Resource-based habitat coverage targets and climate actions in the Columbia Estuary

Catherine Corbett, Chief Scientist

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Lower Columbia Estuary Partnership

Overview

- Resource-Based Habitat Coverage Targets
- Problem with Traditional Conservation Approaches
- Managing for Change
  - Climate Smart Conservation (*adaptation*)
  - Natural Climate Solutions (*mitigation*)

Conservation Reserve Network Status

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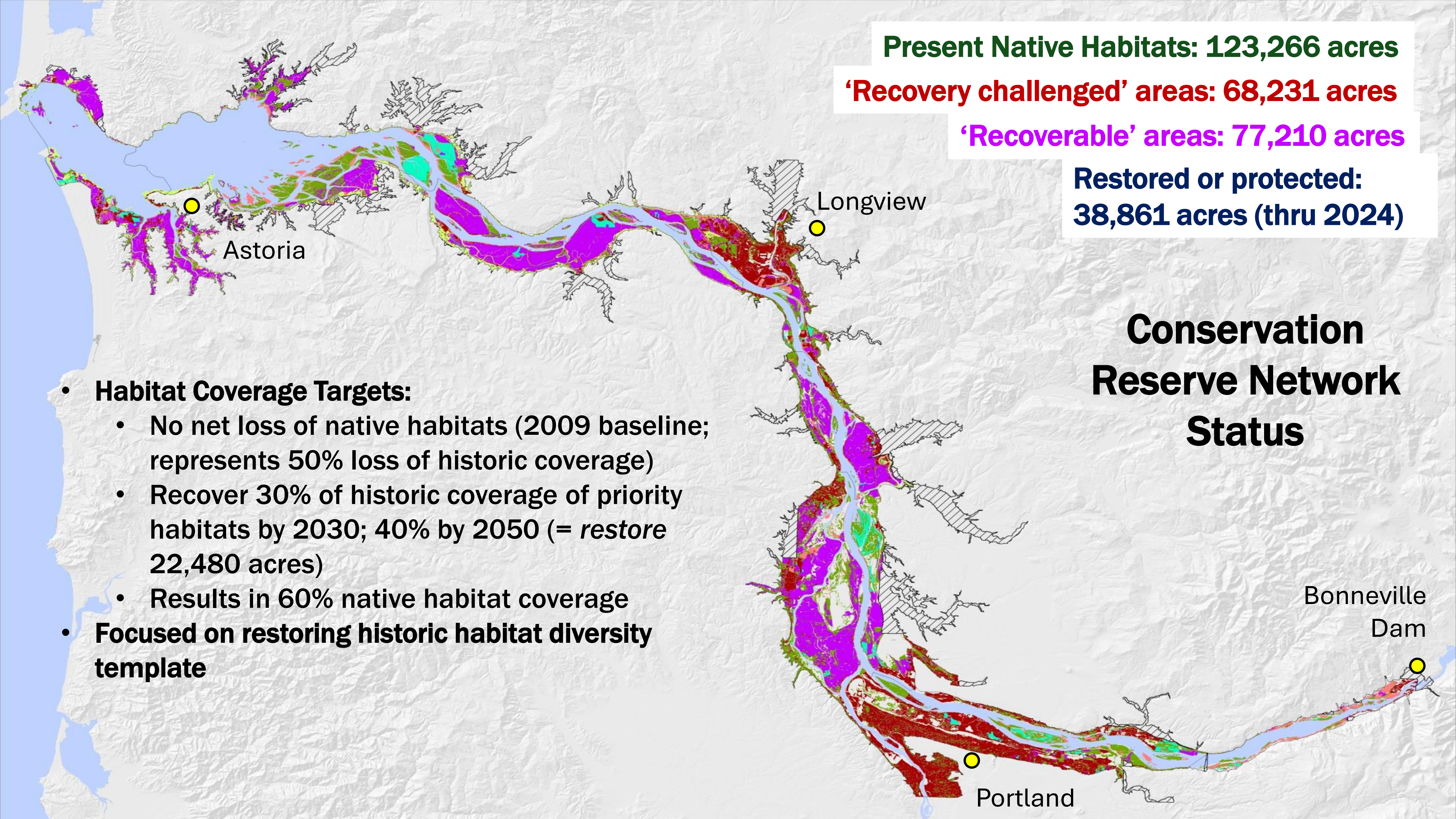


Three Basic Approaches for Identifying Critical Areas for Inclusion in a Reserve Network:

Protect Biodiversity "Hotspots"

Identify areas w/ large number of species use, esp. endemic species not found elsewhere

Pacific Flyway Migratory, Over-wintering habitats

Protect, Restore Under-Represented Habitats

Identify types and severity of habitat loss through human disturbance

Protect, Restore Habitat Required for Focal Species

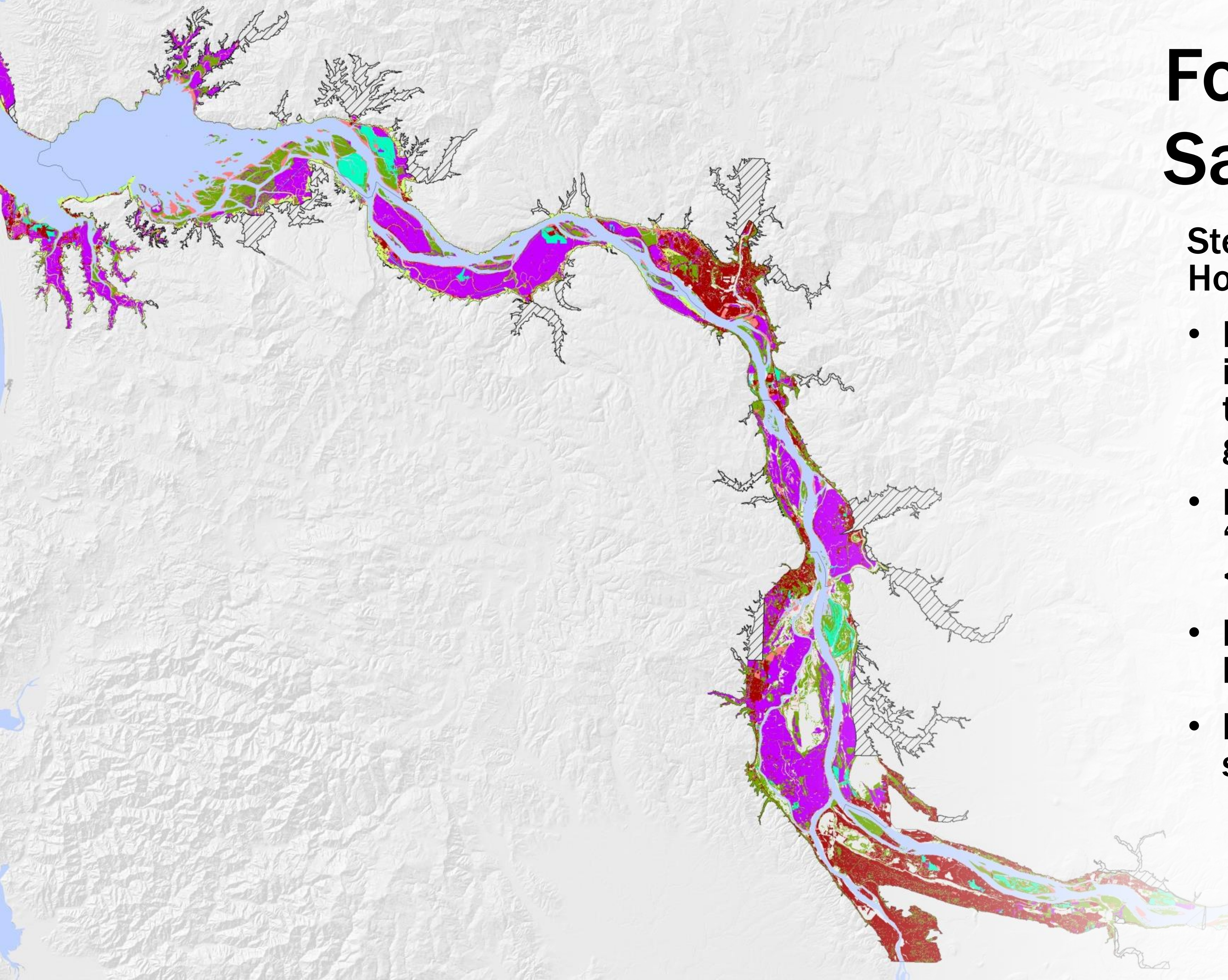
Identify types, locations and extent of habitats essential to focal species

Focal Species:

- **Waterfowl**
- **Columbia White-tailed deer**
- **Herptiles**
- **Salmon & Steelhead**

➢ **These can point to different habitats for protection and restoration**

Adapted from R. Noss 2000



Focal Species - Salmonids

Stepping-stone conceptual model in Hood et al. (2021):

- Provide large habitat patches at important estuary transitions (i.e., tributary junctions, the salinity gradient)
- Reduce salmon travel distances or “gaps” between habitat patches to <5 km.
- Increase the size of available habitat patches
- Improve the quality of the surrounding habitat matrix

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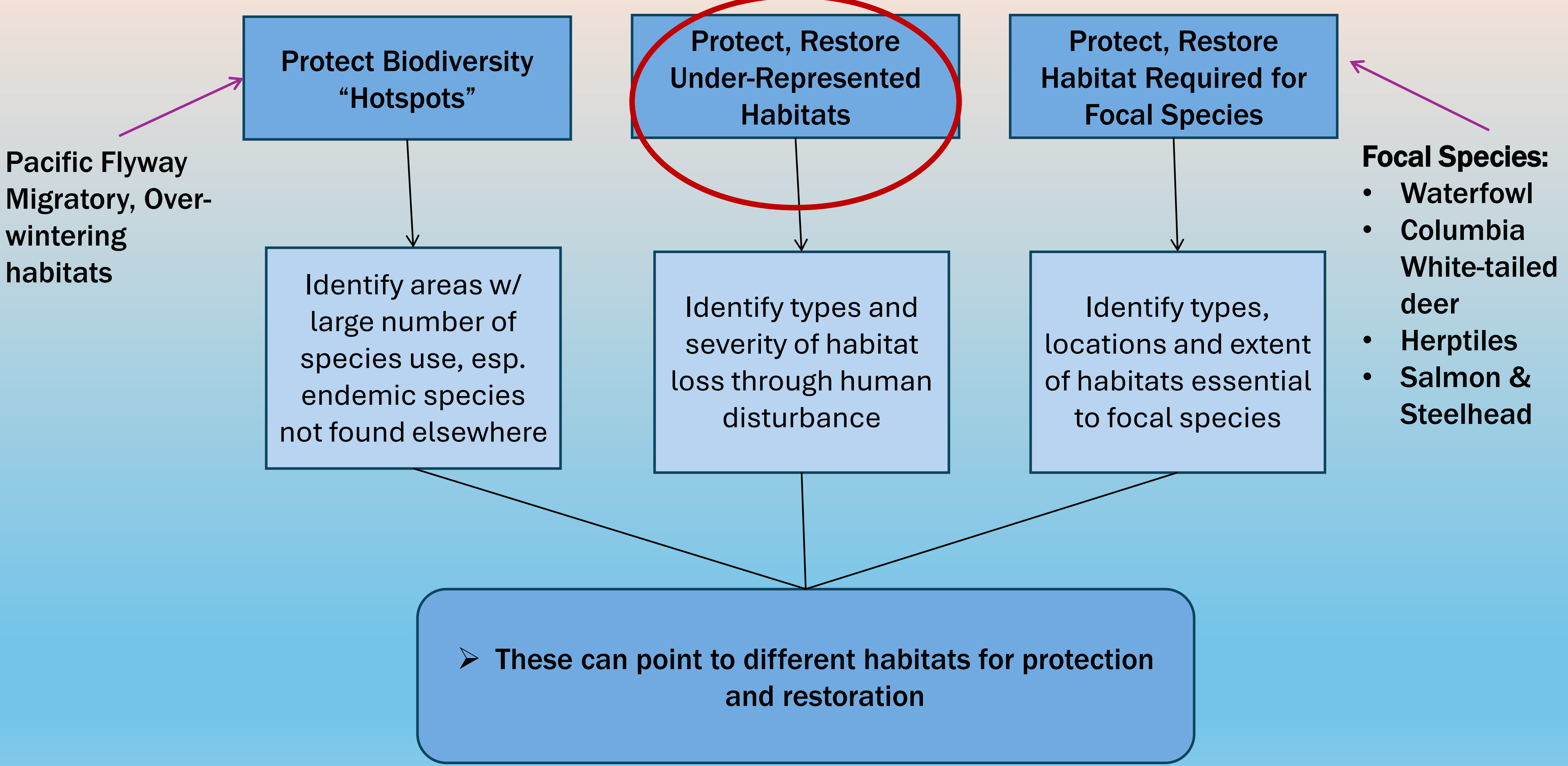
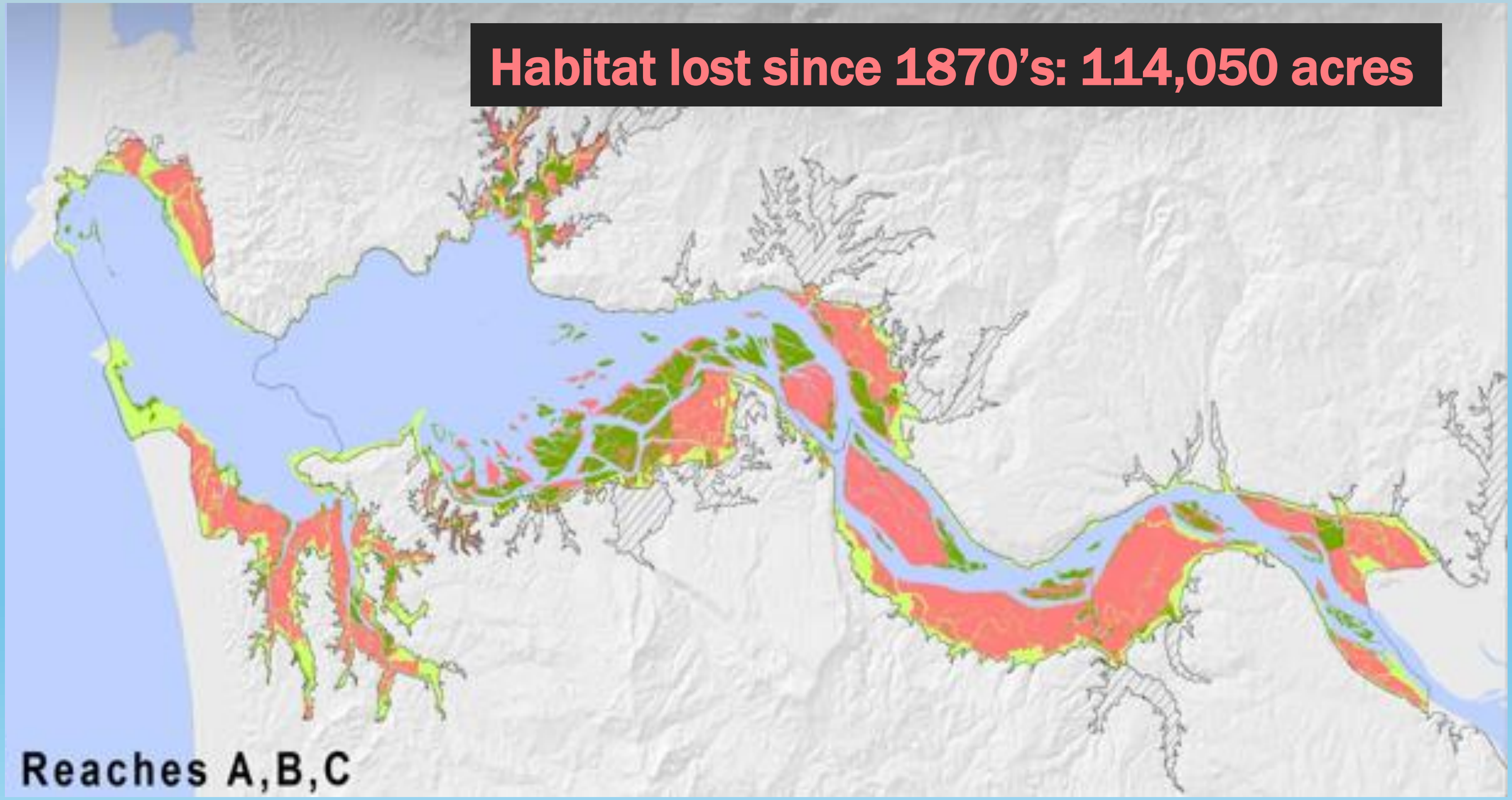


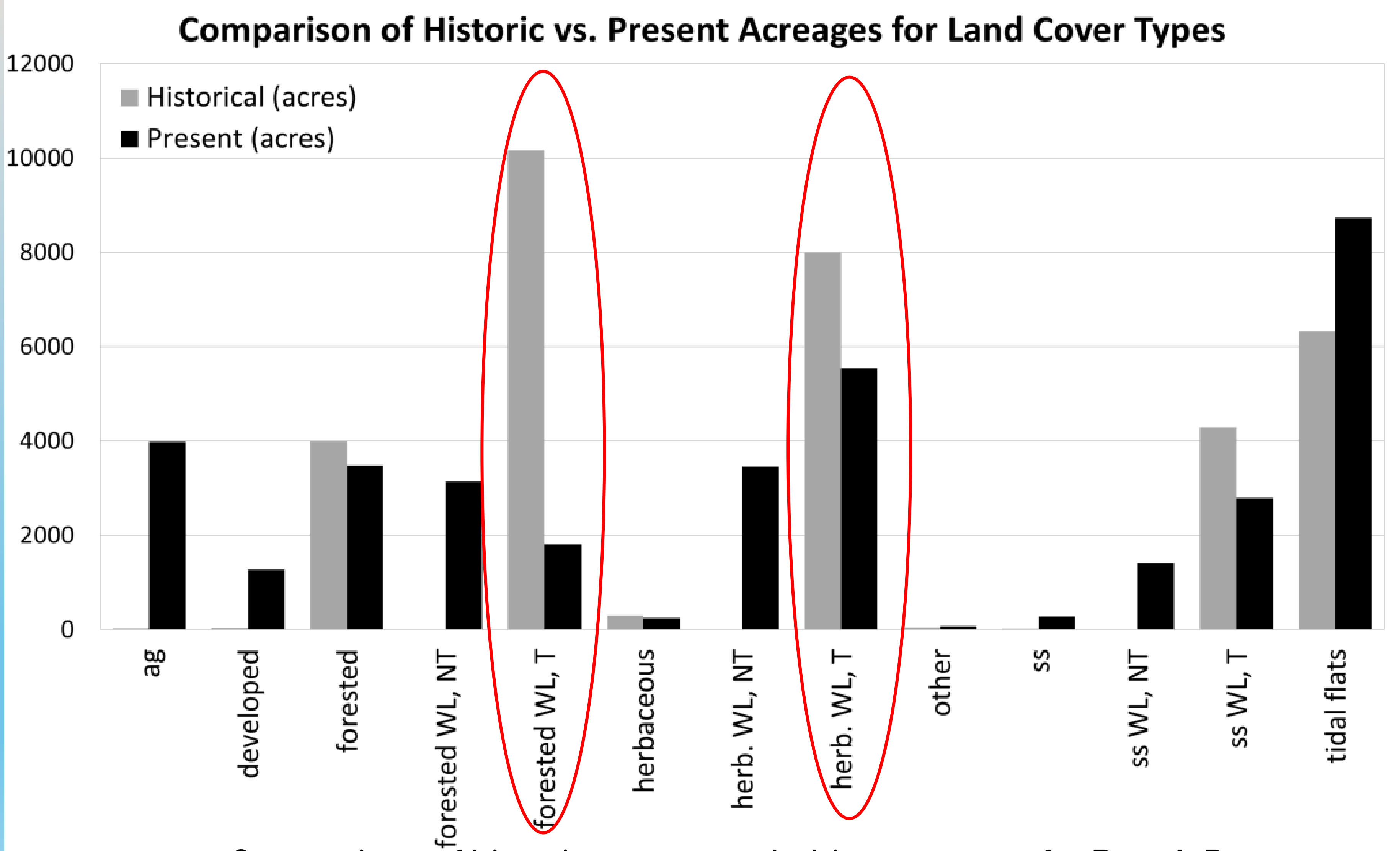
Adapted from R. Noss 2000

Objective - 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			

Methods for Setting Measureable Targets (Tear et al. 2005)

1. **Single species** - identify population goals (e.g., minimum viable population, population viability analyses), and habitat needs to meet them
2. **Multiple Species -** similar to #1, but first identify focal or target species and then pop. goals, etc.
3. **Ecosystems** - protect percentage of historic habitat extent that will be protective of species using those habitats
    - Pre- urbanization or some period where data exists (e.g., Tampa Bay 1950s 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])

Other Considerations

- **Set targets for short (1-25 years) and long time periods**
    - Population viability analyses often use 95% probability of persistence to >100 years
- **Incorporate "three R's":**
    - **Representation** – capturing some of everything
    - **Redundancy** – reduce risk of losing representative components
    - **Resilience** – supports ability to persist through disturbances

Example: The Nature Conservancy

- **Southern Rocky Mountain Ecoregion; 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 (1850s) extent
  - 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 species occur range from 10 - >80

From Tear et al. 2005

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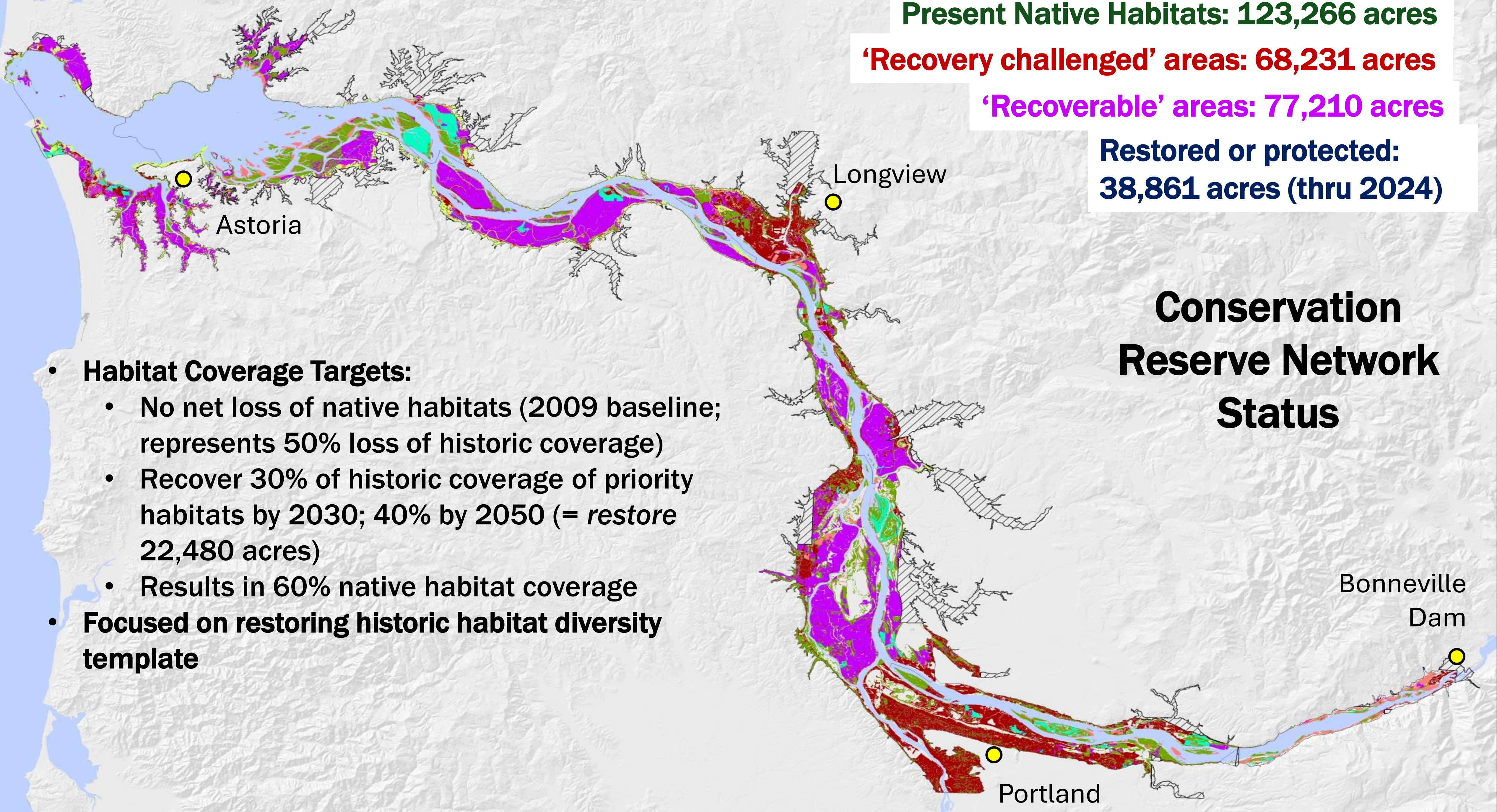

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Results – Habitat Coverage Targets

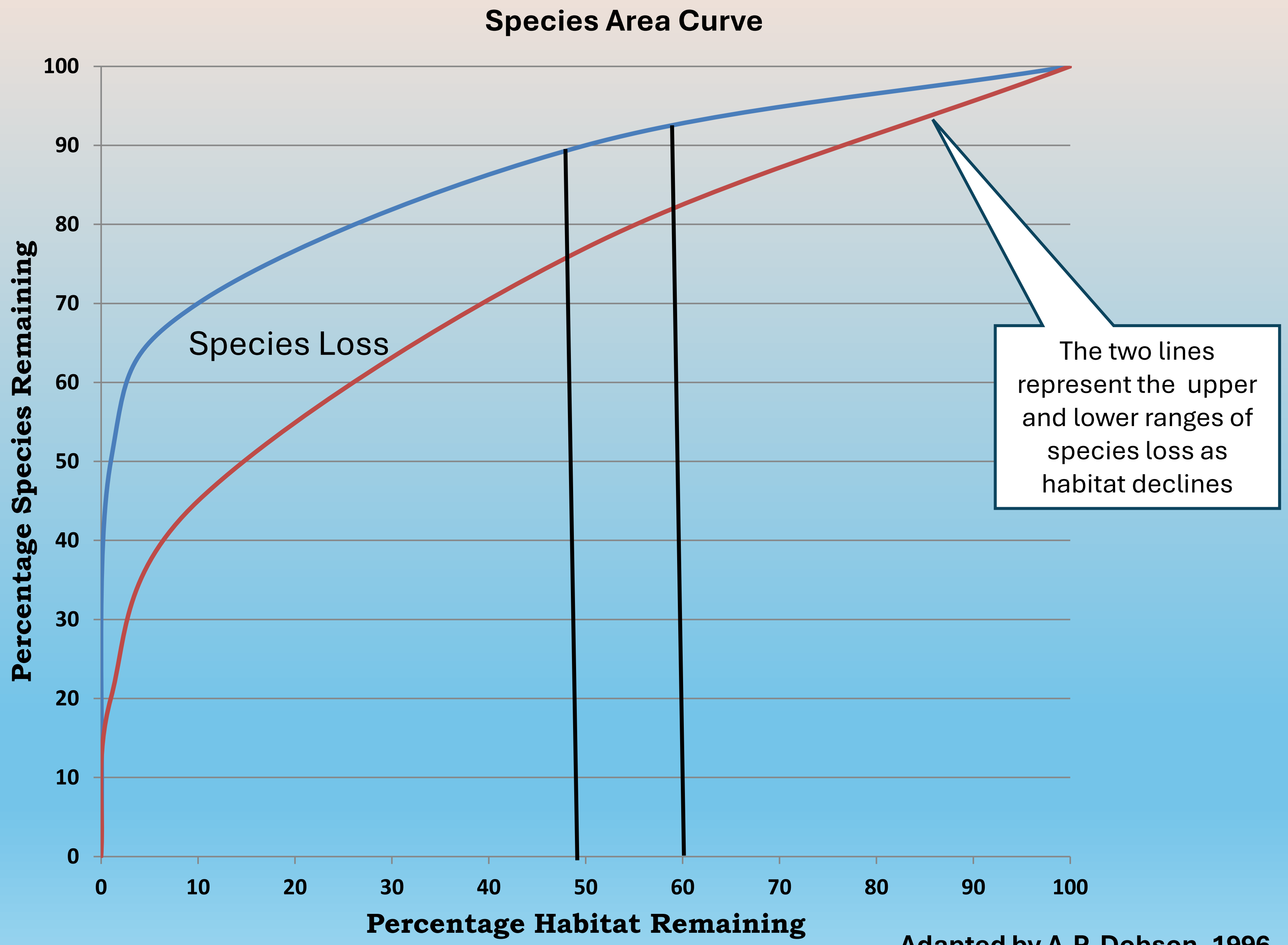
- No net loss of native habitats (2009 baseline; 114,050 acres lost since 1870)
- Recover 30%* of historic extent for priority habitats by 2030; 40%* of historic extent by 2050

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

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

- **TOTAL: Restore 10,382 by 2030; 22,480 acres of priority habitats by 2050**
- **Results in 60% of historic habitat coverage**

Habitat Coverage Targets (2016)



Adapted by A.P. Dobson, 1996

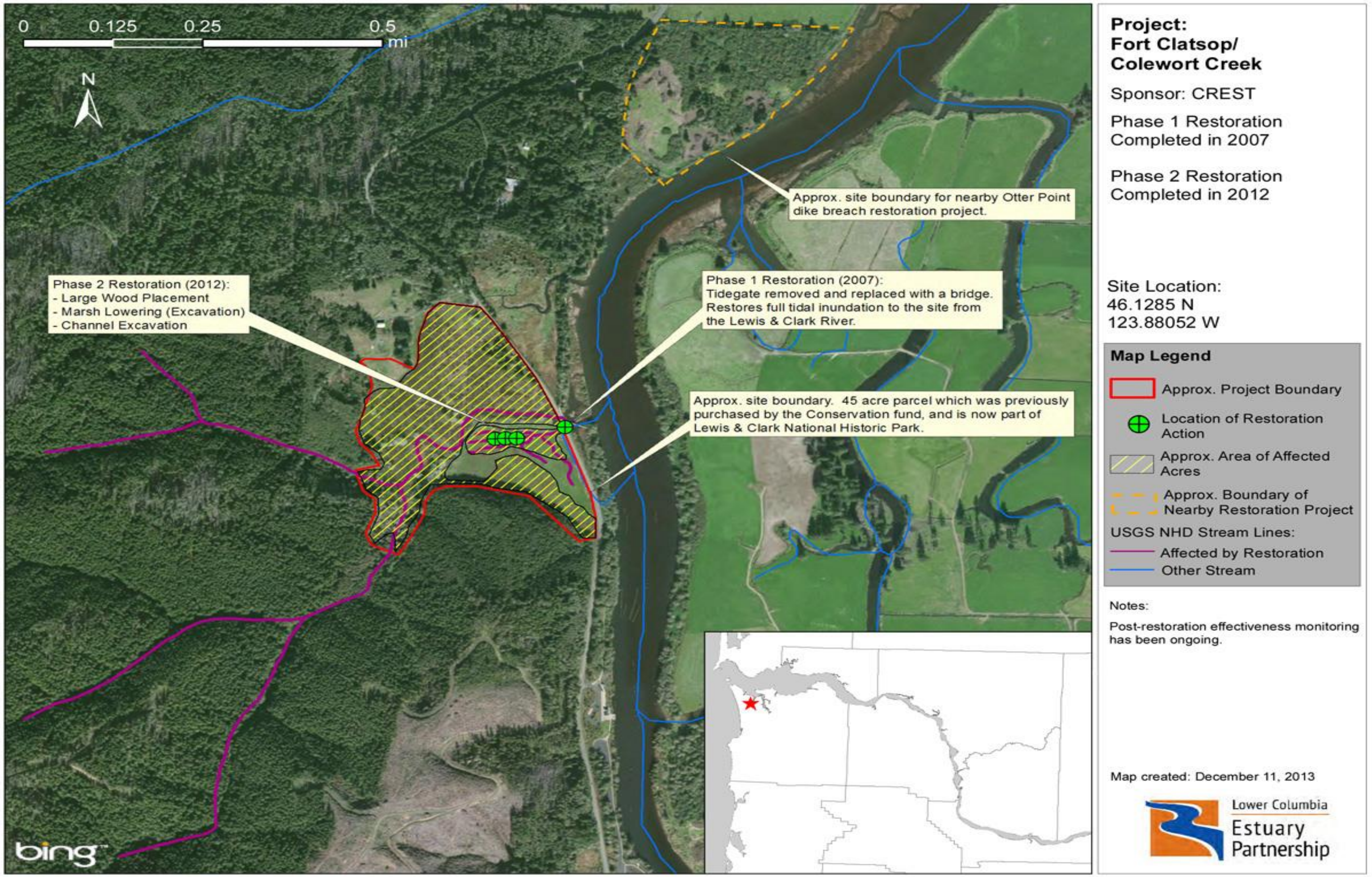
Track Actions in our Restoration Project Inventory

Geodatabase of restoration, protection projects

- 336 projects
- Track status – planned, underway, completed
- Track actions, project location, extent, types of habitats, project sponsor

Application – Compare with Habitat Coverage Targets to identify <u>gaps in actions</u>

Available Online:



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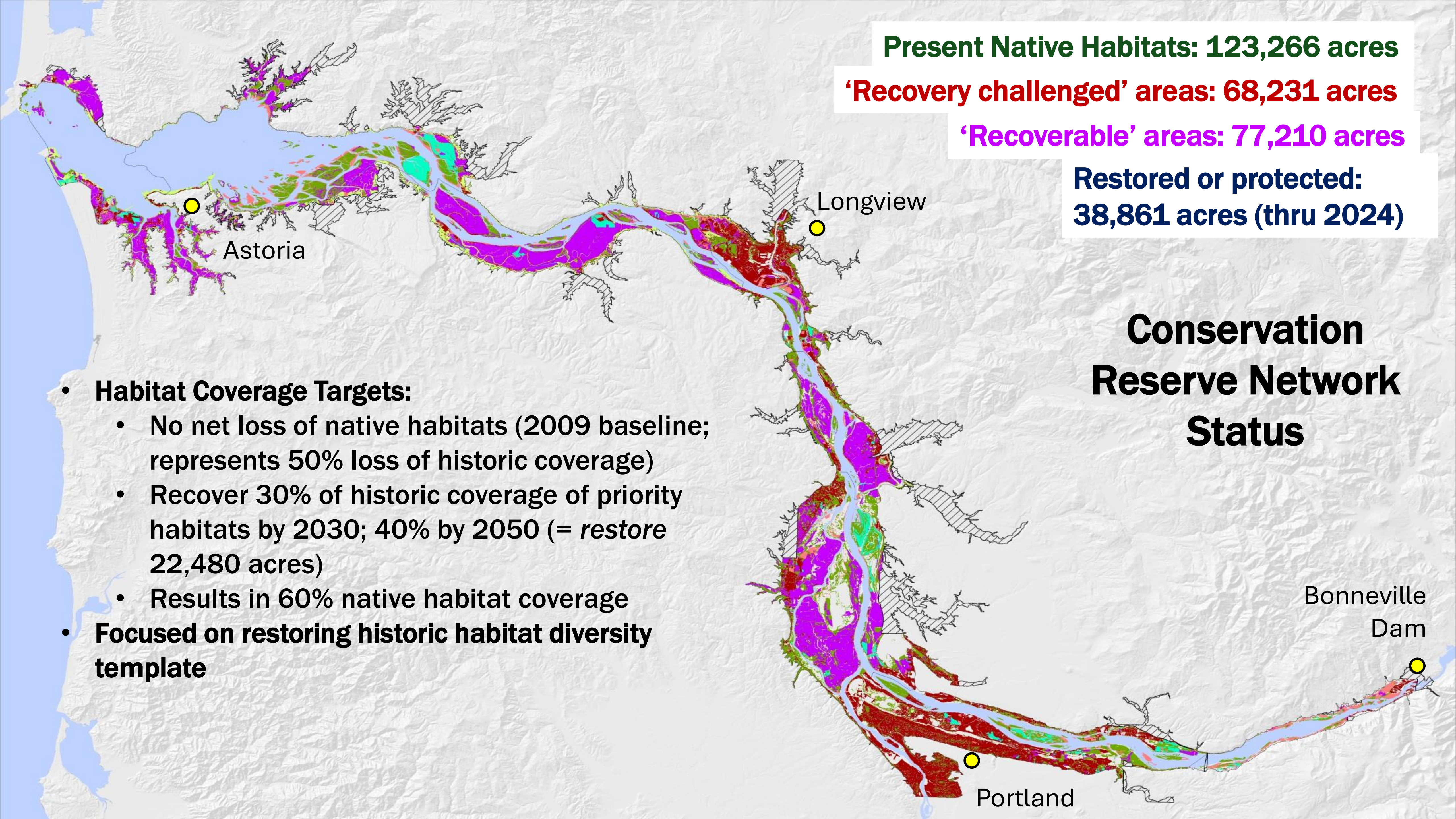

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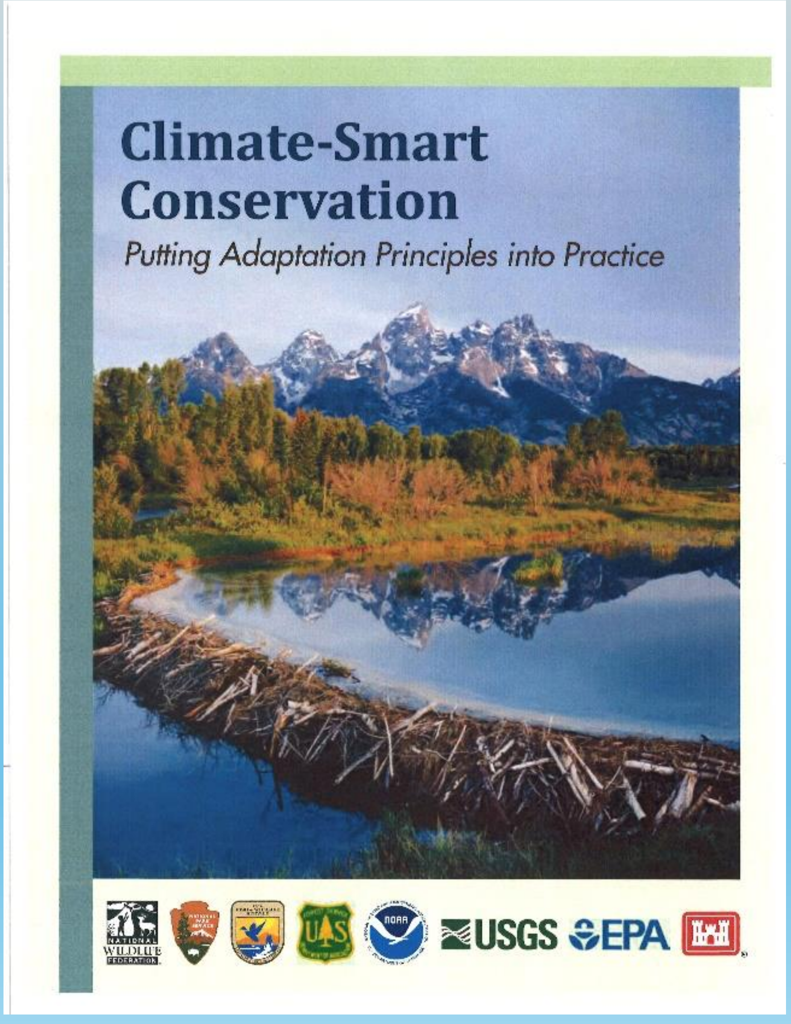
Climate-Smart Conservation

- **Needs to be intentional** – Shift from trusting traditional practices are sufficient
- **Needs to be integrated into every aspect of conservation programs**
  - Reconsider goals, objectives, targets, actions for climate change
- ***Manage for change*, not just persistence**
- **Forward-thinking goals -** allow for ecosystem transformations and novel species assemblages

➢ ***Anticipatory vs reactionary adaptation***

➢ **Major shifts in climate will occur no matter how vigorously greenhouse-gas emissions are reduced**

Good resource is: Stein, B.A., P. Glick, N. Edelson, and A. Staudt (eds.). 2014. *Climate-Smart Conservation: Putting Adaptation Principles into Practice.* National Wildlife Federation, Washington, DC



Climate Adaptation Framework

(adapted from Schmitz et al. 2015)

- ✓ **Protect current patterns of biodiversity**
- ✓ **Protect large, intact, natural landscapes and ecological processes**
- ✓ **Maintain and establish ecological connectivity**
  - Connecting areas to create permeability for species movement, range shifts
  - ➢ Identify where species might move to meet climate niche and evaluate landscape permeability for whether they can move or if other lands needed
- ➢ **Identify and protect areas providing future climate space for species expected to be displaced by climate change**
  - ➢ Identify if these areas are managed to protect these species or ecological conditions
- ➢ **Identify and protect climate refugia**
  - ➢ Places where climate and associated conditions are likely to remain stable or that change but will still be suitable to species in surrounding region
- ➢ **Identify where in target species' life-histories they are vulnerable to climate change**
  - ➢ Identify management actions to address those vulnerabilities (e.g., cold water refuges)

Examples of Our Climate Adaptation Measures

- ✓ **Mapped Sea Level Rise and Potential Loss of Habitats from Coastal Squeeze**
- ✓ **Set back levees, elevate infrastructure, or retreat from low-lying coastal areas** in response to increased flooding with sea level rise and more intense and frequent storms.
- ✓ **Designing bridges and culverts to withstand bigger flows** from sea level rise and more intense, frequent storms resulting in fluvial flooding.
- ✓ **Identifying, protecting and enhancing cold water refuges, hyporheic exchange** in response to warming temperatures.
- ➢ **Focusing on process-based restoration, such as valley bottom reconnection**
- ➢ **Favoring drought-tolerant plant species in plant establishment projects** in response to longer drier summer droughts.
- ➢ **Using prescribed fires to prevent larger, uncontrollable wildfires.**
- ➢ **We all should be including adaptation techniques in our projects**

Project-Specific Climate Adaptation Measures

- **Steigerwald Floodplain Reconnection Project**
  - Reconnected 965 acres of historic floodplain on the mainstem by building setback levees, removing 2.2 miles of existing levee, and removing internal water control infrastructure
  - Focusing on recovery of salmon, steelhead, and lamprey habitat and restoring passage
  - Uses a 500-year flood event as the engineering design standard (instead of 100-year traditionally required)
  - New setback levees have a living shoreline (instead of traditional riprap) for wind/wave protection
  - Restores a historical alluvial fan to provide habitat complexity and thermal cooling
  - Also reduces flood risk for some infrastructure and improves recreation opportunities

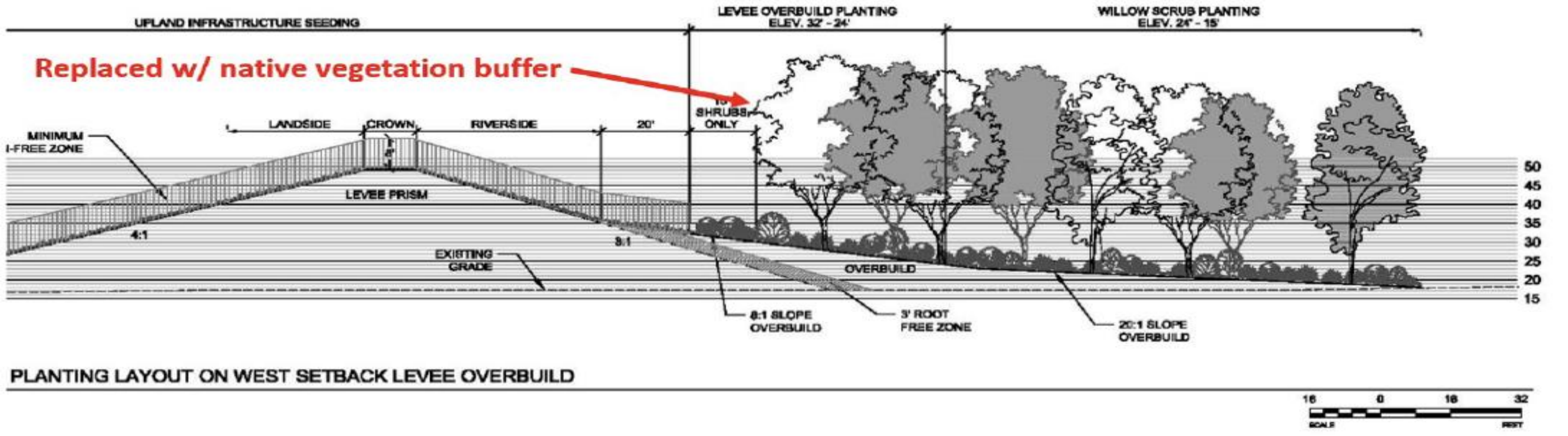


Figure 6. The living shoreline restoration design concept being implemented at the Steigerwald Flood Risk Reduction and Floodplain Restoration Project site.

Integrating Climate *Mitigation* at a Program Scale

- **Protecting and Restoring Natural Lands is critical:**
  - Up to a third of emission reductions needed to meet the Paris agreement by 2030 could be obtained by protecting intact forests, tidal wetlands, etc. and recovering and reforesting lost/degraded (cited in Ripple et al. 2017, 2019).
  - Conversely, loss (or conversion to impervious surface, draining, etc.) of native habitats emits greenhouse gases
  - This ecosystem service should be a consideration for compensatory mitigation and environmental regulations as well as priority for conservation grant funding.
  - LCEP is working on steps to track land conversions and inventory GHG sequestration and emissions by native habitats specific to lower Columbia River at multi-levels:
    - Across estuarine-tidal freshwater gradient
    - Upslope across mud flats, emergent marsh, shrub-scrub, forested
    - Collaborate with PNW Blue Carbon Working Group (For more information, see the website: https://www.pnwbluecarbon.org)

Carbon-Methane Flux Research

Assess methane emissions and carbon sequestration potential of emergent wetlands throughout the lower Columbia River

Expand evolving regional carbon calculators

Funded under the BIL, in partnership with researchers from OHSU, PSU, CRITFC, and Cowlitz Indian Tribe.

- Multi–phased project:
  - Phase 1: Install equipment and test methods (complete).
  - Phase 2: Site-Level Assessment of Carbon Dynamics by Habitat Type (started)
  - Phase 3: Apply methods to suite of habitats representing estuarine-tidal freshwater gradient (started)
  - Phase 4: Apply results to expand regional carbon calculators

Researchers from OHSU, PSU and LCEP at Tongue Point, Astoria with one of the Eddy Covariance Flux towers

Next Steps for the Lower Columbia River:

1) **Identify methods for improved integration of carbon sequestration including inventorying and monitoring carbon stores and methane emissions**
   - Carbon Methane Flux Study – OHSU, PSU, CRITFC, and CIT
   - Inventory potential of habitats for carbon storage and methane emissions
   - Track land conversions (e.g., to development, diking) to track emissions
   - Track protection and recovery of habitats to track potential sequestration
2) **Work with agencies to explicitly fund carbon sequestration in restoration, on natural lands and provide capacity/resources for expanding conservation to working lands**
   - Focus of resource management agencies funding is the protection or recovery of native habitats for the persistence of native species
   - Can we expand this to include carbon sequestration and include this ecosystem service within compensatory mitigation?
   - Expand natural resource management activities to include working lands through regenerative practices that focus on soil health - sequester carbon, retain soil, cycle nutrients, reduce chemical contaminants
   - These practices can often increase habitat for species on working lands and increase permeability of working lands/migration corridors for species.

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Questions?

Please contact:
Catherine Corbett
ccorbett@estuarypartnership.org