

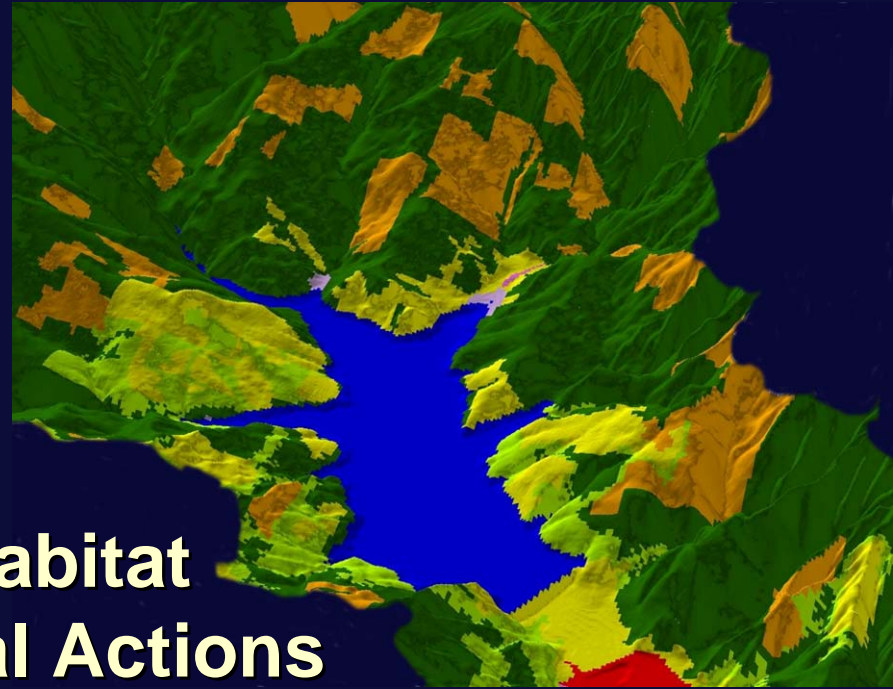
Combined Habitat Assessment Protocols



for
Independent Scientific Review
July 2008



Problem Statements:

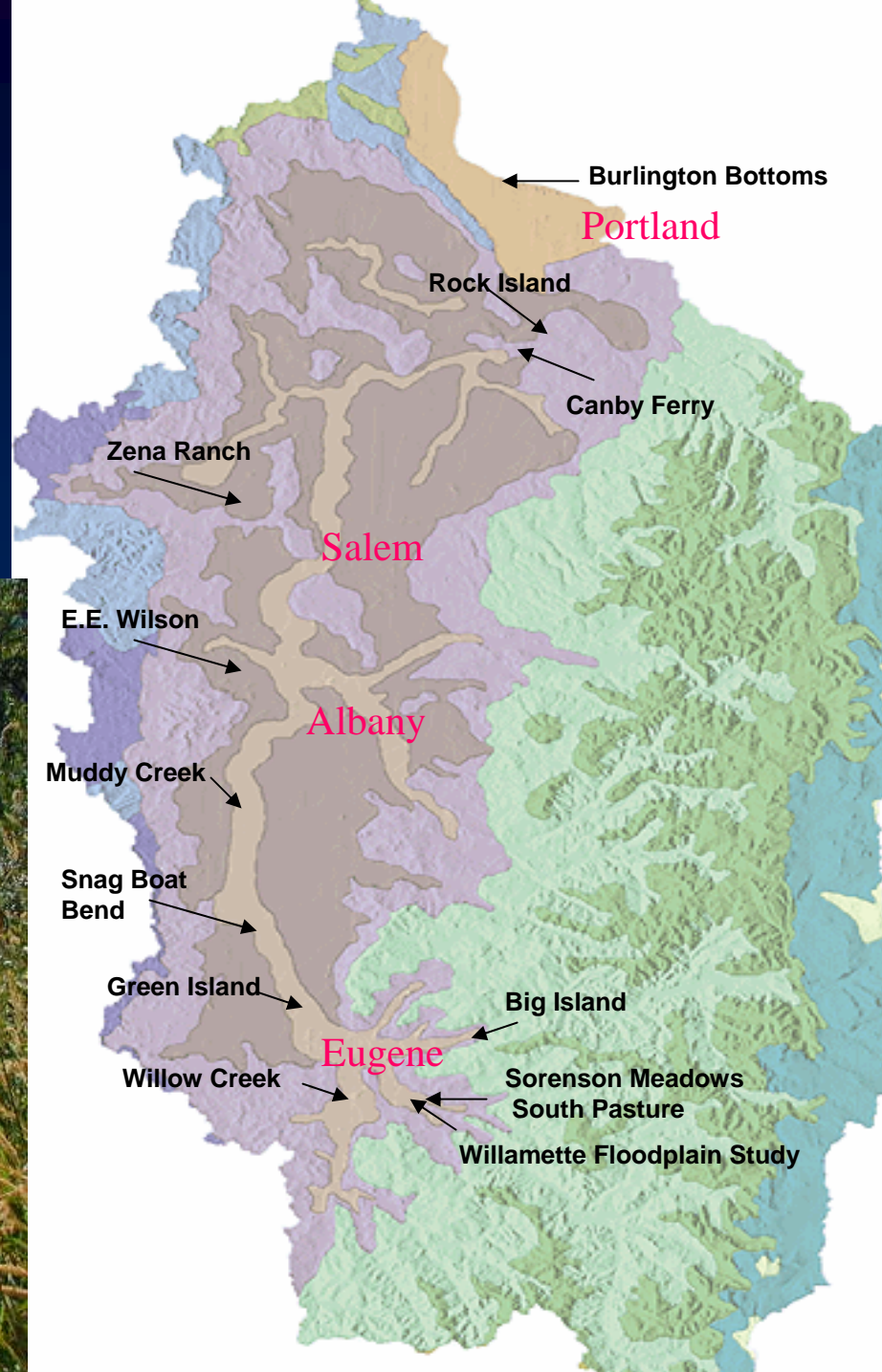


- ▶ **Mitigation needed for Habitat Impact created by Federal Actions in the Willamette Valley, Oregon**
- ▶ **Current habitat assessment methodology (HEP) out-dated, in need of revision**

Why a New Approach

- ▶ **Mitigation out of place and out of kind in Willamette**
 - a) **Species different**
 - b) **Habitats different**
- ▶ **Resolve stacking issues**
- ▶ **Need to define restoration trajectories or benchmarks for mitigation sites**
- ▶ **Want a more ecological based system**

Willamette Subbasin Mitigation Projects



New Approach

Habitat Appraisal and Barter (HAB) method



**HAB + Standard of
Comparison**

Combined Habitat Assessment Protocols
(CHAP)

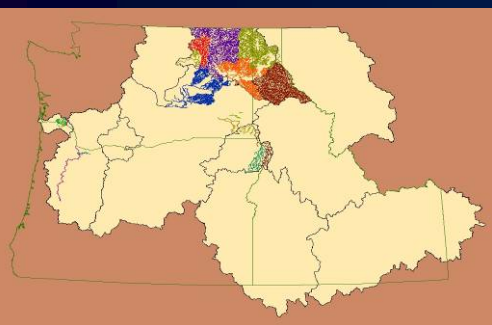
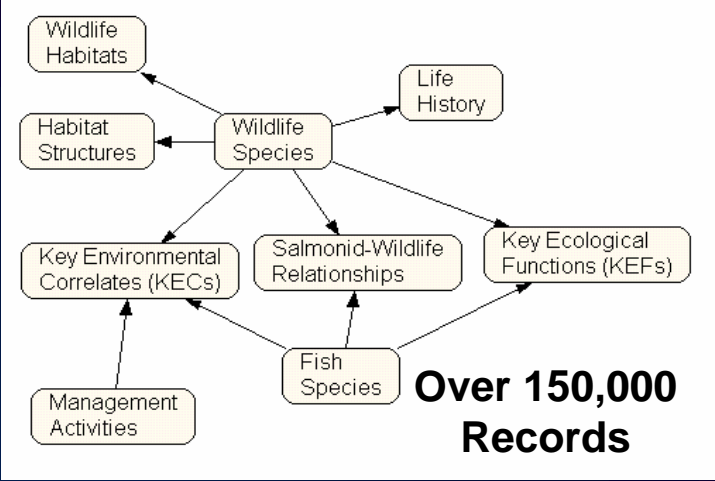
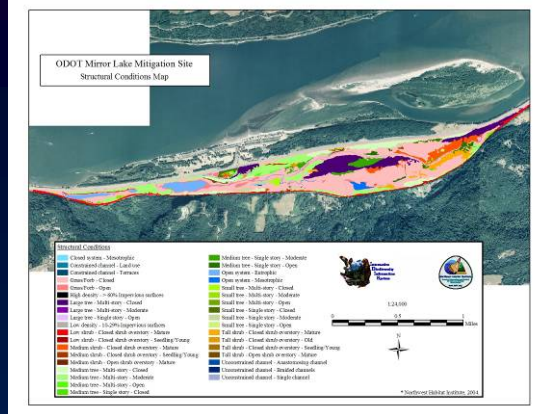
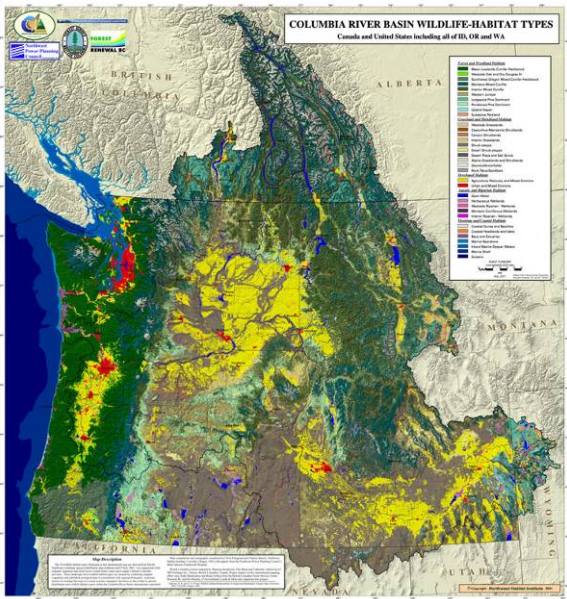
Habitat Appraisal and Barter (HAB) method

- ▶ **Measures habitat quality using diversity, complexity and available habitat size**
- ▶ **Implements information in IBIS database to make links between species, habitat, and functions**

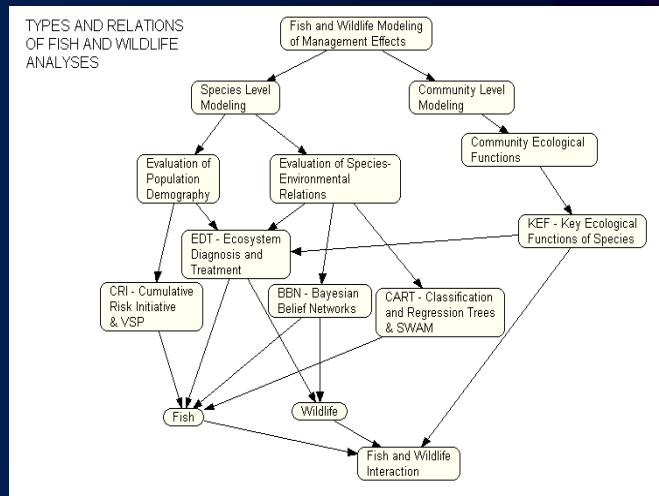
“ATM”



The HAB methodology is considered an **Accounting and Tracking Method (ATM)**



Integrated Habitat and Biodiversity Information System (IBIS)



Main Page Form

PNW HABITAT CLASSIFICATION SYSTEMS

INTRODUCTION SYSTEM INFO. CROSS-WALKS

[Link to Project Description](#)

A Guide to Oregon's FOREST WILDLIFE

Red-tailed Hawk
Buteo borealis

Sharp-shinned Hawk
Accipiter cooperii

A Publication of The Oregon Forest Resources Institute

Birds of Washington

Status and Distribution

WILDLIFE-HABITAT RELATIONSHIPS IN OREGON AND WASHINGTON

DAVID H. JOHNSON and THOMAS A. O'NEIL
Managing Directors

Atlas of Oregon Wildlife

Distribution, Habitat, and Natural History

BLAIR CURTIS, A. JON KIMBERLING, THOMAS A. O'NEIL, MARGARET M. SHUGHNESSY, ELIZABETH J. GILLESPIE, MANUELA M. P. HUSO

ATLAS OF OREGON WILDLIFE

Habitat Assessment Process



- **Ecosystem or Ecological Focus**
- **Linkage and Legacy**
- **Easily Understood**
- **Scientifically Based**
- **Referenced**

HAB method: IBIS database



Interactive
Habitat and
Biodiversity
Information
System

- ▶ A collection of wildlife-habitat relationship data integrated into a searchable database
- ▶ Relationships between: species, habitats, functions
- ▶ Peer-reviewed; expert panels based on topic

Wildlife Habitat Classification

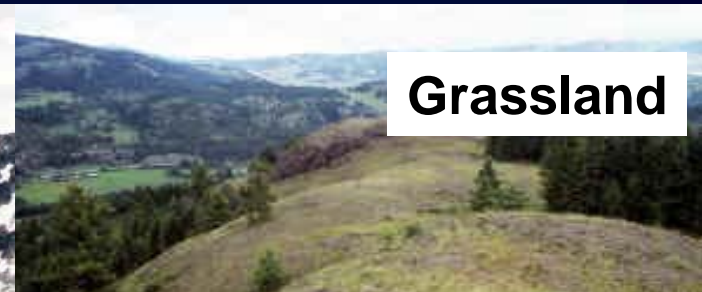
32

**Wildlife-Habitat
Types are
consistently
identified**

(Johnson & O'Neil, 2001)



Alpine



Grassland



Mixed Conifer



Open Water



Agriculture

Wildlife Habitat Classification



**Agriculture
Row Crop**



**Medium Tree
Single Story Open**



**Medium Tree
Single Story Moderate**

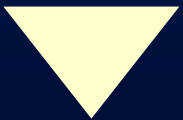
47
**Structural Conditions
and Land Uses are
consistently identified**

Key Environmental Correlates (KECs):

Habitat elements (physical or biological)
thought to most influence potential species presence.



Example



**Northern
River Otter
has 57 KECs**

down wood in riparian areas
beaver/muskrat activity (dams, lodges, ponds)
burrows (aquatic or terrestrial)
oxbows
overhanging vegetation
coarse woody debris in streams and rivers
ephemeral pools

Species List

Determined by:

- ▶ **Occurrences**
 - **State/County**
 - **Range Maps**
 - **Survey/Museum Records**
- ▶ **Life History**
 - **Elevation Ranges**
- ▶ **Habitat Associations**
 - **Habitat Type**
 - **Structural Conditions**
 - **KECs from field inventory**

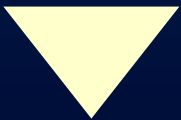


Key Ecological Functions (KEFs):

The principal ways an organism influences the environment.



Example



**Northern
River Otter
has 12 KEFs**

piscivorous

secondary burrow user

creates runways

eats aquatic macroinvertebrates

eats terrestrial invertebrates

HAB Process: Species-Habitat-Function Relationships

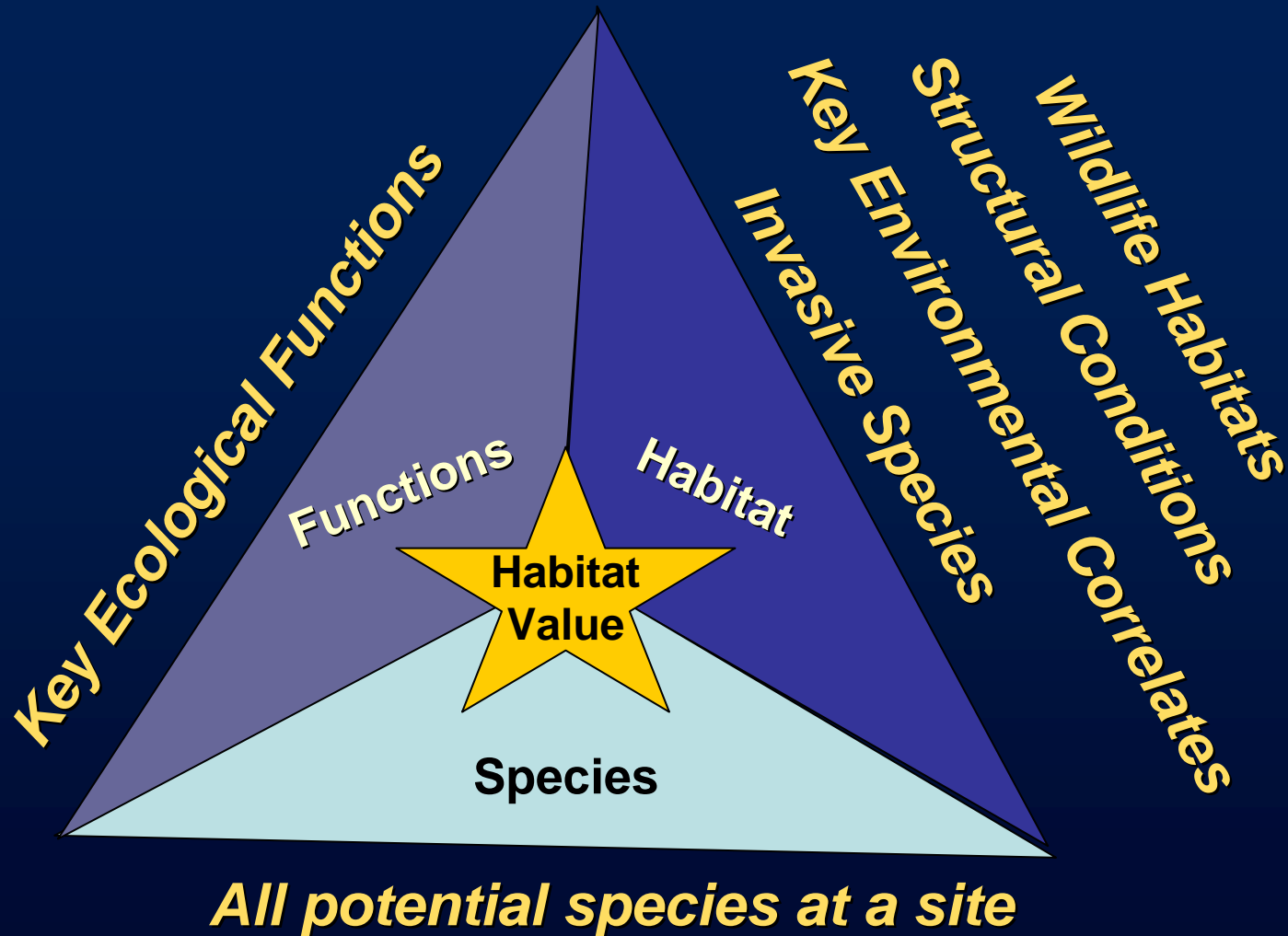
With Habitat Type, Structural Conditions, and KECs mapped

Then ~

IBIS queried to obtain site-specific info:

- ▶ **Potential species list (reviewed)**
- ▶ **Key Ecological Functions (KEFs) performed by species** (the principal ways organisms influence the environment)

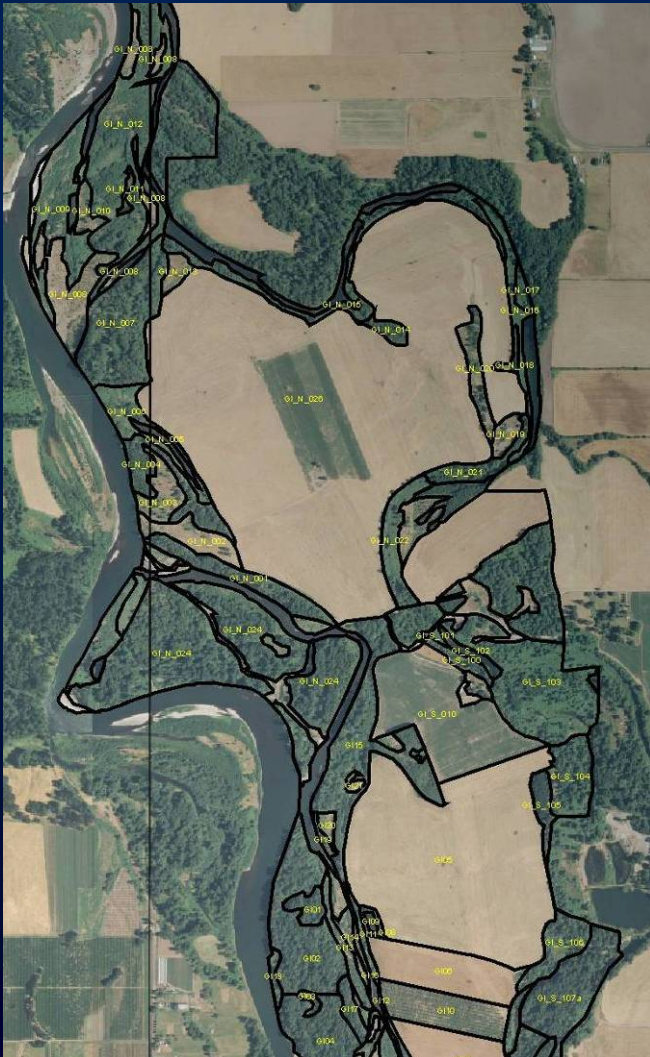
HAB method: Assessment Factors



HAB method: Process

- 1) Preliminary Mapping**
- 2) Field Inventory**
- 3) Species-Habitat-Functions Relationships**
- 4) Calculations**
- 5) Final Maps and Reports**

HAB Process: Preliminary Mapping

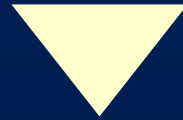


- ▶ **Geo-referenced aerial imagery for site**
- ▶ **Habitat types delineated using GIS (in-office)**
 - **Visual land formation differences**
 - **Vegetation (color, texture)**
 - **Structural conditions**

HAB Process: Field Inventory



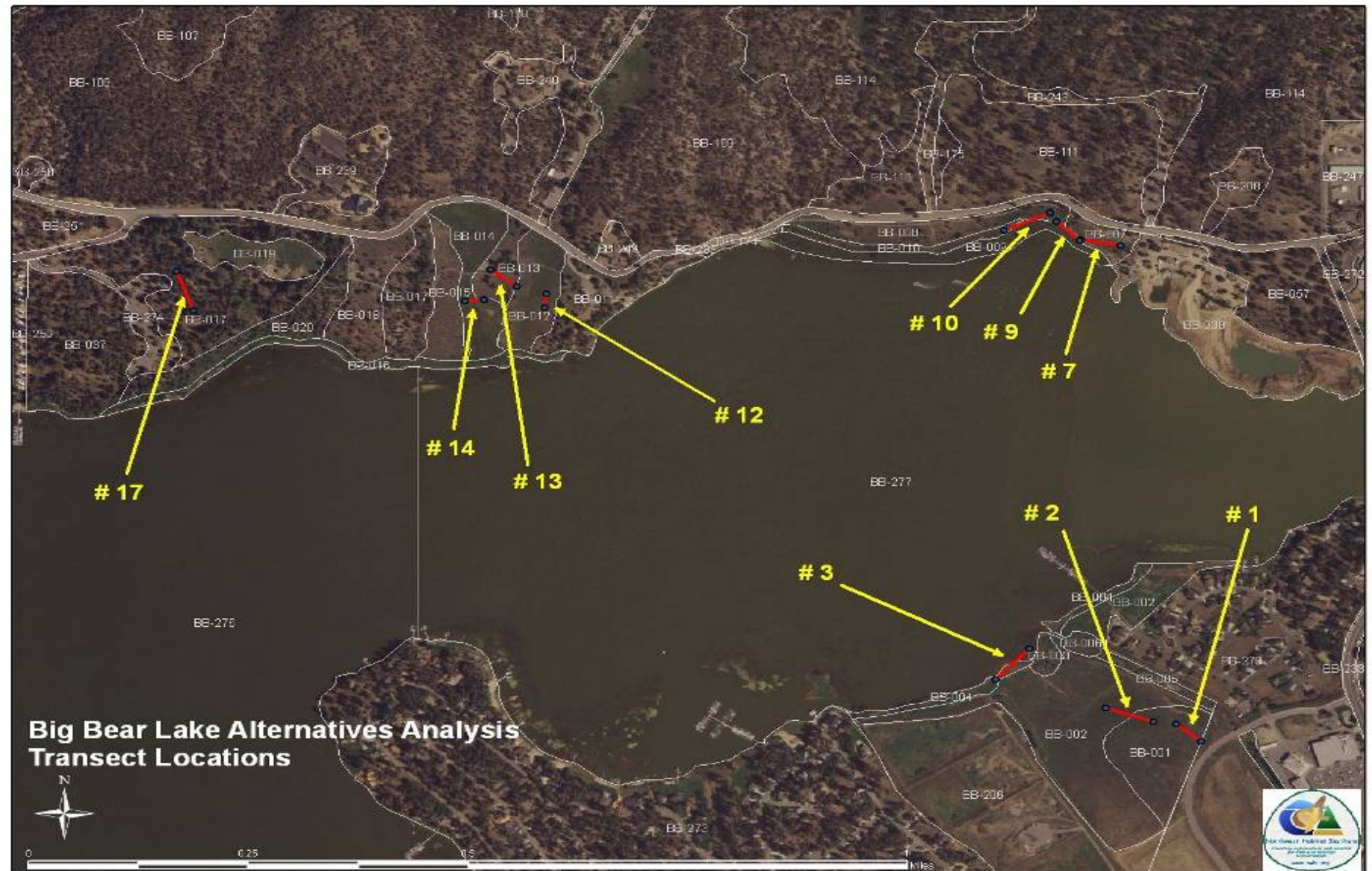
SITE VISIT



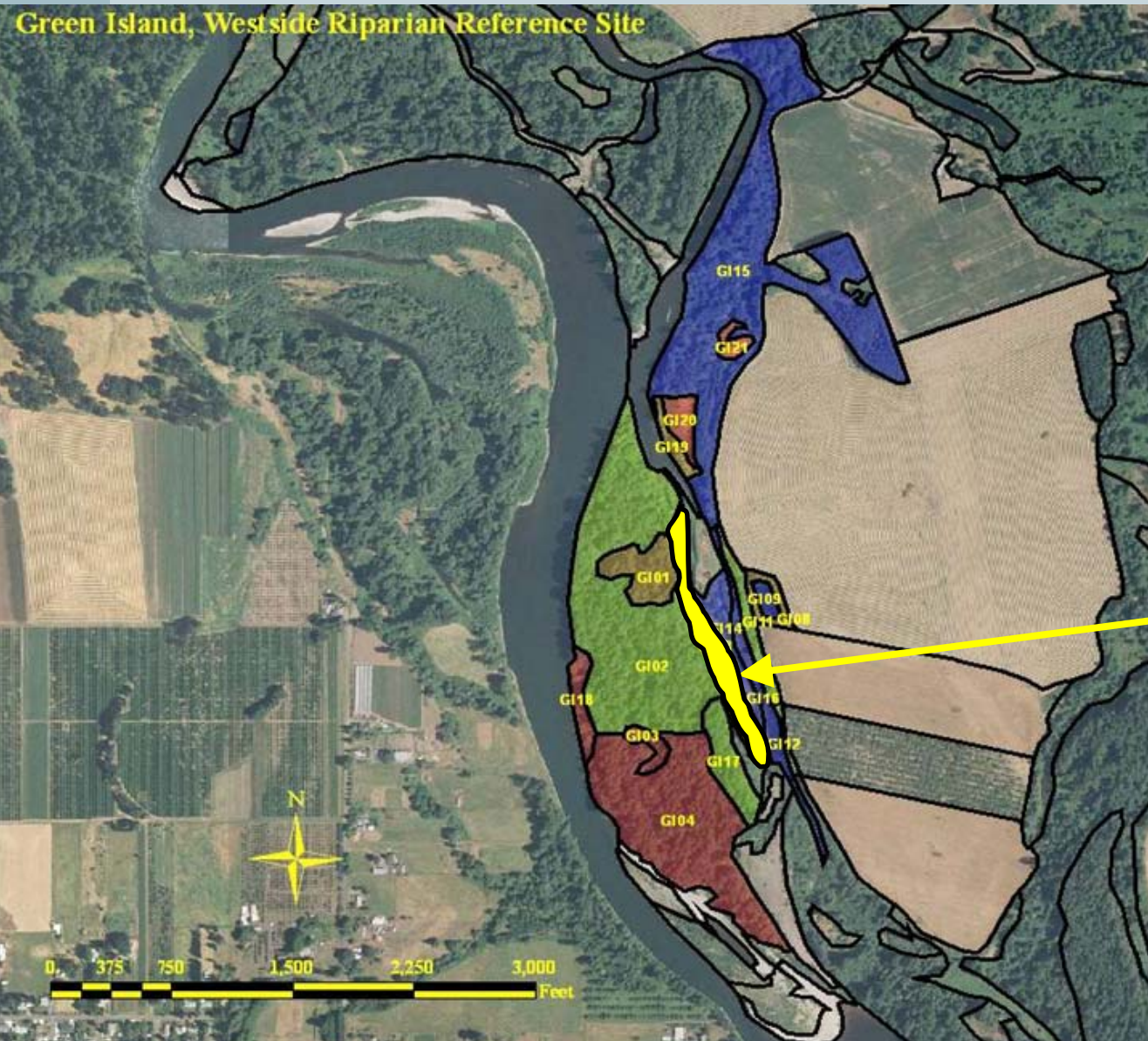
- ▶ **Check/refine delineations**
- ▶ **For each polygon:**
 - **Record invasive plant abundance**
 - **Record Key Environmental Correlates for each polygon**



Verification Transects



HAB Process: Calculations



Information tracked for each polygon at a site.

Focus for further calculations

HAB Process: Calculations

Generation of 2 relationship matrices:

- ▶ **Potential Species x Functions (site)**
- ▶ **KECs x Functions (polygon)**
KECs collected from field inventory

Species ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
20170	1	1	1	1
40140	1	1	0	1
43680	1	1	1	1
44870	1	1	1	0
⋮	⋮	⋮	⋮	⋮	⋮

KEC ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
1.10	0	0	1	1
1.1.3	1	0	0	1
2.4.1	1	0	0	1
2.7.2.1	0	0	1	1
⋮	⋮	⋮	⋮	⋮	⋮

Wildlife Habitat Assessment - Approach

Mean Functional Redundancy Index

(MFRI)- is the mean number of species that perform each function associated with a habitat type.

<u>Habitat Type</u>	Function 1 <i>Creates Feeding, Opportunities for Others</i>	Function 2 <i>Breaks up Down Wood</i>	Function 3 <i>Primary Excavator</i>	Function 4 <i>Eats Terrestrial Insects</i>
Lowland Mixed Conifer				
Williamson's Sapsucker	1	1	1	1
Black Bear	0	1	1	1
Red Squirrel	1	0	0	0
Great Blue Heron	1	0	0	1

KEC Count by KEF for a Project Sites

Habitat types, structural conditions and KECs are usually the main variables **Known** about a site

KEC	leaf-eater	fish prey	seed-eater	flower/bud/ feeder
down wood in riparian	15	0	27	11
tree cavities	3	0	3	0
herbaceous layer	1	0	1	0
edges	0	0	7	5
shrubs	1	0	12	9

HAB Process: Calculations

Two numbers from each matrix:

1. Total number of “1s” in table
2. Total number of non-zero functions

1. Total # of species performing fxns = 14

2. Total # non-zero fxns = 4

Species ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
20170	1	1	1	1	
40140	1	1	0	1	
43680	1	1	1	1	
44870	1	1	1	0	
	⋮	⋮	⋮	⋮	

1. Total # of KECs linked to fxns = 8

2. Total # non-zero fxns = 3

KEC ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
1.10	0	0	1	1	
1.1.3	1	0	0	1	
2.4.1	1	0	0	1	
2.7.2.1	0	0	1	1	
	⋮	⋮	⋮	⋮	

HAB Process: Calculations

Divide:
$$\frac{\text{total number of 1s}}{\text{total number of non-zero functions}}$$

- A**
1. Total # of 1s = 14
 2. Total # non-zero fxns = 4

$$\frac{\text{Number of species performing functions}}{\text{Total number of functions}} = \frac{14}{4} = 3.5$$

- B**
1. Total # of 1s = 8
 2. Total # non-zero fxns = 3

$$\frac{\text{Number of KECs at site}}{\text{Total number of functions}} = \frac{8}{3} = 2.67$$

HAB Process: Calculations

A

$$\frac{\text{Number of species performing functions}}{\text{Total number of functions}} = \frac{14}{4} = 3.5$$

Species Value

B

$$\frac{\text{Number of KECs at site}}{\text{Total number of functions}} = \frac{8}{3} = 2.67$$

KEC Value

HAB Process: Calculations

Uncorrected Per-acre Value =

Species Value + **KEC Value** =

6.17 + **2.34** = **8.51**

HAB Process: Calculations

Corrected Per-acre Value

=

$$\left(\text{Uncorrected Per-acre Value} * \text{Invasives Factor (discount)} \right)$$

From field inventory:
% invasive plant species in
each layer

- grass/forb
- shrub
- tree

HAB Process: Calculations

Corrected Per-acre Value

=

$$\left(\begin{array}{c} \text{Uncorrected} \\ \text{Per-acre} \\ \text{Value} \end{array} * \begin{array}{c} \text{Invasives} \\ \text{Factor} \\ \text{(ex 30\%} \\ \text{discount)} \end{array} \right)$$

8.51

*

0.70

=

5.96



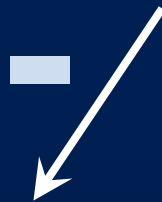
*Portion of value that has been
adjusted for the invasive discount*

**Affected
Habitat Value**

minus

**Baseline
Habitat Value**

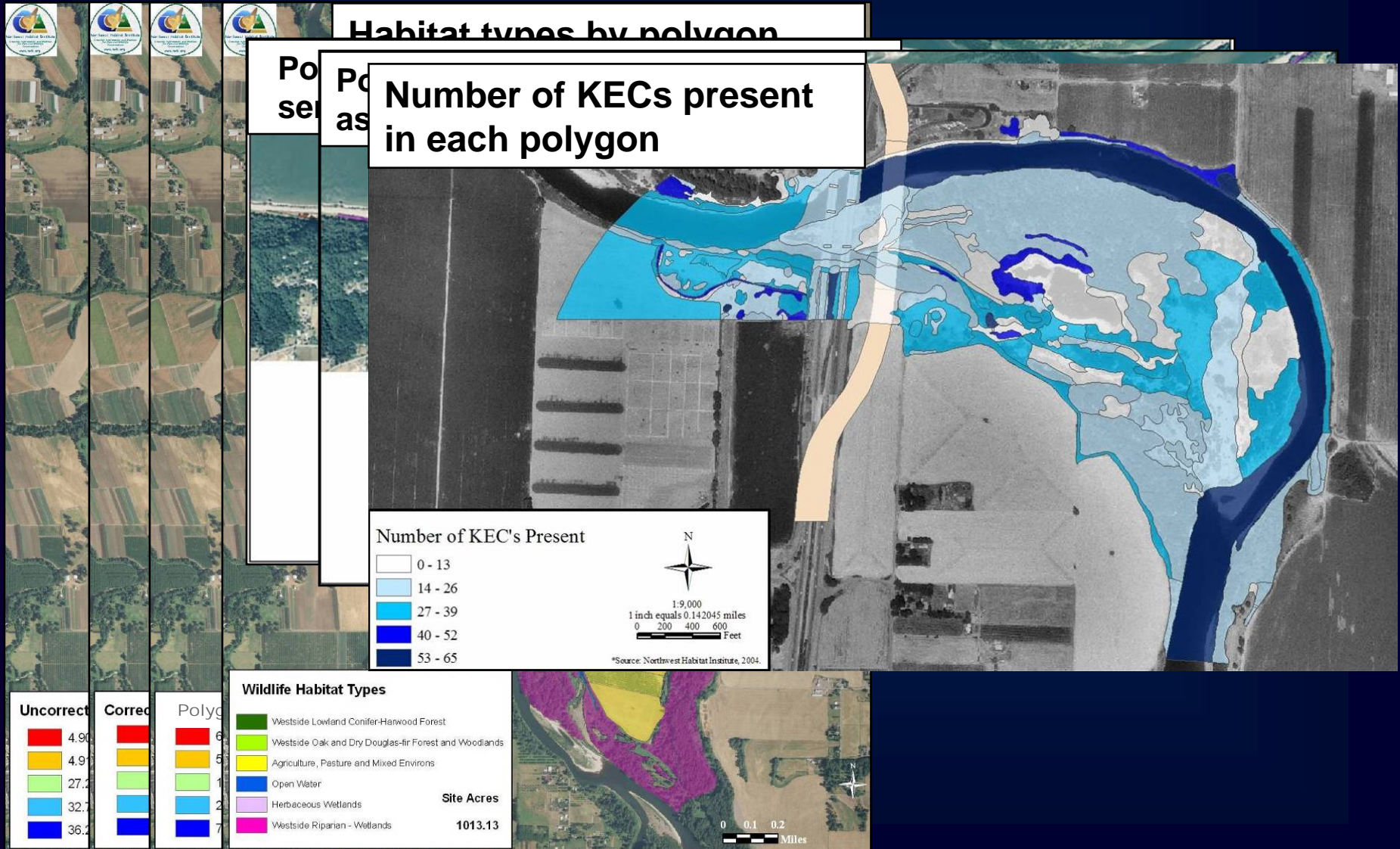
= Impact Value



Debit

Credit

HAB Process: Final Maps and Reports



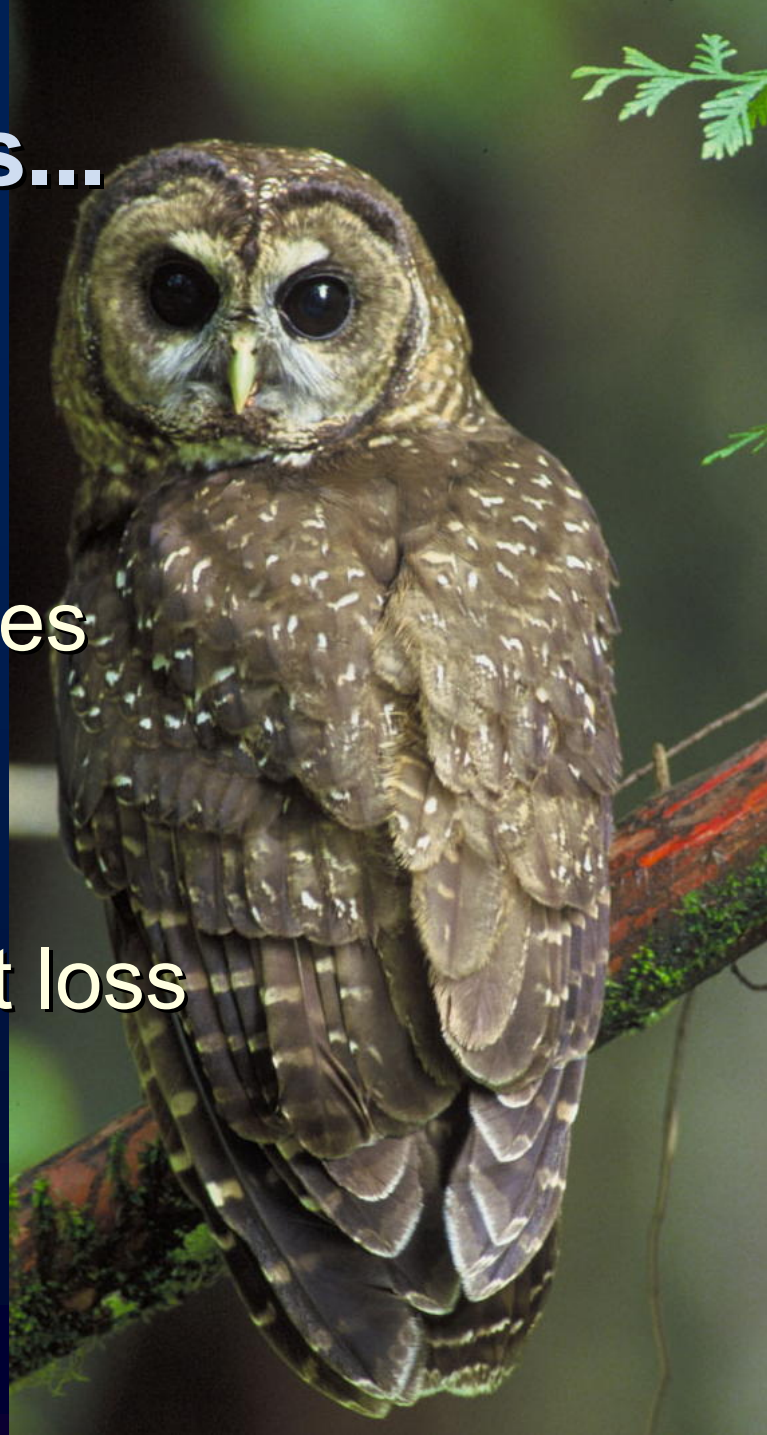
Special Considerations...

T & E

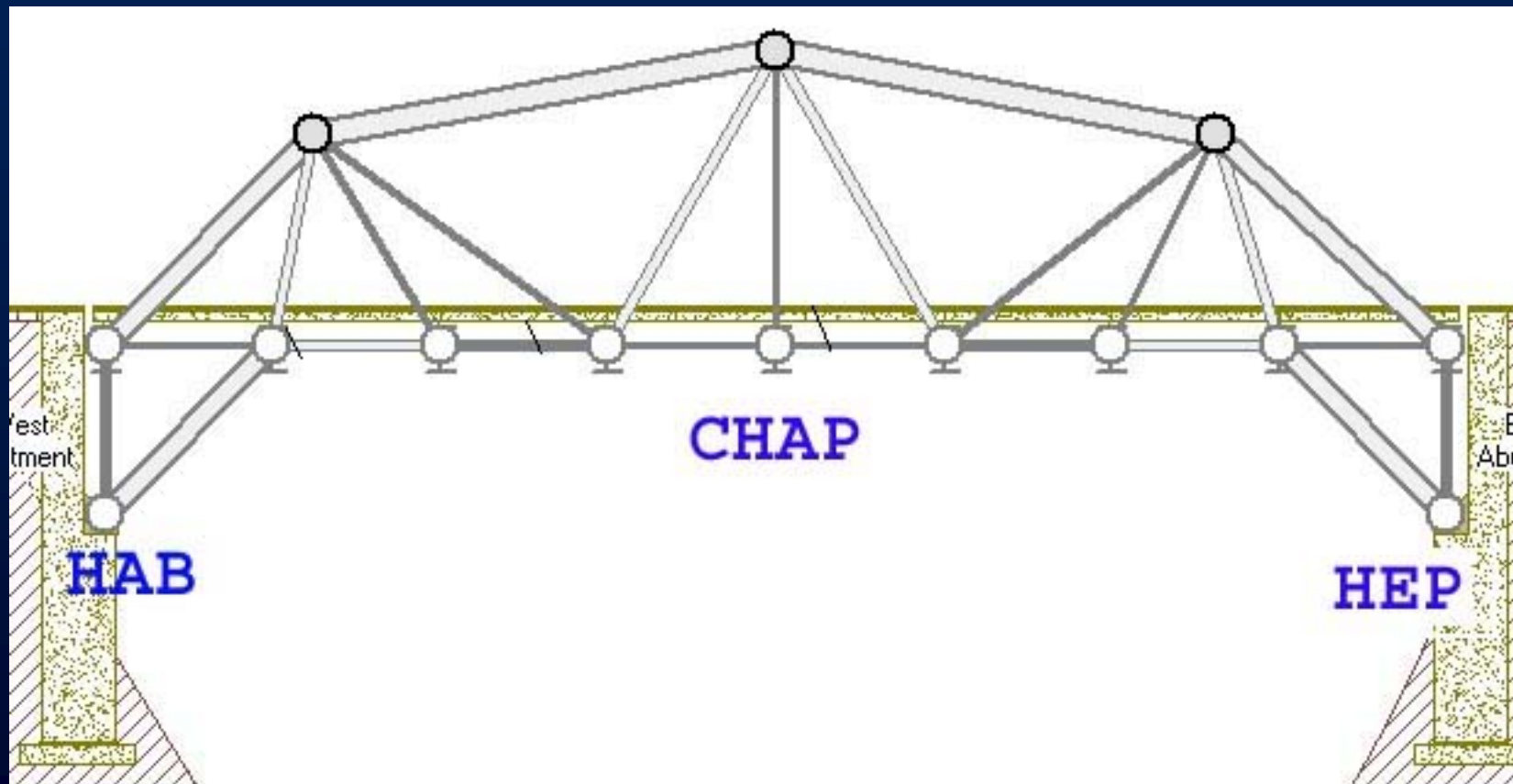
Federally listed T & E species
considered separately

Special consideration for
wetlands to ensure no net loss

Wetlands



Combined Habitat Assessment Protocols (CHAP)



Potential Outcomes

- ▶ **Ecologically-based method to evaluate potential mitigation sites**
- ▶ **Brings consistency and conformity to evaluation process**
- ▶ **Allows for tracking of restoration activities through time**

Combined Habitat Assessment Protocols (CHAP)

- ▶ **Combines HAB (Habitat Appraisal and Barter) with a Standard of Comparison**
- ▶ **Quantifies a multi-species *habitat value*, providing a more meaningful ecological assessment**

CHAP Calculations

1) Create HAB Functional Matrices:

Species Value + KEC Value = Per-Acre Value

Species ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
20170	1	1	1	1	
40140	1	1	0	1	
43680	1	1	1	1	
44870	1	1	1	0	
⋮					

KEC ID #	Function ID #				...
	1.3	2.2	2.6	4.5	
1.10	0	0	1	1	
1.1.3	1	0	0	1	
2.4.1	1	0	0	1	
2.7.2.1	0	0	1	1	
⋮					

2) Apply Correction Factors:

Invasives
Factor
(discount)

and/or

Other
Condition
Factor

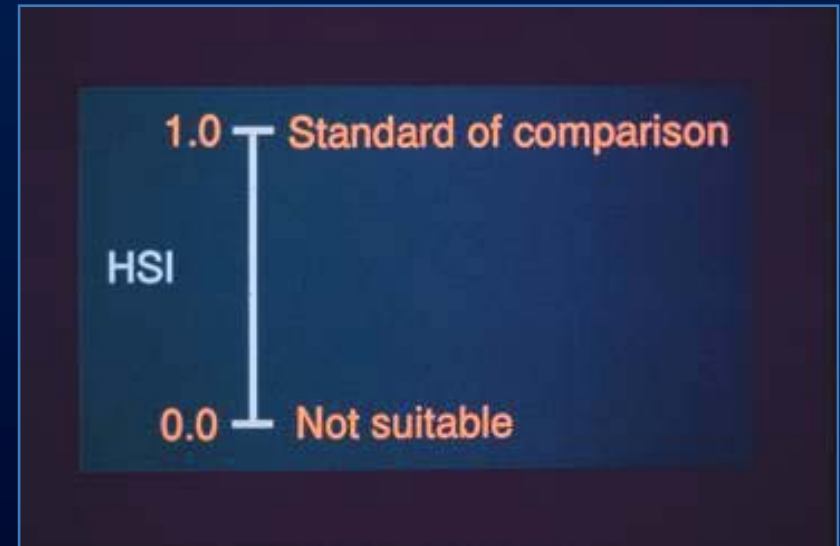
=

Corrected Per-acre Value

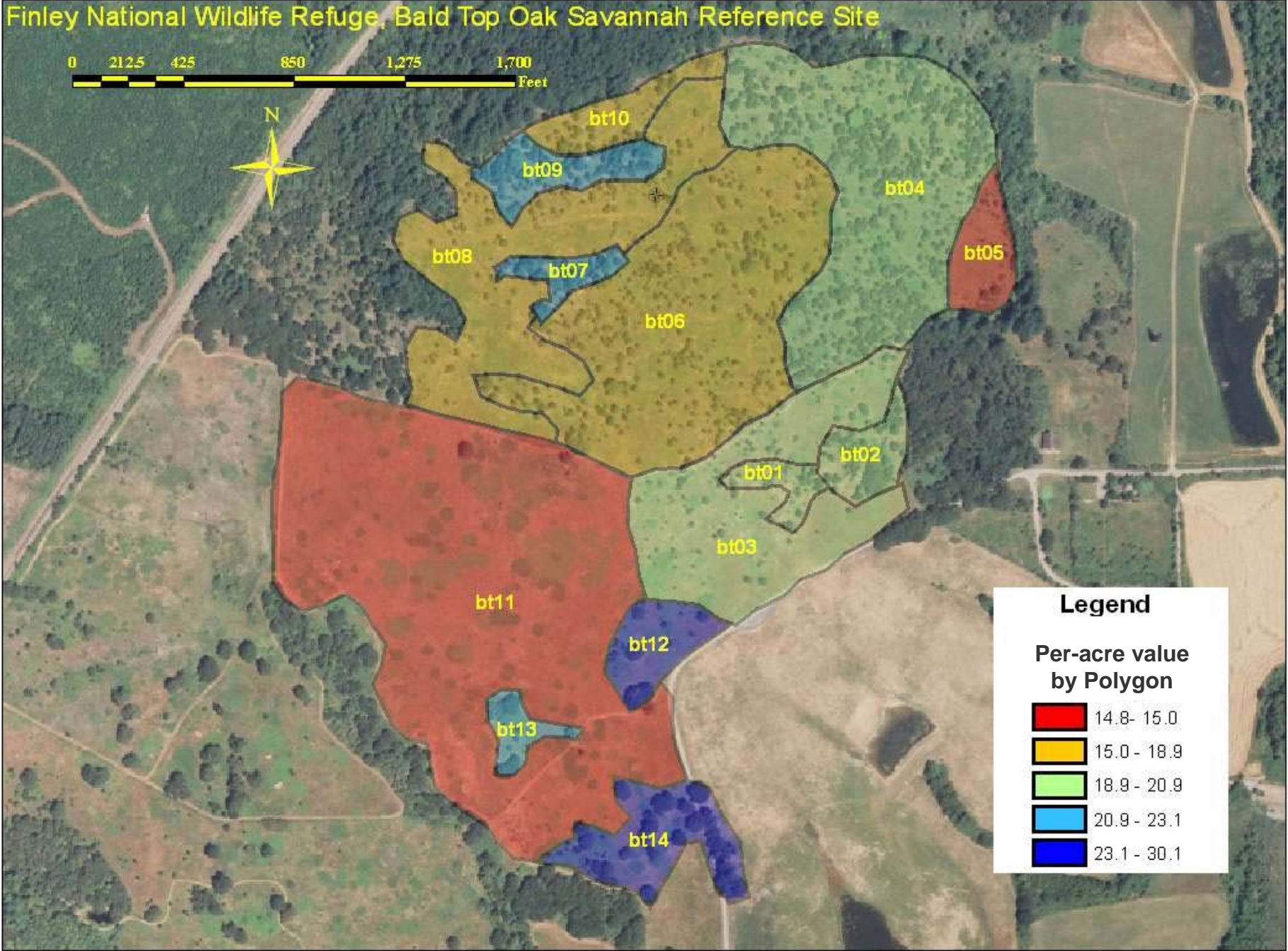
CHAP Rating Process for Habitat Quality

HEP:

- Habitat Quality x Habitat Quantity = **Habitat Units**;
- Habitat Suitability Index (HSI) =
Potential Site Area Conditions ÷ Standard Area of Comparison
- **Habitat Units** =
HSI X Area of Available Habitat
- HEP verification transects








Finley National Wildlife Refuge, Bald Top Oak Savannah Reference Site

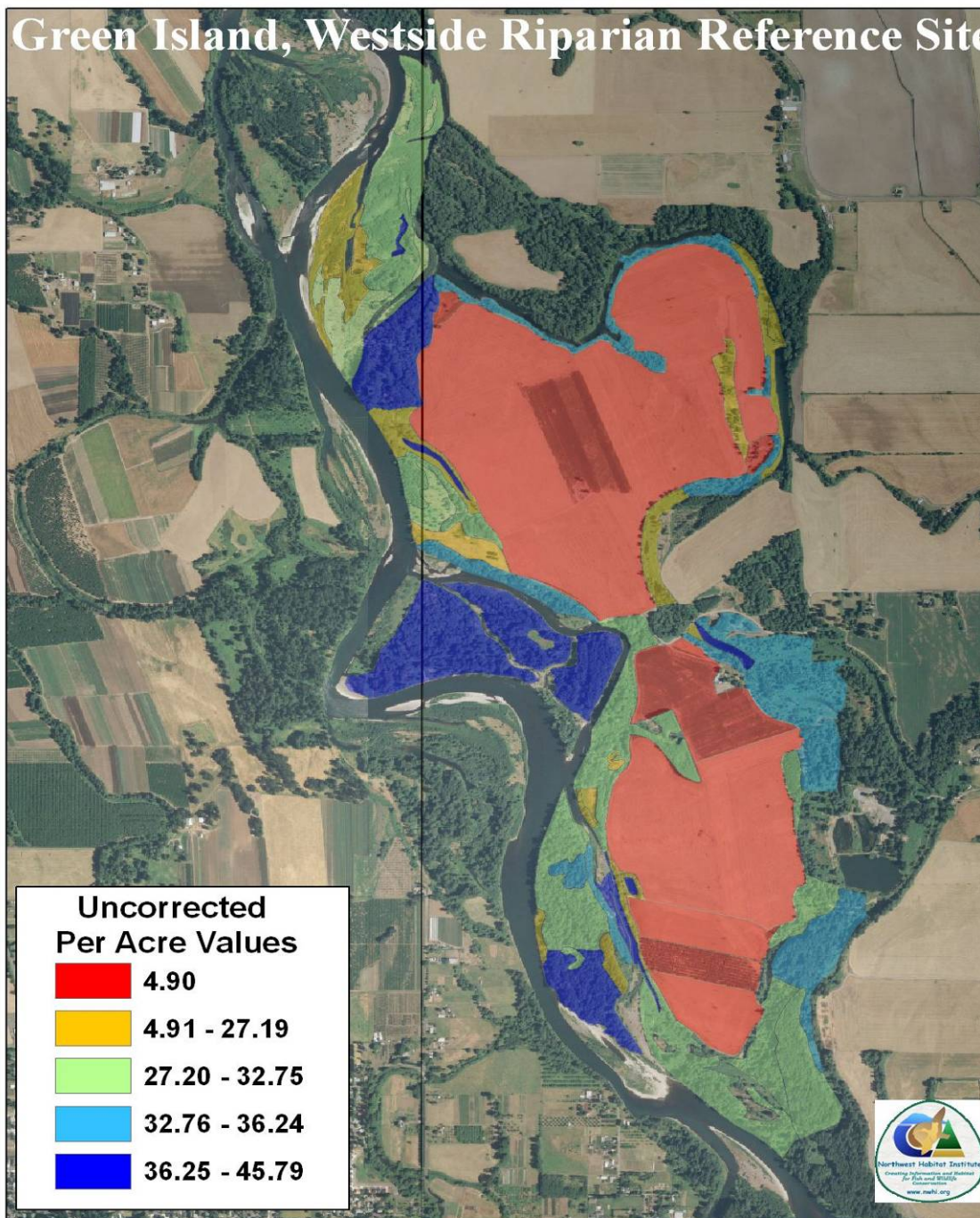


Legend

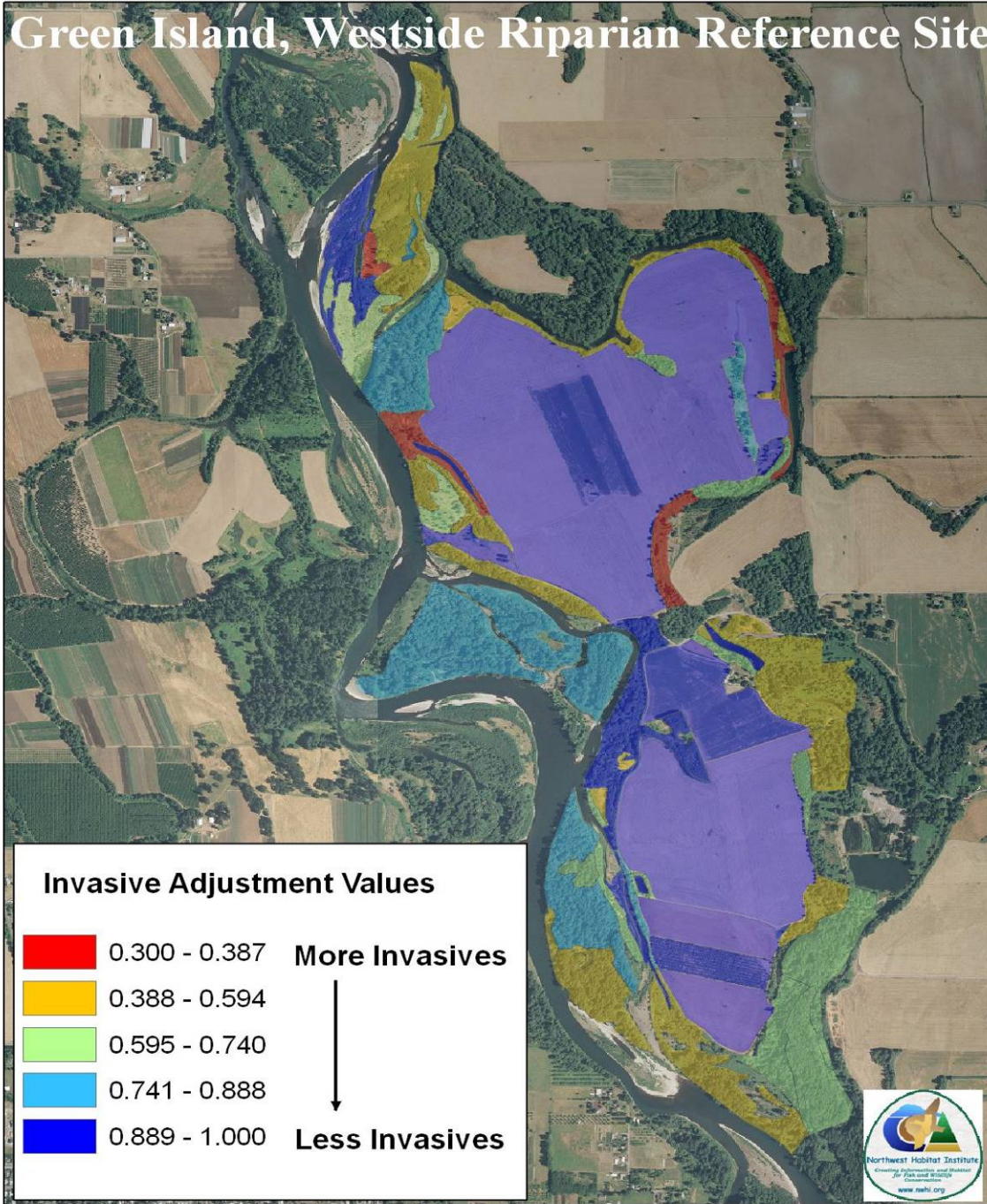
Per-acre value by Polygon

	14.8 - 15.0
	15.0 - 18.9
	18.9 - 20.9
	20.9 - 23.1
	23.1 - 30.1

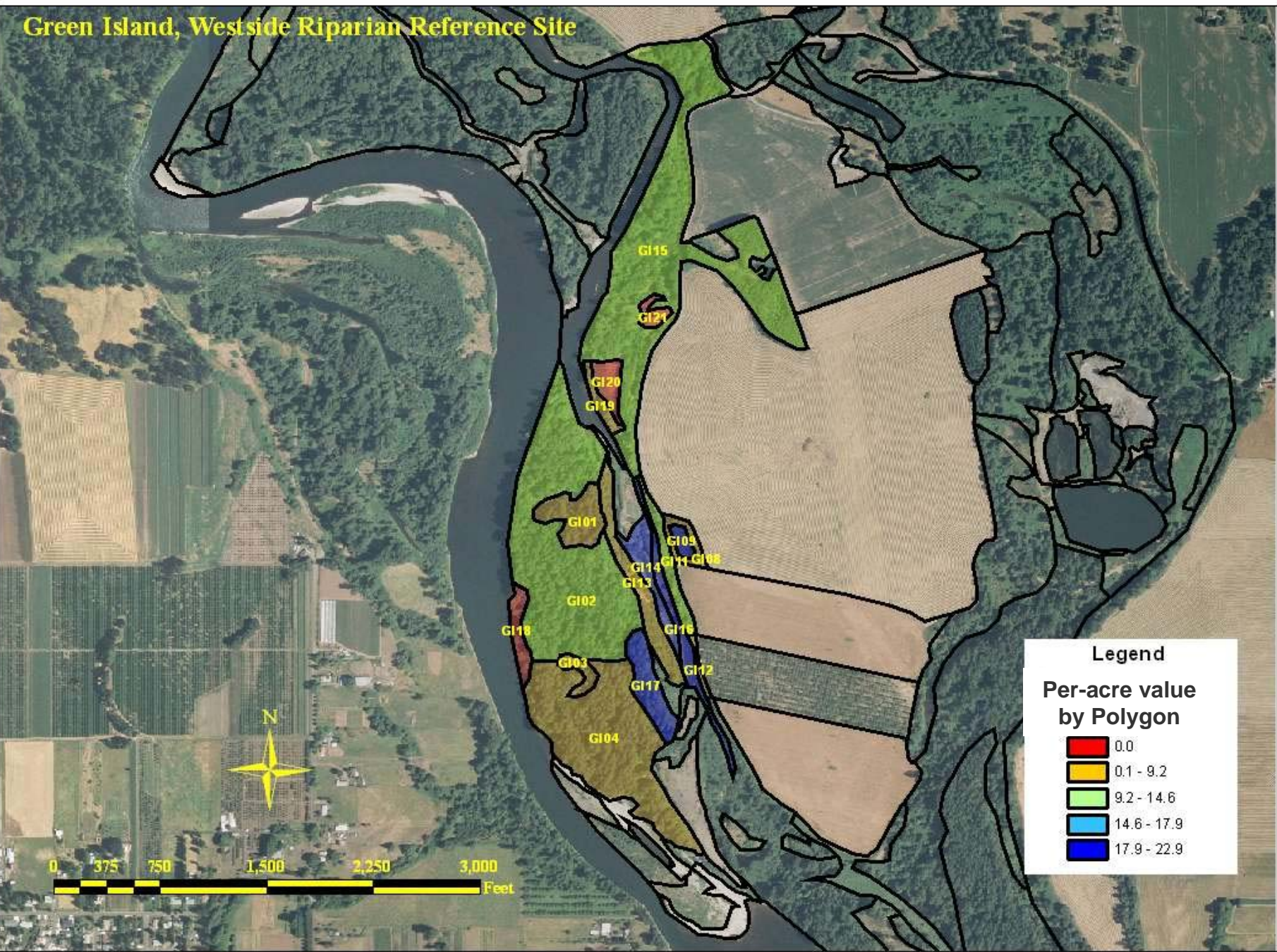
Green Island, Westside Riparian Reference Site



Green Island, Westside Riparian Reference Site



Green Island, Westside Riparian Reference Site



CHAP Value Conversion to HEP/HSI Values

► Compare Reference Site to Evaluation Site:

Site	Per-acre Value
Westside Riparian-Wetland Reference Site (Green Island)	16.81
Westside Riparian-Wetland Evaluation Site (hypothetical)	13.52
Dry Douglas-fir & Oak Reference Site (Bald Top, Finley)	14.92
Dry Douglas-fir & Oak Evaluation Site (hypothetical)	9.77

$$\frac{\text{Per-acre Value}_{\text{eval}}}{\text{Per-acre Value}_{\text{ref}}} = \text{HSI value}$$

Examples:

$$13.52 / 16.81 = 0.80 \text{ HSI}$$

$$9.77 / 14.92 = 0.65 \text{ HSI}$$

CHAP Value Conversion to HEP/HSI Values

▶ **HSI is then multiplied by acres:**

HSI Value x Acreage of Habitat Type = Habitat Units (HUs)

Example: 0.65 HSI x 10 acres = 6.5 HUs

▶ **Habitat units are then multiplied by number of species used to evaluate a specific cover type 20+years ago:**

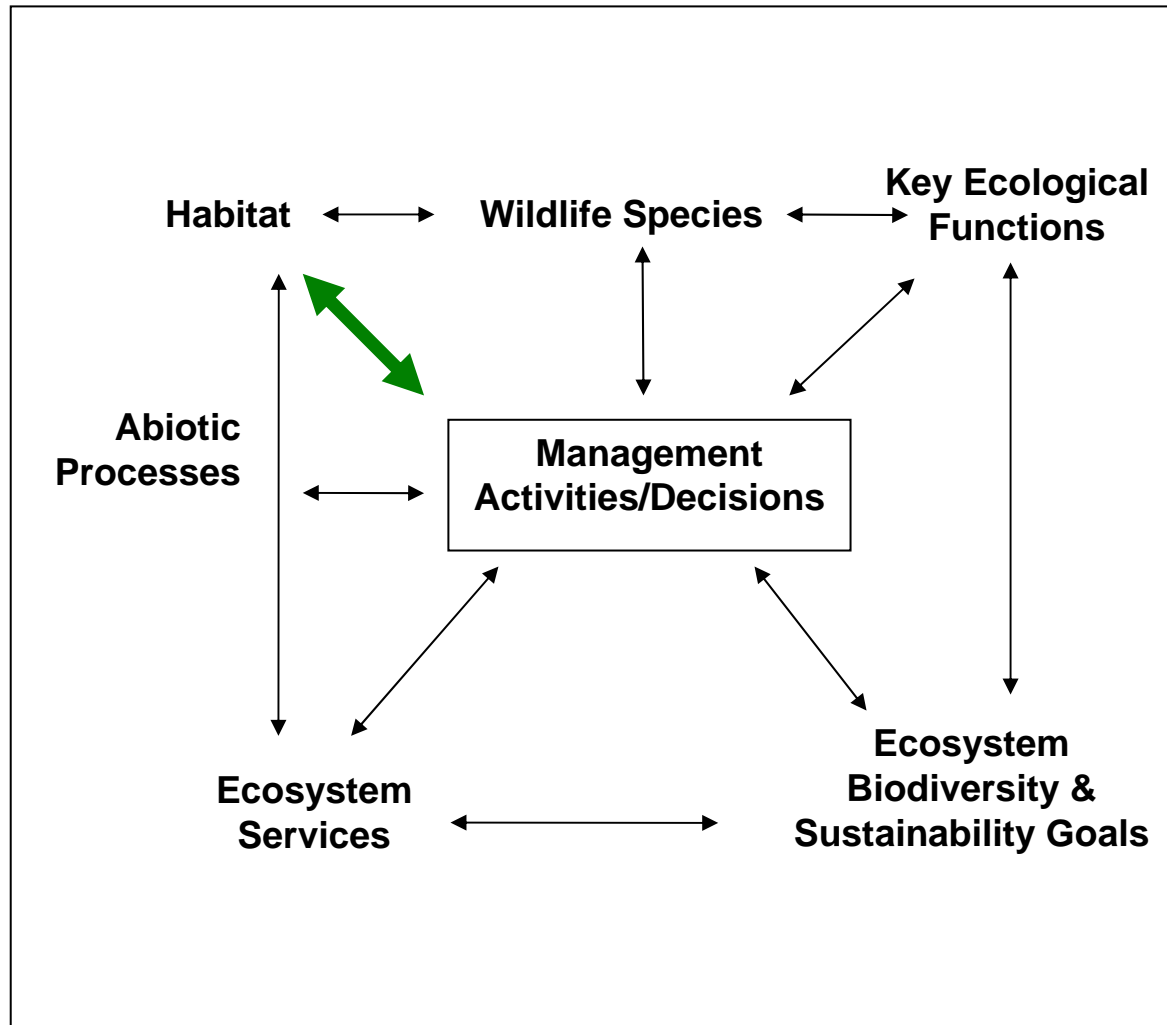
Habitat Units x Number of HEP species = Credited HEP HUs

Example: 6.5 HUs x 5 species = 32.5 Credited HUs

Other Examples



Influences on Management



Linkages to Management Activities










Management Activities Connected to KECs

		Earthwork (Excavation; Embankment) Construction									
KEC	KEC Description	Duration/Months						Season			
		0-6		6-12		>12		Fall	Winter	Spring	Summer
		Affects Negative	Affects Positive	Affects Negative	Affects Positive	Affects Negative	Affects Positive				
	Forest, Shrubland, & Grassland Habitat	1	1	1	1			1	1	1	1
1.1	forest/woodland vegetative elements or substrates	1	1	1	1			1	1	1	1
1.1.1	down wood (includes downed logs, branches, and rootwads, in any context)	1	1	1	1			1	1	1	1
1.1.1.1	decay class	1	1	1	1			1	1	1	1
1.1.1.1.1	hard [class 1, 2]	1	1	1	1			1	1	1	1
1.1.1.1.2	moderate [class 3]	1	1	1	1			1	1	1	1
1.1.1.1.3	soft [class 4, 5]	1	1	1	1			1	1	1	1
1.1.1.2	down wood in riparian areas	1	1	1	1			1	1	1	1
1.1.1.3	down wood in upland areas	1	1	1	1			1	1	1	1
1.1.10	fungi	1	1	1	1			1	1	1	1
1.1.11	roots, tubers, underground plant parts	1	1	1	1			1	1	1	1

Link Scenarios and Evaluations Spatially

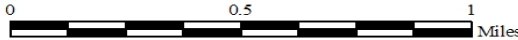
ODOT Mirror Lake Mitigation Site
Mitigation Plan

Areas under consideration for mitigation activities

-  MA1 Pocket Wetlands
-  MA2 Riparian Plantings
-  MA3 Culvert Removal
-  MA4 Blackberry control & forest regeneration
-  MA5 Instream structures
-  MA6 Substrate enhancement
-  MA7 Nonnative control in forested areas.
-  MA8 Habitat Improvements to Latourell Lake
-  MA9 Wetland enhancement near Latourell Lake

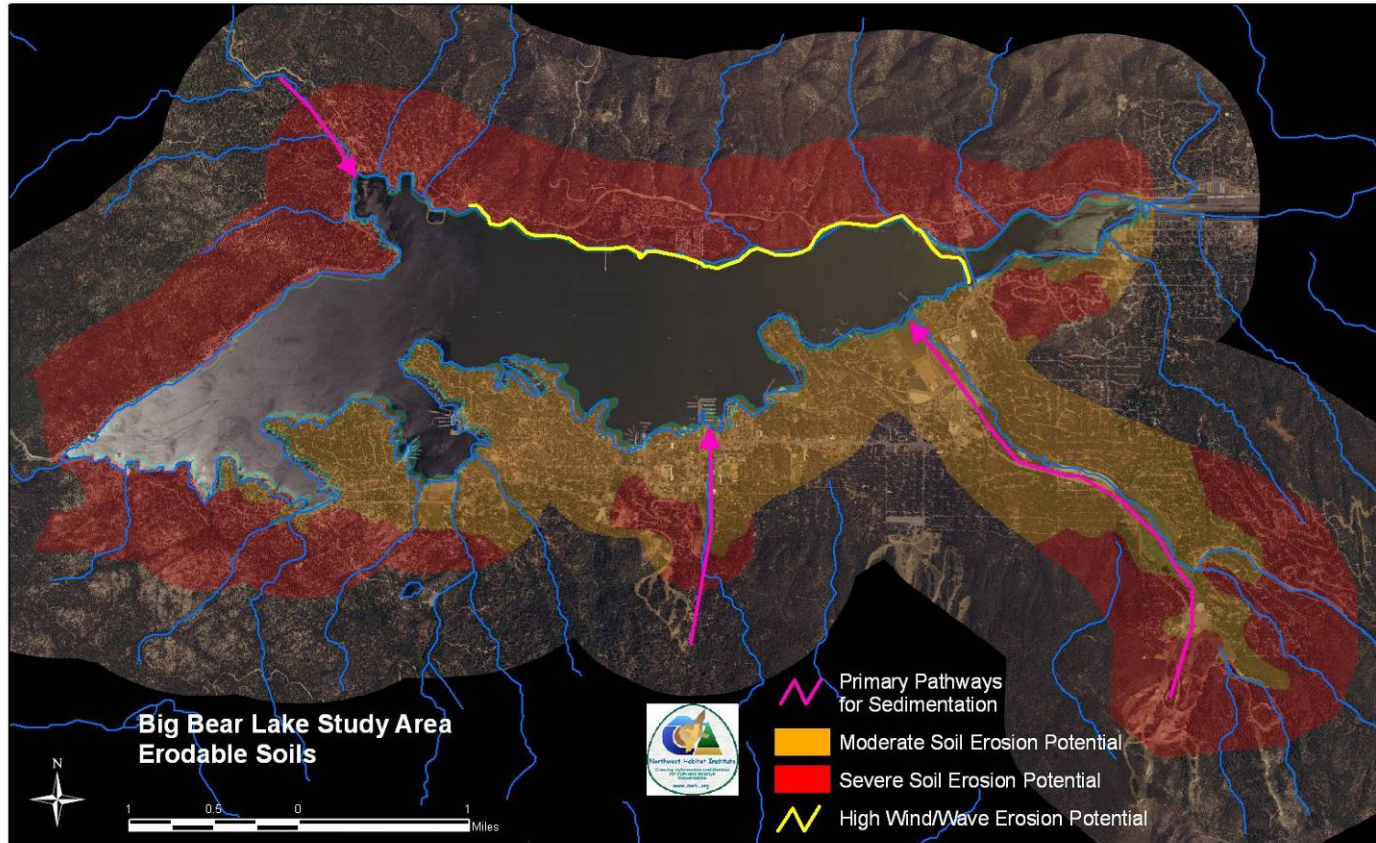


1:24,000



* Northwest Habitat Institute, 2004.

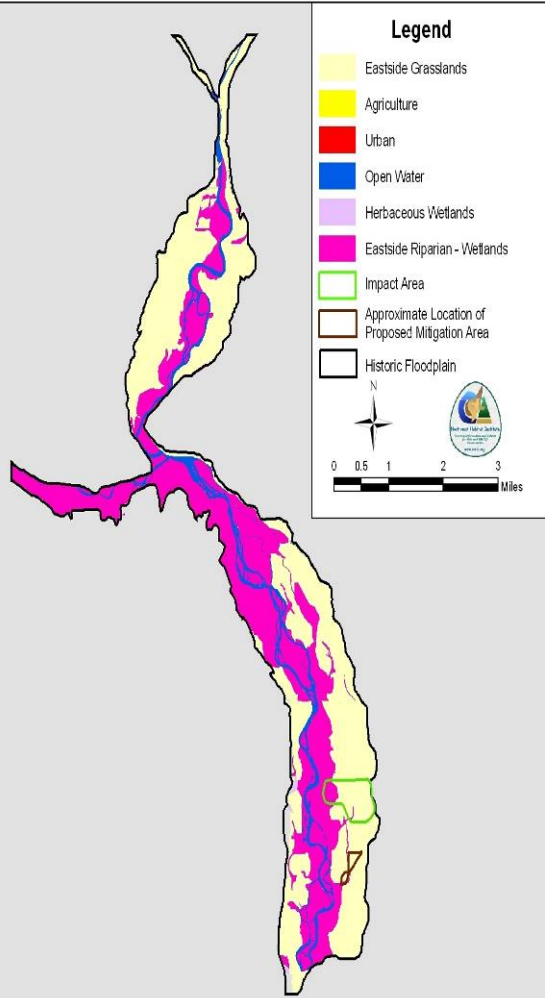
Big Bear Lake Wildlife Habitat Mapping Surrogates



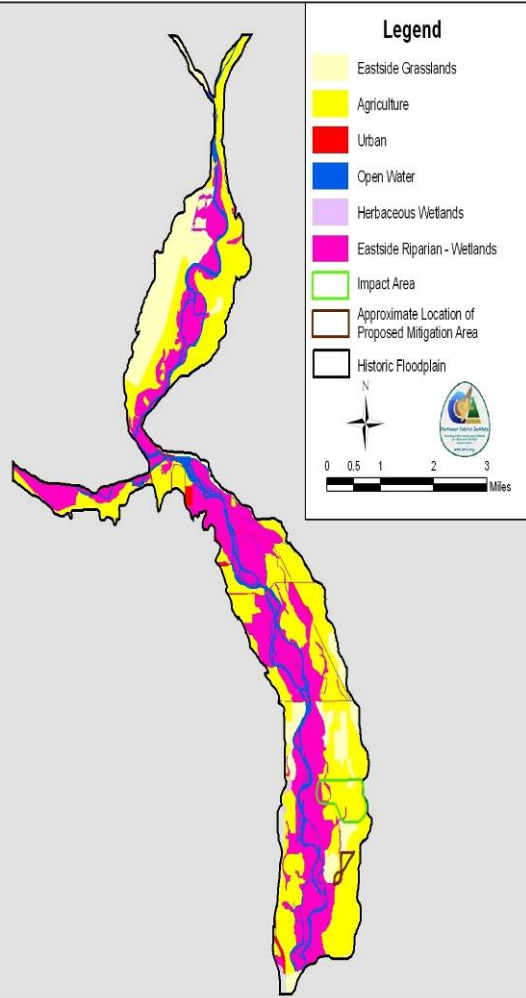
Habitat Types Classification

Change Detection & Cumulative Effects

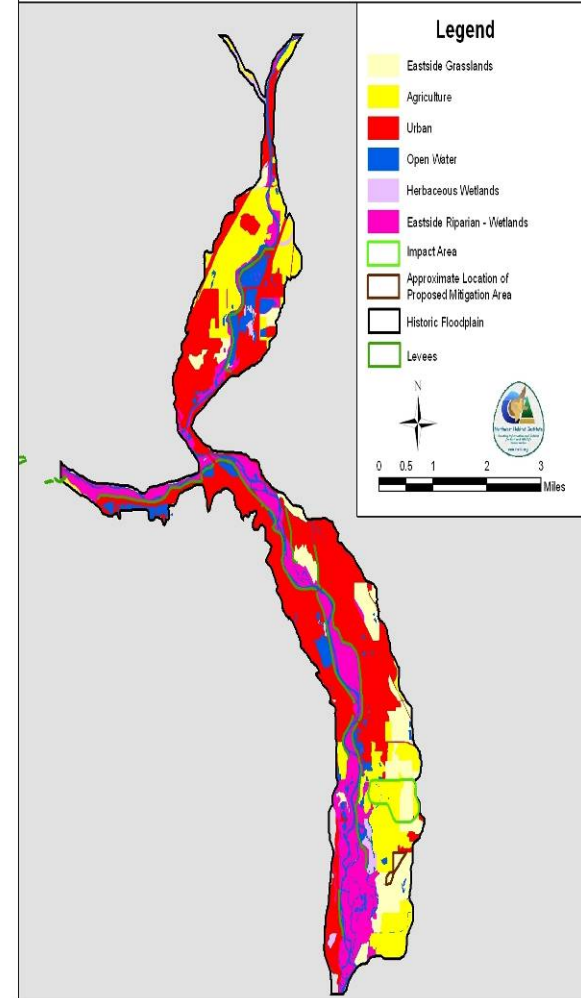
Draft 1850 Wildlife Habitat Types
for the Yakima Valley Floodplain



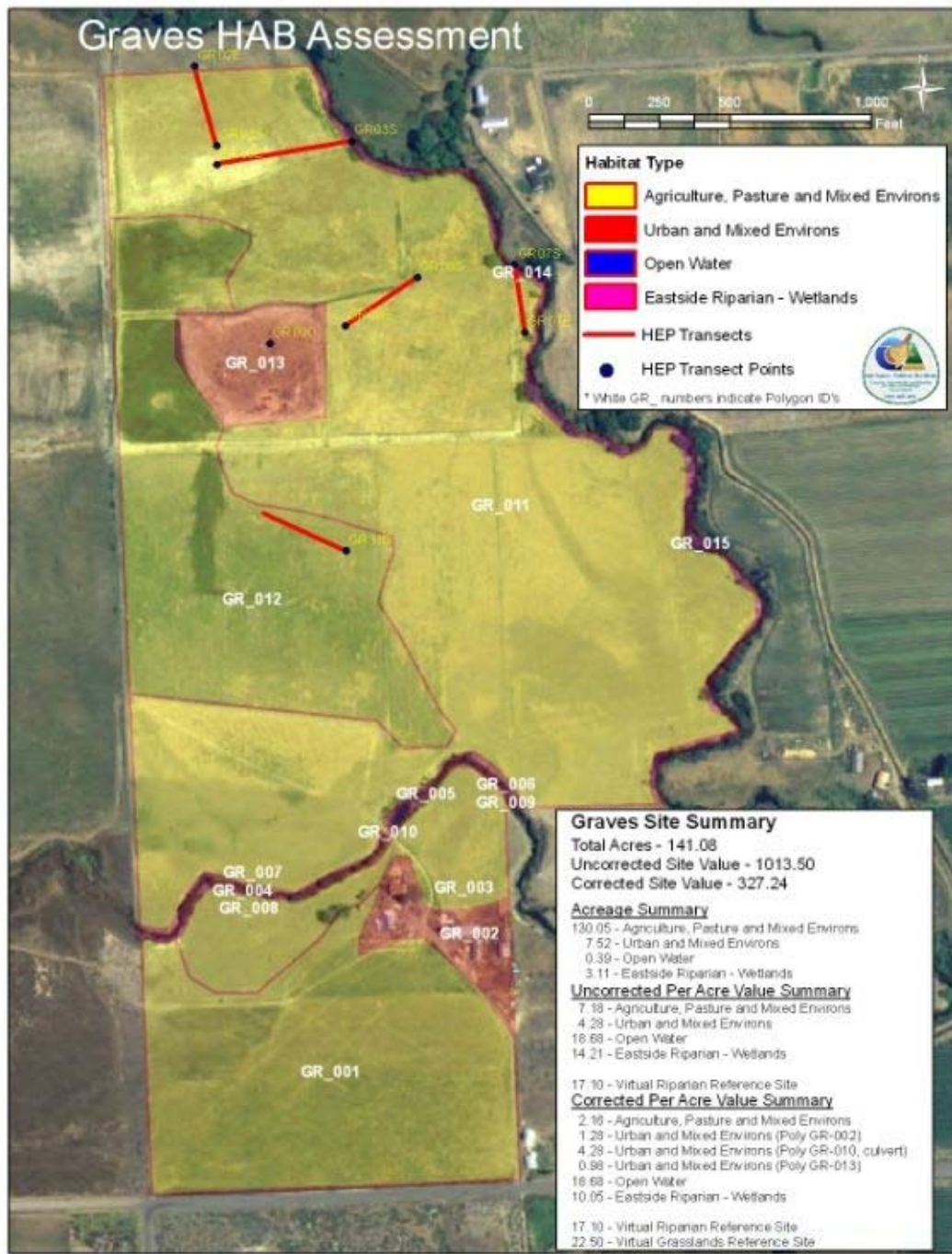
Draft 1927 Wildlife Habitat Types
for the Yakima Valley Floodplain



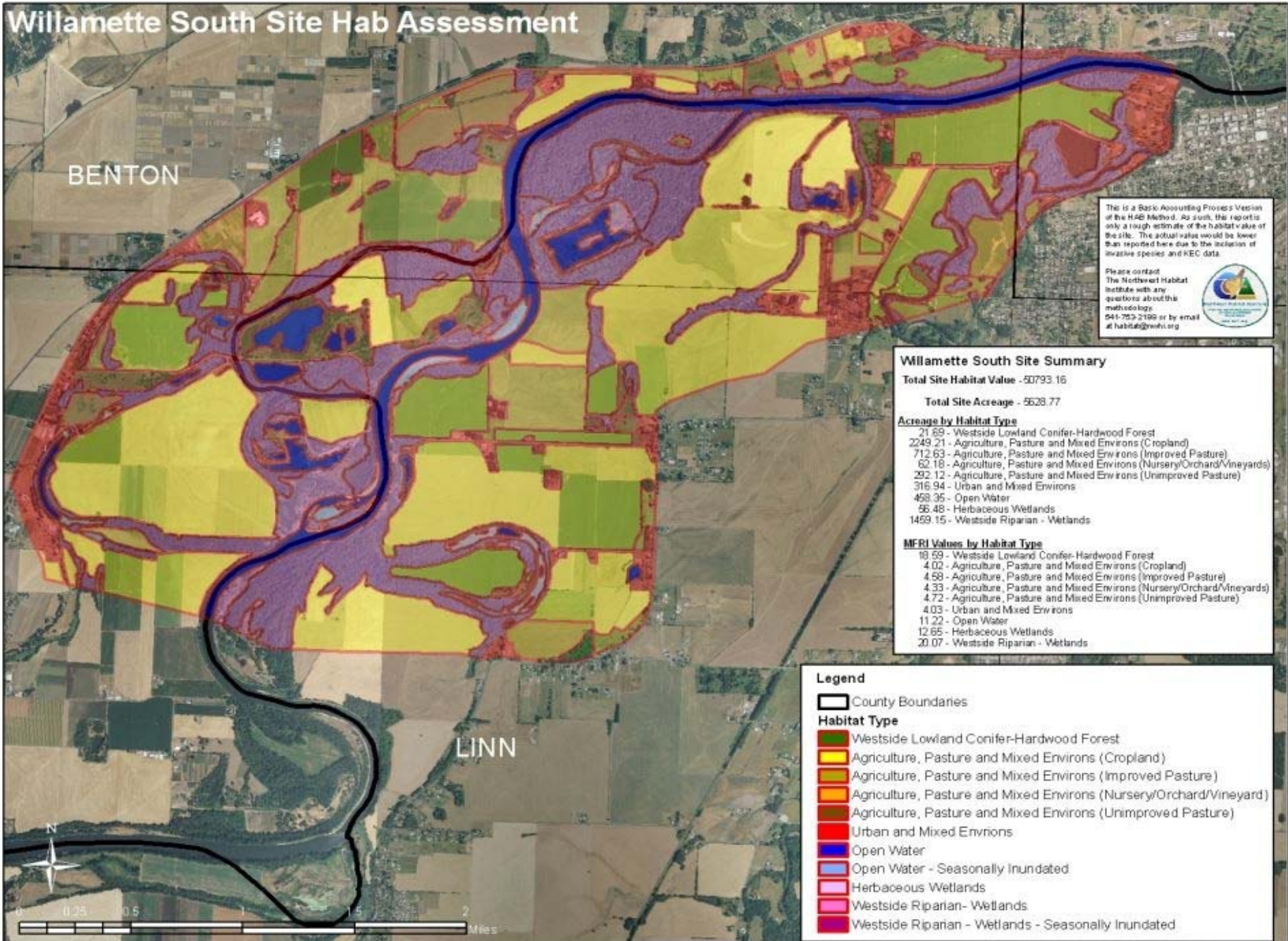
Draft 2005 Wildlife Habitat Types
for the Yakima Valley Floodplain



Graves HAB Assessment



Willamette South Site Hab Assessment



BENTON

LINN

This is a Basic Accounting Process Version of the HAB Method. As such, this reports only a rough estimate of the habitat value of the site. The actual value would be lower than reported here due to the inclusion of invasive species and NEC data.

Please contact The Northwest Habitat Institute with any questions about the methodology: 504-753-2100 or by email at habitat@nwhi.org



Willamette South Site Summary

Total Site Habitat Value - 50793.16
Total Site Acreage - 5528.77

Acreage by Habitat Type

- 21.69 - Westside Lowland Conifer-Hardwood Forest
- 2249.21 - Agriculture, Pasture and Mixed Environments (Cropland)
- 712.63 - Agriculture, Pasture and Mixed Environments (Improved Pasture)
- 62.18 - Agriculture, Pasture and Mixed Environments (Nursery/Orchard/Vineyards)
- 292.12 - Agriculture, Pasture and Mixed Environments (Unimproved Pasture)
- 316.94 - Urban and Mixed Environments
- 458.35 - Open Water
- 56.48 - Herbaceous Wetlands
- 1459.15 - Westside Riparian - Wetlands

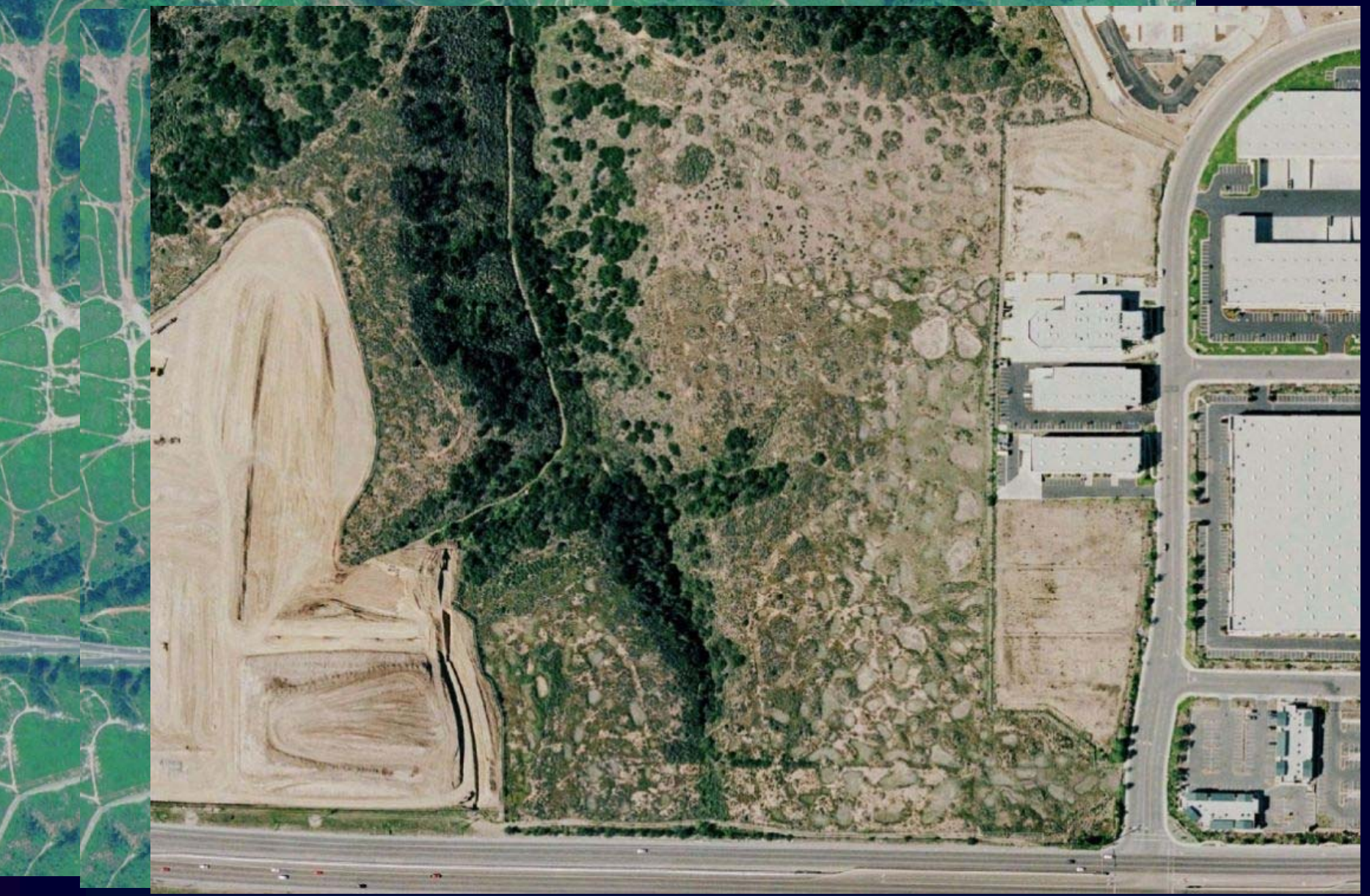
MERI Values by Habitat Type

- 18.59 - Westside Lowland Conifer-Hardwood Forest
- 4.02 - Agriculture, Pasture and Mixed Environments (Cropland)
- 4.58 - Agriculture, Pasture and Mixed Environments (Improved Pasture)
- 4.33 - Agriculture, Pasture and Mixed Environments (Nursery/Orchard/Vineyards)
- 4.72 - Agriculture, Pasture and Mixed Environments (Unimproved Pasture)
- 4.03 - Urban and Mixed Environments
- 11.22 - Open Water
- 12.65 - Herbaceous Wetlands
- 20.07 - Westside Riparian - Wetlands

Legend

- County Boundaries
- Habitat Type**
- Westside Lowland Conifer-Hardwood Forest
- Agriculture, Pasture and Mixed Environments (Cropland)
- Agriculture, Pasture and Mixed Environments (Improved Pasture)
- Agriculture, Pasture and Mixed Environments (Nursery/Orchard/Vineyard)
- Agriculture, Pasture and Mixed Environments (Unimproved Pasture)
- Urban and Mixed Environments
- Open Water
- Open Water - Seasonally Inundated
- Herbaceous Wetlands
- Westside Riparian - Wetlands
- Westside Riparian - Wetlands - Seasonally Inundated

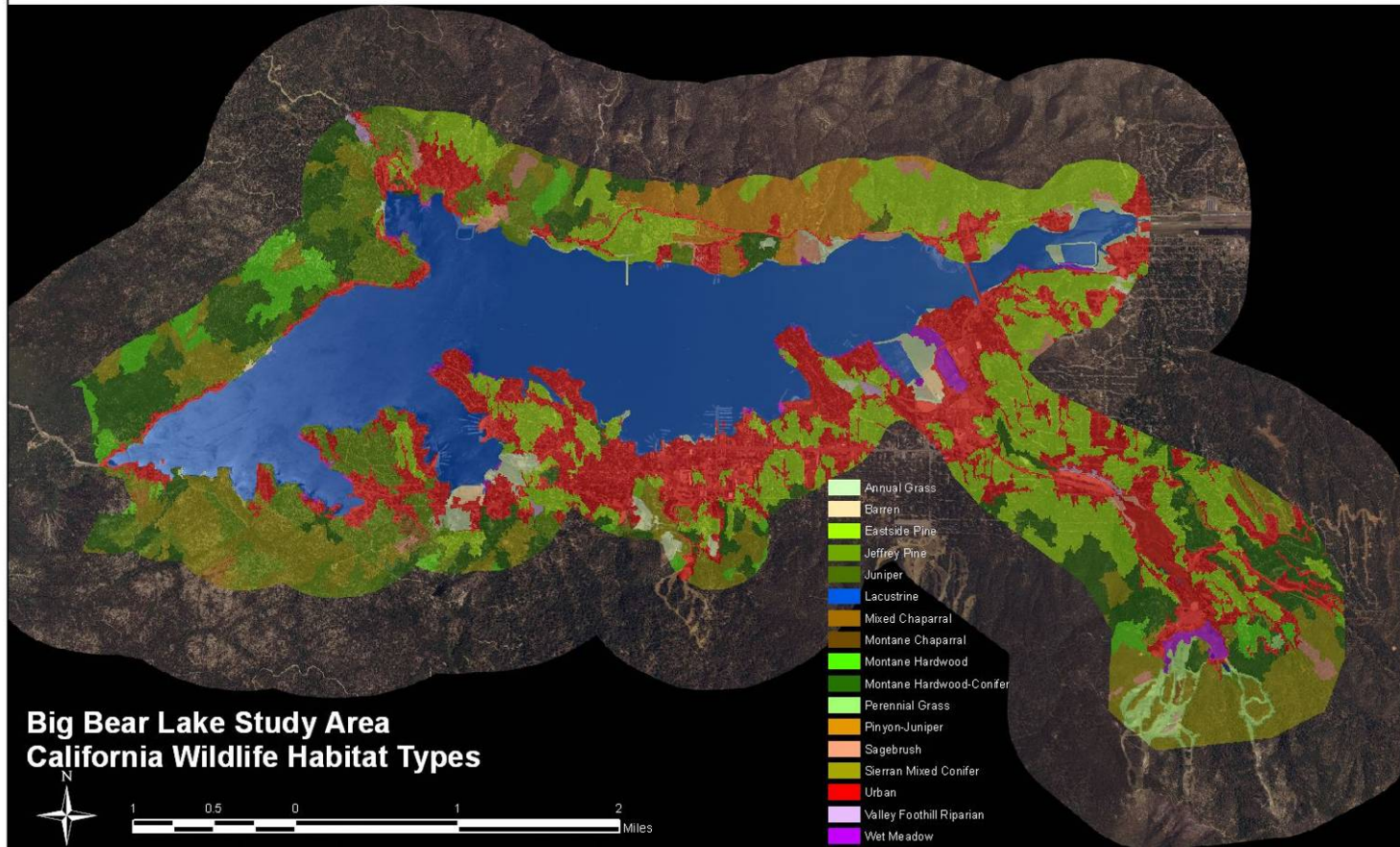




Cal-Terrace 2001 to 2007

Habitat Classifications

California Wildlife Habitat Types



Questions !

