Columbia Basin Fish and Wildlife Authority 2005

Determining a Site's Value for Fish and Wildlife From Impacts to Mitigation

Biological Neat Stuff

- Progressives have been hampered by a focus on specific issues
  "Nature is to complex and we do not have a good way to account for all the species that could potential use a site"
- In facing the force of nature, one can only be "flexible" and "adjust."
  "Yet we manage for unique or rare (T&E) and common is usually only acknowledged or assessed using one or a few species"
- Unable to communicate how each issue fits into a coherent set of values, we lose the fight for a language that resonates with the American public.

Environment is metaphorically framed in terms of economics and market forces

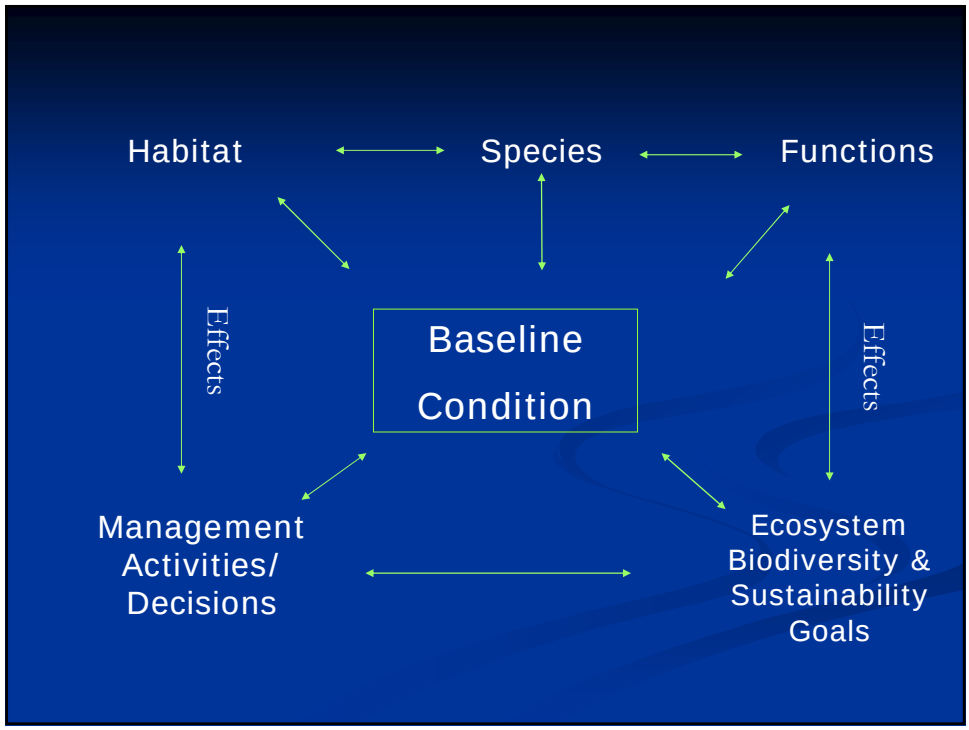
“How much is a Owl or Ants really worth”

But most of us believe that much of the Environment is not a product that can be bought

Old Concept
Yields a
New Currency

Habitat Value

Species-Habitat-Function
Gives a Value
for Fish and Wildlife

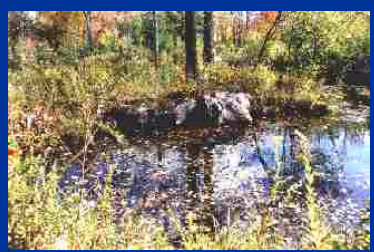


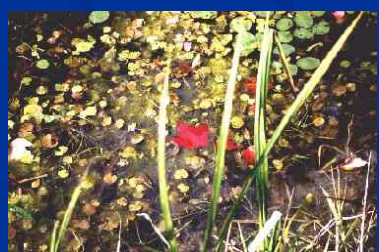
Consistently Identifies 32 Wildlife-Habitat Types

Consistently Identifies 47 Structural Conditions and Land Uses

Consistently Identifies over 350 Key Environmental Correlates (KECs)

Habitat elements that are key or critical microhabitat, substrate, or other environmental (physical or biological) factors thought to most influence a species distribution, abundance, fitness, and viability





Northern River Otter has **57** Key Environmental Correlates (KECs)

1.1.1.2	down wood in riparian areas
2.3	beaver/muskrat activity (dams, lodges, ponds)
2.4	burrows (aquatic or terrestrial)
4.2.1	oxbows
4.2.10	overhanging vegetation
4.2.12	banks
4.2.4.1	boulders
4.2.4.2	cobble/gravel
4.2.5.1	submergent vegetation
4.2.6	coarse woody debris in streams and rivers
4.2.7	pools
4.2.8	riffles
4.2.9	runs/glides
4.3	ephemeral pools
4.6	lakes/ponds/reservoirs

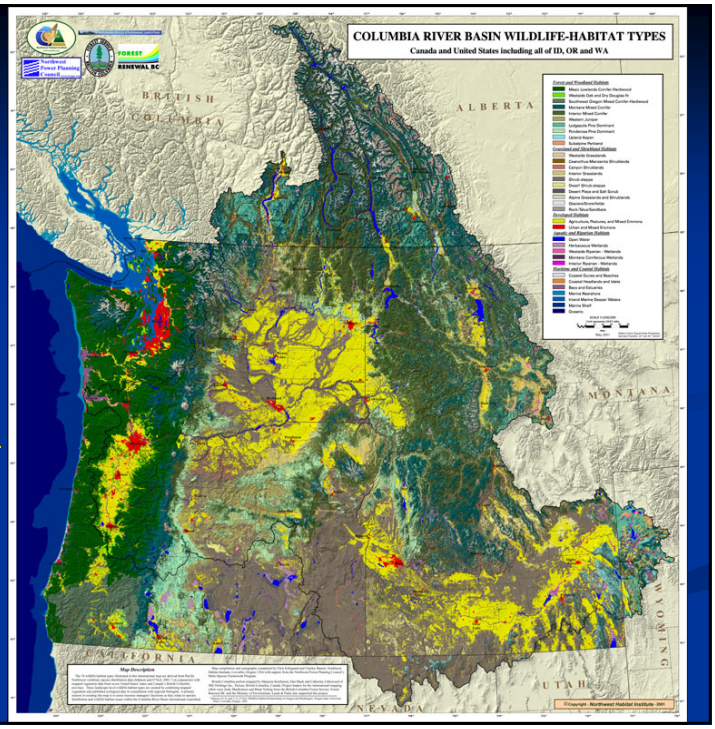
Key Ecological Functions (**KEFs**)

The principal way organisms influence the environment

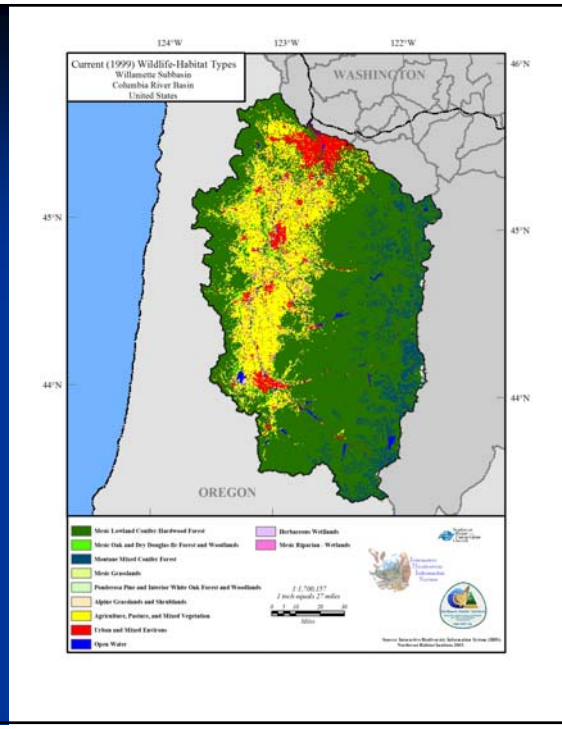
Northern River Otter has 12 Key Ecological Functions

1	Trophic relationships
1.1	heterotrophic consumer
1.1.2	secondary consumer (primary predator or primary carnivore)
1.1.2.1	invertebrate eater
1.1.2.1.1	terrestrial invertebrates
1.1.2.1.2	aquatic macroinvertebrates
1.1.2.2	vertebrate eater (consumer or predator of herbivorous vertebrates)
1.1.2.2.1	piscivorous (fish eater)
3	organismal relationships
3.12	uses burrows dug by other species (secondary burrow user)
3.13	creates runways (possibly used by other species)
3.2	controls terrestrial vertebrate populations (through predation or displacement)

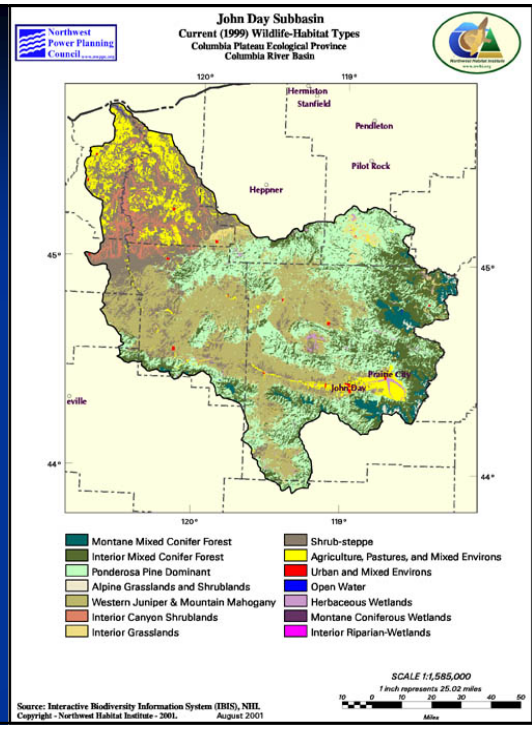
Entire Columbia River Basin

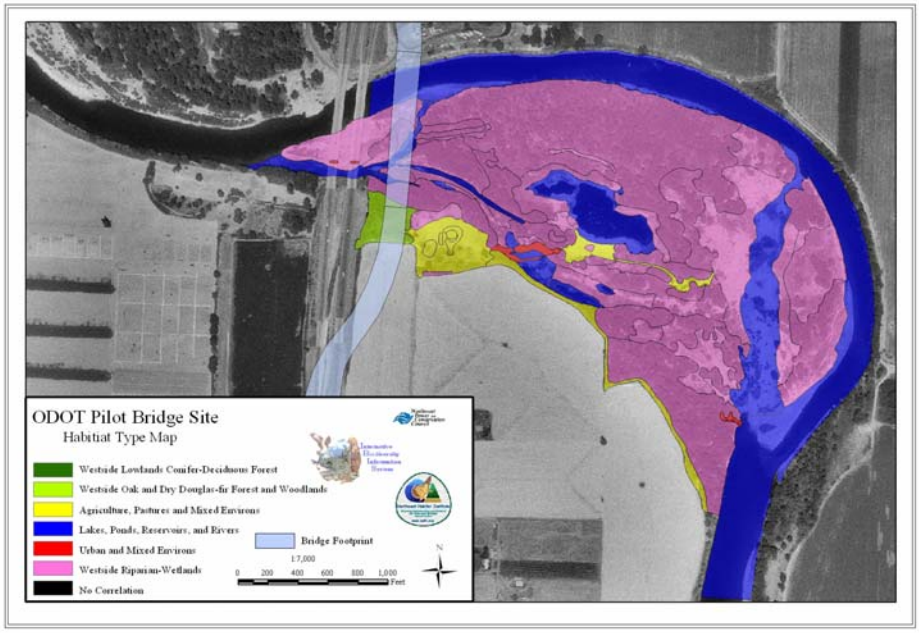


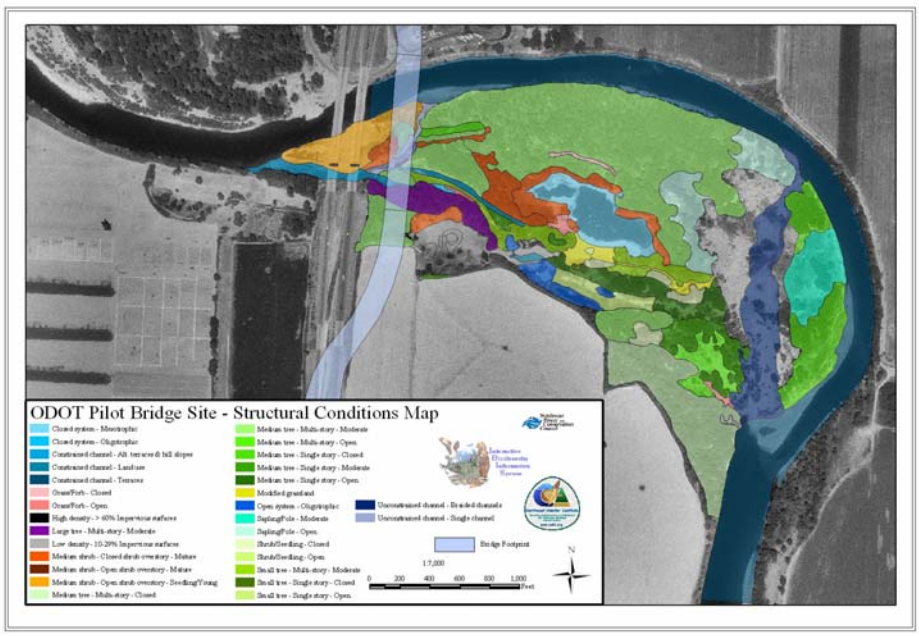
Ecoprovince

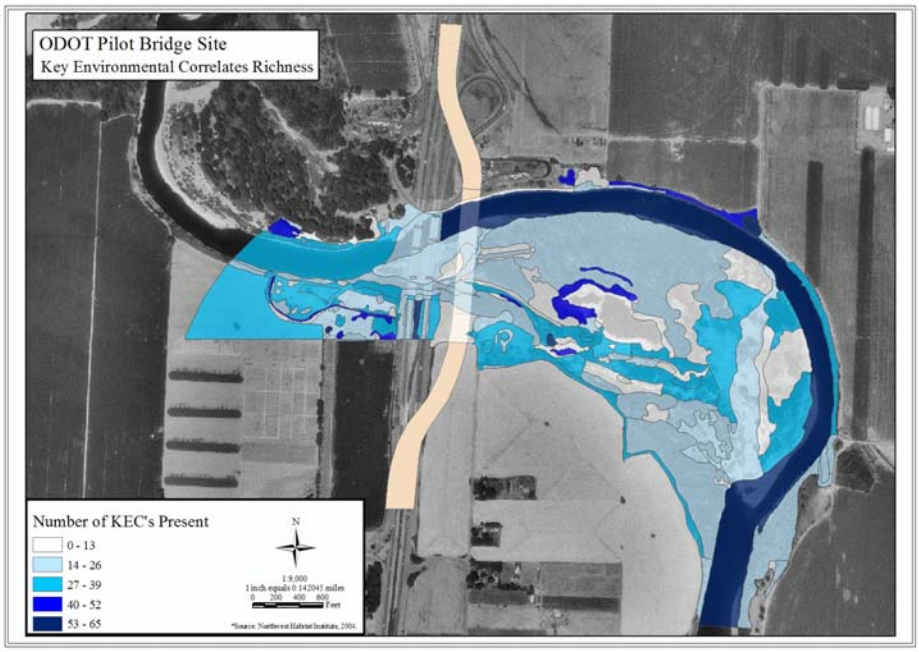


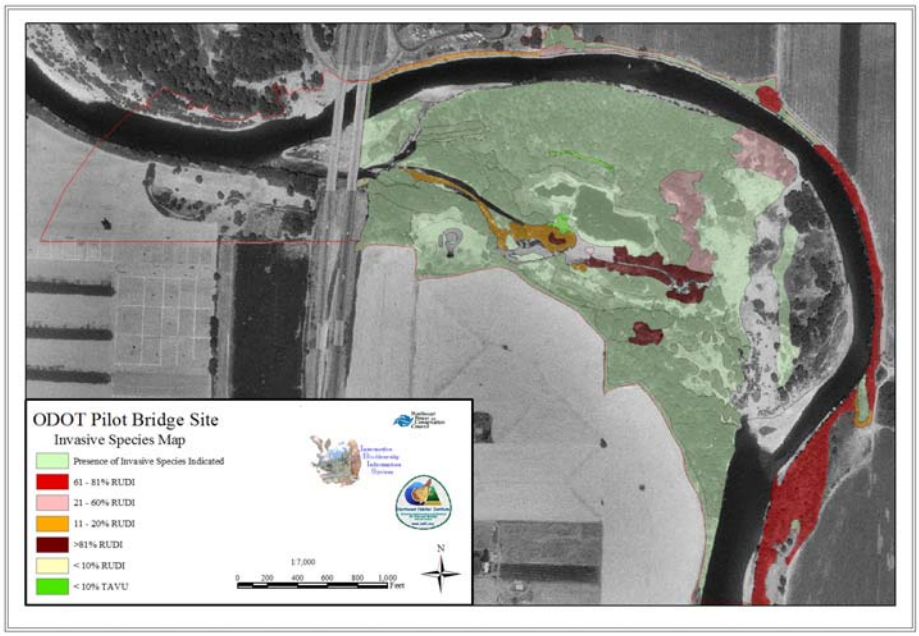
Subbasin

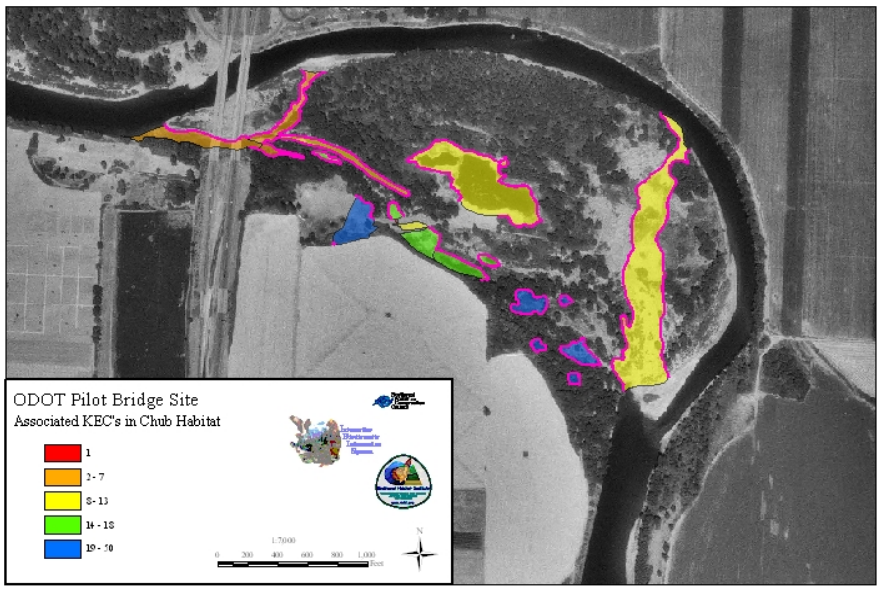



ODOT Pilot Bridge Site
Habitat Type Map
Westside Lowlands Conifer-Deciduous Forest
Westside Oak and Dry Douglas-fir Forest and Woodlands
Agriculture, Pastures and Mixed Environs
Lakes, Ponds, Reservoirs, and Rivers
Urban and Mixed Environs
Westside Riparian-Wetlands
No Correlation
Bridge Footprint
1:7,000
0 200 400 600 800 1,000
Feet
N


ODOT Pilot Bridge Site - Structural Conditions Map
Bridge Footprint
1:7,000
0 200 400 600 800 1,000
Feet
N


ODOT Pilot Bridge Site
Key Environmental Correlates Richness
Number of KEC's Present
0 - 13
14 - 26
27 - 39
40 - 52
53 - 65
N
1:9,000
1 inch equals 0.142045 miles
0 200 400 600
Feet
*Source: Northwest Habitat Institute, 2004.

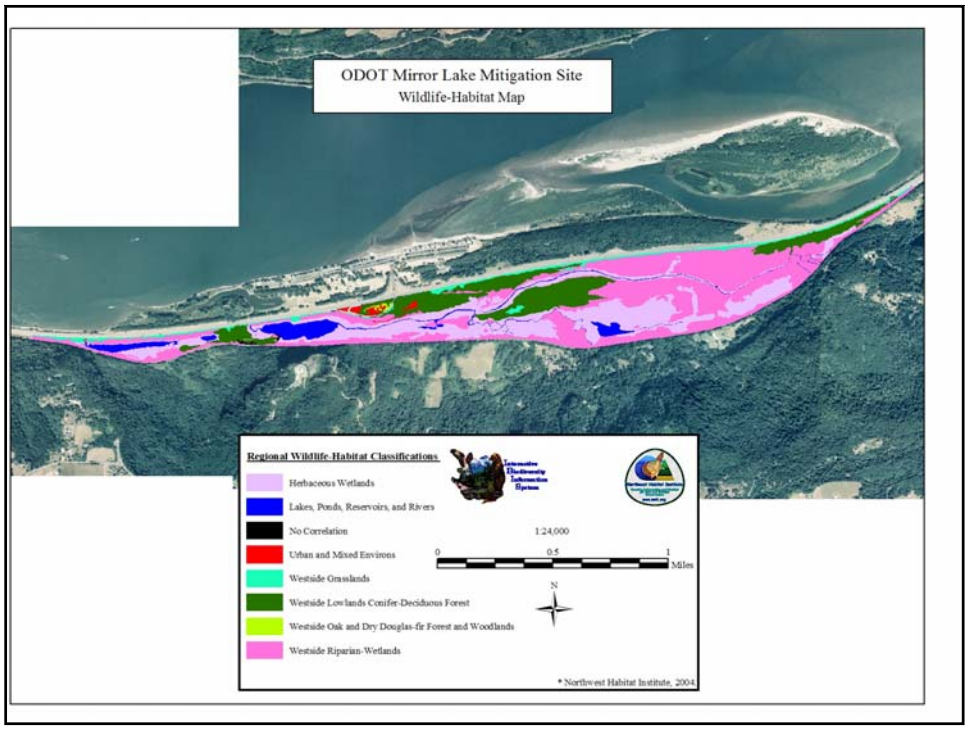

ODOT Pilot Bridge Site
Invasive Species Map
Presence of Invasive Species Indicated
61 - 81% RUDI
21 - 60% RUDI
11 - 20% RUDI
>81% RUDI
< 10% RUDI
< 10% TAVU
1:7,000
0 200 400 600 800 1,000
Feet
N



FRI = Functional Redundancy Index

Number of species potentially performing KEFs/Number of KEFs

Determined for each Ecoprovince by Wildlife Habitat Type



Wildlife-Habitat Acreage X FRI

Minus Adjustment Factors

Rapid Site Value

Functional Redundancy Index

Habitat Type	Ecoprovince		
	Lower Columbia	Willamette Valley	Klamath Mountains
Westside Lowlands Conifer-Hardwood Forest	**17.90**	**18.87**	**0**
Westside Oak & Douglas-fir Forest & Woodlands	**17.51**	**18.15**	**18.25**
Westside Riparian	**19.10**	**20.37**	**0**
Eastside Riparian	**0**	**0**	**21.72**
ETC>>>>>>>>>			

Local Condition	Local Condition Adjustment Factor
Adjacent Land Use	
High Urban Development like Major Roads	**0.05**
Intensive Industrial Forestry or Agriculture	**0.05**
Invasive Plant Species within Map Unit	
25-50% cover	**0.1**
50-75% cover	**0.2**
>75% cover	**0.3**
Substantial Anthropogenic Impacts within Map Unit (soil compaction, pollution, etc.)	
Limited	**0.05**
Extensive	**0.1**
Map Unit Area	
Map Unit Area > 20 acres	**0**
Map Unit Area > 10 but ≤ 20 acres	**0.05**
Map Unit Area > 5 but ≤ 10 acres	**0.1**
Map Unit Area > 1 but ≤ 5 acres	**0.15**
Map Unit Area ≤ 1 acres	**0.2**

Wildlife-Habitat Type	Acre	FRI	Anthro. Impacts	Adjacent Land Use	Grass/Forb Layer	Shrub Layer	Tree Layer	Invasive Species Factor	Habitat Value
Westside Riparian	0.11	20.4	0.95	0.56	0.90	0.70	1.00	0.86	1.0
Westside Riparian	0.03	20.4	0.95	0.60	0.90	1.00	1.00	0.97	0.4
Urban Mixed Environs	0.29	4.1	0.95	1.00	1.00	NP	NP	1.00	1.1
Open Water	0.78	10.4	0.95	0.96	NP	NP	NP	1.00	7.4

Advance
Establish a Baseline Value

- Inventory site for habitat types, structural conditions and key environmental correlates (KECs)
- Determine the amount and proportion of each habitat type on site
- Determine a potential species list for the site
  - Based on habitat types, structural conditions, & KECs
- Determine potential number of functions that may occur on site
  - Based on the potential list of fish and wildlife species

Baseline Habitat Value

Field Work:
- Habitat Types
- Structural Conditions
- Key Environmental Correlates (KECs)
- Invasive Species

↓

Species List

↓

List of Key Ecological Functions (KEFs)

→

Weighted Value for Each KEF =
(# of species) x (% of total acreage)

↓

Multivalue for Each Habitat Type =
Sum of Weighted Values

↓

Discrete Weighted Area Average Value (DWAAV) for Each Habitat Type =
(Multivalue) ÷ (# of KEFs)

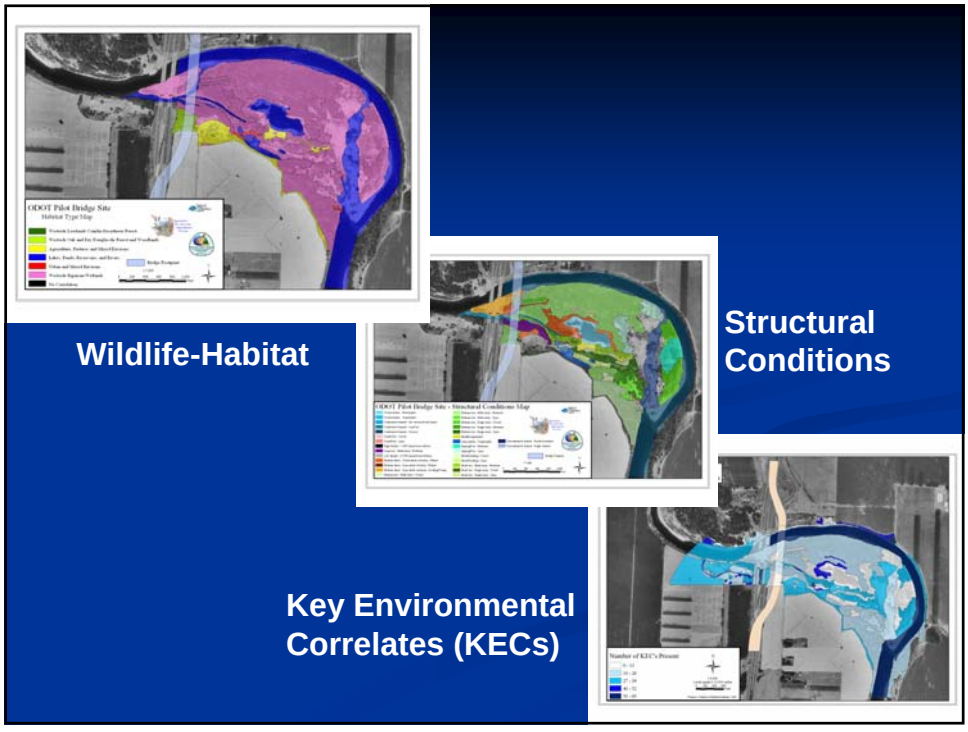
↓

Potential Habitat Value for each Habitat Type
$V^*_H = DWAAV \times A_H \div (A_H / A_S)$

↓

Potential Habitat Value for each Map Unit
$V^*_M = DWAAV \times A_M \div (A_H / A_S)$

↓

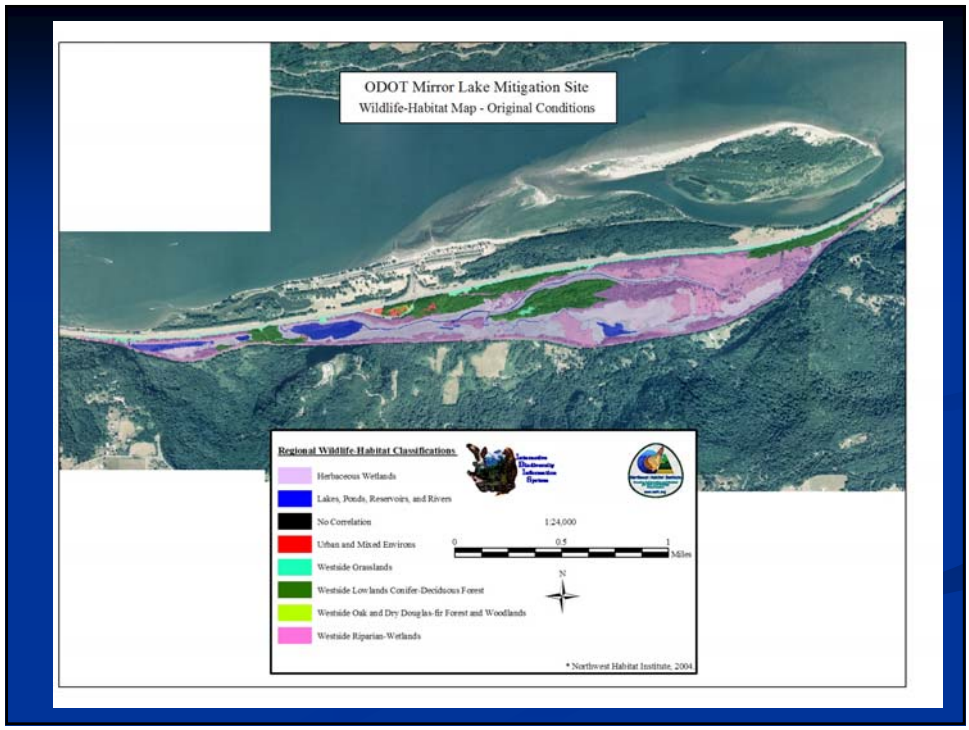


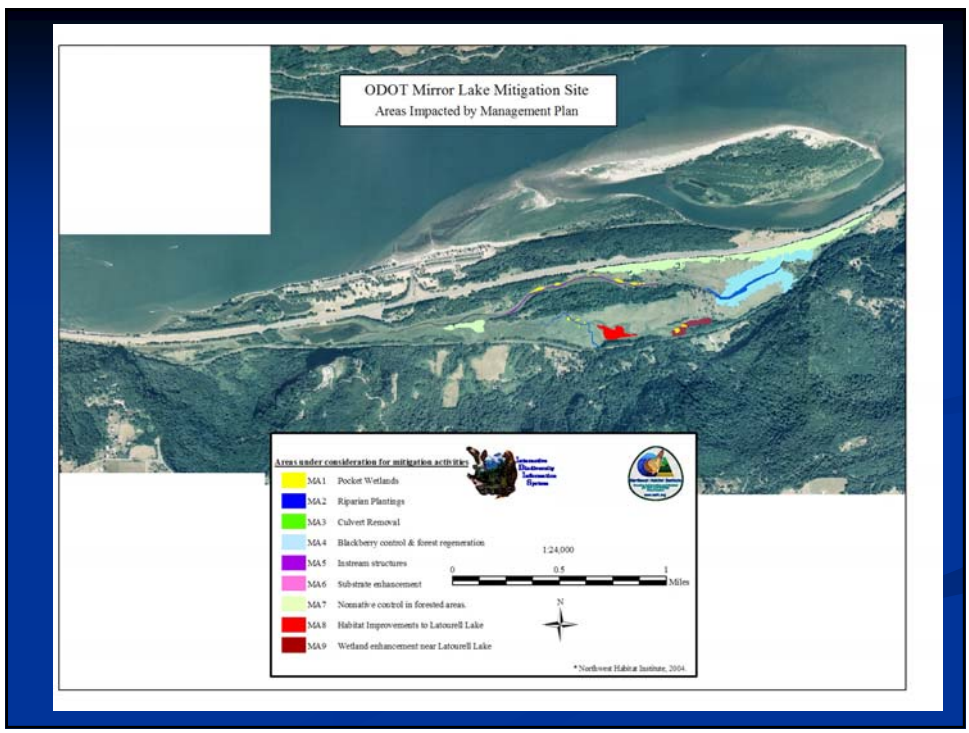
Baseline Habitat Value

Step	Spatial Scale
1. Determine baseline *potential* habitat value	Habitat Type
↓	
2. Determine baseline *potential* habitat value	Map Unit
↓ *invasive species factor*	
3. Determine baseline habitat value	Map Unit
↓	
4.a. Determine baseline habitat value	Habitat Type
4.b. Determine baseline habitat value	Entire Site

Anticipated Future Habitat Value

Step	Spatial Scale
1. Delineate management actions	Habitat Type /
↓	Map Unit
2. Determine future *potential* habitat value	Map Unit
↓ *invasive species factor*	
3. Determine future habitat value	Map Unit
↓	
4.a. Determine future habitat value	Habitat Type
4.b. Determine future habitat value	Entire Site

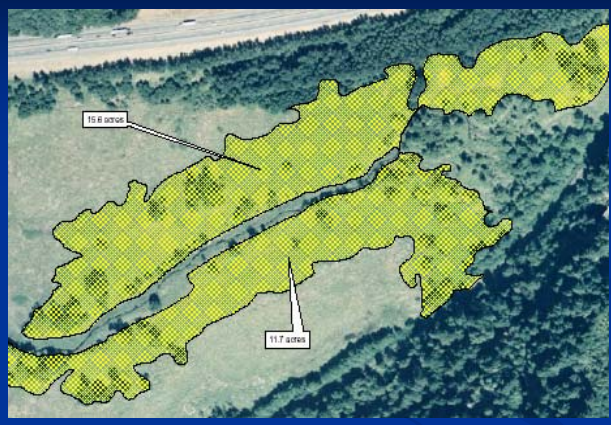

ODOT Mirror Lake Mitigation Site
Wildlife-Habitat Map - Original Conditions
Regional Wildlife-Habitat Classifications
Herbaceous Wetlands
Lakes, Ponds, Reservoirs, and Rivers
No Correlation
Urban and Mixed Environs
Westside Grasslands
Westside Lowlands Conifer-Deciduous Forest
Westside Oak and Dry Douglas-fir Forest and Woodlands
Westside Riparian-Wetlands
1:24,000
0
0.5
1
Miles
N
* Northwest Habitat Institute, 2004


ODOT Mirror Lake Mitigation Site
Areas Impacted by Management 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
0
0.5
1
Miles
N
* Northwest Habitat Institute, 2004

Mirror Lake – Site Value Presentation

MA4 – Blackberry Control & Forest Regeneration

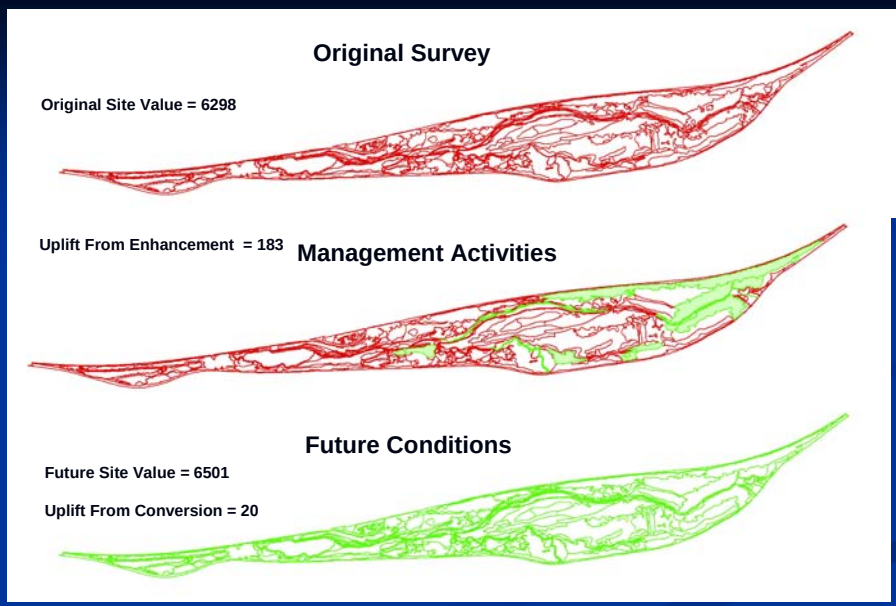
- Mechanical removal of blackberry
- Potentially supplement mechanical removal with herbicide treatments
- Plant native herbaceous and woody species (primarily composed of Oregon ash and cottonwoods)



Mirror Lake – Site Value Presentation

MA1 – Pocket Wetlands

- Mimic existing on-site wetlands with native species dominance
- Excavate to create hydrologic regime that favors native species
- Plant native species (e.g., sedges, wapato, etc.)
- Import downed wood structures for habitat diversity
- To be constructed along margins of Latourell and Young Creeks
- Provide off-channel fish habitat during high flows



Impact Value

Future Value MINUS **Baseline Value**

Baseline Condition

HABITATS	Westside Oak and Dry Douglas-fir Forest & Woodlands	Agriculture, Pasture, and Mixed Environs (westside)	Urban and Mixed Environs (westside)	Lakes, Rivers, Ponds, and Reservoirs	Westside Riparian - Wetlands
Multi-Value of Habitat	13.29	8.17	0.52	419.96	616.46
Number of KEFs	65	43	32	64	65
Discrete Weighted Area Average Value	0.2044	0.1901	0.0164	6.5618	9.4840
Habitat Acreage	2.23	7.23	0.75	52.93	95.28
Baseline Value (V*m) by Habitat Type	32.38	30.11	2.59	1039.52	1502.45
Priority Habitats Weighted Area Average:	9.69	All Natural Habitats Weighted Area Average:	16.25	Overall Weighted Area Average:	16.46
Priority Habitats Site Value:	1535	All Natural Habitats	2574	Total Site Value:	2607

Impact Value

BASELINE Priority Habitats Weighted Area Average	9.69	BASELINE All Natural Habitats Weighed Area Average	16.25	BASELINE Total Site Value:	16.46
BASELINE Priority Habitats Value:	1535	BASELINE All Natural Habitats Value:	2574	BASELINE Total Site Value:	2607
FUTURE Priority Habitats Weighted Area Average	8.64	FUTURE All Natural Habitats	11.05	FUTURE Total Site Value:	11.25
FUTURE All Natural Habitats Value	935	FUTURE Site All Natural Habitats	1752	FUTURE Total Site Value:	1770
DIFFERENCE	-600	FUTURE All Natural Habitats	-822	FUTURE Total Site Value:	-837

Future Value

1	+	Future New KEC's in Polygon	/	Number of Original KEC's in Polygon	+	0.33	*	Future Enhanced KEC's in Polygon	/	Number of Original KEC's in Polygon	=	Augmentation Multiplier

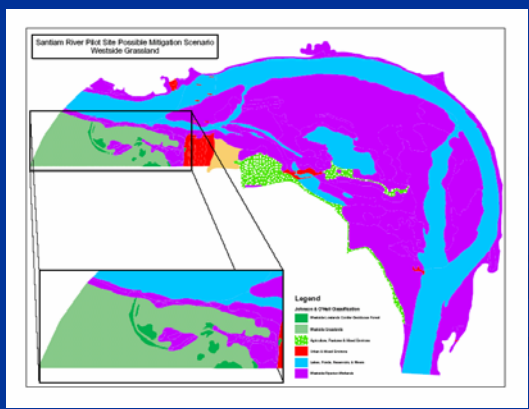
	MA1	MA2	MA3
Original KEC count	27	36	18
Future New KEC's	17	30	5
Future Enhanced KEC's	9	1	3
Augmentation Multiplier	1.74	1.84	1.33

Future Value of Polygon (V'm) formula.

DWAAV'	*	Area of Polygon'	/	(Ah/As')	*	Augmentation Multiplier	=	Future Value (V*m')

Calculation of Future Value of Site (V'm).

MIT_SITE	SITE_ID	REG_CLASS	DWAAV	Acres	Ah / As	Augmentation Multiplier	Future Value (V*m')
Mirror Lake	MP-298	1	2.57	4.32	0.1751	1.74	110.33
Mirror Lake	MP-288	2	0.03	0.90	0.0018	1.74	26.10
Mirror Lake	MP-002	11	0.36	4.49	0.0421	1.00	38.39
Mirror Lake	MP-073	20	0.03	0.73	0.0072	1.00	3.04
Mirror Lake	MP-004	21	0.93	5.89	0.0602	1.85	168.33
Mirror Lake	MP-168	22	1.79	24.01	0.2755	1.31	204.36
Mirror Lake	MP-237	23	7.36	13.56	0.4377	1.31	298.70
		Sum of Polygon Future Values = Future Site Value					849.25

Creation Value
(performance driven)

- Achieved by increasing amount of habitat(s) #Spp x portion of Habitat Type(s) by KEFs