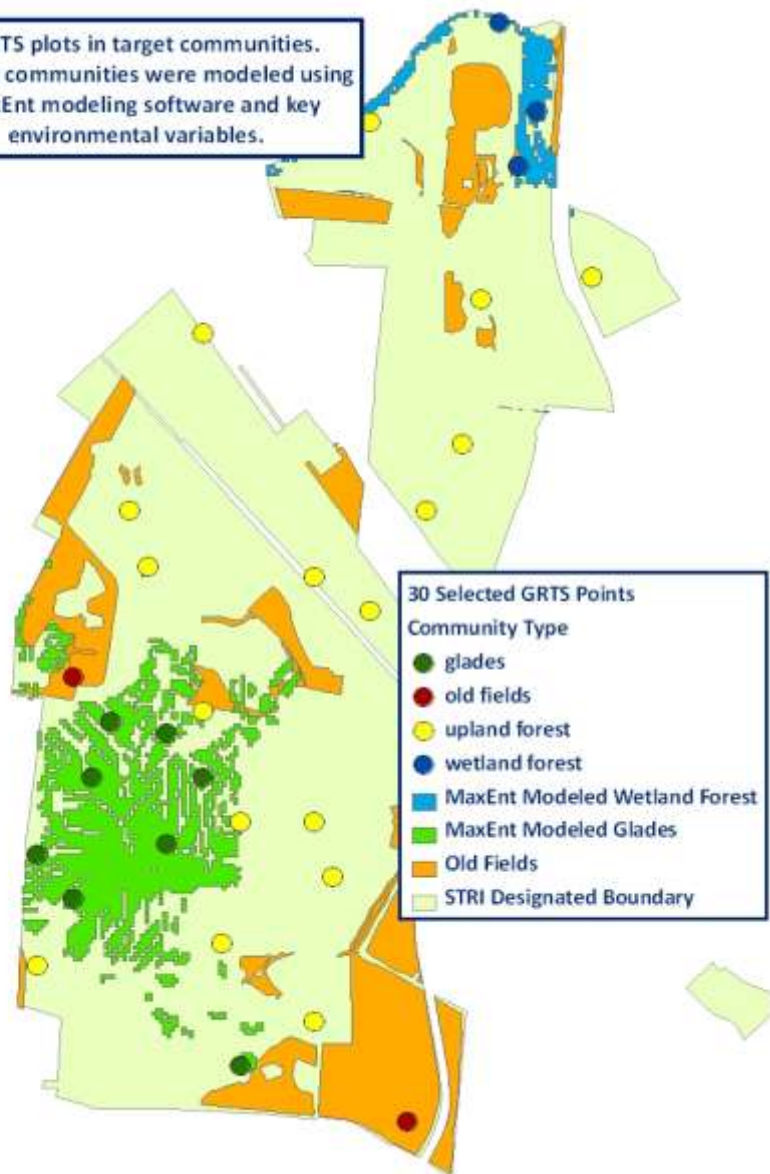


Target Community Site Selection

- Literature suggests that areas/vegetation communities of interest be stratified using abiotic factors.
- Stratification on a dynamic variable such as vegetation type has been problematic because vegetation changes in time.
- Further, a sampling design with strata based on vegetation types prevents inferences about those vegetation types not sampled.
- An alternative to stratification by vegetation type is stratification based on a more permanent landscape feature such as elevation, slope, aspect, or geology.

Target Communities

- GRTS plots in target communities.
- Target communities were modeled using MaxEnt modeling software and key environmental variables.



Why monitor key communities?



Glades/Barrens



Glade Flora (all photos courtesy of Tom Govus)



Pediomelum subacaule (Nashville breadroot)

Glade Flora



Ratibida pinnata (prairie coneflower)

Glade Flora



Asclepias viridis (green milkweed)

Glade Flora



Ruellia humilis (glade petunia)

Glade Flora



Scutellaria leonardii (glade skullcap)

Glade Flora



Sedum pulchellum (widow's cross)

Key Communities

- Glades/barrens/woodlands
- Wetland and Riparian Forests
- Old fields/successional shrublands
- Bogs/Fens
- Cliffs

Level III Data Collection

Level 3 Data Entry

Site Name: L3 Assessment Code: - - -

Vegetation Profile

Unvegetated Surface (% cover) If the L3 Unvegetated Surface values are the same as the L2 values, click Pre-populate button below to fill in those values from the L2 records.

Bedrock Large rocks (>10 cm)

Small Rocks (0.2 - 10 cm) Sand (0.1 - 2 mm)

Dead Wood >1 cm Litter, duff

Bare Soil Water Other (describe):

Species Profile

Select the module in which the species was first recorded.
 Percent cover is for 400m2 plot if modules 2, 3, 8, or 9 are selected, and 1000m2 if "Rest" is selected.
 Leave "Module first recorded" and "% Cover" blank if "Present Nearby" is checked.

Species	Growth Form	Collection Info	Module first recorded					% Cover	Present Nearby
			2	3	8	9	Rest		
▶ Acer rubrum	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	2	<input type="checkbox"/>
Acer saccharinum	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	4	<input type="checkbox"/>
Asimina triloba	Unidentified		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Boehmeria cylindrica (including	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3	<input type="checkbox"/>
Carex albursina	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Carex muskingumensis	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	2	<input type="checkbox"/>
Carya ovata	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6	<input type="checkbox"/>
Celtis occidentalis	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2	<input type="checkbox"/>
Chelone glabra	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Cinna arundinacea	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Collinsonia canadensis	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Cryptotaenia canadensis	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3	<input type="checkbox"/>
Cystopteris protrusa	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Euonymus obovata	Unidentified		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Fagus grandifolia	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Fraxinus americana	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Hydrophyllum canadense	Unidentified		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Hydrophyllum virginianum	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2	<input type="checkbox"/>
Juglans nigra	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	2	<input type="checkbox"/>
Laportea canadensis	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3	<input type="checkbox"/>
Lindera benzoin	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5	<input type="checkbox"/>
Parthenocissus quinquefolia	Unidentified		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1	<input type="checkbox"/>
Pilea pumila	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>
Relbunium suberosum	Unidentified		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1	<input type="checkbox"/>

Record: 1 of 46

Record: 1 of 49

Level II/III Data Collection

L2 Data Entry

Site Name: Calvert-Porter Nature Preserve L2 Assessment Code: IN . RLH . L2 . 006 Date: 7/29/2009 Assessment_ID: 6

L2 General L2 Environmental L2 Vegetation Site L2 Metrics: Landscape Context L2 Metrics: Vegetation L2 Metrics: Hydrology L2 Metrics: Soil & Size L2 Stressors

A. GENERAL INFORMATION

Site Name: Calvert-Porter Nature Preserve

L2 Assessment Code Assess Area ID: IN-527

State Initials # Date: IN . RLH . L2 . 006 7/29/2009

State Code (EO Code)

Elcode	EO #	State	EO ID
CFORFLACEN	005	IN	527

Team Members:

Name	Role
Roger Hedge	Field Leader
Mike Homoya	Field Co-Leader

Photo IDs: future

Photographer: Mike Homoya

Ownership: Indiana Department of Natural Resources

B. LOCATION

Directions:

Directions to EO: EO Acreage: 54

County: St. Joseph USGS Quad Name: Shannondale

GPS Locations ****import into GIS instead; not here****

UTM Zone	NAD	UTM	UTM-N	LAT	LONG
*					

EO Managed Area: CALVERT AND PORTER WOODS NATURAL

C. SITE CHARACTERISTICS

Elevation: 880 meters feet

Slope (degrees): 0

Aspect (compass): 0

Aspect Comments:

Landform(s): Ground Moraine

Comments:

D. ECOLOGICAL CLASSIFICATION

Observed State Type: Central Till Plain Flatwoods

EO Rank / Date: A / 10/8/2009

NVC Macrogroup: Northern & Central Swamp Forest

NatureServe Ecological System: North-Central Interior Wet Flatwoods

NVC Plant Associations:

Association_ID	Primary
Beech - Hardwoods Till Plain Flatwoods	<input checked="" type="checkbox"/>
*	<input checked="" type="checkbox"/>

Classification Change: Yes No

Original State Type: Central Till Plain Flatwoods

EO Rank Change with Comments:

Reason for Change in Type:

Other Types Present at Site: Fringe of floating leaved aquatics. Fringe of shrub swamp.

HGM Class

HGM Class	Primary
Depressional	<input checked="" type="checkbox"/>
*	<input checked="" type="checkbox"/>

HGM Subclass:

Cowardin System:

Record: 3 of 161 Unfiltered Search

Level II Data Collection

L2 Data Entry

Site Name: Calvert-Porter Nature Preserve L2 Assessment Code: IN . RLH . L2 . 006 Date: 7/29/2009 Assessment_ID: 6

L2 General L2 Environmental L2 Vegetation Site L2 Metrics: Landscape Context L2 Metrics: Vegetation L2 Metrics: Hydrology L2 Metrics: Soil & Size L2 Stressors S < >

2. VEGETATION CONDITION

2a. Vegetation Structure Comment/ Evidence

A B C

Note: Choices vary depending on wetland type, as shown on the field form.

2b. Organic Matter Accumulation Comment/ Evidence

A B C D

Note: Choices vary depending on wetland type, as shown on the field form.

2c. Cover of Native Plant Increasers Comment/Evidence

A B C D

2c. Evidence: Native Plant Increasers

Species	% Cover
*	

Record: 1 of 1 No Filter Search

2d. Relative Total Cover of Native Plant Species Comment/Evidence

A B C D

2e. Cover of Exotic Invasive Plant Species Comment/Evidence

A B C D

2f. Vegetation Regeneration: Floodplain & Swamp Forest only Comment/Evidence

A B C D

2g. Vegetation Composition Comment/Evidence

A B C D

Record: 3 of 161 Unfiltered Search

EIA Rank Calculator

Scorecard_Metrics

Site: Wetland Type (MG): State:

RANK FACTOR	MAJOR ECOLOGICAL ATTRIBUTE/ Metric	Assigned Rating	Score (Points)	Weight	Weighted Score	Calculated Rank/ Rating	Manual Rank
EIA RANK			2.7			C	
LANDSCAPE			1.4	0.25	0.3	D	
	LANDSCAPE CONTEXT		1.4	1.00	1.4	D	
1a	Landscape Connectivity		1.7	1.00	1.7	D	
	Core Landscape (L1)	D	1.25	1.00	1.3		
	Supporting Landscape (L1)	C	2.50	0.50	1.3		
1b	Land Use		1.3	1.00	1.3	D	
	Core Landscape (L1)	D	1.25	1.00	1.3		
	Supporting Landscape (L1)	D	1.25	0.50	0.6		
1c	Buffer Index		1.3	1.00	1.3	D	
	% Contiguous Buffer (L1)	D	1.25	1.00	1.3		
	Buffer Length (L1)	D	1.25	1.00	1.3		
	Buffer Condition (L2)	D	1.25	1.00	1.3		
	Summed Weights and Scores			3.0	4.2		
SIZE			1.3	0.15	0.2	D	
	SIZE		1.3	1.00	1.3	D	
5a	Absolute Size	D	1.25	1.00	1.3		
5b	Relative Size	D	1.25	0.50	0.6		
	Summed Weights and Scores			1.5	1.9		
CONDITION			2.8	0.60	1.7	C	
	VEGETATION		2.8	1.00	2.8	C	
2a	Vegetation Structure	C	2.50	1.00	2.5		
2b	Organic Matter Accumulation	C	2.50	0.50	1.3		
2c	Increase Cover	D	1.25	1.00	1.3		
2d	Native Cover	B	4.00	1.00	4.0		
2e	Invasives Cover	B	3.75	1.00	3.8		
2f	Vegetation Regeneration			1.00			
2g	Vegetation Composition	C	2.50	1.00	2.5		
	Summed Weights and Scores			5.3	15.3		
	HYDROLOGY		2.9	1.00	2.9	C	
3a	Water Source	B	3.75	1.00	3.8		
3b	Hydroperiod	D	1.25	1.00	1.3		
3c	Hydrologic Connectivity	B	3.75	1.00	3.8		
	Summed Weights and Scores			3.0	8.9		
	SOILS		2.5	0.50	1.3	C	
4a	Soil Surface Condition (Disturbance)	C	2.50	1.00	2.5		
4b	Water Quality			1.00			
4c	Physical Patch Types (Patch Diversity)	C	2.50	0.50	1.3		
	Summed Weights and Scores			1.5	3.8		

EQ Rank:

EQ Rank: "B" recorded on
Change:

State Heritage Name:

Macrogroup:

Primary MGM Class:

Classification Change

Assess Code:

Assess ID:

Assess Area ID:

Site:

Date:

Record: 4 of 161 |

Park-Wide Analysis Example

Seedling counts for CARL



- Quercus alba
- Quercus rubra
- Fagus grandifolia
- Quercus prinus

Sapling counts for CARL



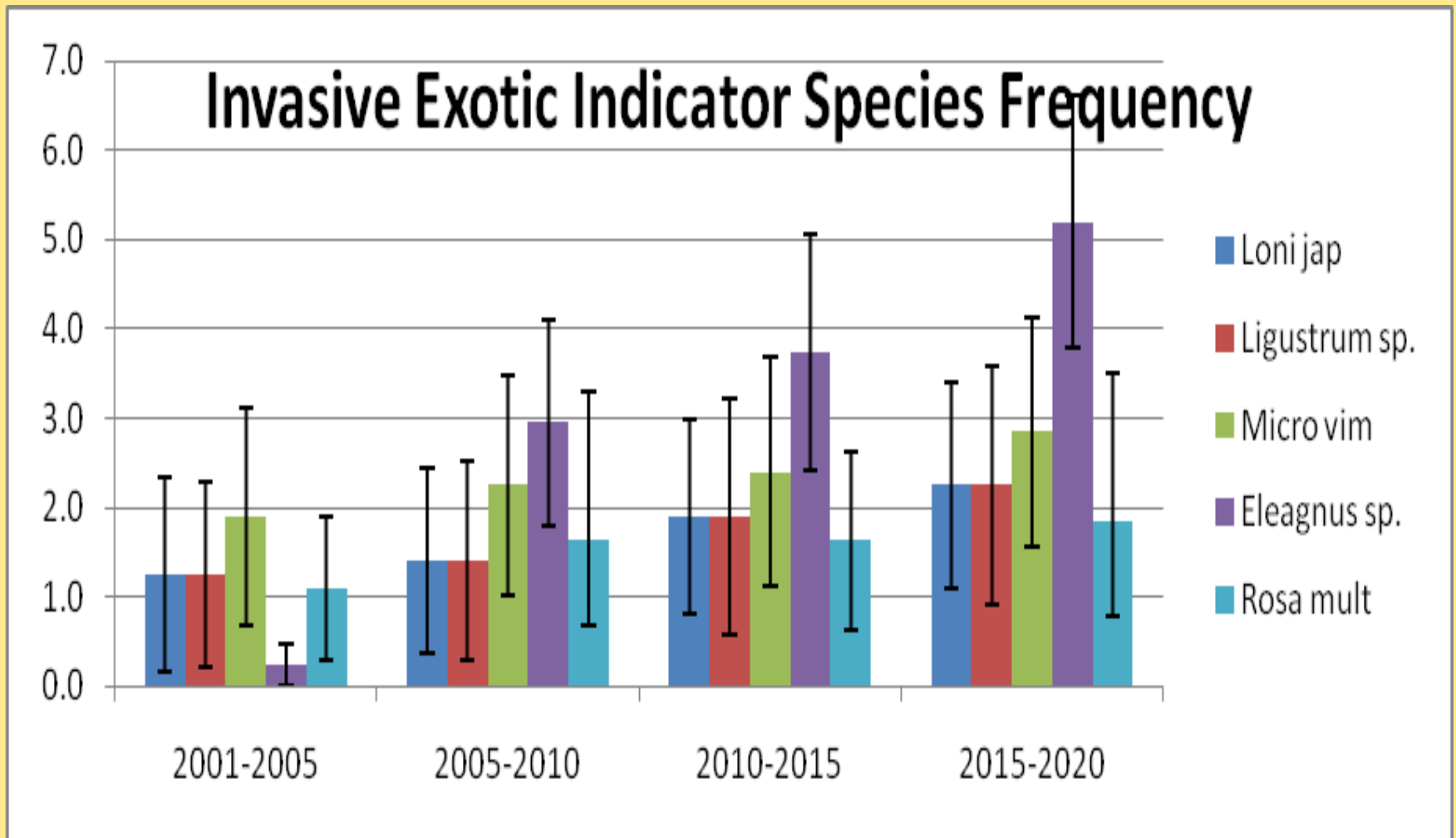
- Quercus alba
- Quercus rubra

Basal area of canopy trees...

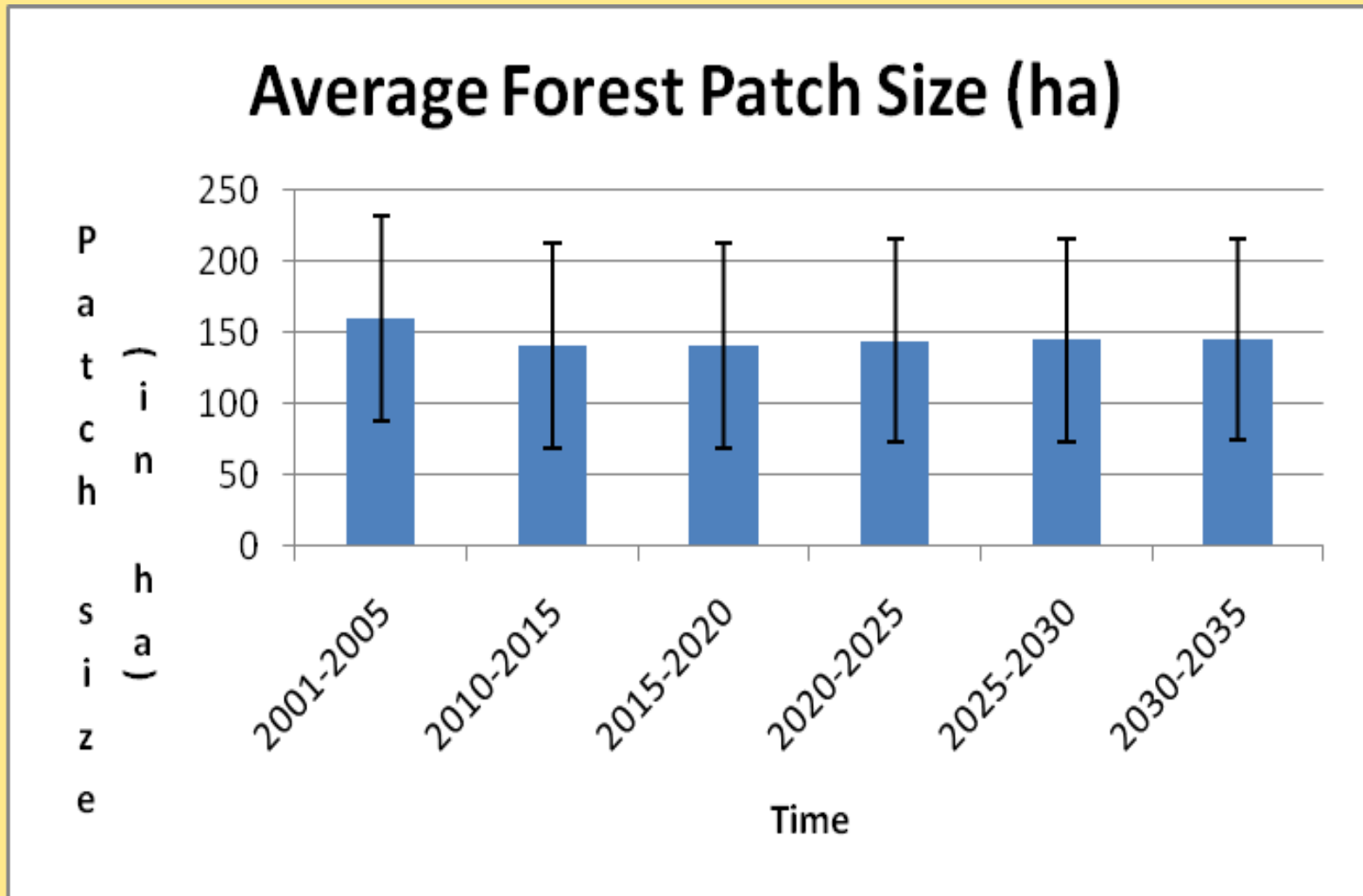


- Quercus alba
- Quercus rubra
- Fagus grandifolia

Park-Wide Summary Analysis Example



Park-Wide Summary Analysis Example



Individual Metric Reporting

Metric type	Metric	Metric Cutoffs	Rating for Park
Landscape Structure	Forest patch size	100+ ha	Good
		10-100 ha	Fair
		0-10 ha	Poor

Combined Metric Scores

Metric type	Metric	Rating for Park
Landscape Structure	Forest patch size	Good
	Anthropogenic land use	Good
Structure	Stand structural class	Fair
	Snag abundance	Good
	CWD Volume	Fair
Composition	Tree regeneration	TBD
	Tree condition	Good
	Biotic homogenization	TBD
	Indicator species - invasive exotic plants	Good
	Indicator species - deer browse	TBD
Function	Tree growth and mortality rates	TBD
	Soil chemistry - acid stress	Fair
	Soil chemistry - nitrogen saturation	Fair
	Earthworms	TBD
Ratings	Good	
	Fair	
	Poor	

Q&A

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