



Lower Columbia  
Estuary  
Partnership

# **Habitat Coverage Targets for the Lower Columbia River - How Much is Enough?**

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# Ecosystem-Based Management

Requires these conditions (UNEP 2006):

- **holistic vision/plan** - comprehensive description of system, articulation of management objectives
- **community** - effective engagement of policy makers, managers, stakeholders, scientists
- **foundation** - legal framework, management institutions, financial resources, effective communications
- **process** - effective adaptive management



# Define Vision for the lower Columbia

## What is Biological Integrity?

- **USEPA definition** - the ability of an aquatic ecosystem to support a **balanced, integrated, adaptive community of organisms** having a **species composition, diversity, and functional organization** that is **comparable to natural habitat** in the region

(Karr and Dudley 1981; Frey 1977)



# Management Plan - Biological Integrity is Ultimate Goal

## ➤ Biological Condition Gradient for Assessment

(USEPA: Davies and Jackson 2006)

- Similar to Index of Biological Integrity (Karr 1981)
- Used in freshwater streams; USEPA adapting it to estuaries
- ***Science Community identifies key ecosystem attributes***
  - a. Natural Habitat Diversity, Historical Habitat Mosaic**
  - b. Focal Species:** e.g., Pacific salmonids, Col. White-tailed deer, Pacific Flyway species, herptiles (modified from NPCC 2004)
  - c. Water Quality**
  - d. Ecosystem Processes**



# Define Quantifiable Conservation Targets

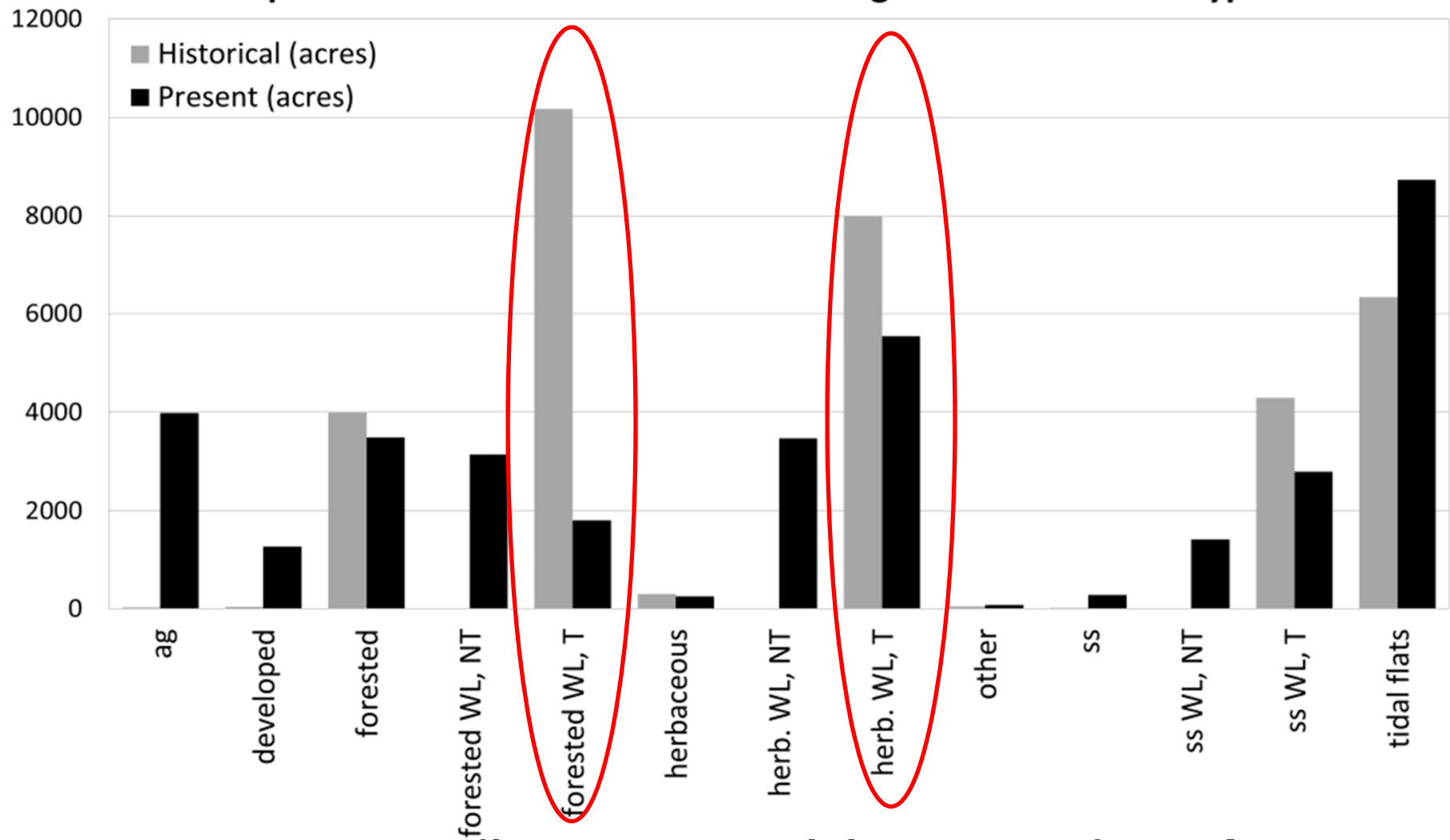
## a. Natural Habitat Diversity, Historic Habitat Mosaic

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



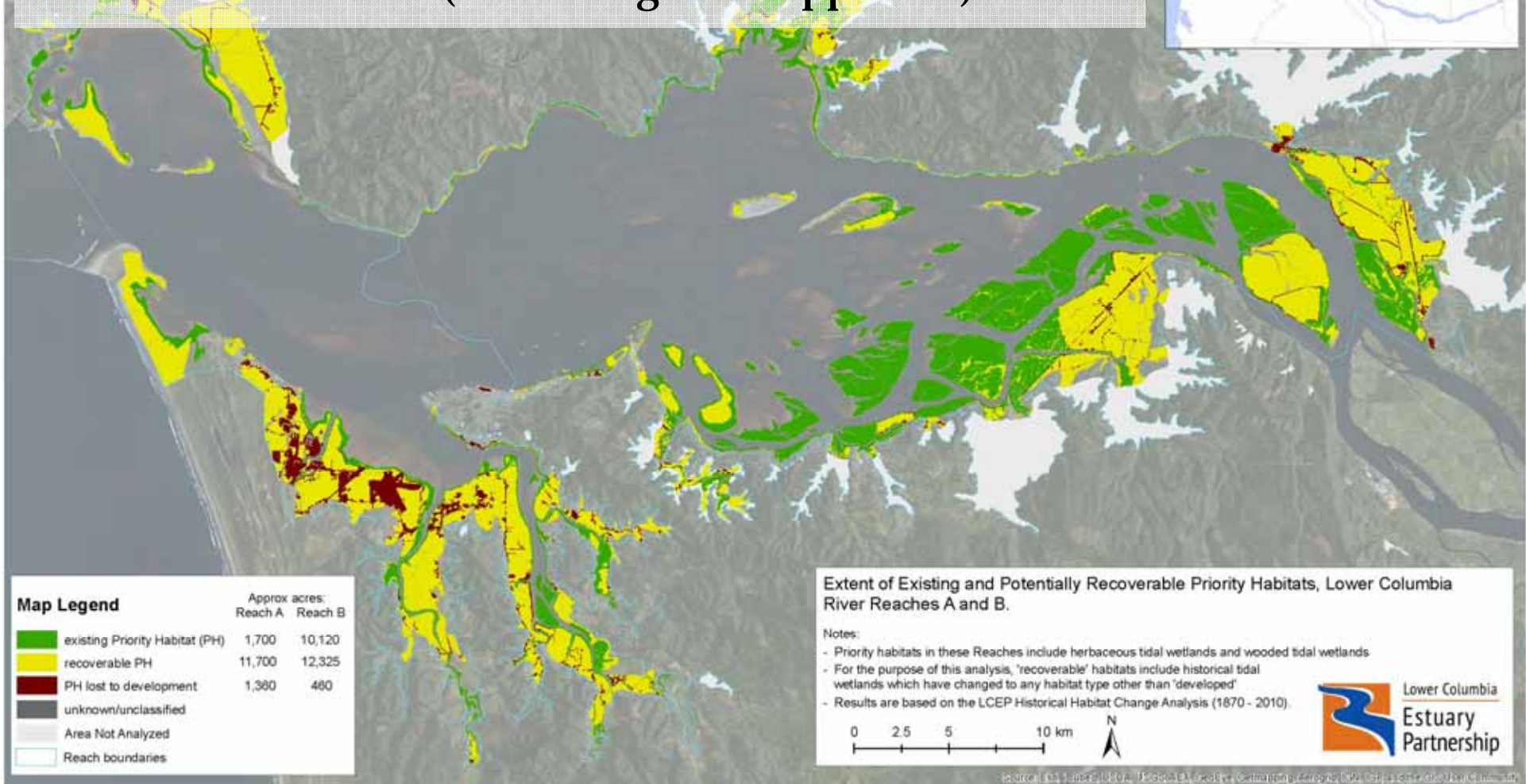
Comparison of historic vs. current habitat coverage for **Reach B**

# Priority Habitats to Recover Historic Habitat Diversity:

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

# Define Targets –where, how much?

- Where - Intact (green); “Recoverable” (yellow)
- How much – (evaluating draft approach)



Application of Lines of Evidence 1 – Priority Habitats for Recovering Habitat Diversity

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



# Methods for Setting Measureable Targets

- **Historic conditions** - 1870, 2010 or somewhere in between if data exist for entire lower Columbia (e.g., Tampa Bay 1950s habitats)
- **Reference site conditions** - analogous river system to the Columbia?
- **Regulatory threshold** - e.g., water quality “not-to-exceed” thresholds
- **Resource –based** - Three Overarching Approaches:
  1. **Single species** - identify population goals (e.g., minimum viable population, population viability analyses), then identify habitat needs to meet population goals as basis for targets
  2. **Multiple Species** - similar to #1, but identify focal or target species, population targets, habitat needs
  3. **Ecosystems** - protect percentage of historic habitat extent and if sufficient will be protective of species using those habitats
    - 12% on national scale (WCED 1987); 10% (IUCN 1993)
    - 30% – 42% based on evidence-based approaches (e.g., species-area curves [MacArthur and Wilson 1967])

# Principles for Credible Targets

- **Separate science from feasibility**
  - Targets should be ecologically based and insulated from political or social pressures
  - Science alone should drive the target setting
  - Once targets are set, feasibility may be considered to evaluate likelihood of achieving stated targets
- **Follow scientific method**
  - Follow transparent process that can be challenged or refuted by evidence
  - Assumptions should be clearly documented
  - Uncertainties should be explained, documented
  - Subjected to peer review
- **Anticipate change**
  - Incorporate scientific monitoring and research to reduce key uncertainties
  - If new knowledge indicates the targets will not meet overall vision, goals of program, adaptively manage

Adapted from Tear et al. 2005

# Standards for Credible Targets

## 1. Use best available science

- Underlying reasoning is scientifically valid
- Theory or technique can be (or has been) tested
- Subjected to peer review and publication
- Known or potential error rate and existence of standards
- Attracted widespread acceptance within relevant scientific community

## 2. Evaluate multiple alternatives

## 3. Set targets for short (1-25 years) and long time periods

- Population viability analyses often use 95% probability of persistence to >100 years

## 4. Incorporate “three R’s”:

- **Representation** – capturing some of everything
- **Redundancy** – reduce level of risk of losing representative components of targets
- **Resilience** – refers to condition, quality of component, refers to ability to persist through disturbances

## 5. Evaluate errors and uncertainties

Adapted from Tear et al. 2005

# Example: The Nature Conservancy

- **Also National Wildlife Refuges explored this same approach**
  - **Coarse-filter/fine-filter approach** – conserving full array of natural habitats will adequately support the vast majority of species
    - Coarse filter – representation of all native ecosystem types and communities
    - Fine filter – add areas for rare and vulnerable species that are inadequately represented by coarse filter
  - For *resiliency*, minimum size criterion for each ecosystem type
  - For *representation* and *redundancy*, target number of occurrences for each ecosystem type, stratified by region
  - Overall target of 30% of an ecosystem type's historic extent (1850s)
    - Based on mathematical relationship between habitat area and the number of species an area can support or “species-area curve” (MacArthur and Wilson 1967)
    - Researchers evaluated 10% and 30% of each ecosystem's historic extent to determine if protective of ecoregion's more common species
    - Chose 30% - 1) additional habitat exist outside reserve network; 2) species and communities tend to occur across multiple ecoregions; 3) published thresholds generally suggest # of discrete locations where common species occur ranging from 10 - >80 rangewide

From Tear et al. 2005

# Draft Habitat Coverage Targets (April 2014)

- **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**
  - *Representation* of priority habitats
  - *Representation* of 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”
  - Smaller patches interspersed that fill gaps, ensure corridors, increase connectivity
  - *Identify minimum size criterion*
  - *Identify minimum number of occurrences of habitats by region*

# Next Steps

- **Identify minimum size criterion for larger “reserves” and small patches of habitats**
  - Encourage implementation of anchor areas
- **Identify minimum number of occurrences of habitats by region**
- **Identify gaps in habitats, key corridors**
- **Determine if these targets are protective of common species**
  - ensure # discrete locations 10->80 for use by common species
- **Have targets peer reviewed (*planned*)**
- Track implementation of targets
- Monitor effectiveness of targets in reaching goal (i.e., *restoring biological integrity of lower Columbia*)
- *Develop targets for focal species attributes and revisit these targets to ensure they don't conflict*

# Draft Habitat Coverage Targets (April 2014)

Reach	Available Recoverable Habitat	Total Acres Restored	Total Acres Protected	PH1					PH2					Acre Margin for 30% recovery	Acre Margin for 40% recovery
				Habitat Type	Hist. Extent	Current Extent	Target 30% recovery	Target 40% recovery	Habitat Type	Hist. Extent	Current Extent	Target 30% recovery	Target 40% recovery		
A	10062	491	1539	HWT	8031	1480	929	1732	WWT	3578	219	854	1212	8278	7117
B	10417	556	3658	WWT	14459	4589	(251)	1195	HWT	7983	5533	(3138)	(2340)	10417	9222
C	18837	338	1764	WWT	13876	2226	1937	3324	HWT	11753	1353	2173	3348	14727	12164
D	1098	23	0	HWT	2570	133	638	895	WWT	2740	283	539	813	(79)	(610)
E	9173	173	1629	H	5243	416	1157	1681	F	7473	3462	(1220)	(473)	7483	6662
F	24567	2799	603	F	29253	9095	(319)	2606	H	9688	2070	836	1805	23628	19846
G	2510	2048	142	F	18790	6429	(792)	1087	H	7537	1578	683	1437	1827	(14)
H	546	203	0	WW	3342	1132	(129)	205						546	341
				PH3					PH4						
D	1098	23	0	F	8164	3399	(950)	(133)	H	3135	1293	(353)	(39)		
E	9173	173	1629	S	1680	166	338	506	HWT	1290	192	195	324		
F	24567	2799	603	HW	11604	6189	(2708)	(1547)	S	2069	518	103	310		
G	2510	2048	142	HW	3392	1967	(949)	(610)							

## Notes:

- Negative Values are shown in Red - indicate enough of this habitat type exists to meet recovery goals
- Negative Acres Margin values (Reaches D, G) indicate there is not enough Recoverable Habitat to meet total recovery goals for the Reach.
- Restored Acres do not reflect quality of restoration. In upper Reaches, these values include acreages affected by DU projects which may not be beneficial to fish
- Protected Acres do not reflect habitat type. Protected habitats may not be Priority Habitats. Further analysis is required to assess existing Priority Habitats under protection.
- Protected Acres include land acquisitions and conservation easements. Federal Wildlife Refuges are not counted.

# Draft Habitat Coverage Targets (new)

## Focus Restoration of Priority Habitats in Historic Locations:

### Reach A

- Focus HWT on Chinook, Youngs, Lewis and Clark tributaries
- Focus WWT on northern Lewis and Clark tributary

### Reach B

- Hold the line, keep on doing great work

### Reach C

- Focus WWT on western end of reach (potentially leverage work in eastern reach B)
- Focus HWT on eastern end of reach

### Reach D

- Hold the line on H and F
- Focus all recoverable areas on HWT and WWT

### Reach E

- Hold the line on F
- Focus H and SS just north of Woodland area
- Focus HWT with a smattering of SS and H on Deer Island area

### Reach F

- Hold the line on HW
- Focus F on St Helens, Scappoose, Warren areas with some around Vancouver Lake
- Focus SS and H on fringes, ridge and scroll
- H,SS and F could be all on same patches depending on management objectives

### Reach G

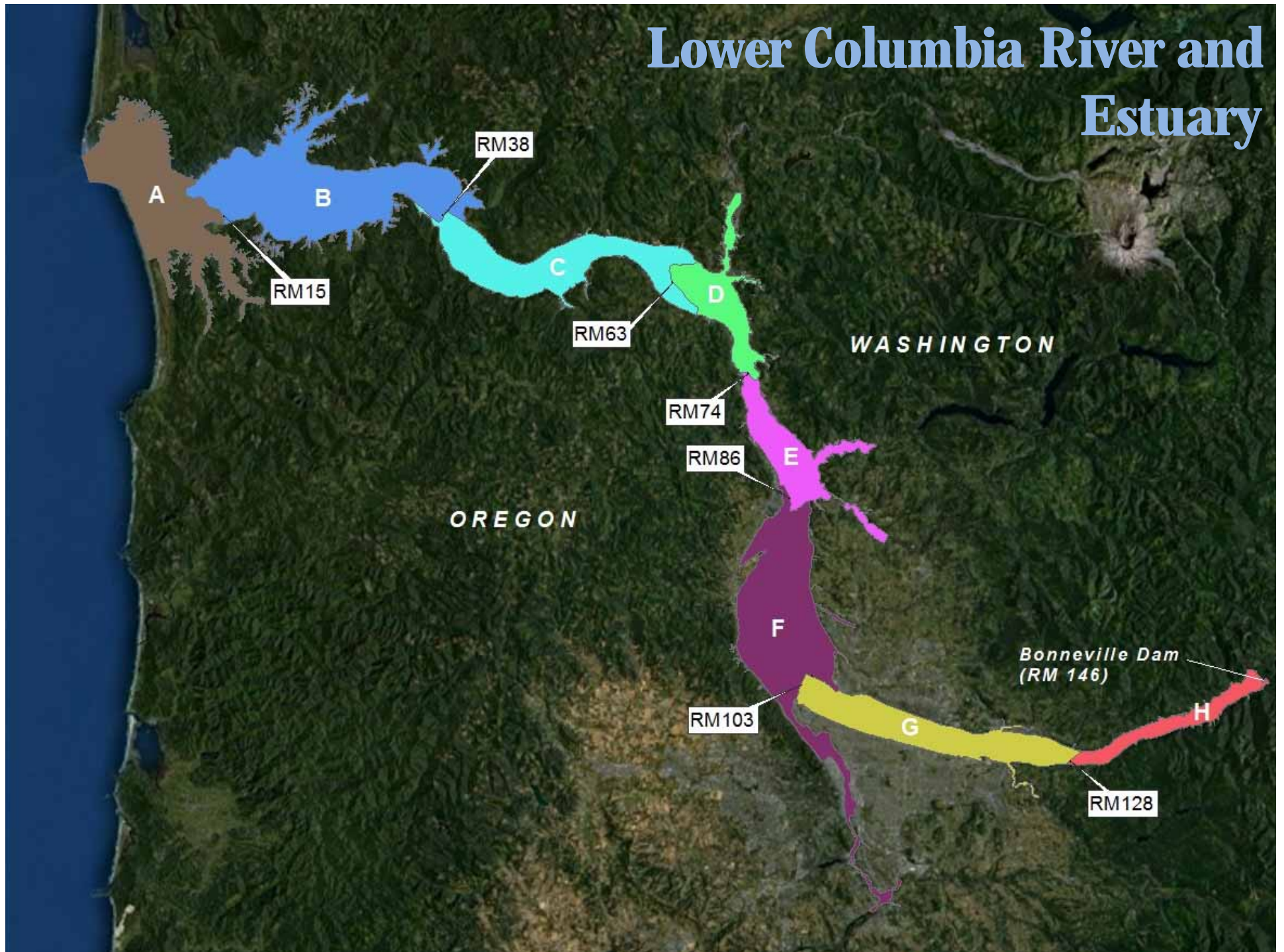
- Hold the line on HW
- Focus H and F on recoverable areas (Government Island and Steigerwald)

### Reach H

- Focus WW on recoverable areas



# Lower Columbia River and Estuary





**Pink – Native habitats lost since 1870 – 114,050 acres**  
**Red – Developed**



**Pink** – Native habitats lost since 1870 – 114,050 acres

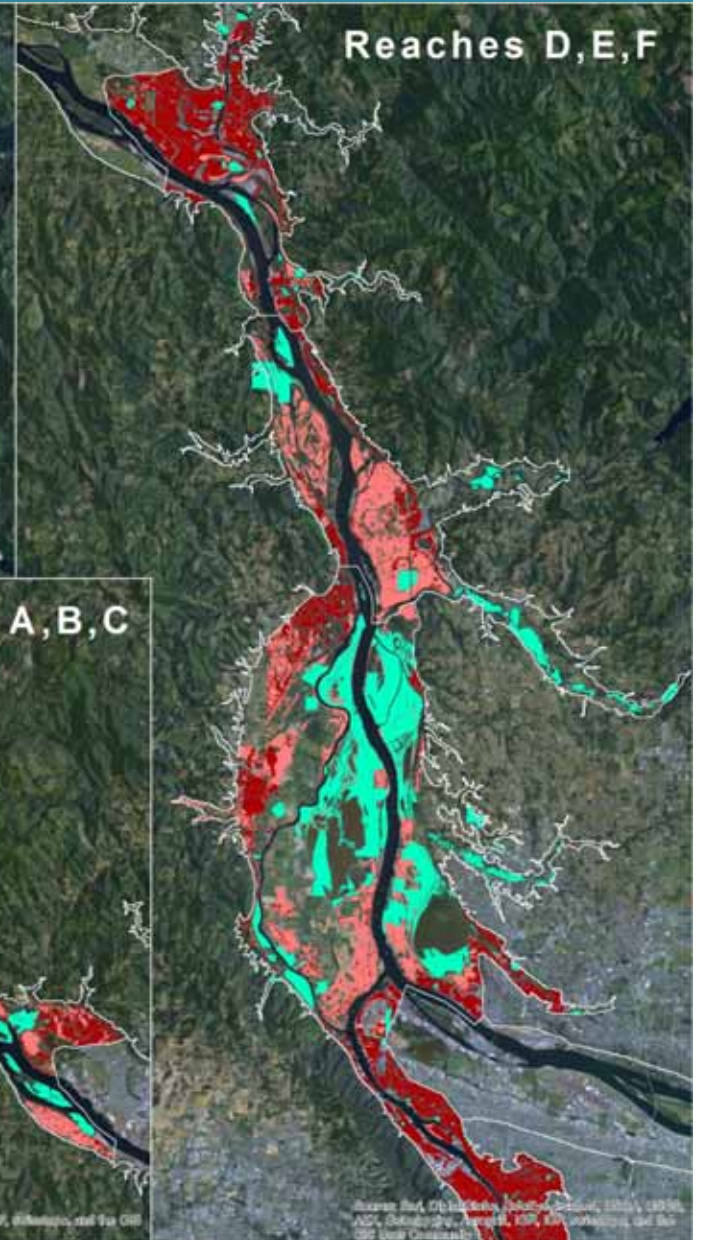
**Red** – Developed

**Aqua** – Public, acquired

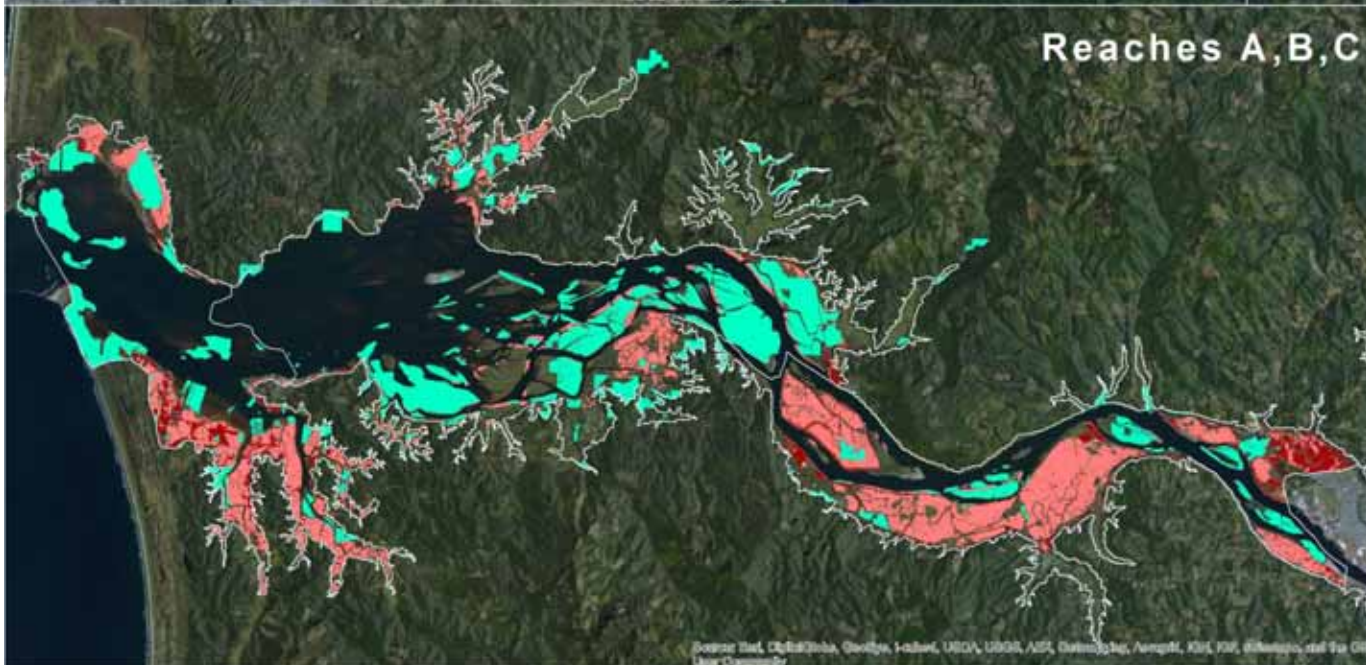
Reaches G,H



Reaches D,E,F



Reaches A,B,C



**Pink** – Native habitats lost since 1870 – 114,050 acres

**Red** – Developed

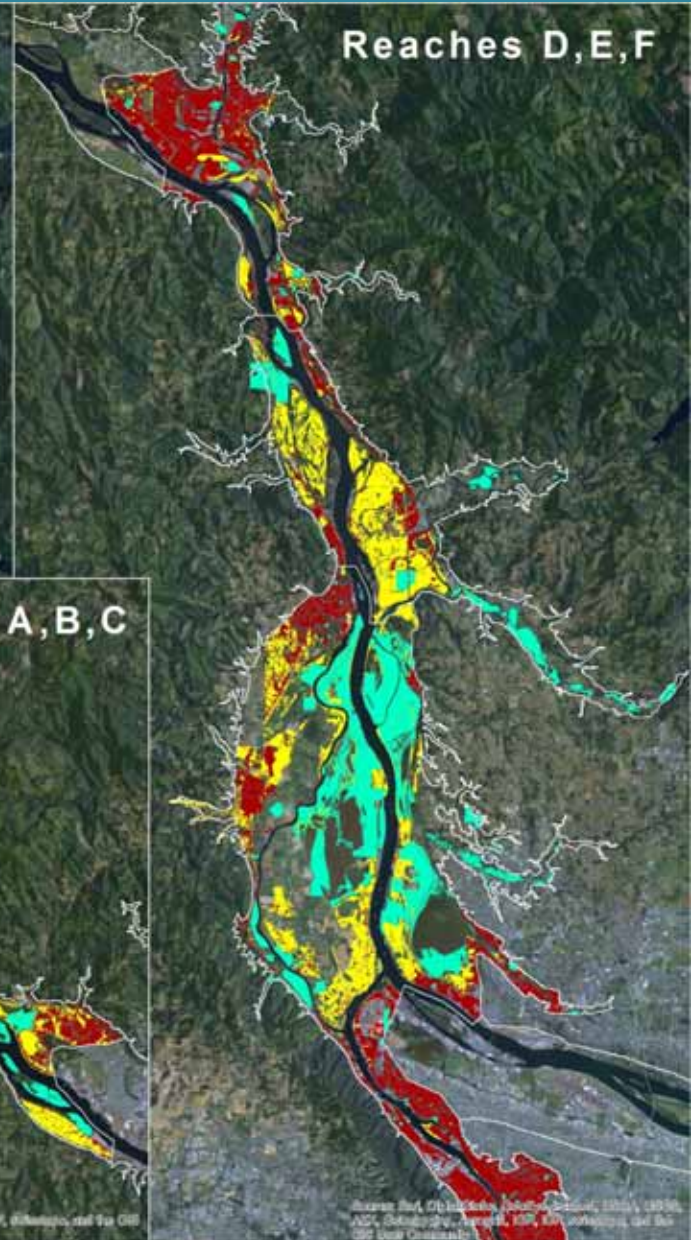
**Aqua** – Public, acquired

**Yellow** – “Recoverable”

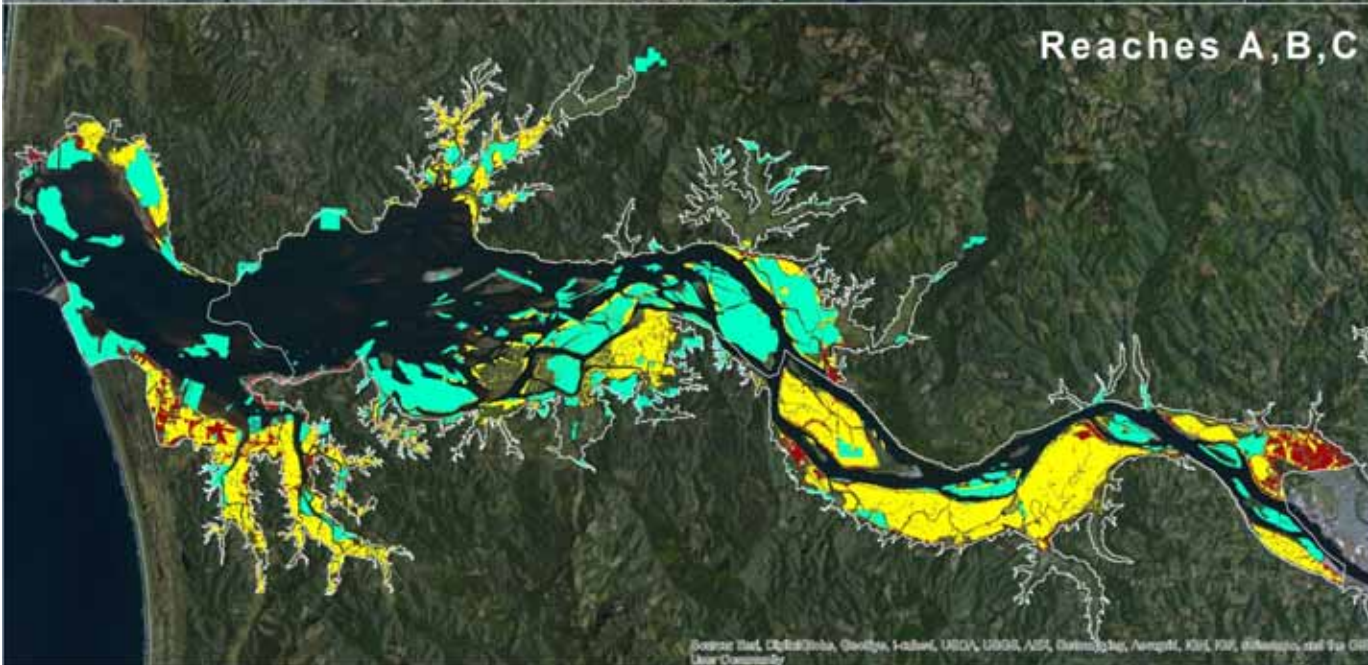
Reaches G,H



Reaches D,E,F



Reaches A,B,C



**Pink – Native habitats lost since 1870 – 114,050 acres**

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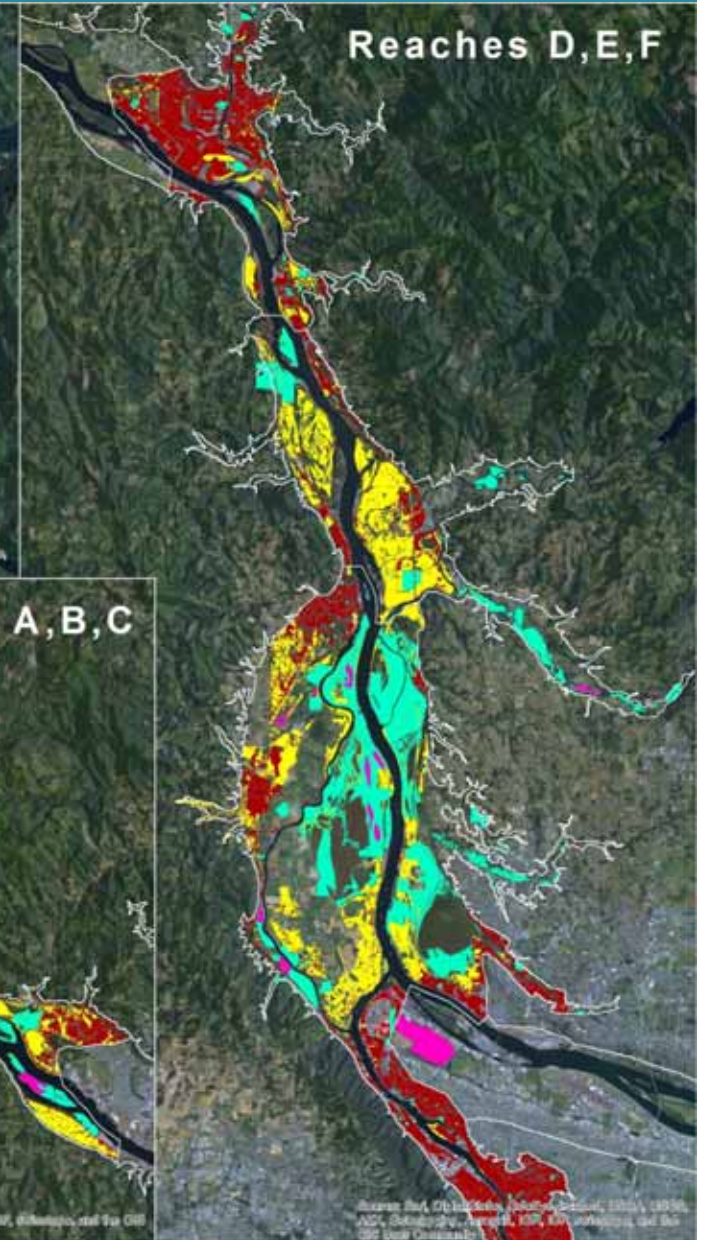
**Yellow – “Recoverable”**

**Magenta - Restored**

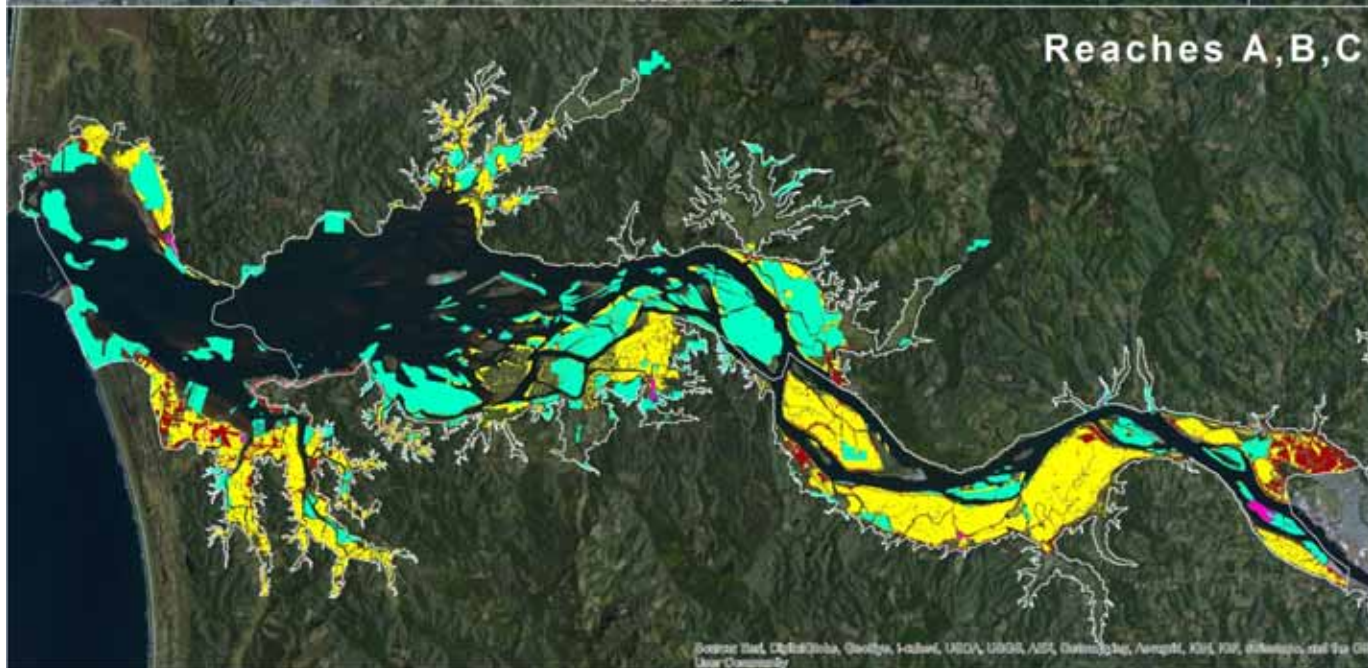
Reaches G,H



Reaches D,E,F



Reaches A,B,C



# Geographic Priorities for other Attributes (focal species, water quality, ecosystem processes)

1. **Juvenile salmonid Habitat Suitability Index model (*complete*)**
  - Identify locations in mainstem of optimum water velocities, temperature, and depth, adapting regional criteria, employing OHSU SELFE model results
2. **Priority tributaries in OR and WA Salmonid Recovery Plans (*complete*)**
  - Tidal reaches of tributaries priority for chum and fall/late fall Chinook (subyearling life history strategy that rear extensively in tidal areas); weighted system on mainstem based on Skagit data
3. **Columbia White-tailed deer habitat (USFWS) (*complete*)**
4. **Priority Toxic Contaminant Clean up sites (Yakama Nation) (*draft*)**
5. **Habitats Priority for Pacific Flyway, Avian (USFWS) (*underway*)**
6. **Amphibian habitat suitability (states, USFWS) (*planned*)**
7. **Climate change impacts**
  - Sea level rise and inland migration of wetlands (*planned*)
  - Mapping and assessment of cold water refugia (*planned*)
  - Changes to habitat structure with increased CO<sub>2</sub>, temperature, changes in precipitation (*underway*)



**Comments?**

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