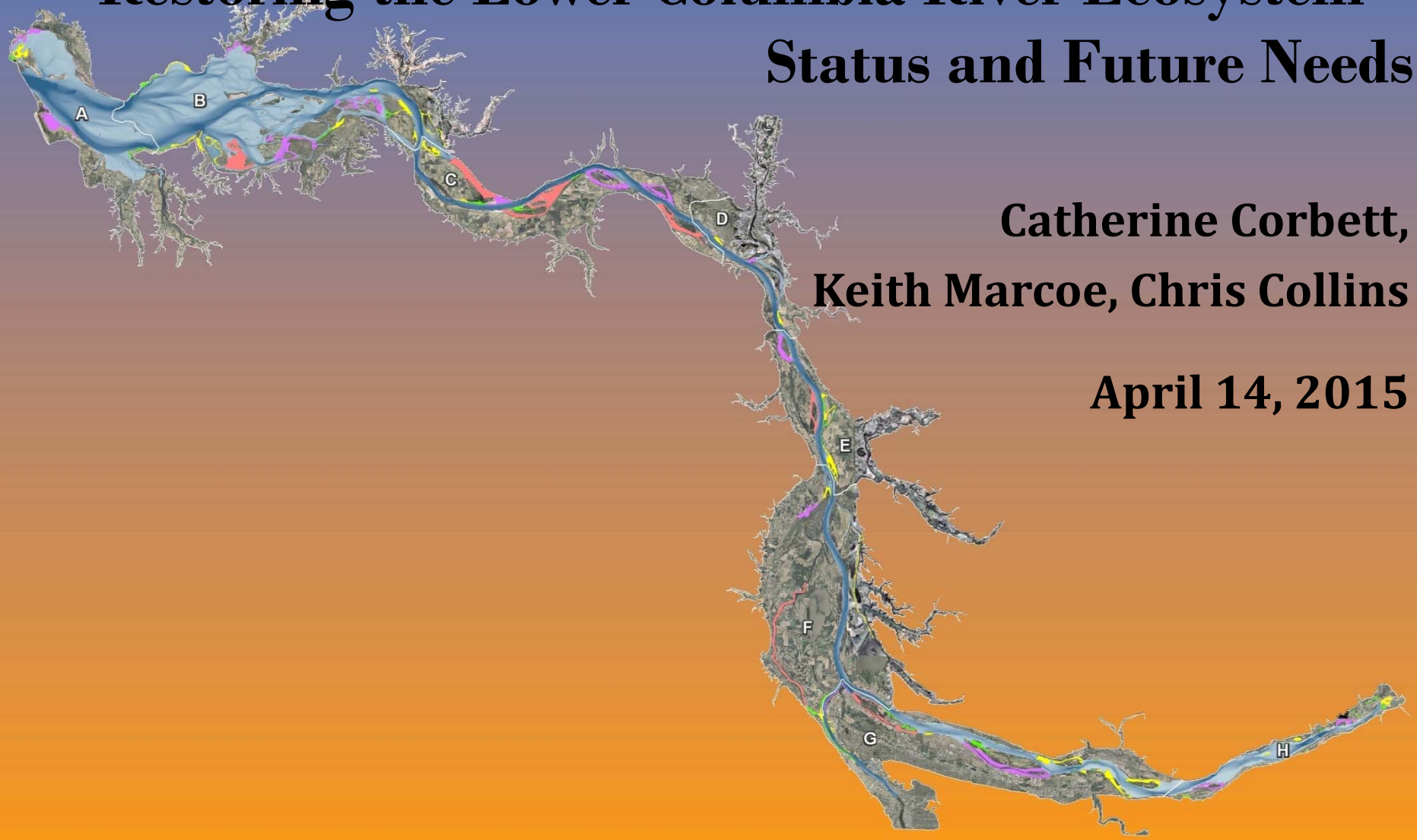
Lower Columbia Estuary Partnership

Restoring the Lower Columbia River Ecosystem – Status and Future Needs



Catherine Corbett,

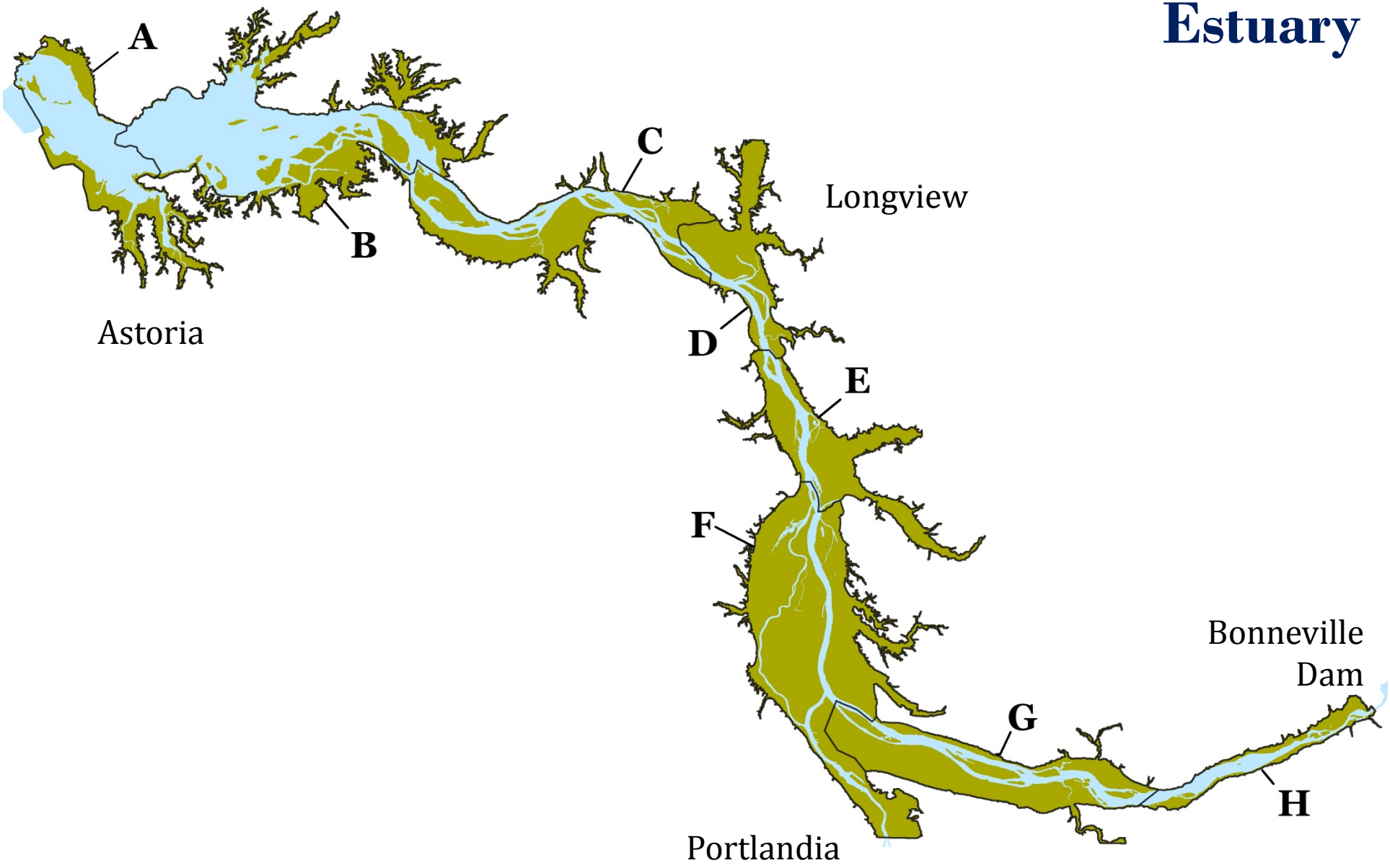
Keith Marcoe, Chris Collins

April 14, 2015

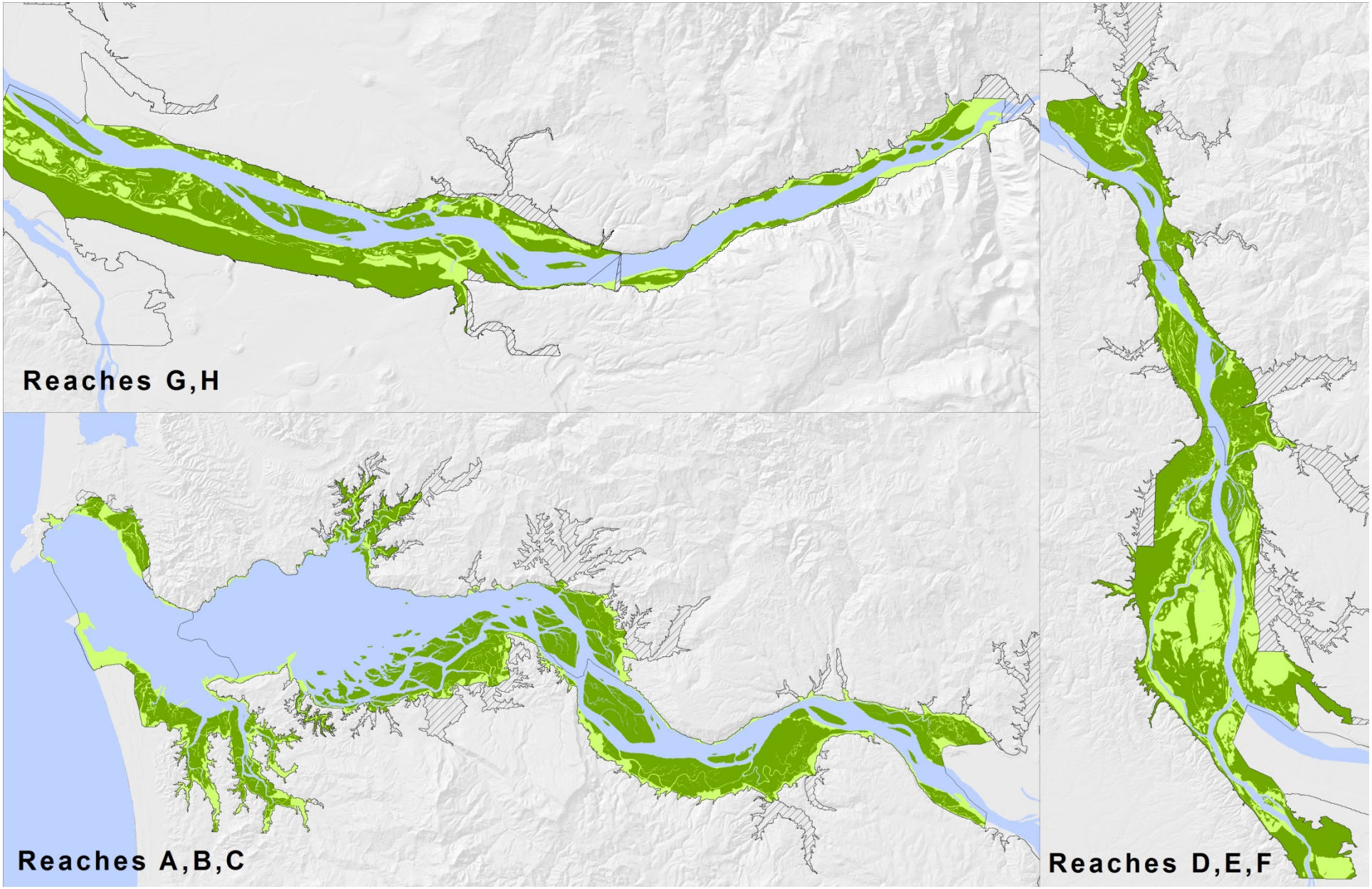
Central Message

- Protection and restoration have historically been focused on single species, faunal guilds, restoring historic conditions
  - Ex: Waterfowl, Columbia White-tailed Deer, Pacific salmon
- Shift to multi-species approach going forward
  - Restoration is expensive, avoid the need to retrofit projects
  - Limited funding
  - Many imperiled species w/ differing habitat needs
  - Protect common species from becoming imperiled
- Shift to integrate climate change impacts
  - Wetland migration inland
  - Protection, restoration of cold water refugia
  - Adaptive management for species shifts, migration

Lower Columbia River and Estuary

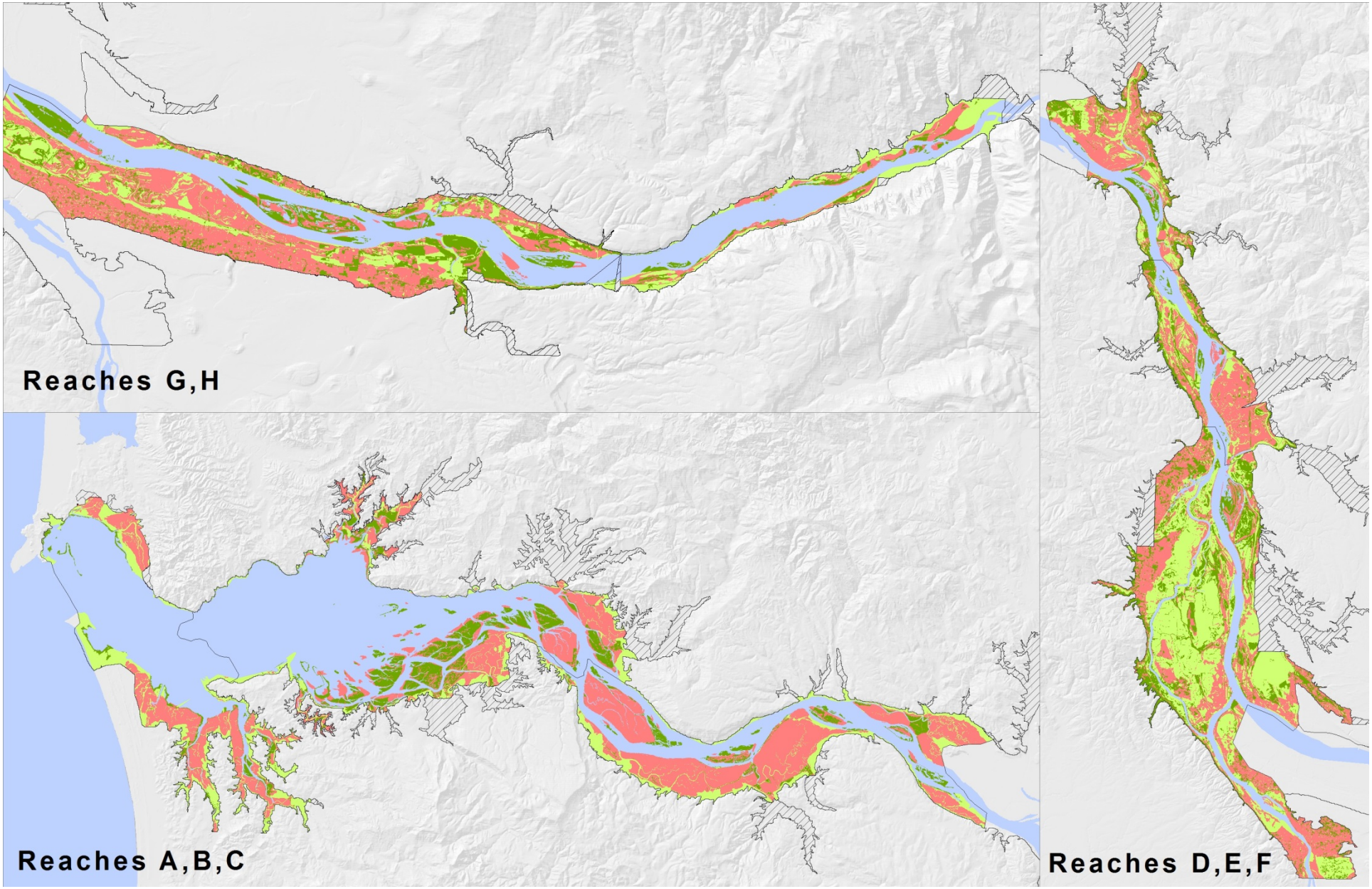


Historic Native Habitats Coverage (green)



Historic Native Habitats Coverage (green)

Habitat Loss (pink) since 1870s = 114,050 acres



Historic Native Habitats Coverage (green) 'Recovery challenged' areas (red) = 68,231

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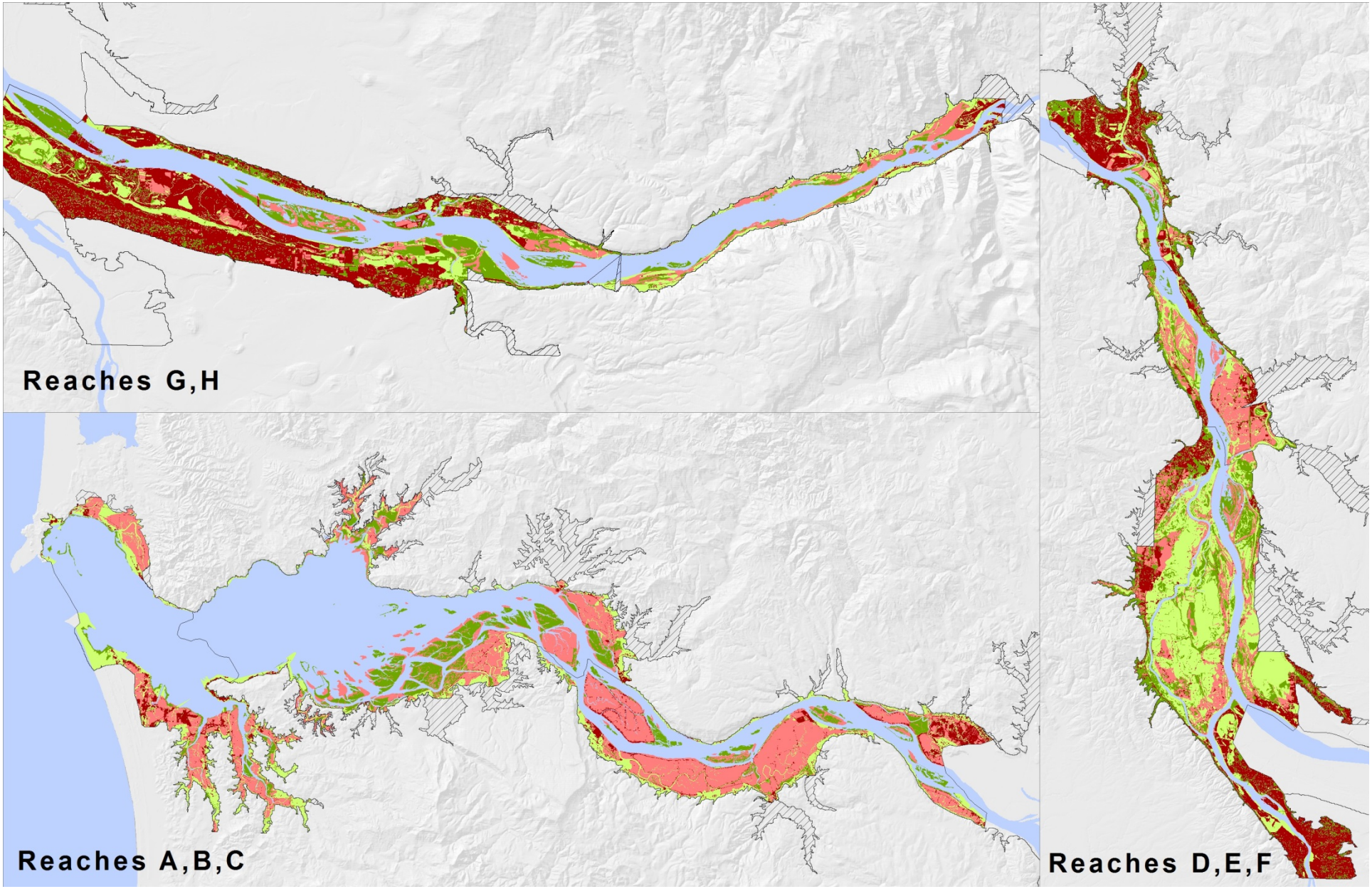

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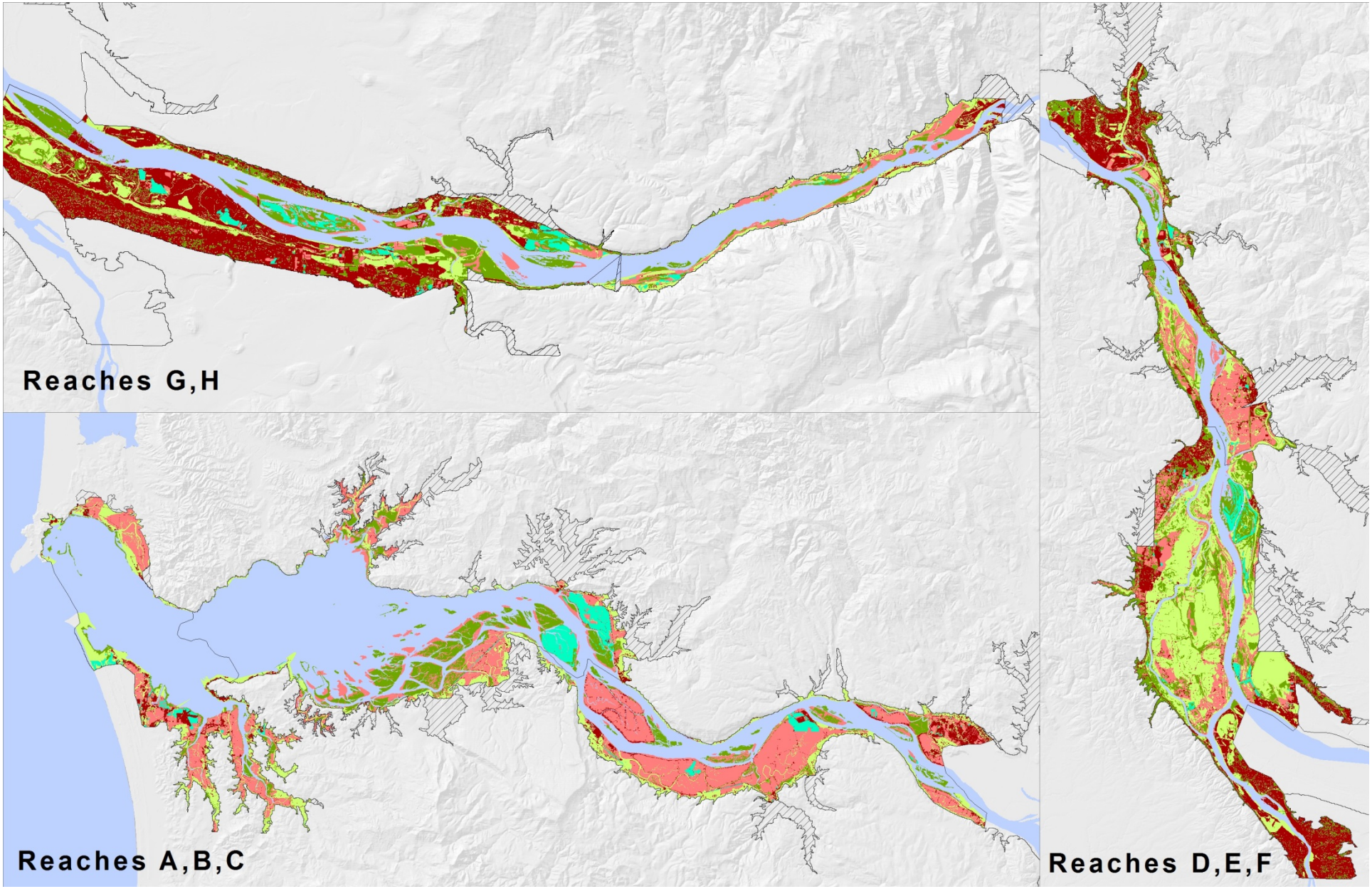

Historic Native Habitats Coverage (green) **'Recovery challenged' areas (red) = 68,231**

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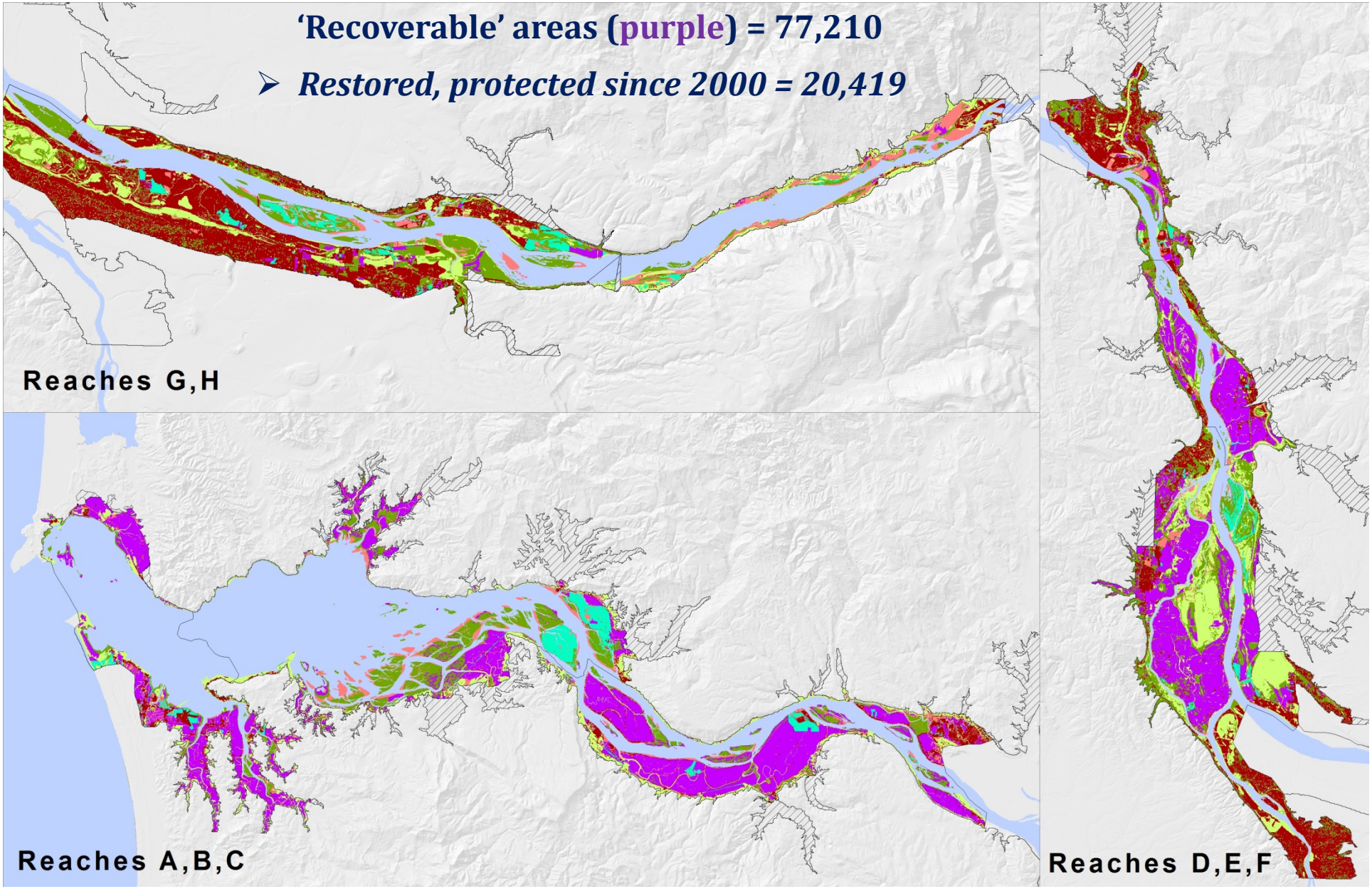


National Estuary Program Management Plan - Biological Integrity is Ultimate Goal

➢ Biological Condition Gradient for Assessment

(USEPA: Davies and Jackson 2006)

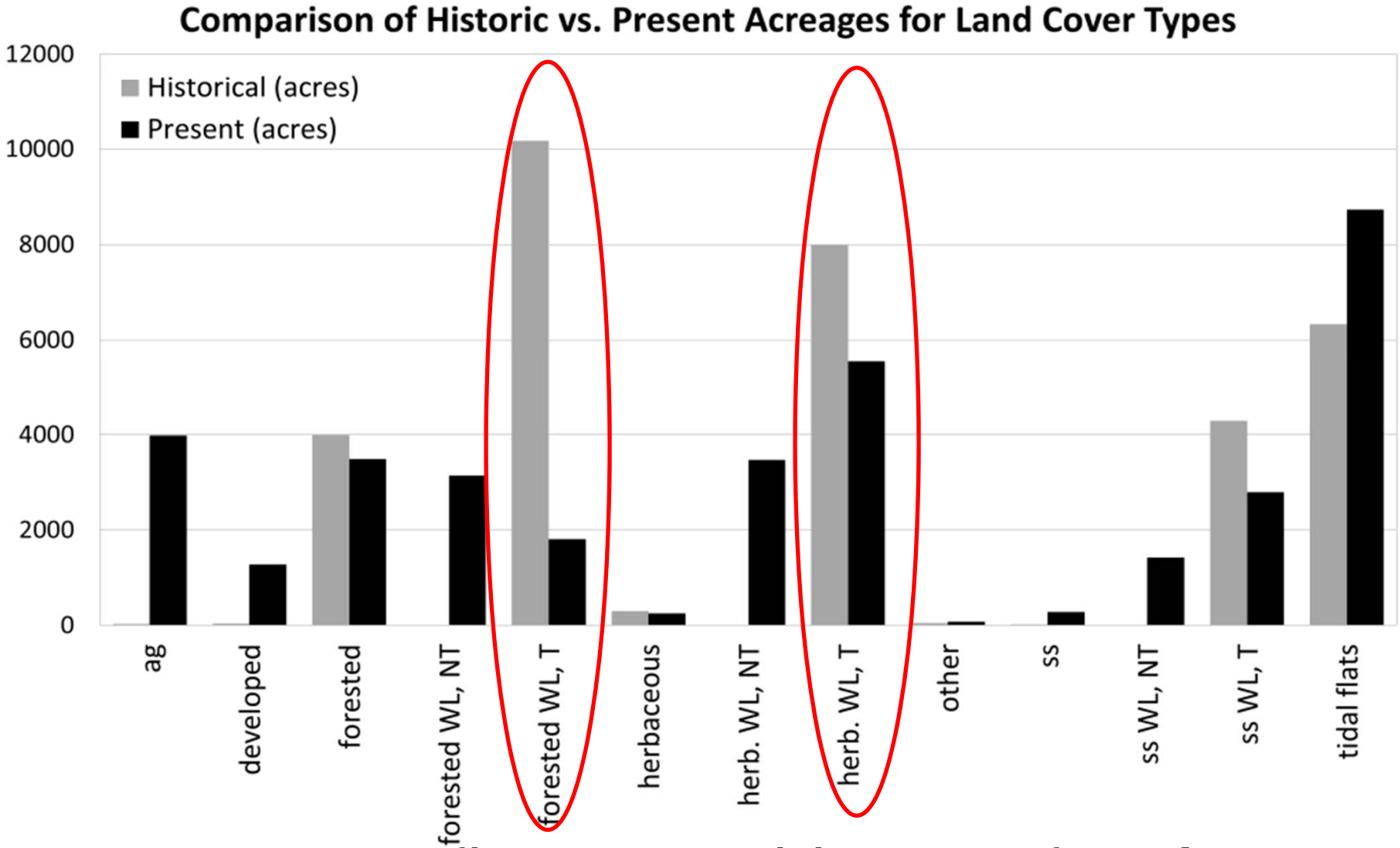
- Similar to Index of Biological Integrity (Karr 1981)
- ***Science Community identifies key ecosystem attributes***
  a. **Natural Habitat Diversity, Historical Habitat Mosaic**
  b. **Focal Species:** e.g., Pacific salmonids, Col. White-tailed deer, Pacific Flyway species (NPCC 2004)
  c. **Water Quality**
  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



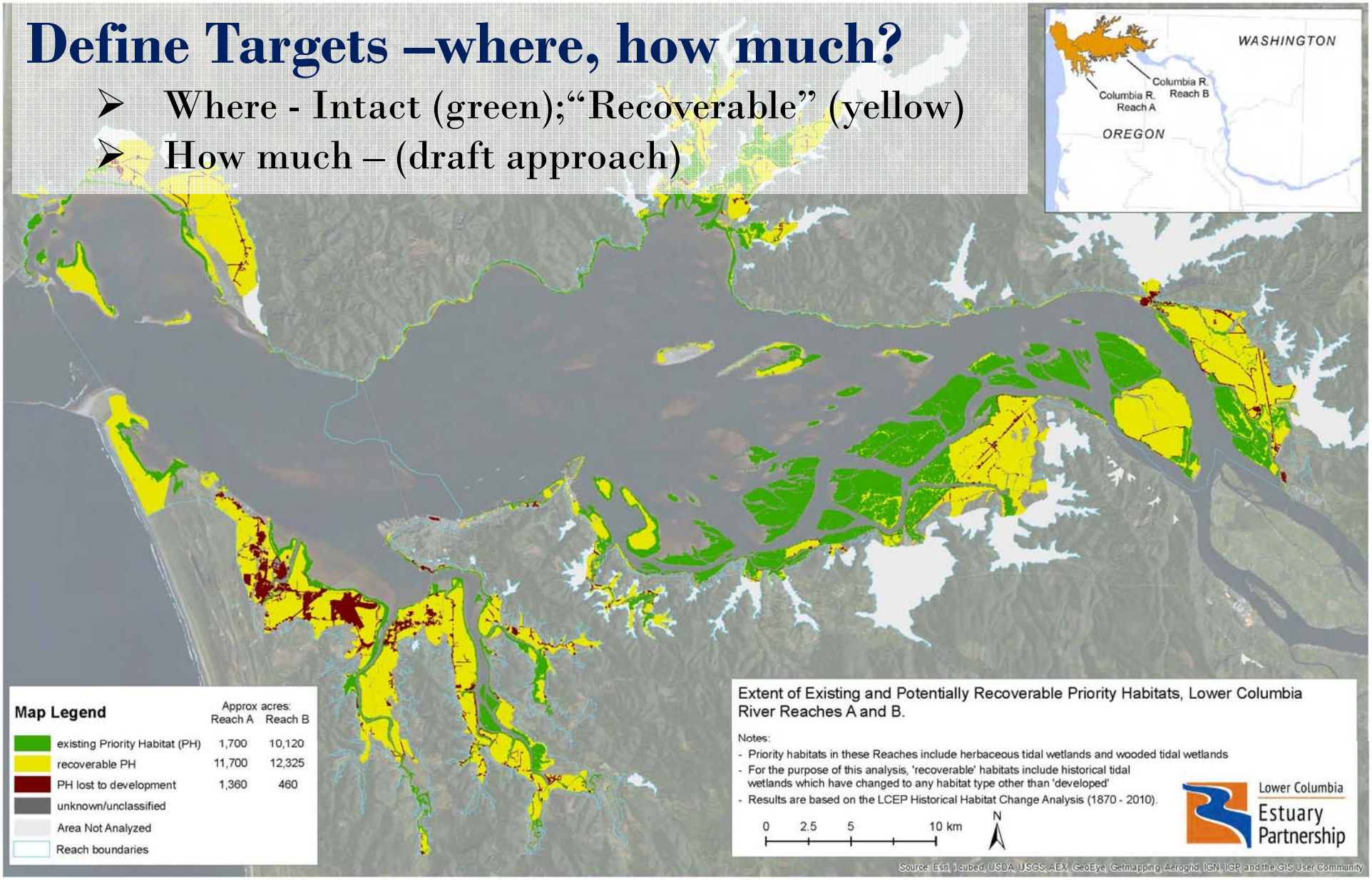
Comparison of historic vs. current habitat coverage for **Reach B**

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 – (draft approach)



Priority Habitats for Recovering Habitat Diversity

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

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" with smaller patches interspersed that fill gaps, provide corridors, connectivity
  - *Identify minimum size criterion, minimum number of occurrences by region*

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

Draft Habitat Coverage Targets (April 2014)

Reach	Available Recoverable Habitat	Total Acres Restored	Total Acres Protected	PH1 Habitat Type	PH1 Hist. Extent	PH1 Current Extent	PH1 Target 30% recovery	PH1 Target 40% recovery	PH2 Habitat Type	PH2 Hist. Extent	PH2 Current Extent	PH2 Target 30% recovery	PH2 Target 40% recovery	**Acre Margin for 30% recovery**	**Acre Margin for 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.

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*

That's Great, But…

Climate change impacts:

- **Sea level rise –**
  - Submersion and conversion of habitats
- **Changing precipitation patterns** –
  - More precipitation falling as rain, lower snow packs in mountains
  - Higher winter flows, lower summer flows
  - Altered timing and rates of change in flow events
  - More intense storms, increased wave energy, increased erosion
- **Changes in upwelling patterns** off coast -
  - Increased potential intrusion into estuary of hypoxia and acidification
  - Increased influence with lower summer flows w/precip changes
- **Warmer temperatures**–
  - Less habitat for cold water species
  - Species shifts, migration, mortality, increased competition

Paradigm Shift

Mitigating for Climate Change:

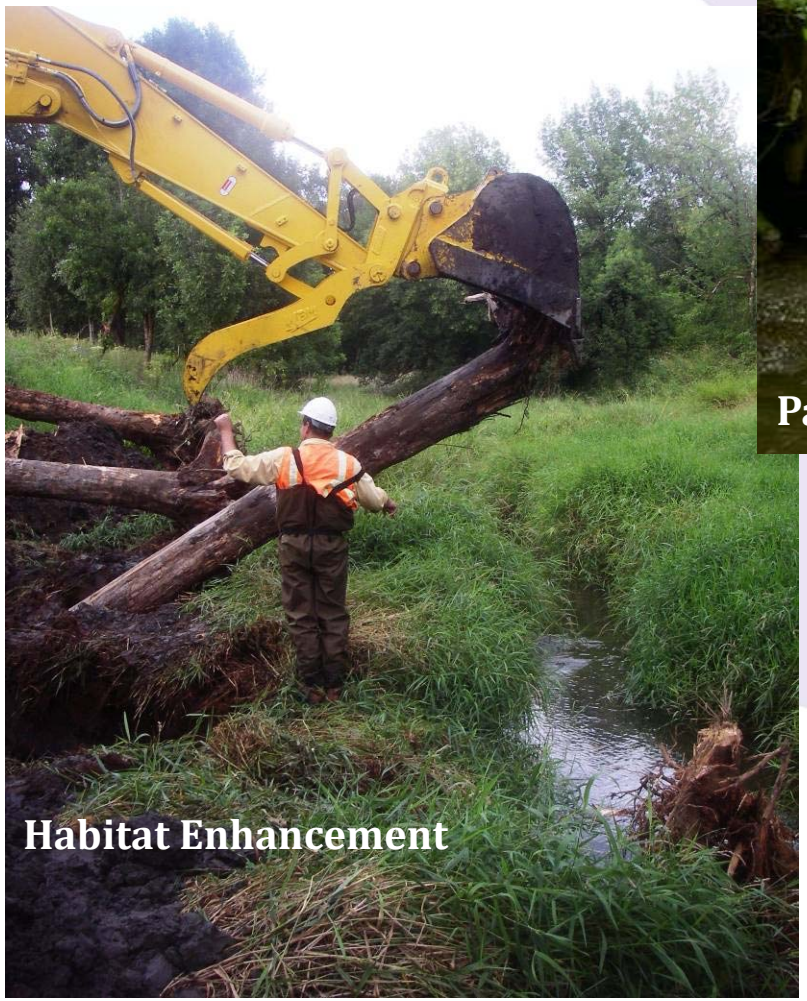
- To maintain floodplain wetlands, will need to **allow wetlands to migrate inland**
  - Assess sea level rise, marsh erosion, submersion
  - Identify areas - urban, productive agricultural - that will be protected
  - Protect more inland, upland areas behind current habitats
  - Strategic levee and dike modification
- Identify ways to support **species ability to adapt**
  - Provide diversity of habitats to support resiliency of species using them
  - Protect, restore base flow, groundwater inputs to tributaries, alluvial fans to provide cold water refugia
  - Understand likely changes in habitat structure with increasing temperatures, changing precipitation and inundation, flow patterns
  - Understand likely species shifts, migration, mortality, competition
  - *Adapt management strategies – focus on restoring historic conditions might not be protective of native species*

Challenge for Restoration in Short Term

- **Integrate multiple species in project designs**
  - Funding may be focused on single species (e.g., Pacific salmon, steelhead, avian) BUT
  - Responsibility of practitioners to not cause harm to other native species (e.g., amphibians, turtles)
  - Sponsors can integrate aspects into design to benefit other species
    - Ex. - survey for frog egg masses and design intertidal reconnections so that tidal fluctuations will not cause desiccation of eggs; add large wood for turtles, beaver, others
- **Protect, restore cold water refugia**
  - Protect, restore instream baseflow to tributaries
  - Remove diversions, weirs that dewater downstream areas
  - Remove barriers, improve riparian conditions, increase complexity
- **Protect future wetlands - wetland migration inland with sea level rise**
- **Fill gaps in habitat diversity, expand protected areas for larger "anchor areas" for resiliency**

Typical Restoration Practices Now

Most projects have occurred in the floodplain and tributaries

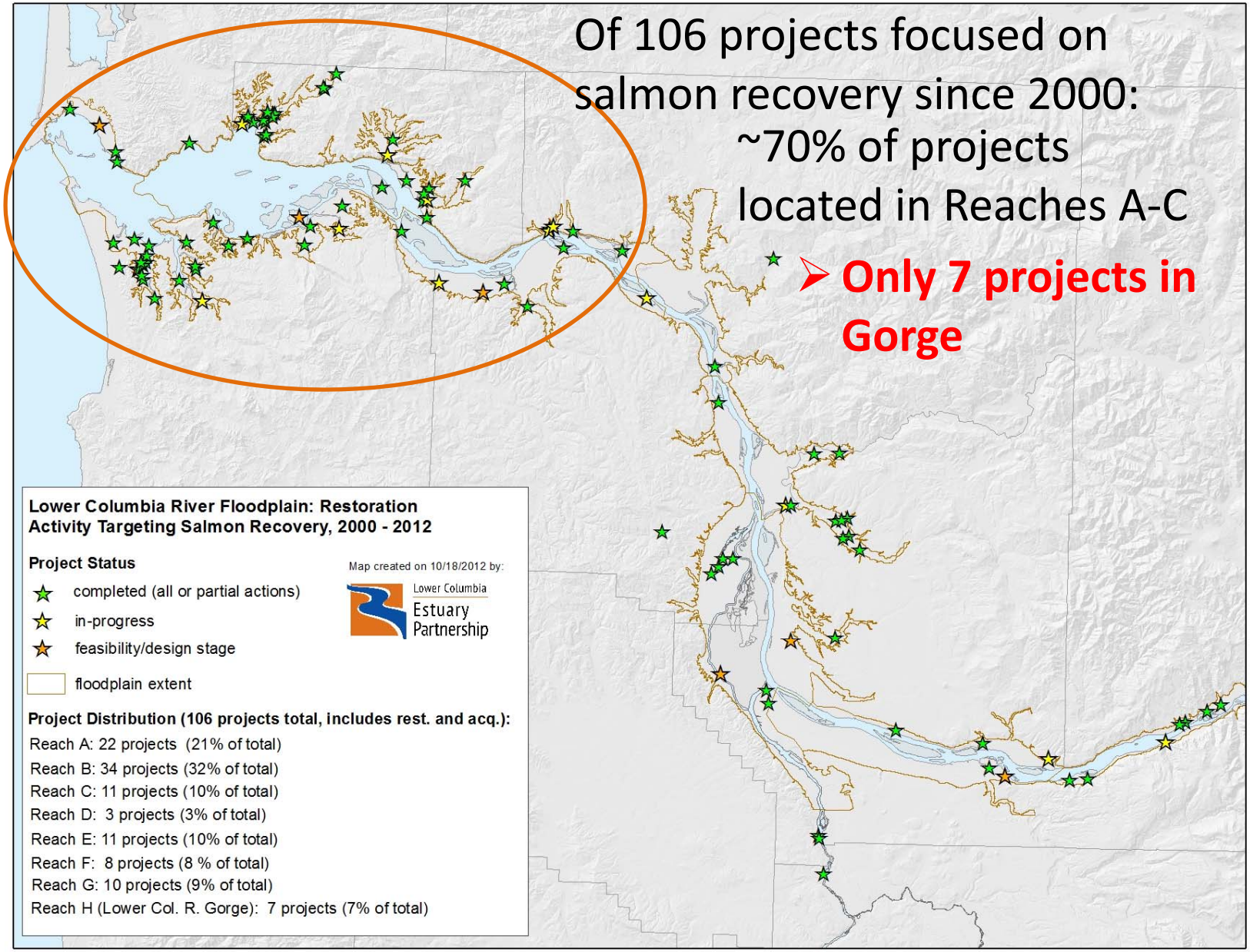


Habitat Enhancement

Passage Improvements

Floodplain Reconnections

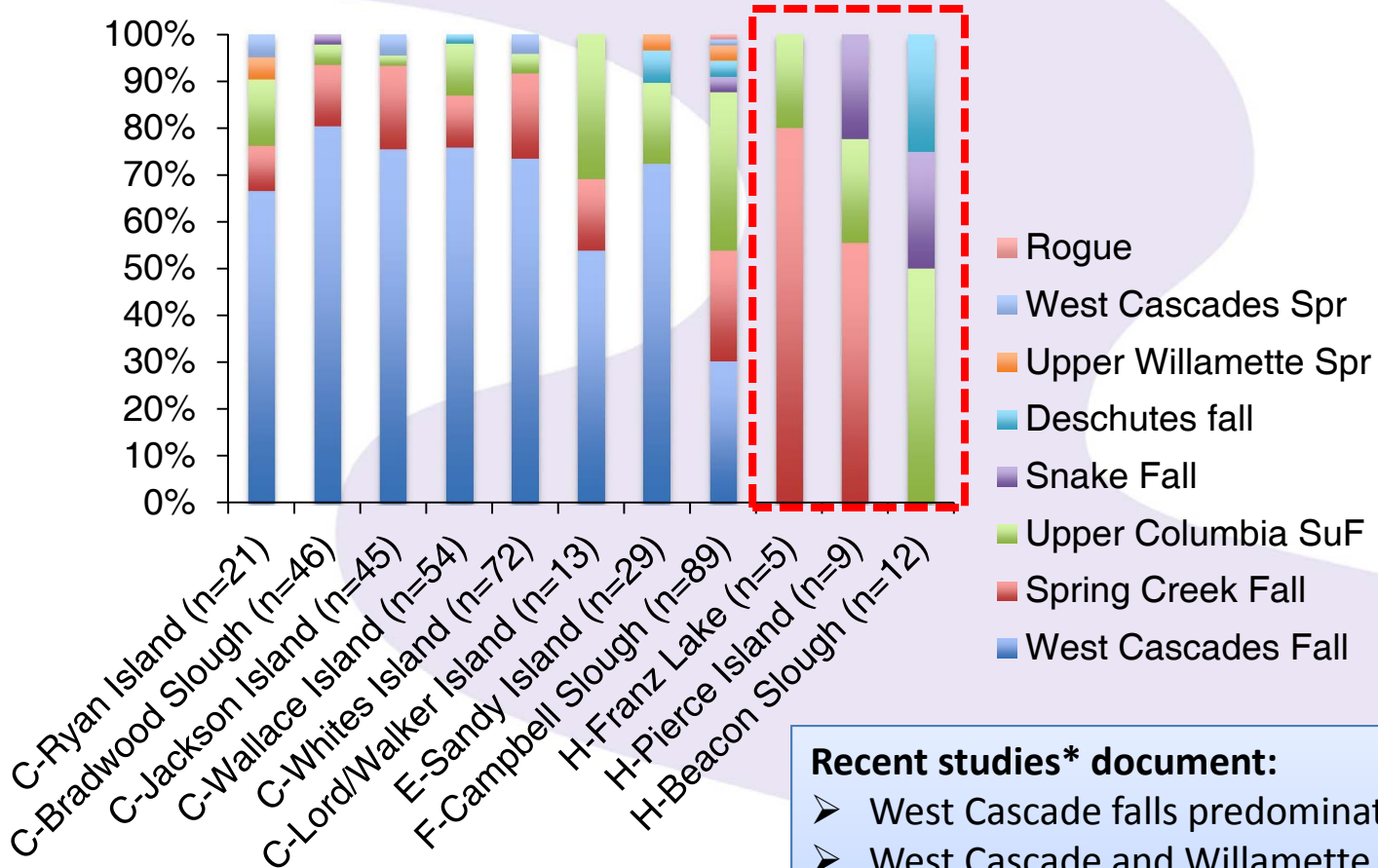
Where Restoration Occurs Now



Why the Gorge?

Basin-wide salmon recovery - Estuary residency and habitat use varies by stock, timing, size

- **Important rearing habitat for upriver juvenile Chinook**



From Sagar et al. 2012

Recent studies* document:

- West Cascade falls predominate in Reaches C - E
- West Cascade and Willamette springs and Spring Creek Group falls in most reaches
- Upper CR summer/fall in upper reaches, especially H
- Small proportions of Snake falls in the upper estuary
- Rogue and coastal fish in Reach A

*Bottom et al. 2011, Sather et al. 2011, Roegner et al. 2012, Sagar et al. 2012

Why the Gorge?

Thermal refugia – mouths of some tributaries important for summer/fall returning adults

- ~50% steelhead used Gorge tributaries when temperatures were 19-21°C in mainstem
- >70% steelhead used tributaries when temperatures were > 21°C

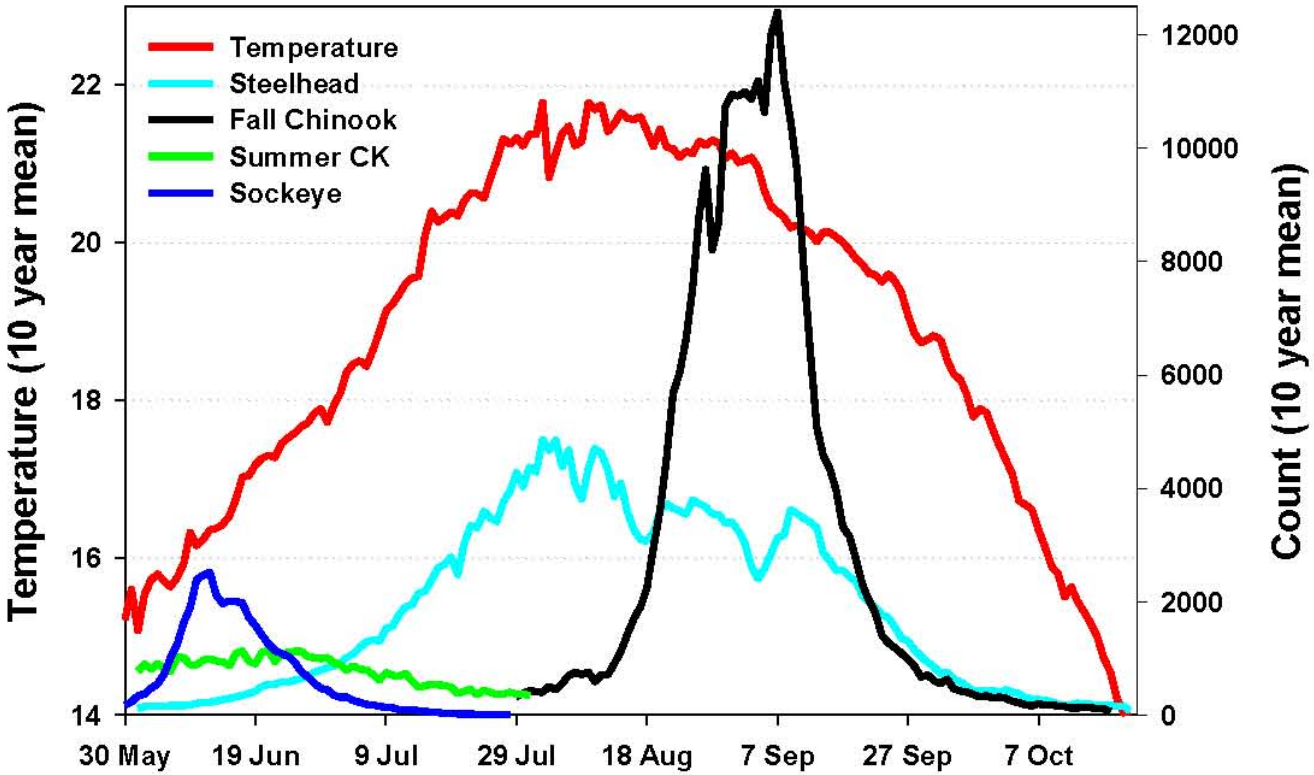


Figure 2. Ten-year (1996-2005) mean lower Columbia River water temperature (°C) and mean run size and timing of adult summer Chinook salmon, fall Chinook salmon, sockeye salmon, and summer steelhead at Bonneville Dam. Thermal refugia use by many adult populations has been associated with

From Keefer et al. 2011

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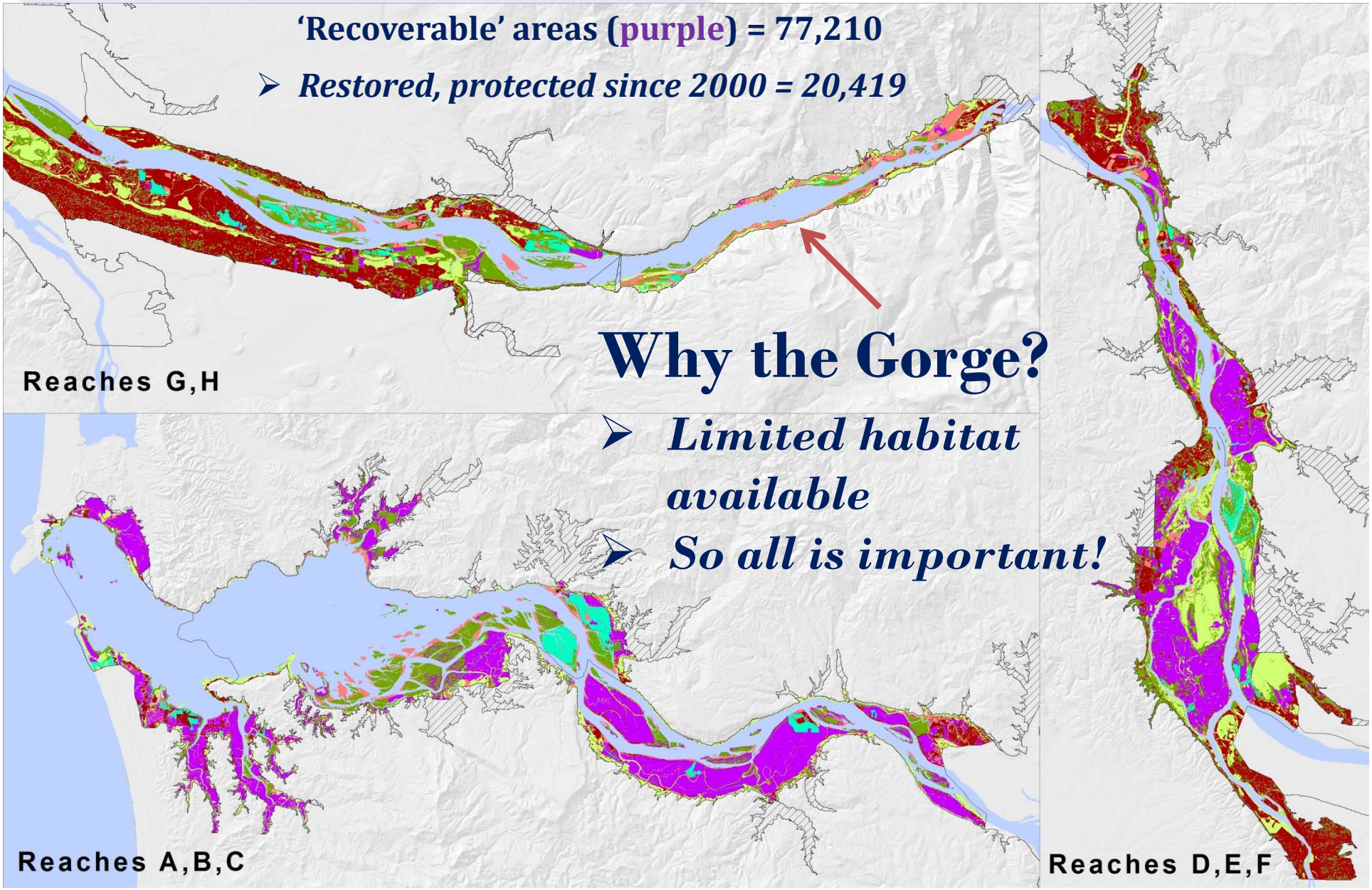

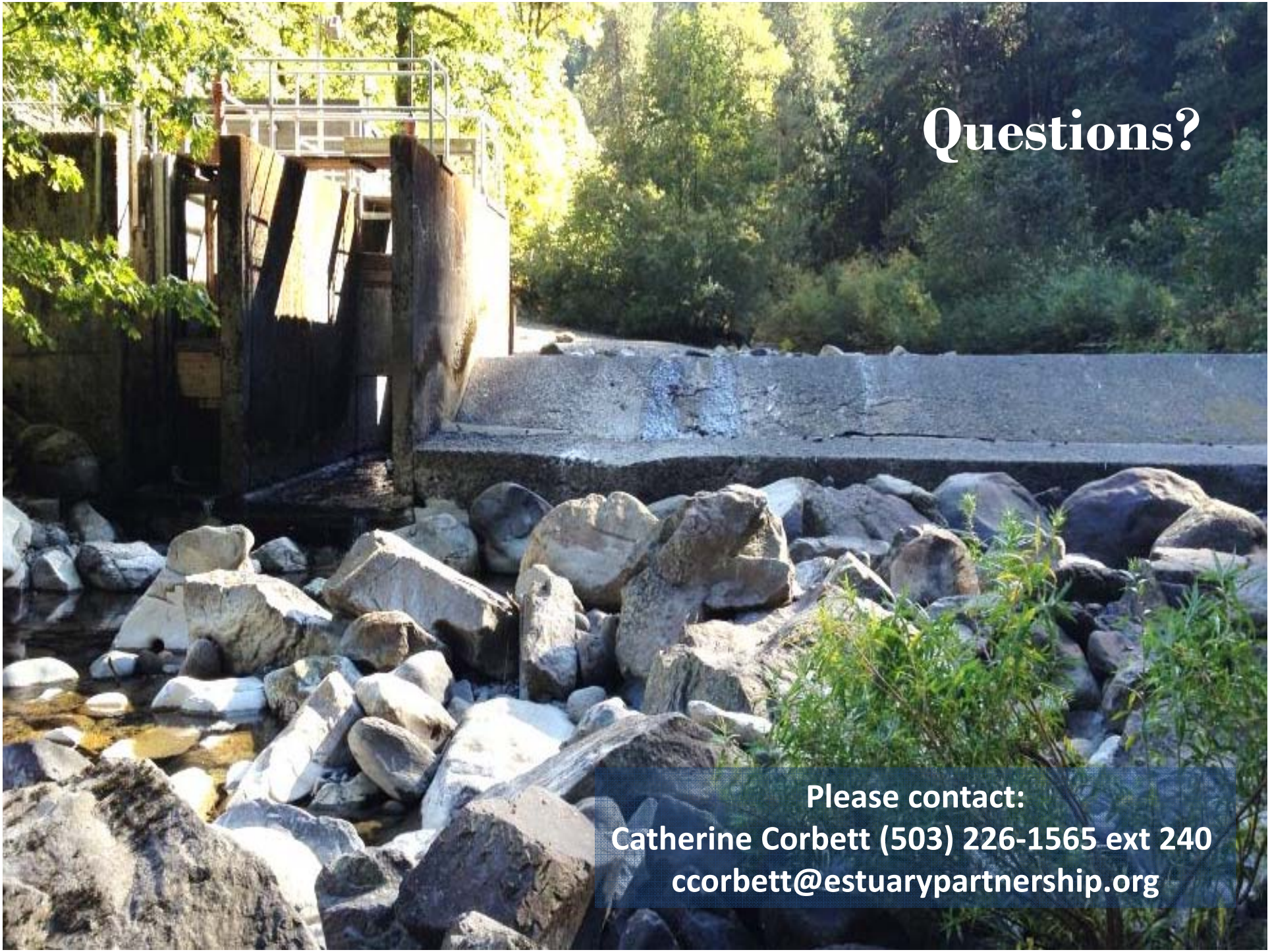
Questions?
Please contact:
Catherine Corbett (503) 226-1565 ext 240
ccorbett@estuarypartnership.org