



Lower Columbia
Estuary
Partnership

Status of Habitat Availability, Reserve System in the Lower Columbia River



Catherine Corbett, Keith Marcoe and Matt Schwartz
October 26, 2017

Vision, Goals, Actions - Estuary Partnership Management Plan (required of all NEPs)

Actions in Management Plan call for:

- ✓ Inventory and prioritize habitat types
- ✓ Monitor status and trends of conditions
- **Protect, restore or enhance:**
 - ✓ 16,000 acres of habitat by 2010
 - ✓ 19,000 acres of habitat by 2014
 - 25,000 acres of habitat by 2025
- ✓ **Protected and/or restored 23,195 acres since 2000**
- ***Empirically-derived habitat coverage targets:***
 - No net loss as of 2009 (50% loss, or 114,050 acres lost)
 - Restore 10,382 acres of priority habitats by 2030
 - Restore 22,480 acres of priority habitats by 2050

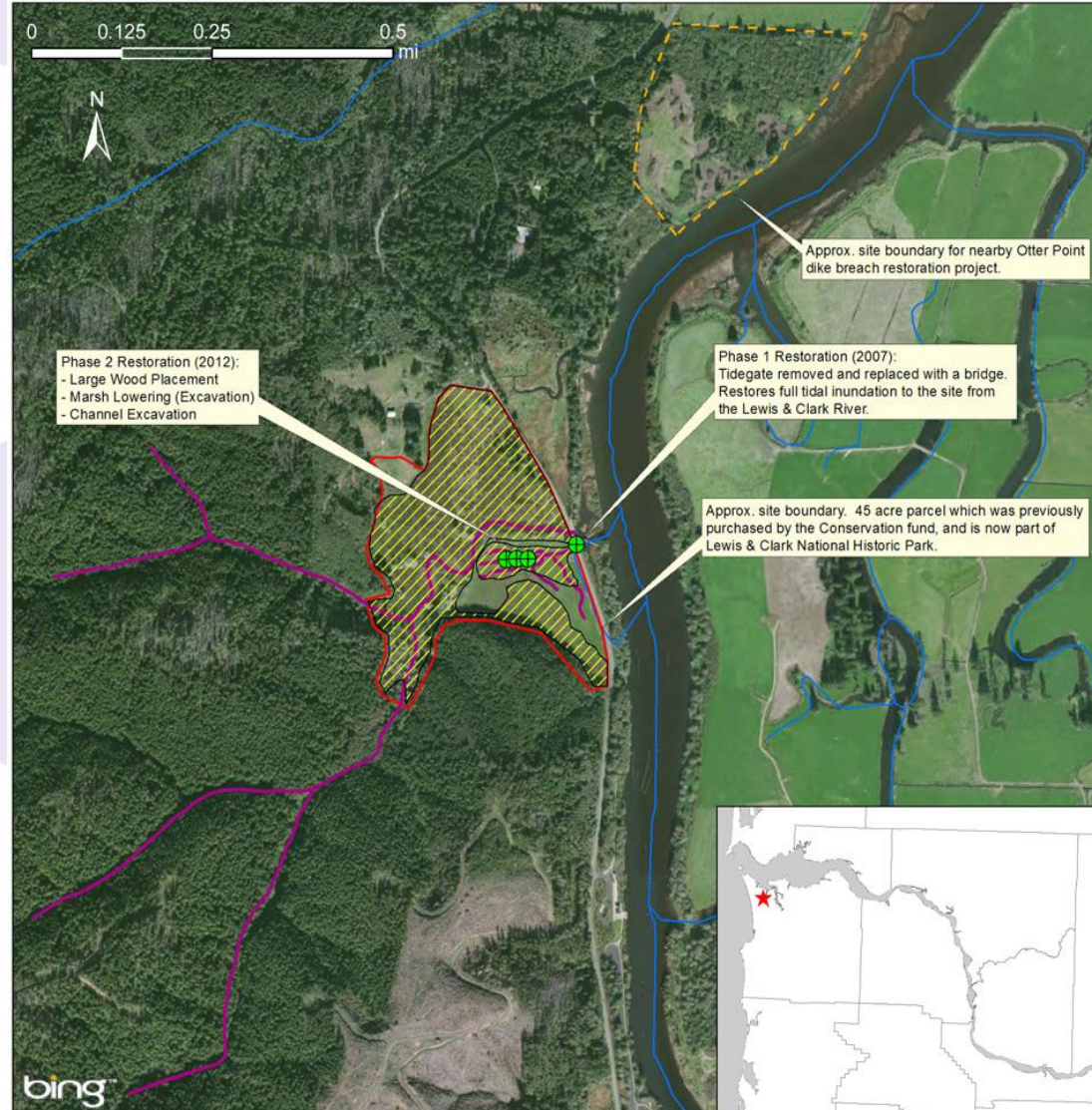


Track Actions in a Restoration Project Inventory

Geodatabase (polygon) of restoration, protection projects

- > 200 projects
- Track status – planned, underway, completed
- Track actions, project location, extent, types of habitats, project sponsor
- **Application** – Use with Habitat Coverage Targets to identify gaps in actions

Available Online:



Project:
Fort Clatsop/
Colewort Creek

Sponsor: CREST
Phase 1 Restoration
Completed in 2007

Phase 2 Restoration
Completed in 2012

Site Location:
46.1285 N
123.88052 W

Map Legend

- Approx. Project Boundary
- Location of Restoration Action
- ▨ Approx. Area of Affected Acres
- Approx. Boundary of Nearby Restoration Project
- USGS NHD Stream Lines:
 - ▬ Affected by Restoration
 - ▬ Other Stream

Notes:
Post-restoration effectiveness monitoring has been ongoing.

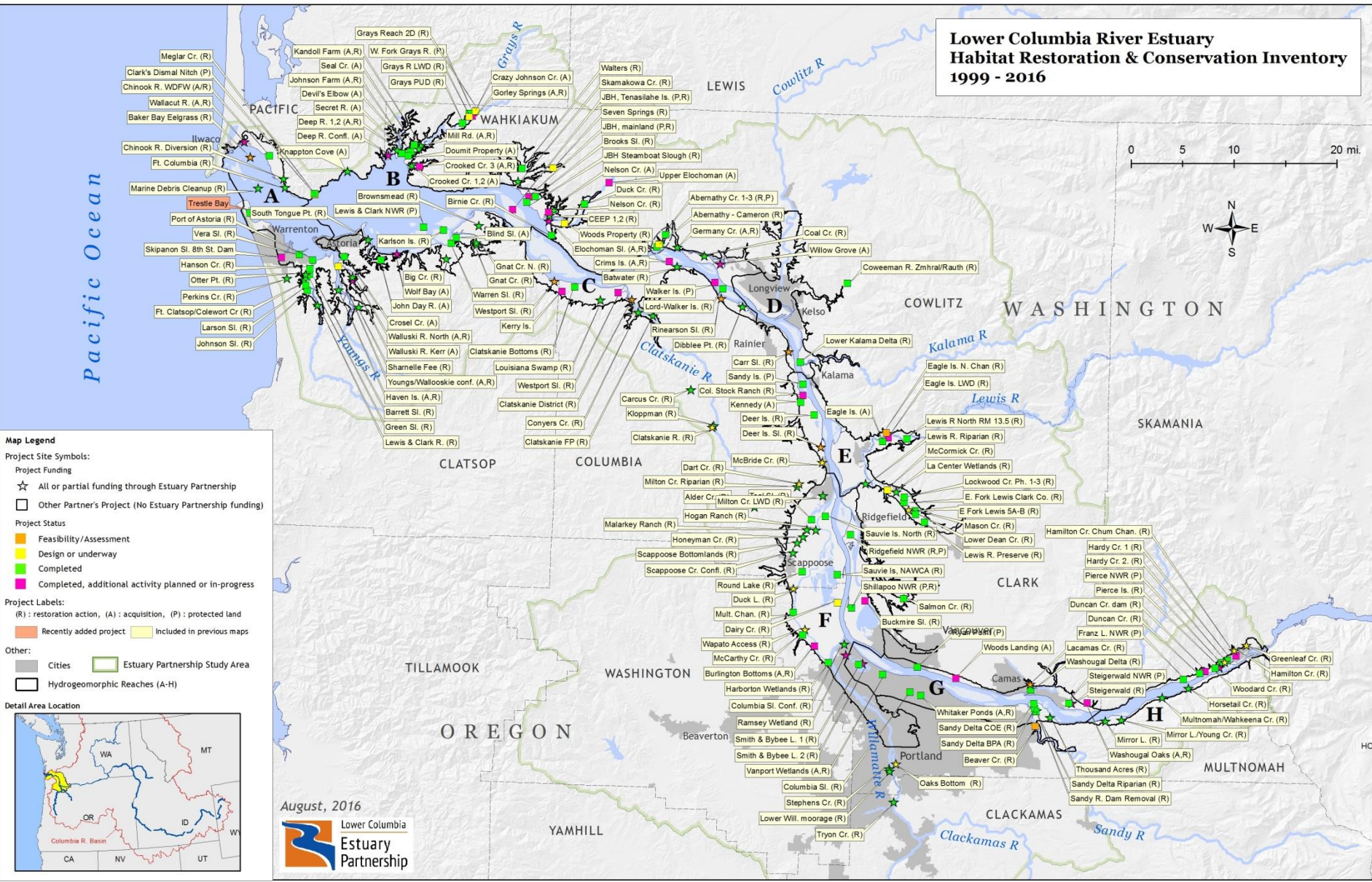
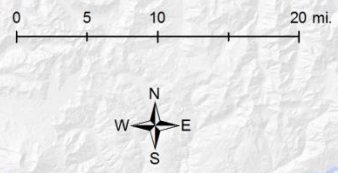
Map created: December 11, 2013



➤ 200 projects in different stages (planned, design, completed)

➤ 23,195 acres restored or protected

**Lower Columbia River Estuary
Habitat Restoration & Conservation Inventory
1999 - 2016**



Map Legend

Project Site Symbols:

Project Funding

- ☆ All or partial funding through Estuary Partnership
- Other Partner's Project (No Estuary Partnership funding)

Project Status

- Orange square: Feasibility/Assessment
- Yellow square: Design or underway
- Green square: Completed
- Pink square: Completed, additional activity planned or in-progress

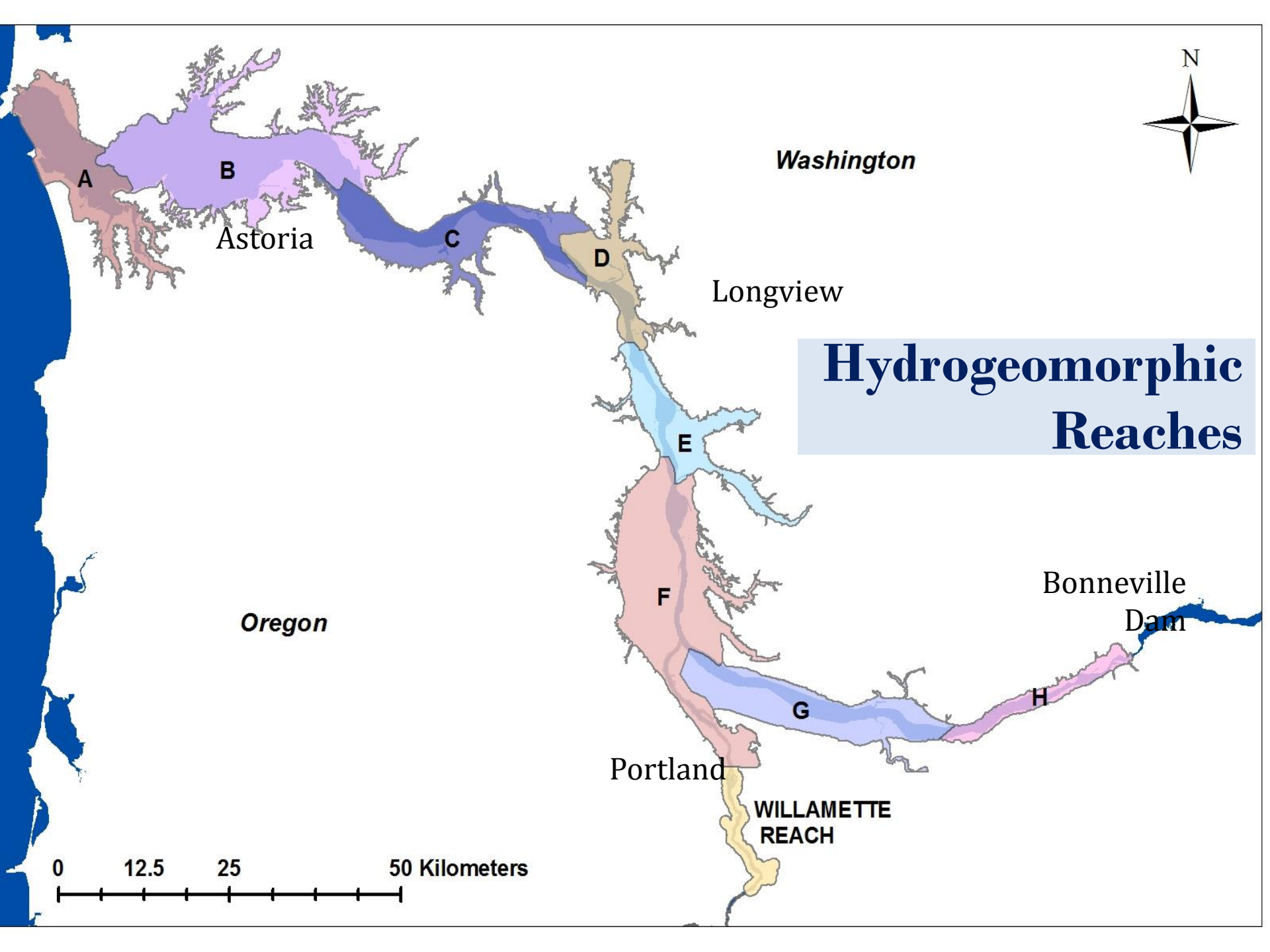
Project Labels:

- (R) : restoration action, (A) : acquisition, (P) : protected land
- Red square: Recently added project
- Yellow square: Included in previous maps

Other:

- Grey square: Cities
- Green outline: Estuary Partnership Study Area
- Blue outline: Hydrogeomorphic Reaches (A-H)





N



Washington

A

B

Astoria

C

D

Longview

Hydrogeomorphic Reaches

F

Oregon

Bonneville Dam

G

H

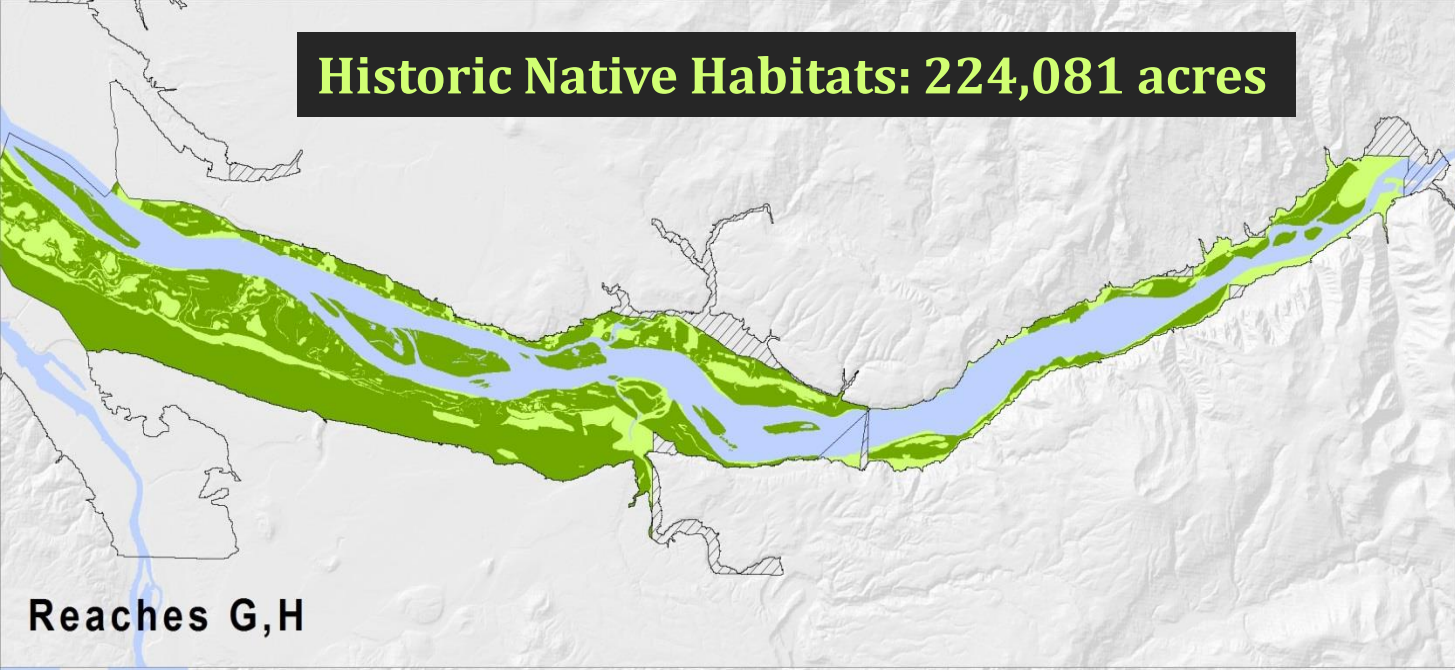
Portland

WILLAMETTE REACH

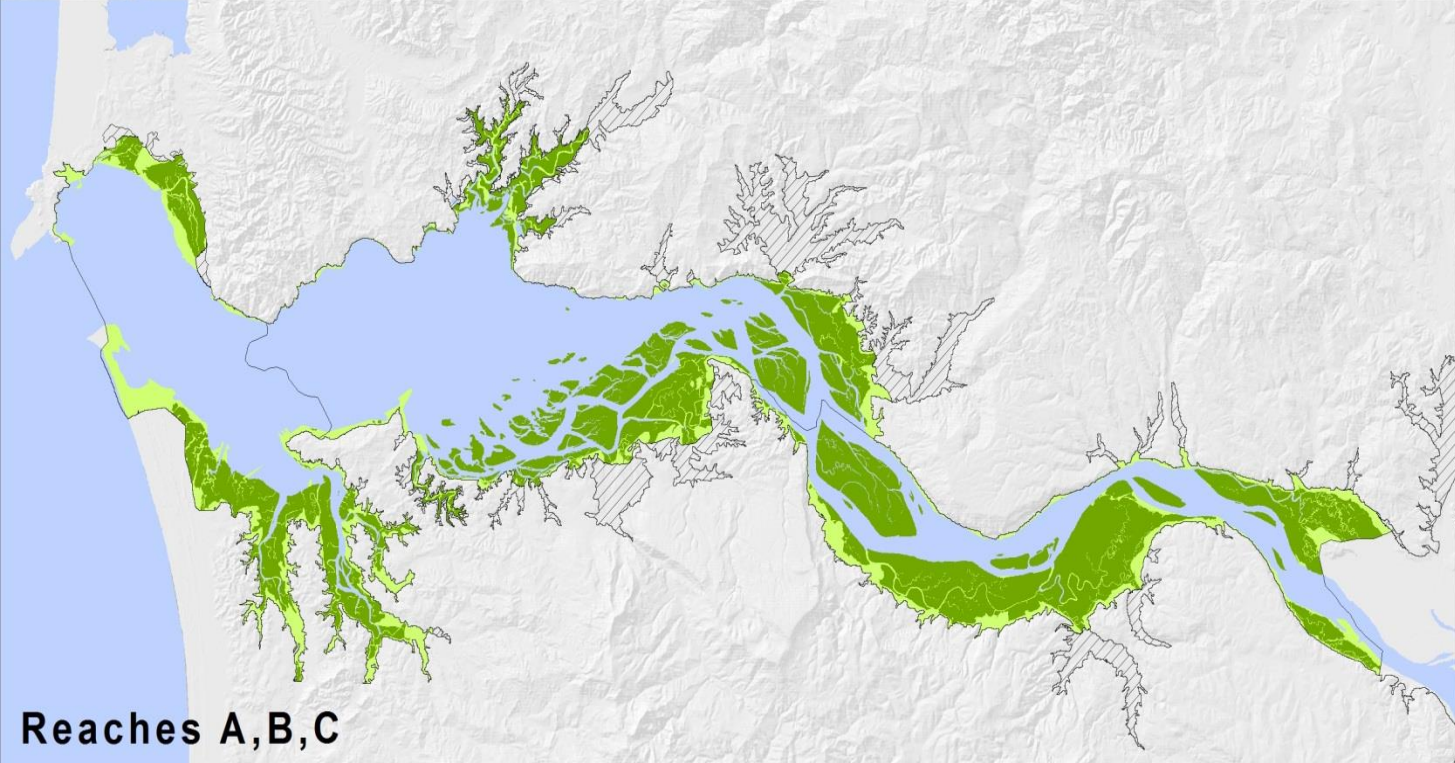
0 12.5 25 50 Kilometers



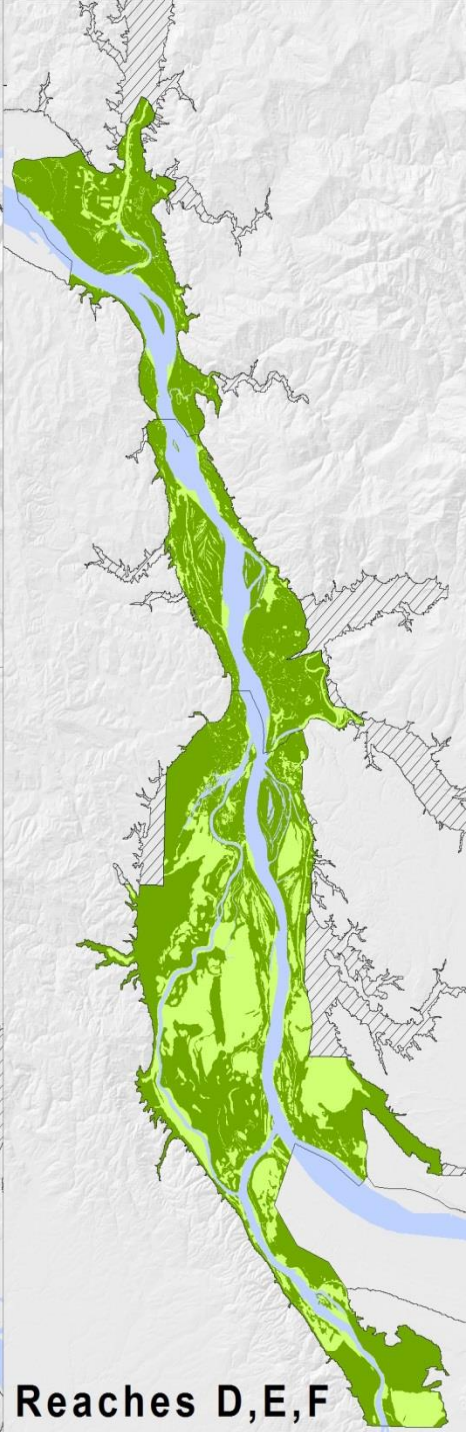
Historic Native Habitats: 224,081 acres



Reaches G,H

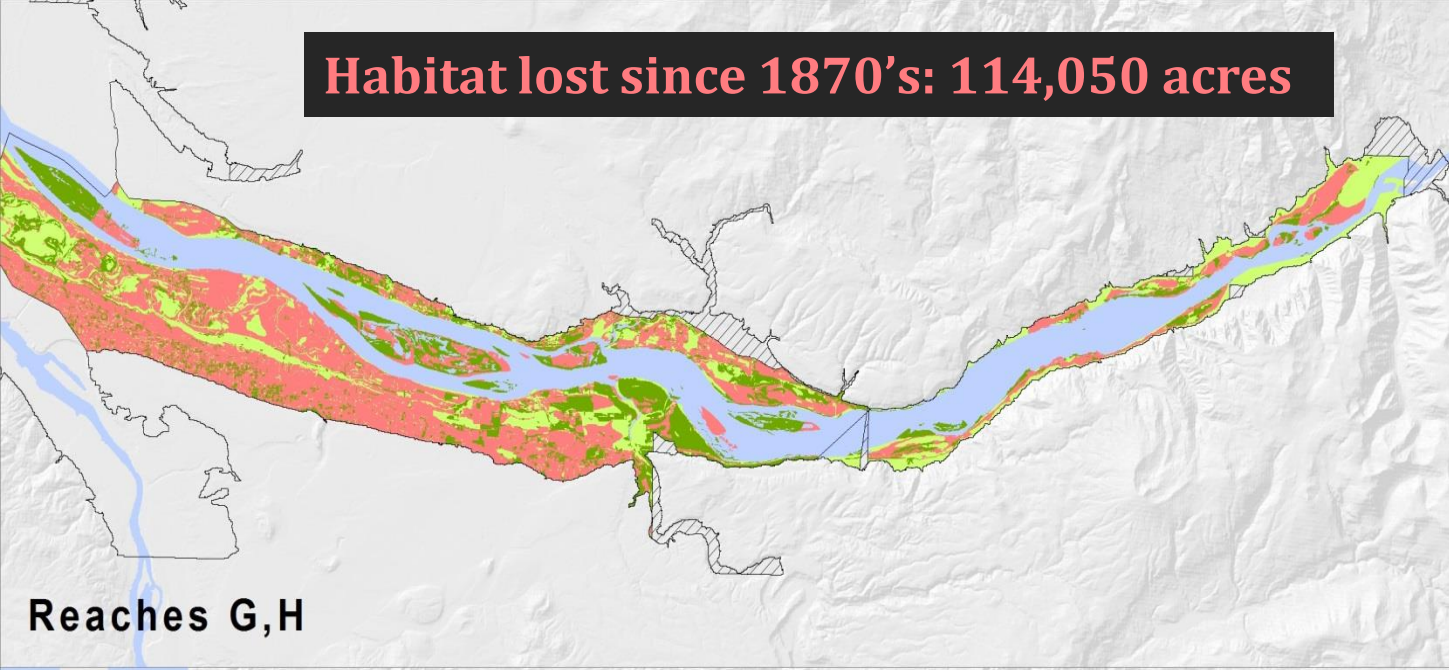


Reaches A,B,C

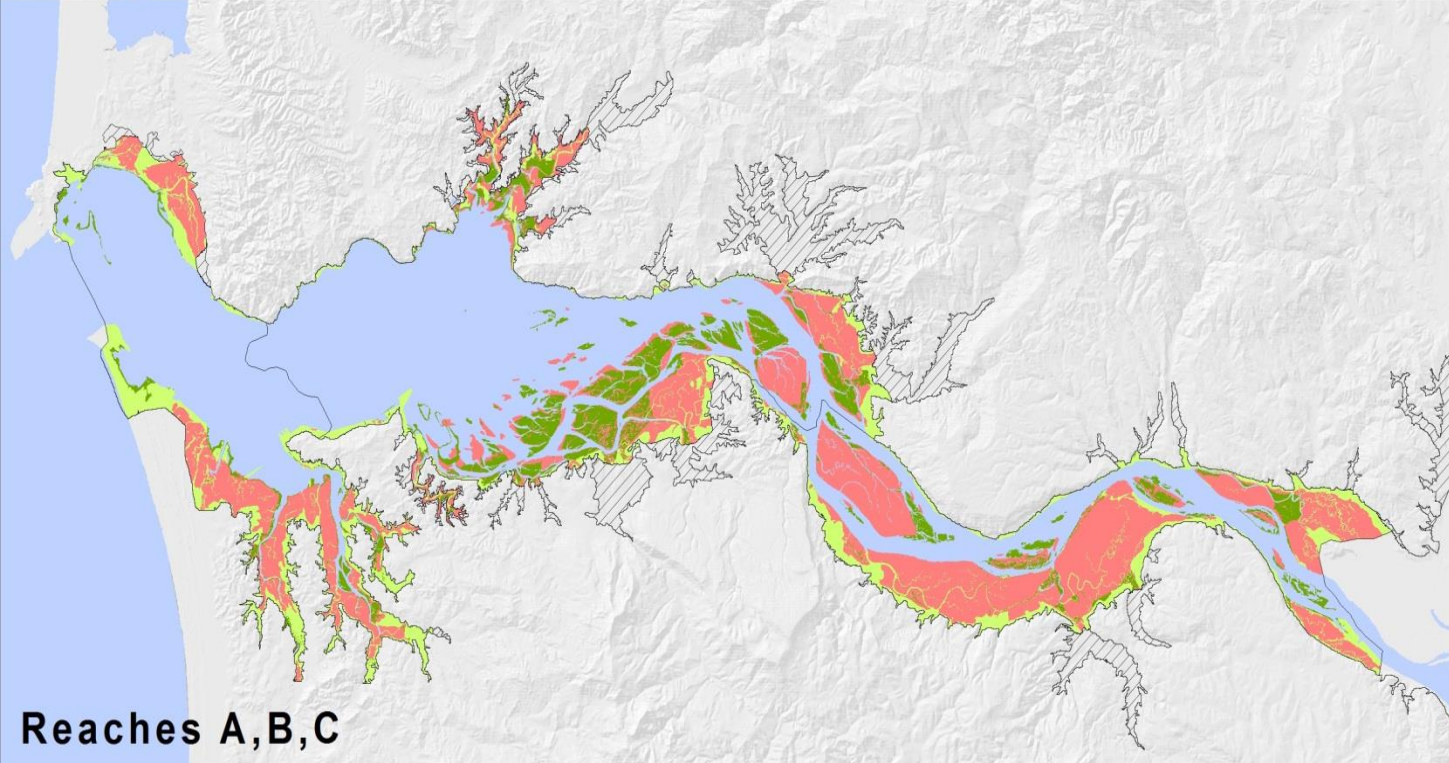


Reaches D,E,F

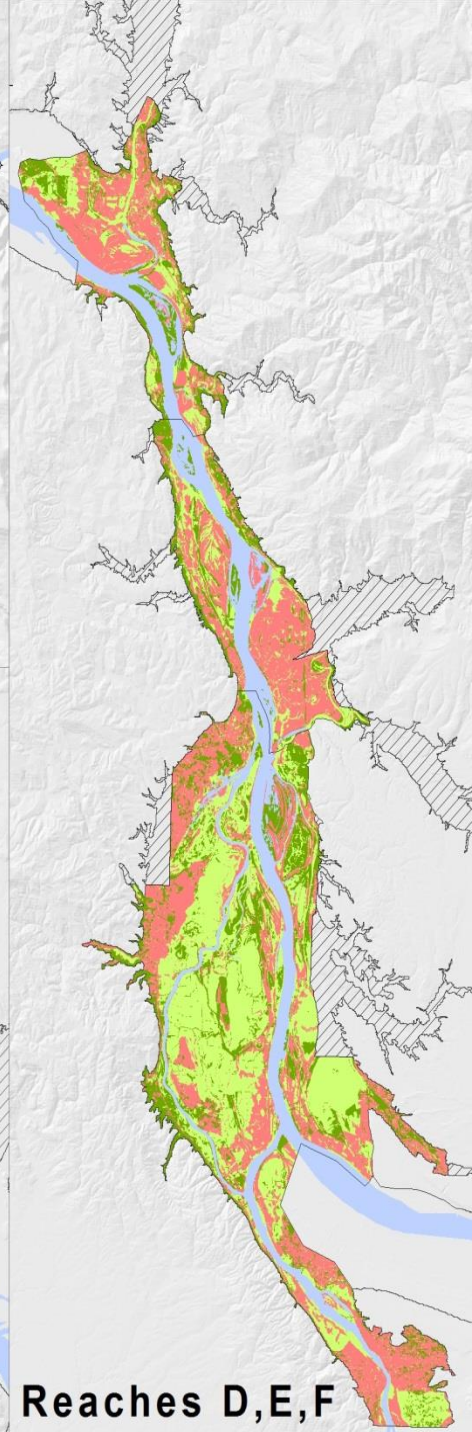
Habitat lost since 1870's: 114,050 acres



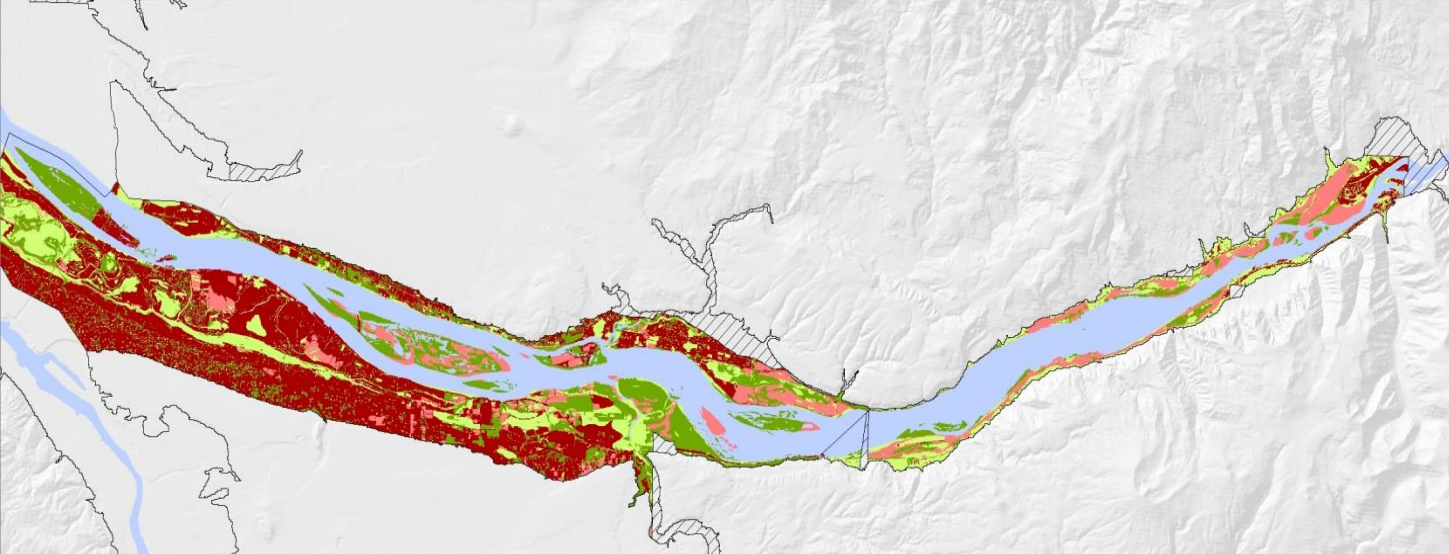
Reaches G,H



Reaches A,B,C

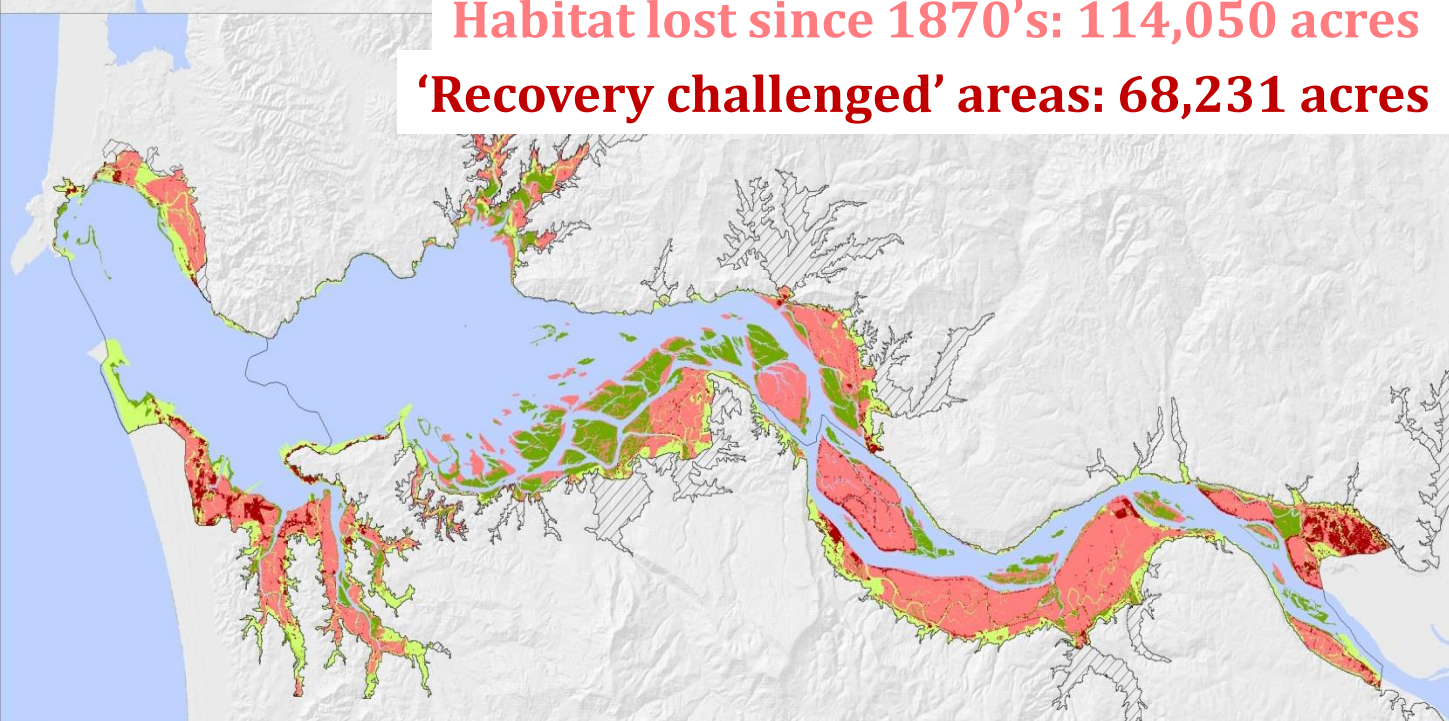


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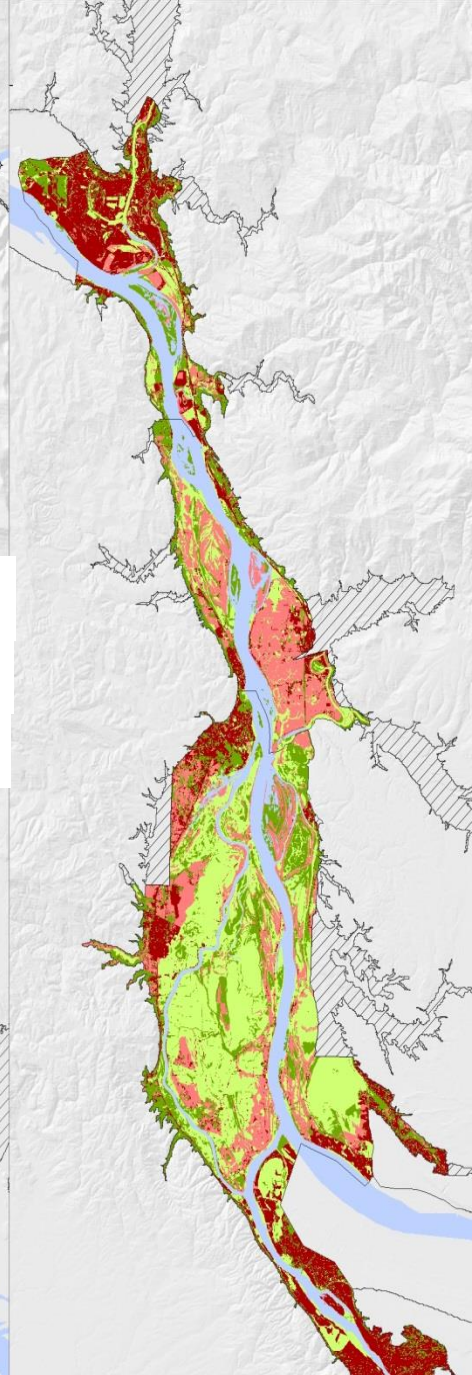


Reaches G,H

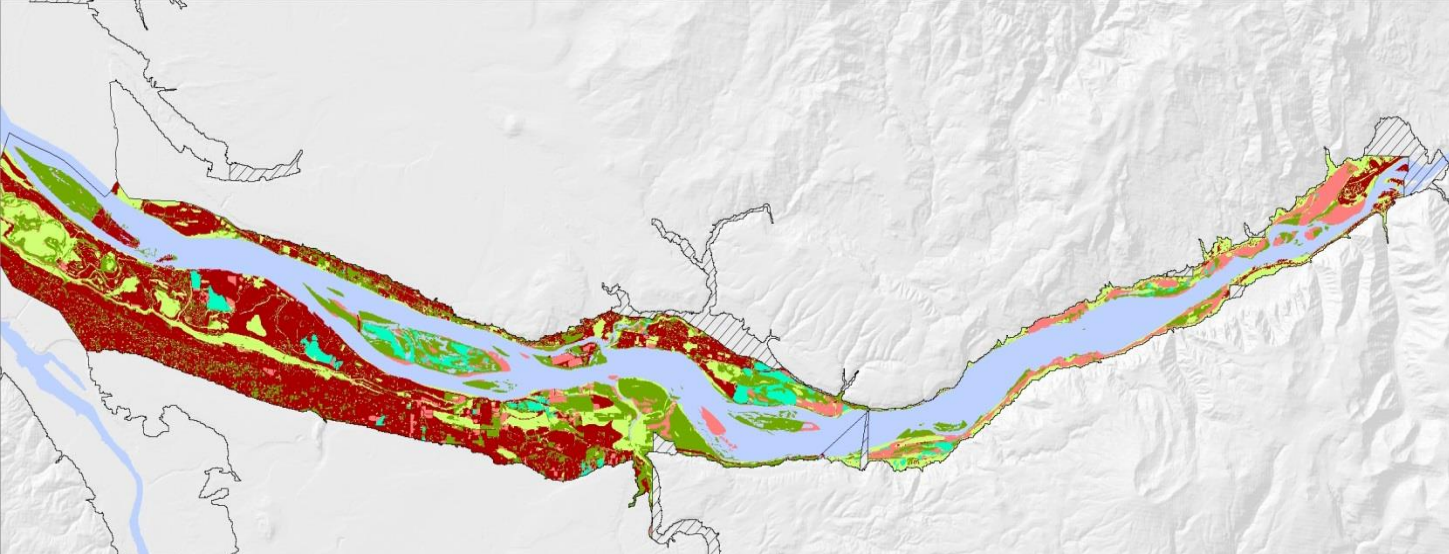
Present Native Habitats: 123,266 acres
Habitat lost since 1870's: 114,050 acres
'Recovery challenged' areas: 68,231 acres



Reaches A,B,C

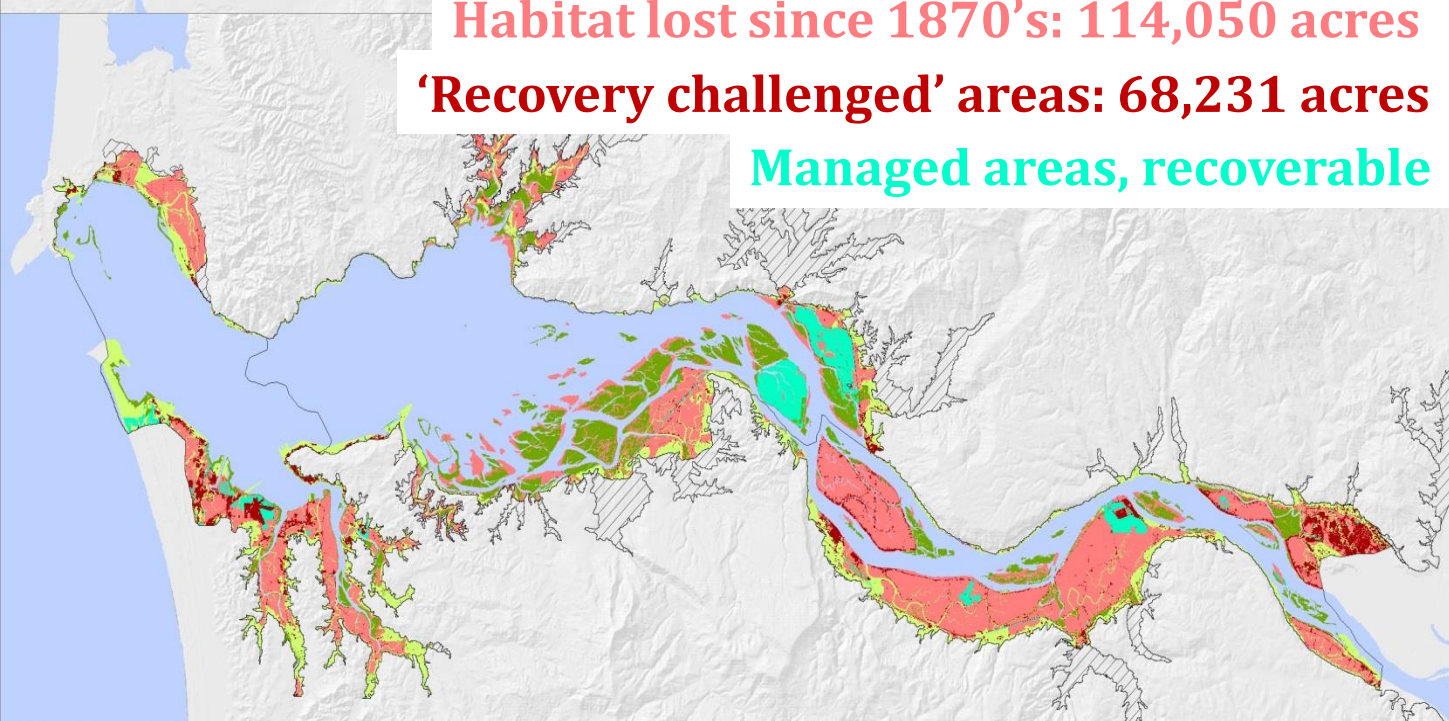


Reaches D,E,F

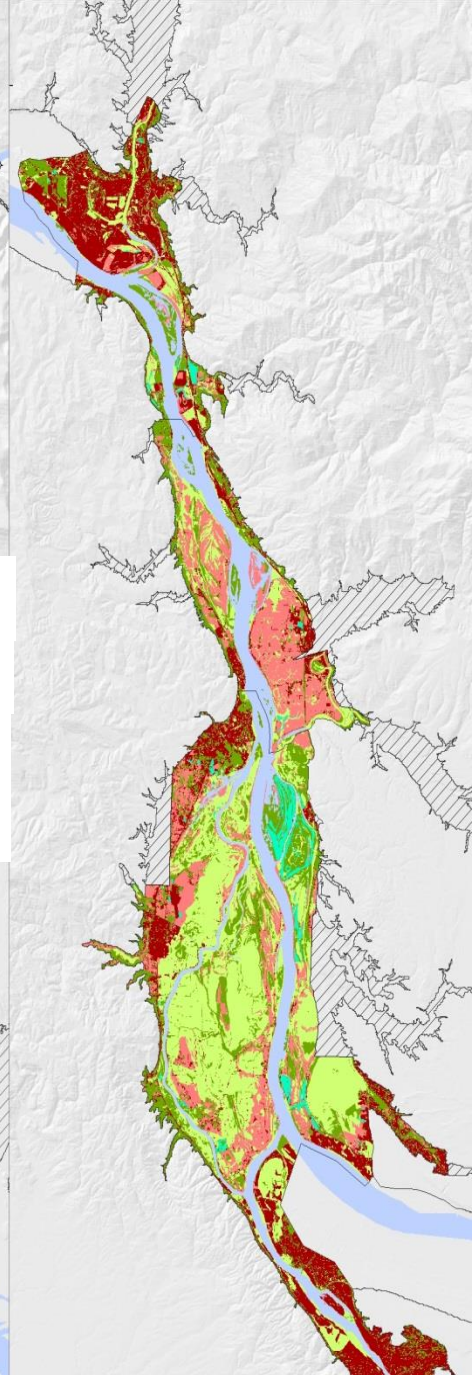


Reaches G,H

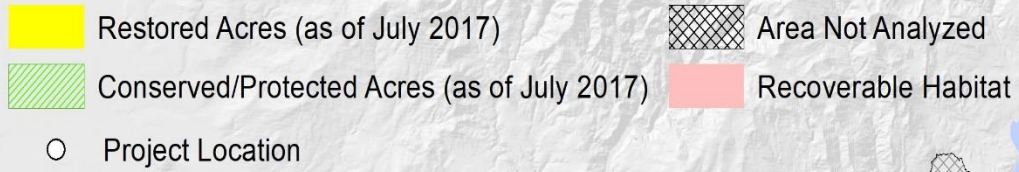
Present Native Habitats: 123,266 acres
Habitat lost since 1870's: 114,050 acres
'Recovery challenged' areas: 68,231 acres
Managed areas, recoverable



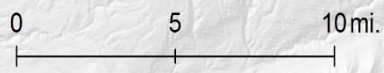
Reaches A,B,C



Reaches D,E,F

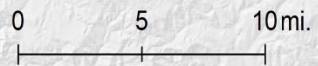


Reaches G,H

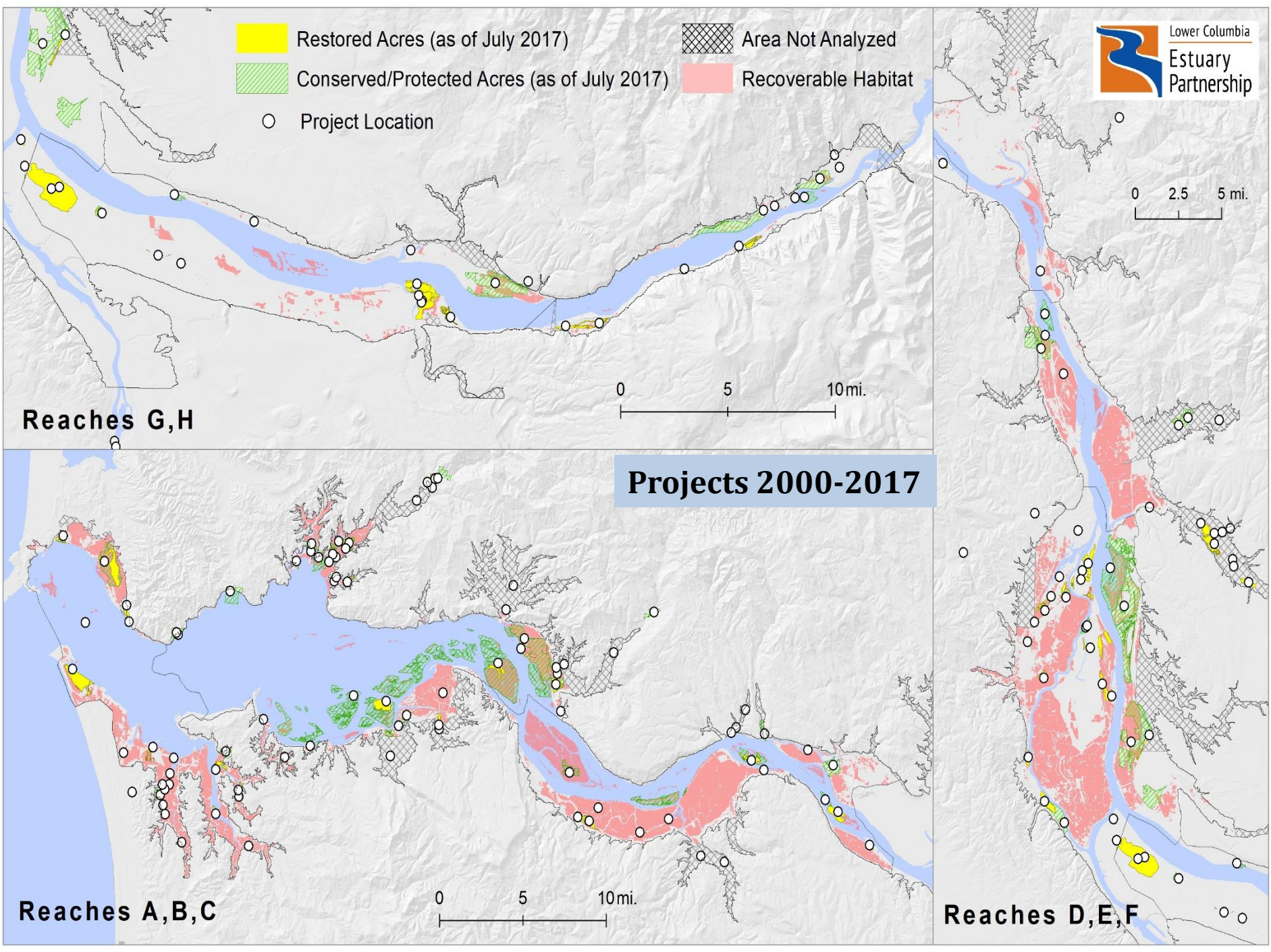


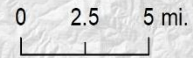
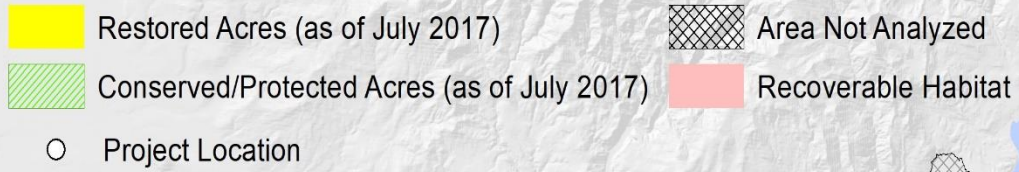
Projects 2000-2017

Reaches A,B,C

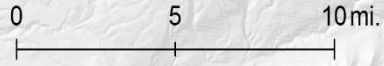


Reaches D,E,F



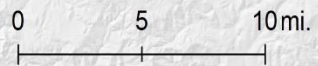


Reaches G,H

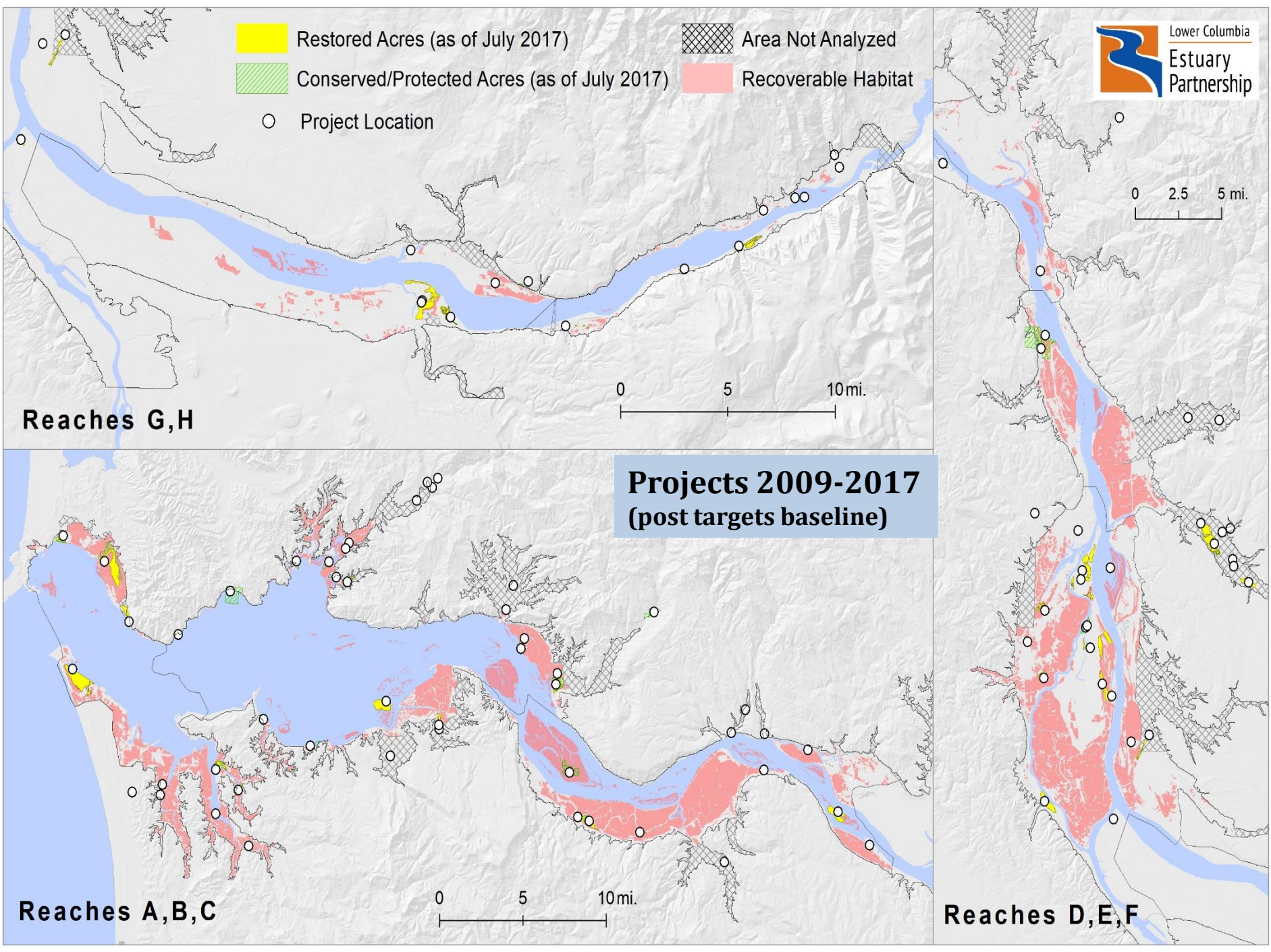


**Projects 2009-2017
(post targets baseline)**

Reaches A,B,C

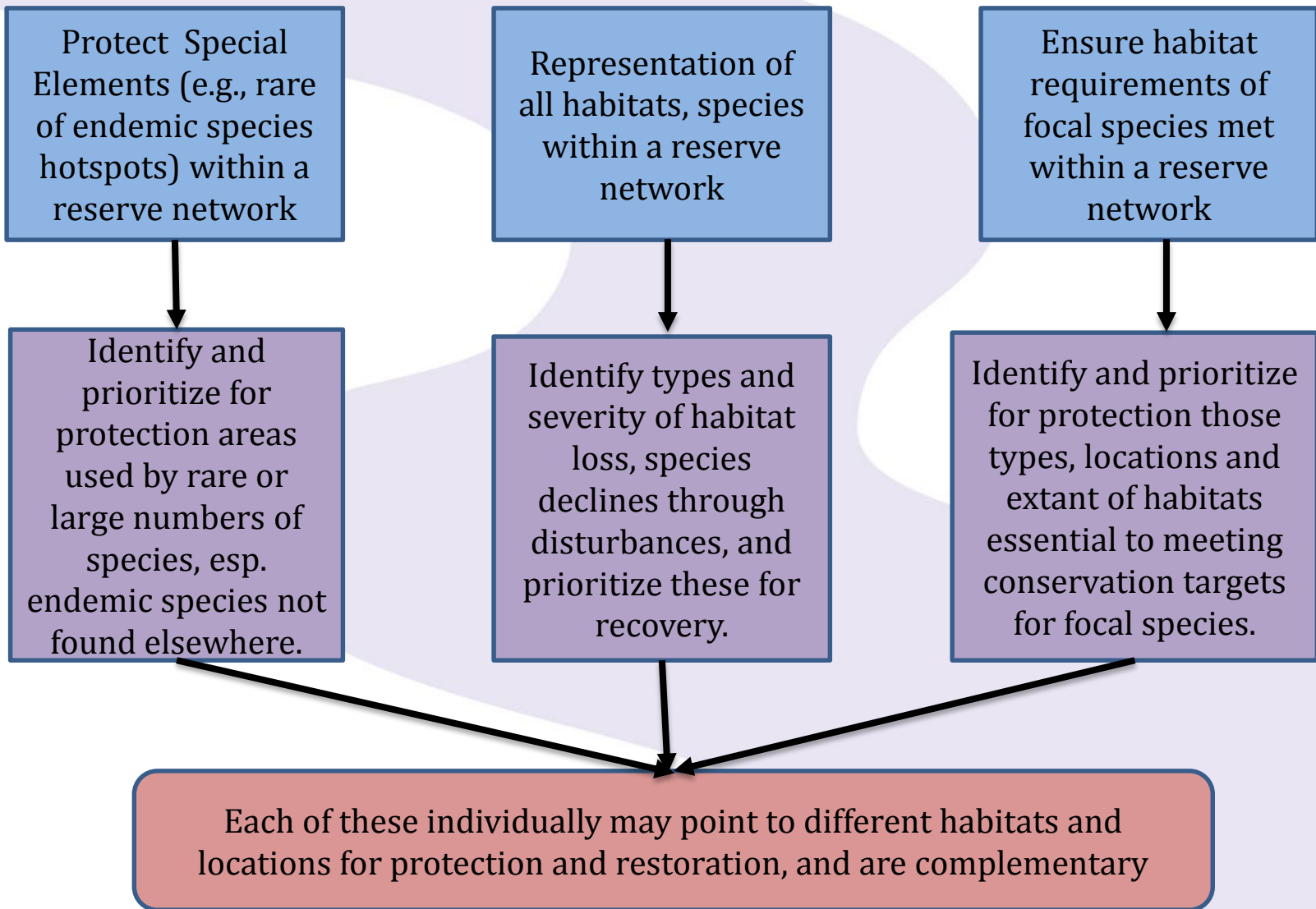


Reaches D,E,F



Method for Setting Targets, Identifying Needs for Reserve Network

three general approaches used in conservation biology:



Adapted from R. Noss 2000

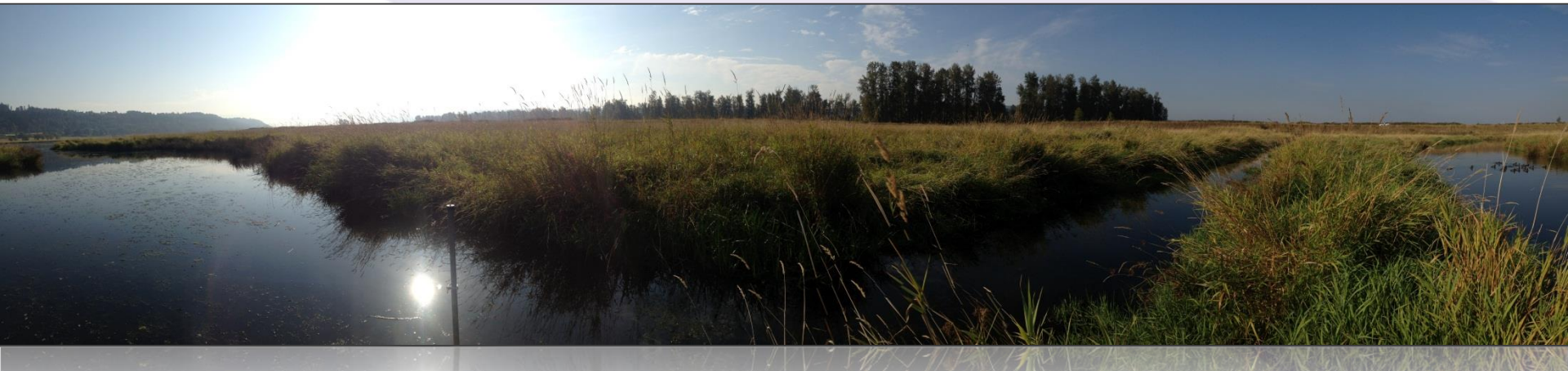
Quantifiable Conservation Targets

Goal - Natural Habitat Diversity, Historic Habitat Mosaic

- Integral for other ecological attributes (e.g., focal species)
- Native species evolved with historic habitat conditions; restoring to those conditions should be protective of those native species

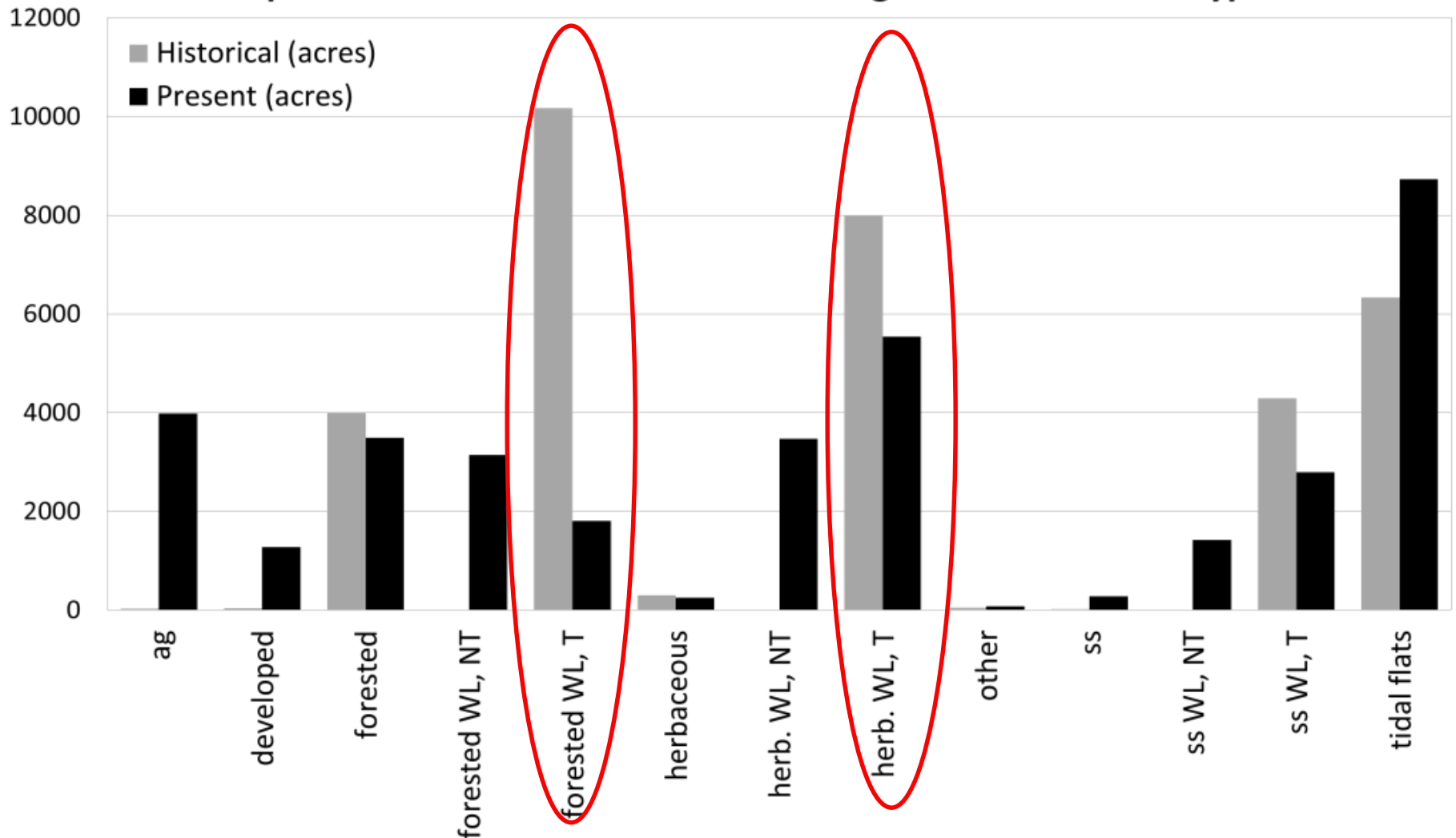
How - Completed Habitat Change Analysis comparing 1870s habitat coverage to 2010

- Historic habitat coverage is proxy for natural habitat diversity
- Identify significant losses and types
- Protect remaining intact habitats; recover lost habitats in areas where practical



Prioritized Habitats by Severity of Loss by Reach, Region and Entire Lower River

Comparison of Historic vs. Present Acreages for Land Cover Types



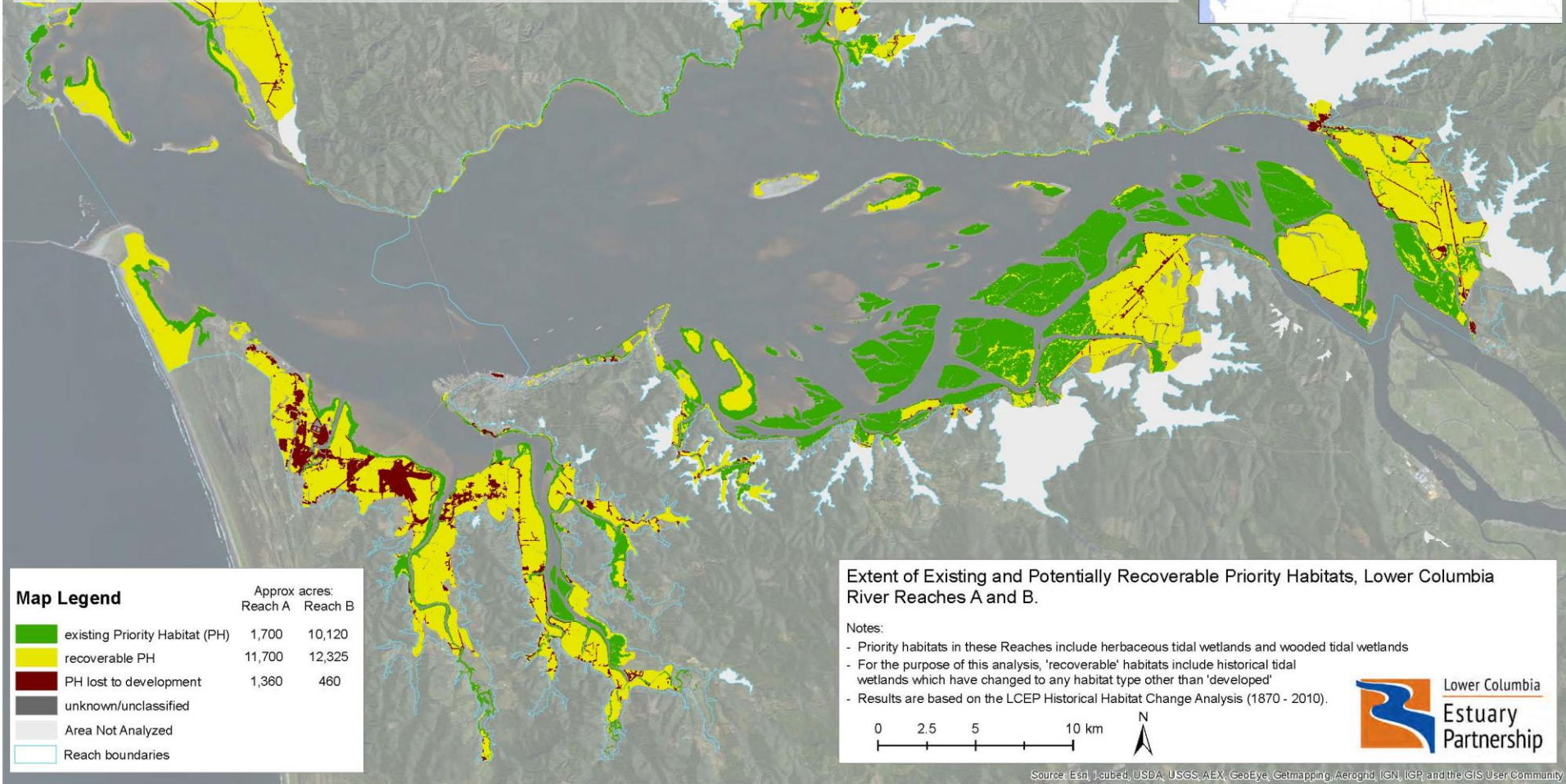
Comparison of historic vs. current habitat coverage for **Reach B**

Priority Habitats to Recover Historic Habitat Diversity:

Reach	Priority Habitats			
	1	2	3	4
A	herbaceous tidal WL	wooded tidal WL		
B	wooded tidal WL	herbaceous tidal WL		
C	wooded tidal WL	herbaceous tidal WL		
D	herbaceous tidal WL	wooded tidal WL	forested	herbaceous
E	herbaceous	forested	shrub-scrub	herbaceous tidal WL
F	forested	herbaceous	herbaceous WL	shrub-scrub
G	forested	herbaceous	herbaceous WL	
H	wooded WL			

Define Targets –where, how much?

- Where - Intact (green); “Recoverable” (yellow)
- How much – (targets)



Priority Habitats for Recovering Habitat Diversity

Available from website: <http://www.estuarypartnership.org/historical-habitat-change>

Final Habitat Coverage Targets

- **Protective of common species (so they don't become imperiled)**
- **No net loss of native habitats (2009 baseline; 114,050 acres lost since 1870)**
- **Recover 30%* of historic extent for priority habitats by 2030; 40%* of historic extent by 2050 by reach**
 - *Representation* of priority habitats, and rare, vulnerable habitats
 - Ensure many examples of habitats in each region for *redundancy*
 - Restore quality, condition of habitats - *resiliency* of habitats to persist through disturbance
- **Other aspects:**
 - Multiple large “reserves” with smaller patches interspersed that fill gaps, provide corridors, connectivity
 - *Identify minimum size criterion for anchor areas, minimum number of occurrences by region*

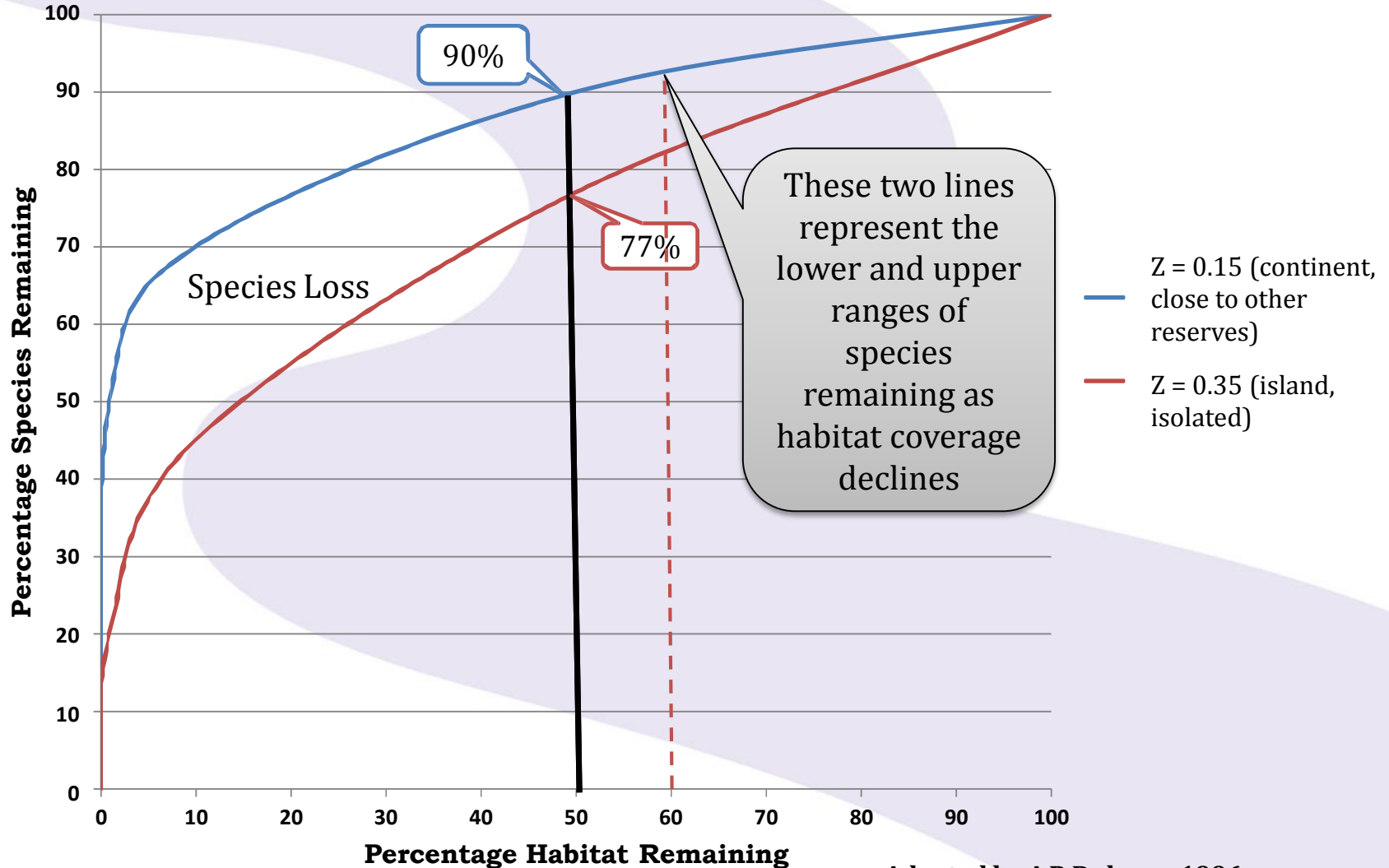
**Based on species-area curves (MacArthur and Wilson 1967)*

Final Habitat Coverage Targets

Reach	Future Habitat with Targets							
	30% Target				40% Target			
	Priority Habitat	Other Habitat	Total	% of Historic	Priority Habitat	Other Habitat	Total	% of Historic
A	3,483	11,825	15,308	81.6	4,644	11,825	16,469	87.8
B	10,122	12,032	22,154	82.8	10,122	12,032	22,154	82.8
C	7,689	10,806	18,495	58.7	10,252	10,806	21,058	66.8
D	5,108	2,097	7,205	42.6	6,644	2,097	8,741	51.7
E	4,706	2,700	7,406	44.7	6,274	2,700	8,974	54.1
F	17,872	7,976	25,848	41.9	21,046	7,976	29,022	47.1
G	9,974	2,991	12,965	39.6	11,888	2,991	14,879	45.5
H	1,132	4,301	5,433	80.8	1,337	4,301	5,638	83.9
All	60,085	54,728	114,813	54.3	72,205	54,728	126,933	60.0

Final Habitat Coverage Targets

Species Area Curve



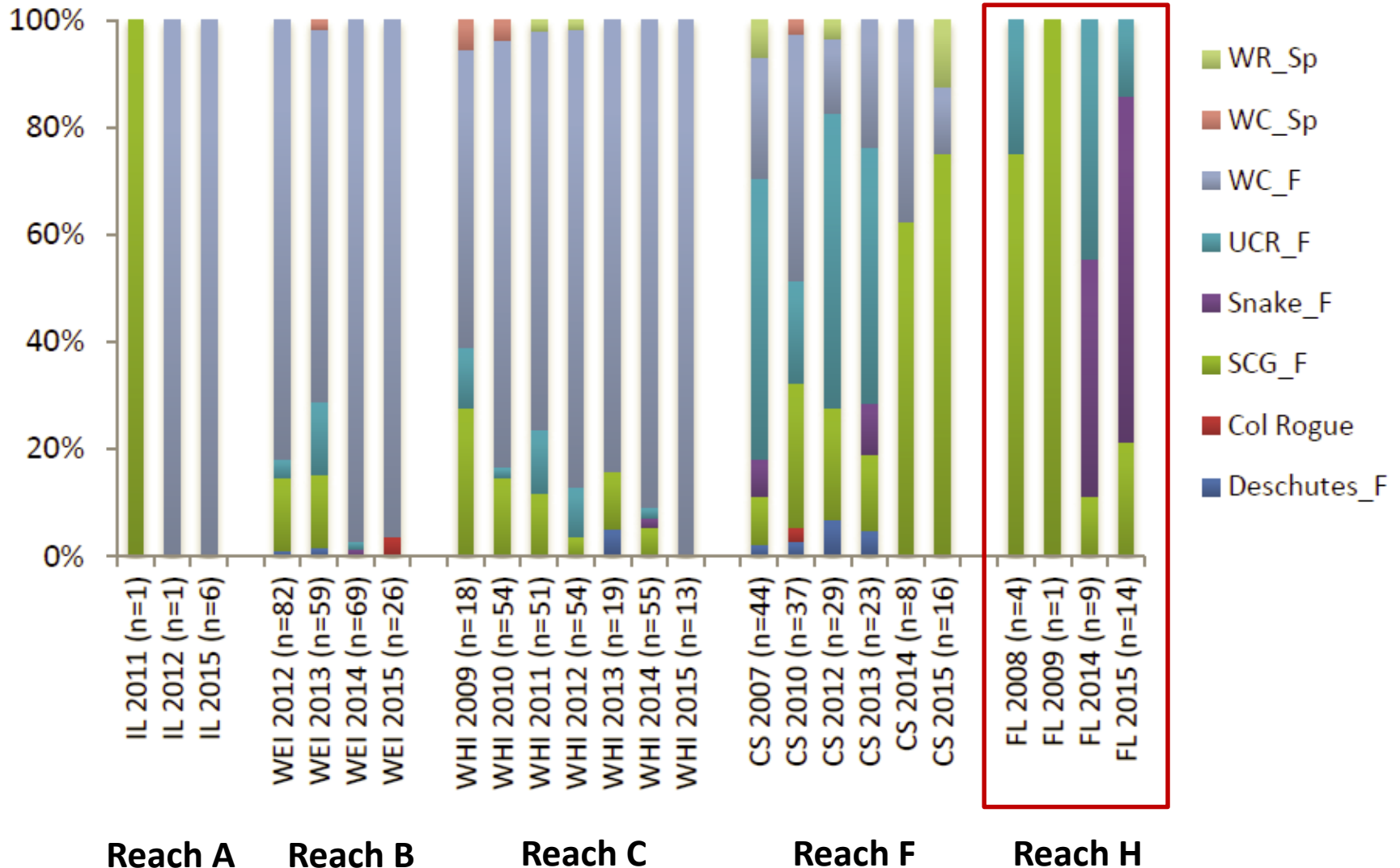
Adapted by A.P. Dobson, 1996

Next Question - Are juvenile salmon in lower Columbia food-limited?

- Not finding this as an issue in subyearling Chinook we find in emergent marsh habitats
- Stomach contents consistently show active feeding
 - Chironomids (Dipteran larvae) at upstream, riverine dominated sites and Ampiphods (Corophiids) at downstream, tidally well-flushed sites

➤ *EXCEPT...*

Genetic Composition of Unmarked Chinook



*From Regan McNatt, Lyndal Johnson (NMFS) under Estuary Partnership Ecosystem Monitoring Program

What can prey selection and availability tell us about the quality of a habitat?

Energy Ration

Energy ration (ER), was calculated as a measure of energy consumption for each juvenile Chinook salmon and is driven by prey availability and quality.

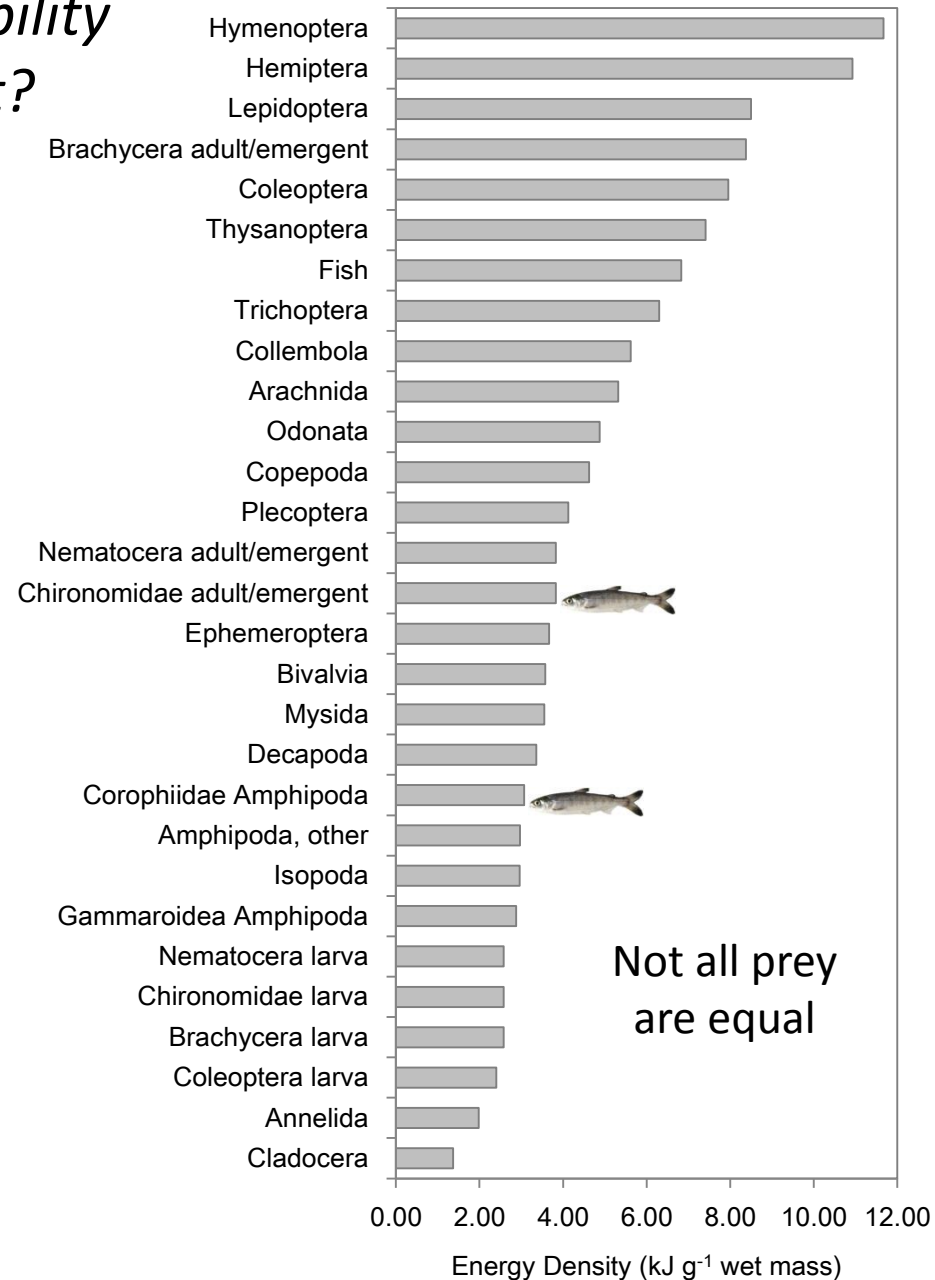
$$ER = \frac{\sum w_i \cdot k_i}{W}$$

w = prey mass consumed of prey taxa i

k = energy density (kJ g⁻¹ wet mass) of prey taxa i

W = total fish mass (g)

Thus, Energy Ration equals kilojoules consumed per gram of fish.



Not all prey are equal

Energy densities were acquired from the literature and compiled in David et al. (2016)

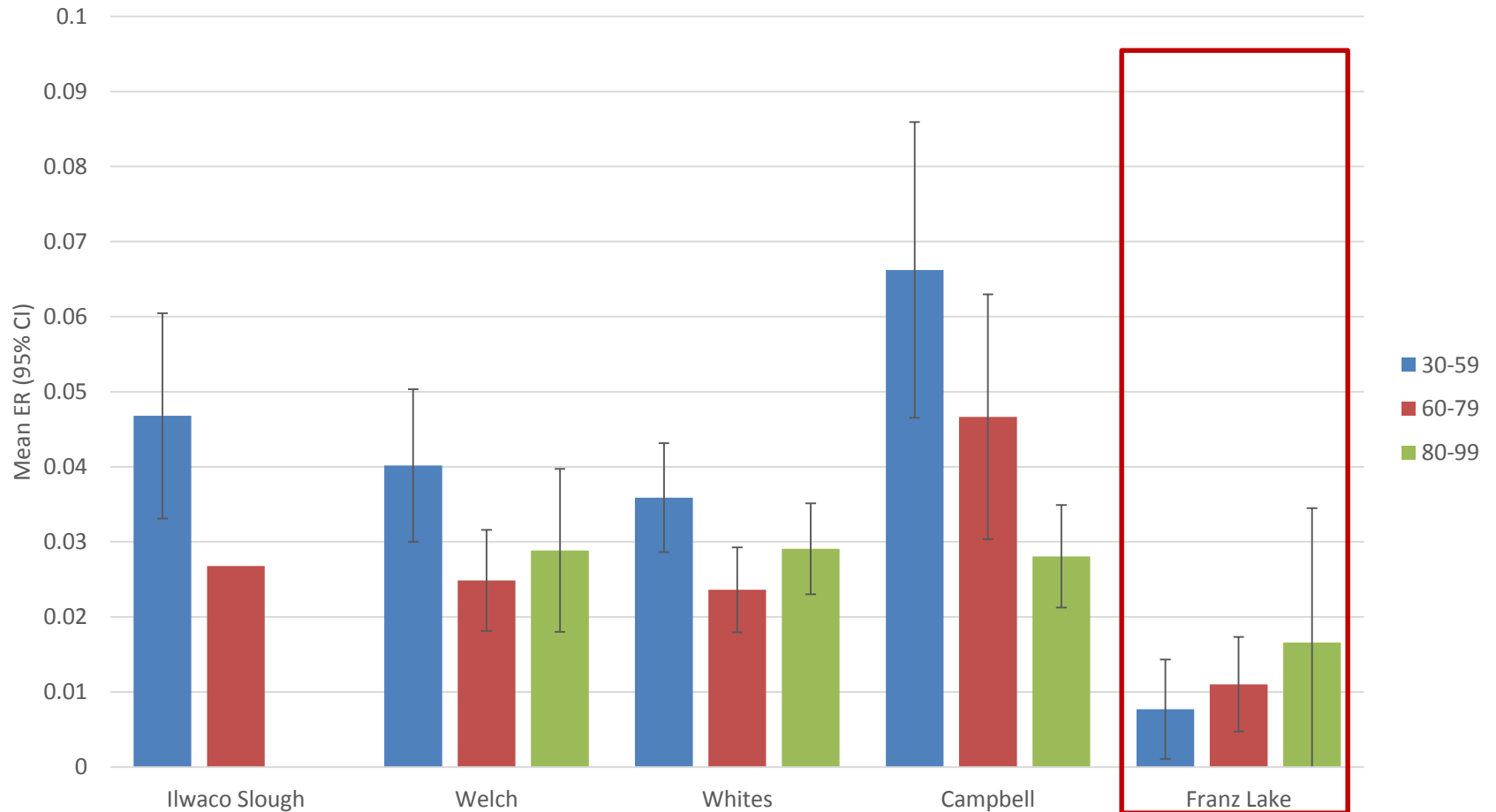
*From Mary Rameriz, Jeff Cordell (UW) under Estuary Partnership Ecosystem Monitoring Program

Energy Ration

by site, size class

compiled over 2008-2013, 2015-2016; April, May, June

reflects both fullness and energy consumed



*From Mary Rameriz, Jeff Cordell (UW) under Estuary Partnership Ecosystem Monitoring Program

Actively Feeding* Salmon and Steelhead Caught in Mid Columbia vs Estuary

John Day Dam bypass:

- 11-12% juvenile steelhead, yearling Chinook
- 27% subyearling Chinook

Bonneville Dam:

- 5% steelhead, yearling Chinook
- 7% subyearling Chinook

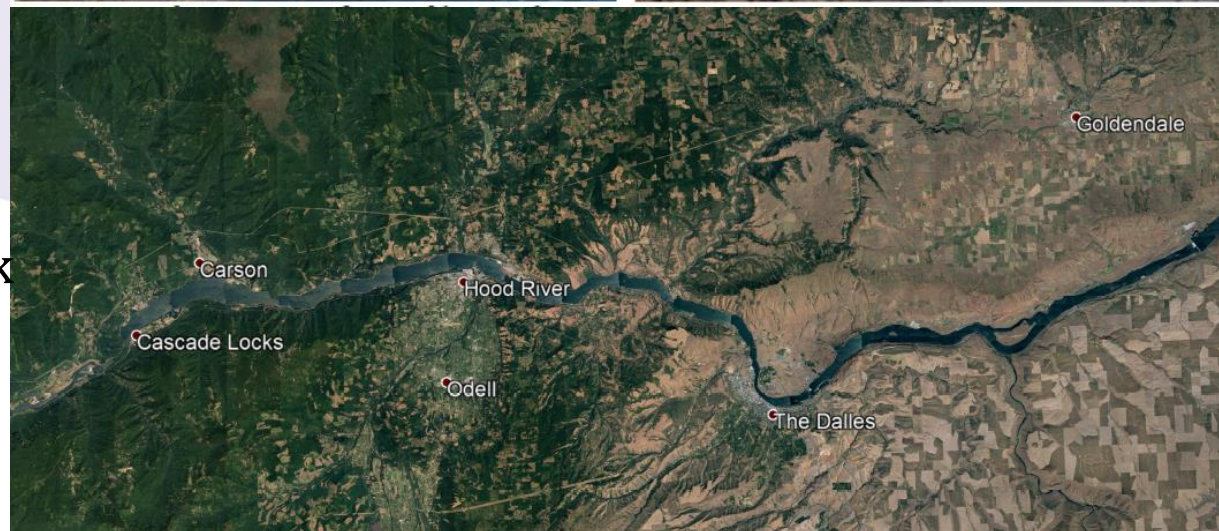
Estuary Transect:

- 56-68% steelhead, yearling Chinook
- 52% subyearling Chinook

*Stomach fullness >24% defined as “actively feeding”

(from Deifenderfer et al. 2013)

Photos from MCFEG (2013)

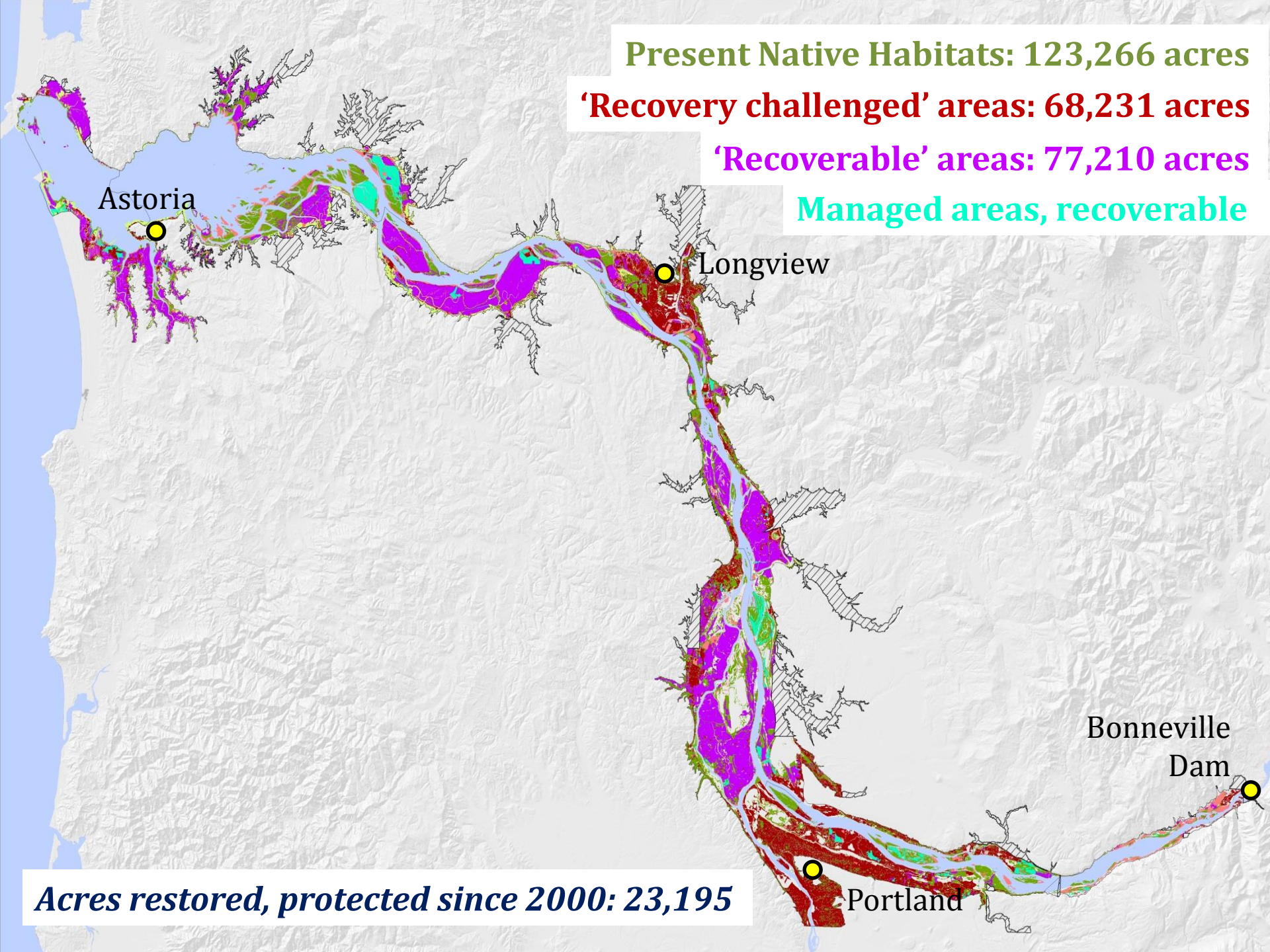


Present Native Habitats: 123,266 acres

'Recovery challenged' areas: 68,231 acres

'Recoverable' areas: 77,210 acres

Managed areas, recoverable



Astoria

Longview

Bonneville
Dam

Portland

Acres restored, protected since 2000: 23,195

Questions?



Please contact:
Catherine Corbett
(503) 226-1565 ext 240

Batwater Station Levee Breach –Columbia River Watershed Council

Horsetail Creek PIT Array Results 2017

- 26 unique detections from May 7 – Sep 1
- 10 fall Chinook (hatchery)
 - Max residence time = 2.5 hours, median 35 min
- 4 Spring Chinook (1 wild)
 - Max residence time = 1 hour, median 12 min
- 5 Summer steelhead (2 wild)
 - Max residence time = 24.5 days, median 43 min
- 1 Northern Pikeminnow
 - Residence time = 21 days
- 6 “Orphans”
 - Max residence time = 46 min, median 24 min

Origins of detected salmonids at Horsetail

