Estuarine Restoration Priorities: A Landscape Approach

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Photo by David Pitkin

Estuary Module of the Oregon Watershed Assessment Manual

- Characterizes current and former tidal wetlands from ocean to head of tide
- Prioritizes tidal wetlands for restoration and conservation actions
- Based on field work, literature review
- Peer-reviewed
- Developed/tested in 6 estuaries

Tidal wetland assessments & prioritizations completed by GPC & co-authors

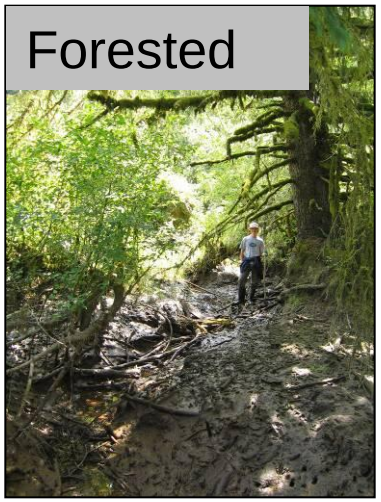
- Necanicum*
- Nehalem
- Yaquina
- Alsea
- Siuslaw
- Umpqua

Estuary Module of Oregon Watershed Assessment Manual

*Necanicum assessment in progress by FWS/GPC in 2006

What is assessed and prioritized?

- All tidal wetlands from ocean to head of tide



- Excludes mudflats, eelgrass beds, open water
- Excludes filled lands
- Method applies to estuaries S of the Columbia

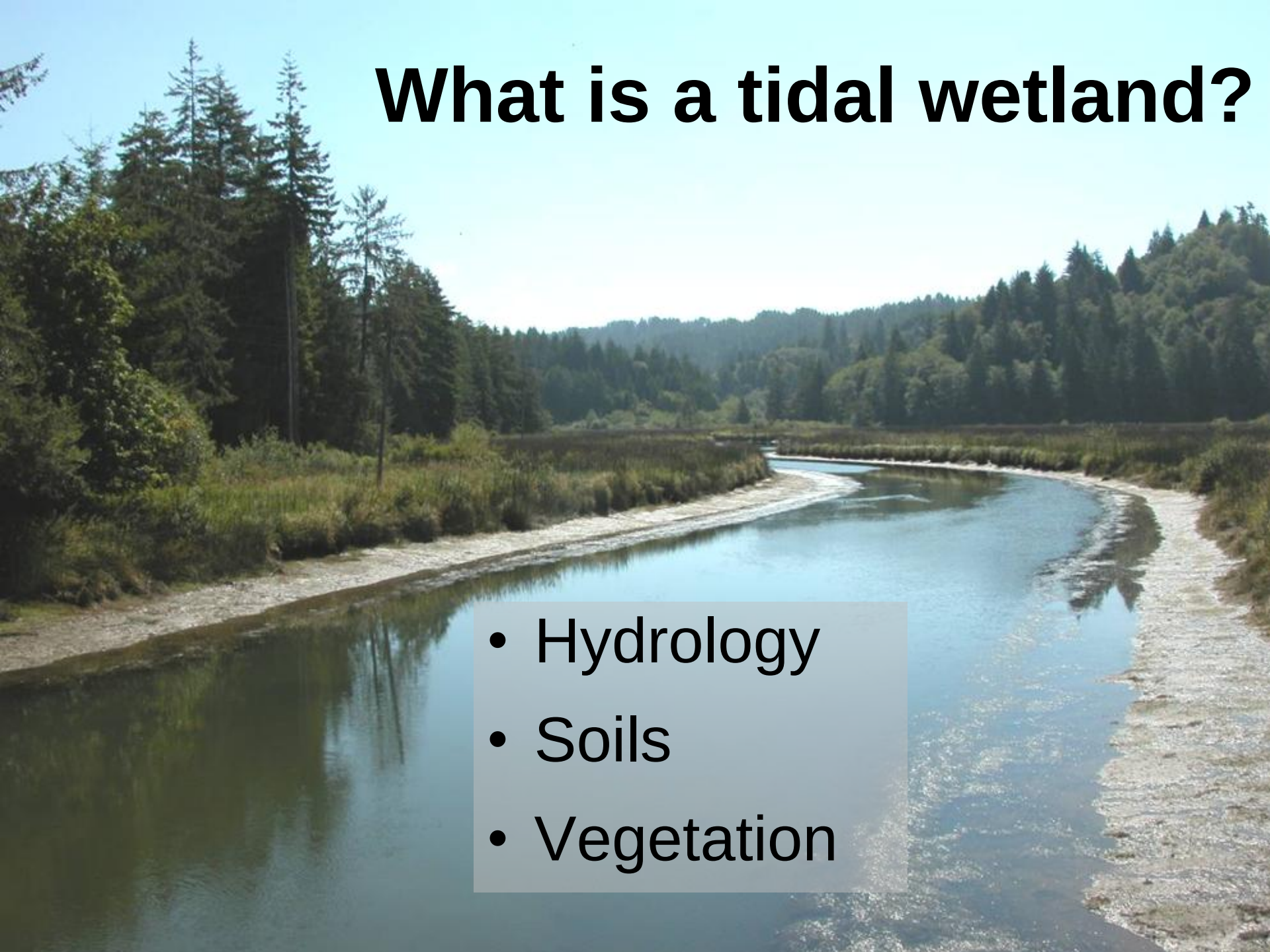
Why assess tidal wetlands?

- Valuable ecological functions
  - Habitat
  - Food web
  - Water quality protection
  - Flood/storm protection
- Highly altered landscape
- Development pressure
- Inadequate existing data

Why prioritize the resources?

- Extensive losses (~70%)
- Urgent need for action
- Limited funding
- Grant requirements

What is a tidal wetland?



- Hydrology
- Soils
- Vegetation

Hydrology

- Water level is affected by tides
- Water may be salt, brackish or fresh
- May have freshwater input

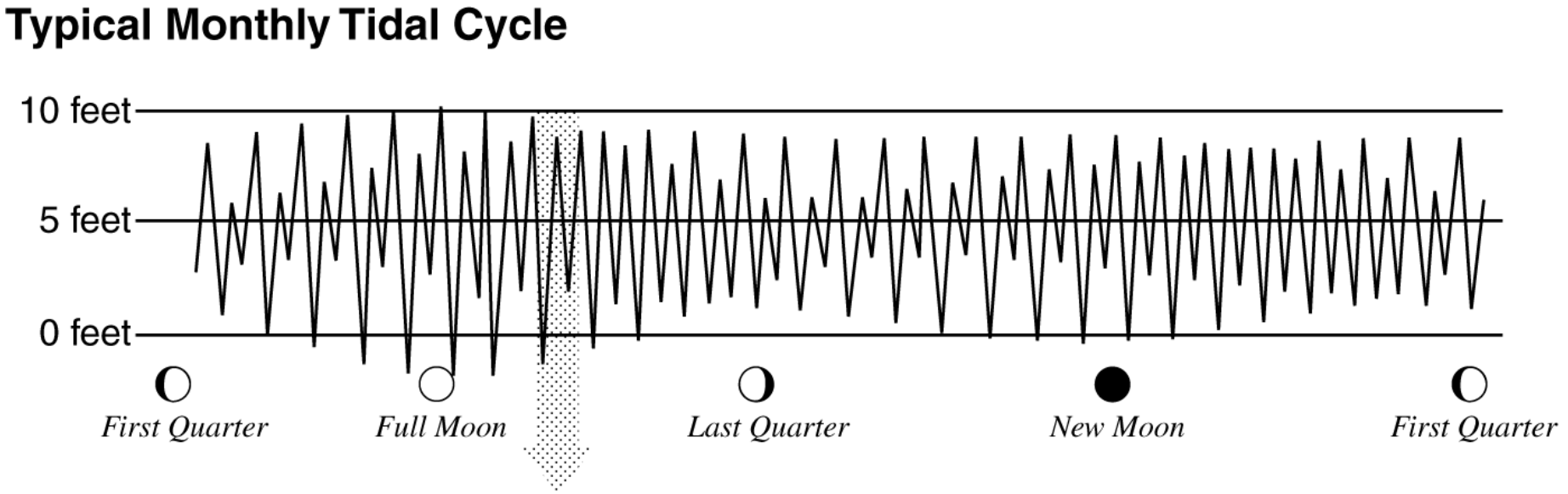


Illustration courtesy of Dr. James Good, Oregon State Univ.

Soils

- Saturation
- Salinity
- Organic matter
- Texture

Low marsh

Tidal wetland vegetation:

I. Tidal marsh

High marsh

Tidal wetland vegetation:

II. Tidal swamp


Scrub-shrub


Forested

Tidal swamp

Landscape array of tidal wetland classes

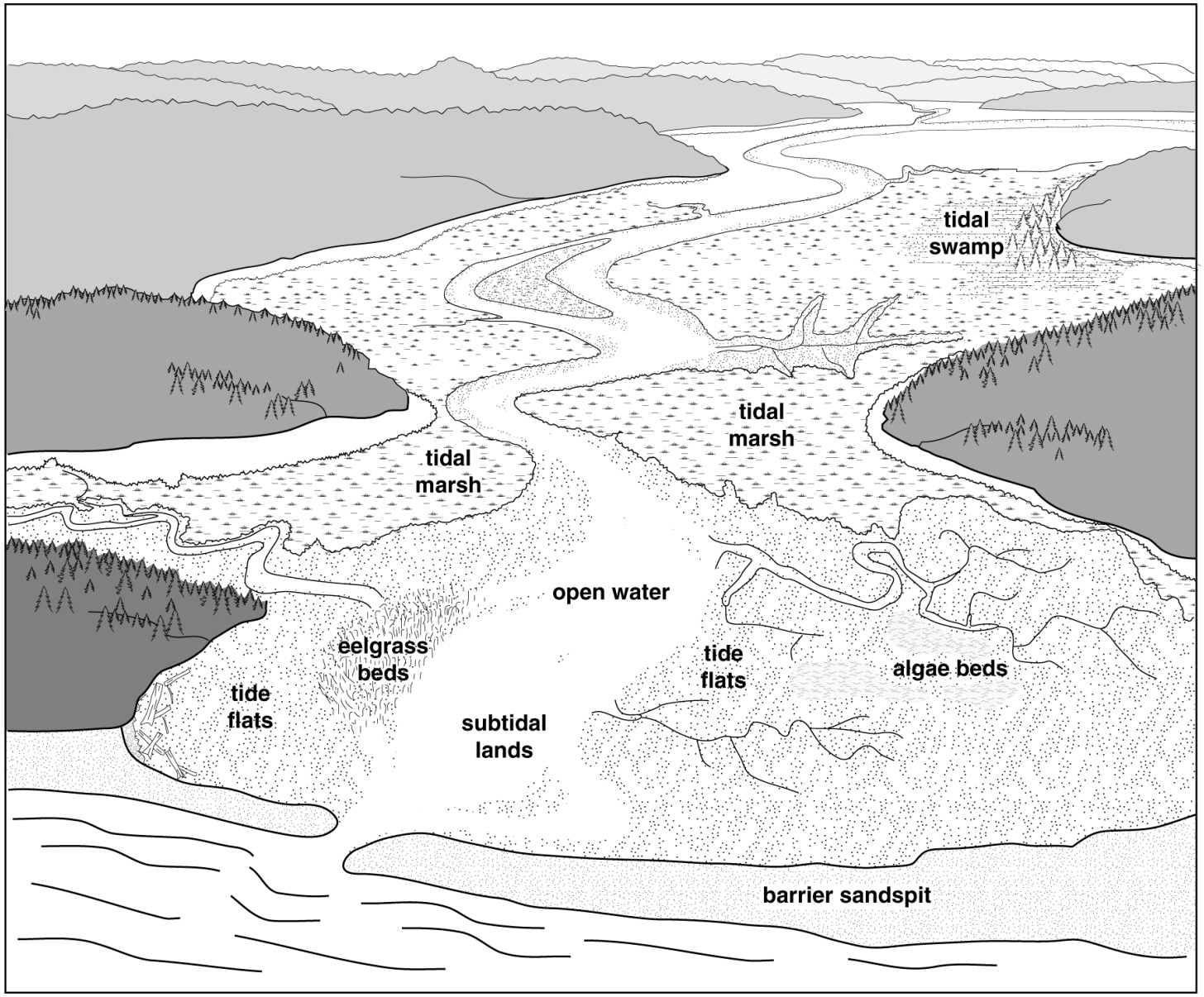


Illustration courtesy of Dr. James Good, Oregon State Univ.

Physical features

- Deep, steep-sided channels
- High sinuosity
- Natural levees
- Internal salinity gradients

Why prioritize tidal wetlands for conservation and restoration?

- **Extensive losses (~70%)**
- Urgent need for action
- Limited funding
- Grant requirements

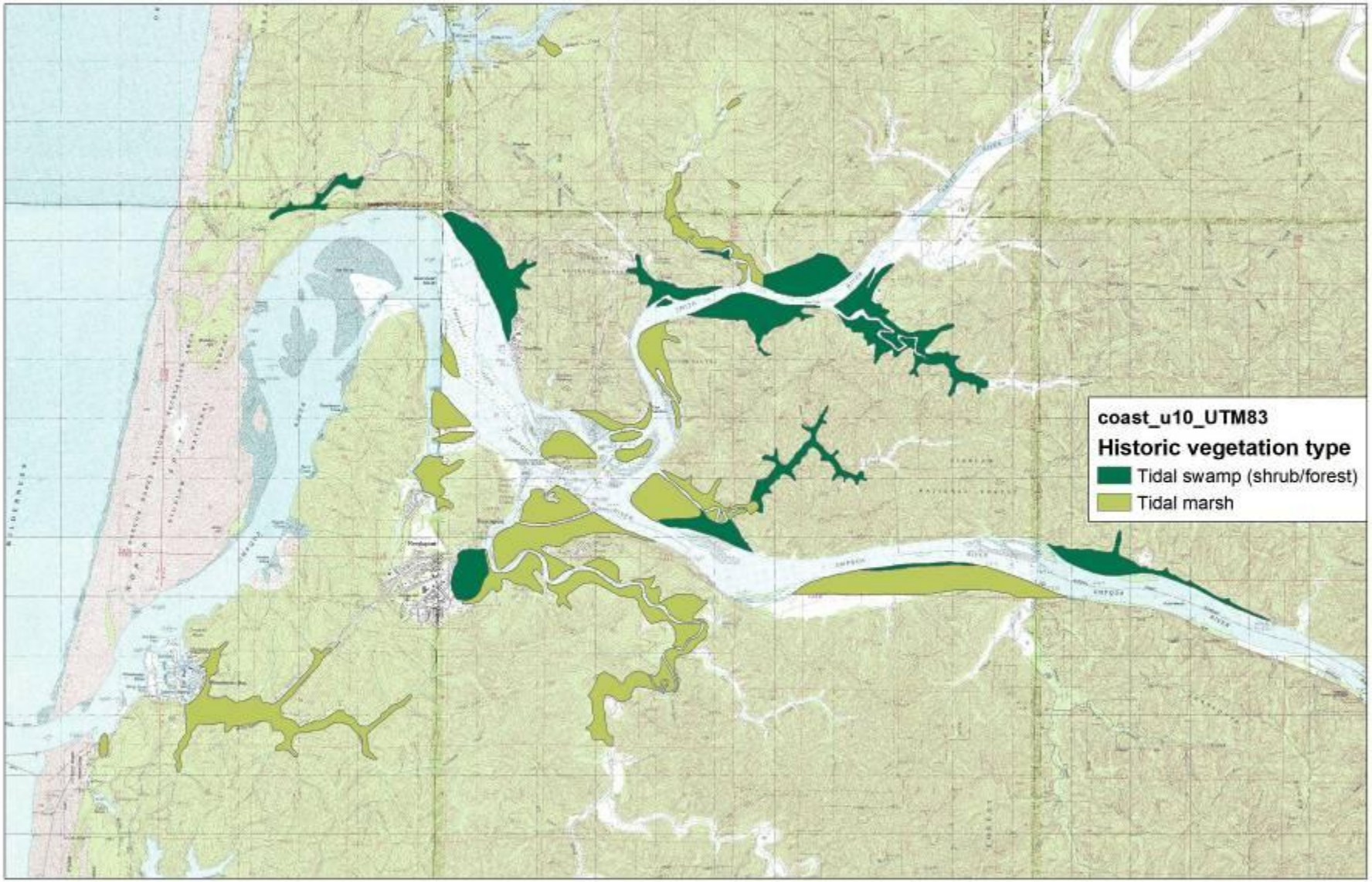
Tidal wetland loss/conversion estimates

- Oregon:
  - 70-80% of tidal marshes
  - >> 90% of tidal swamps
- Washington
  - 70% of tidal wetlands in Puget Sound area
- California:
  - 90% of tidal wetlands statewide

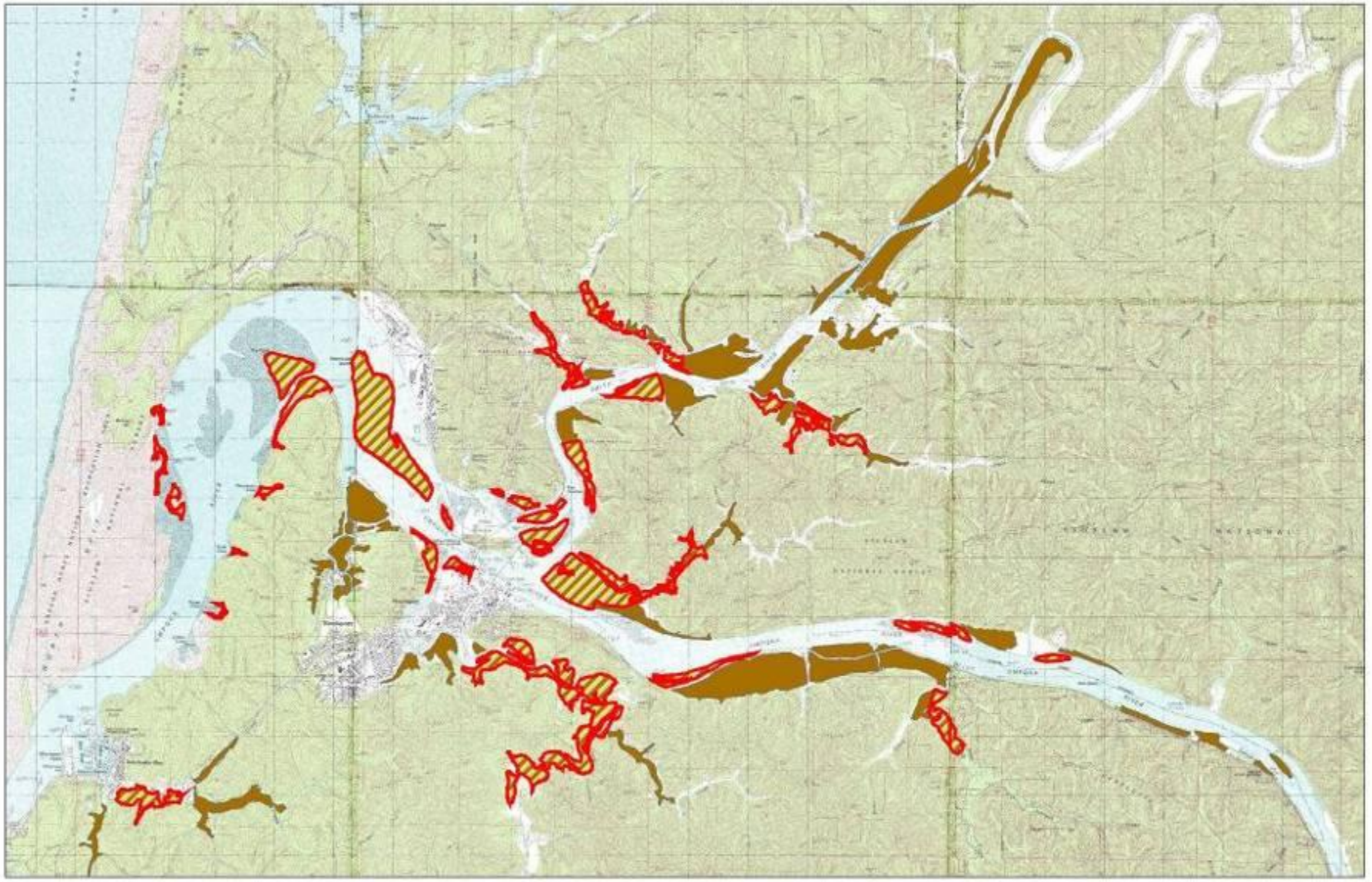
Alterations to tidal wetlands

- Diking
- Ditching
- Tide gates / restrictive culverts
- Excavation / fill

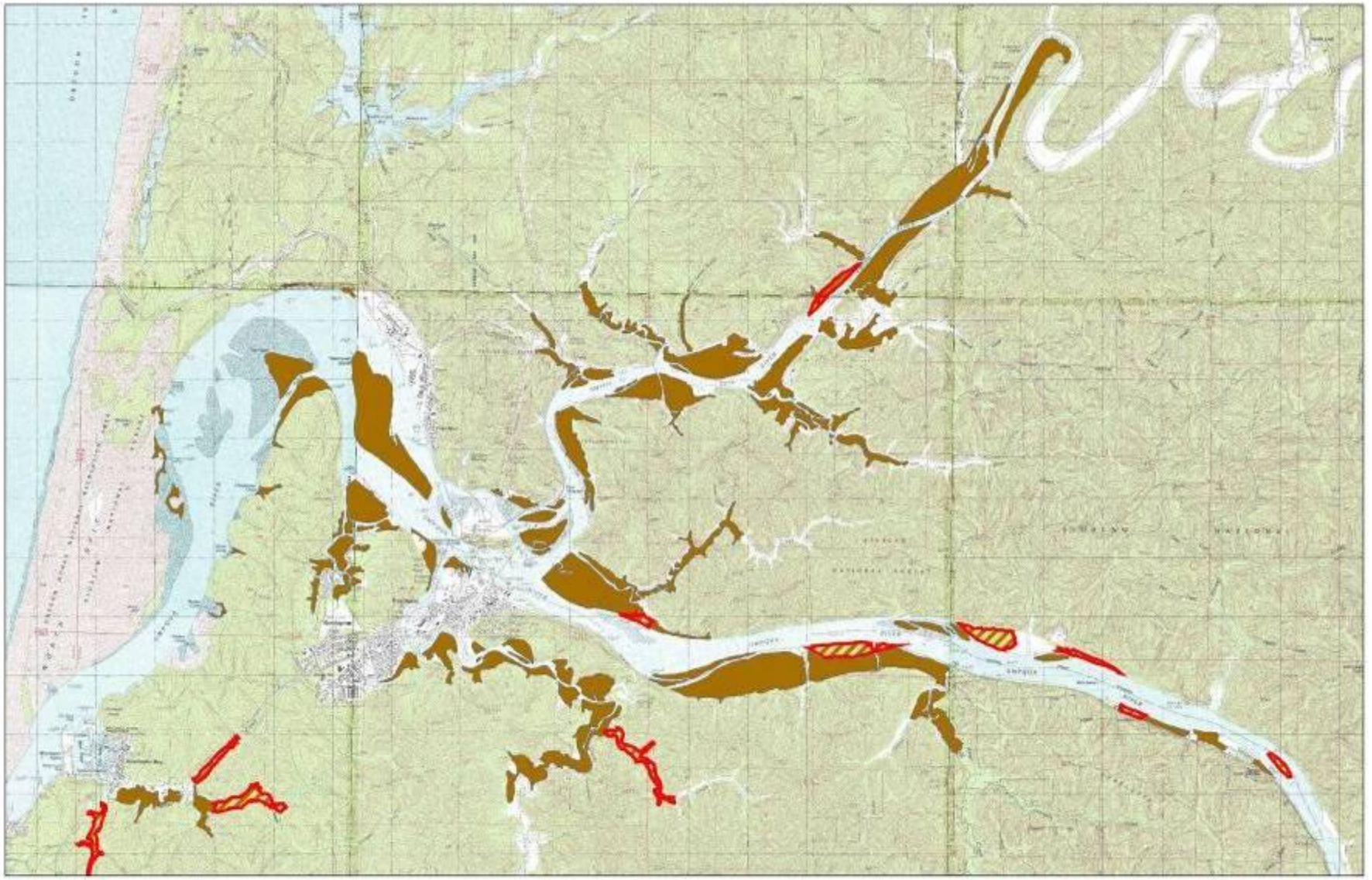
Historic vegetation type, Umpqua River estuary



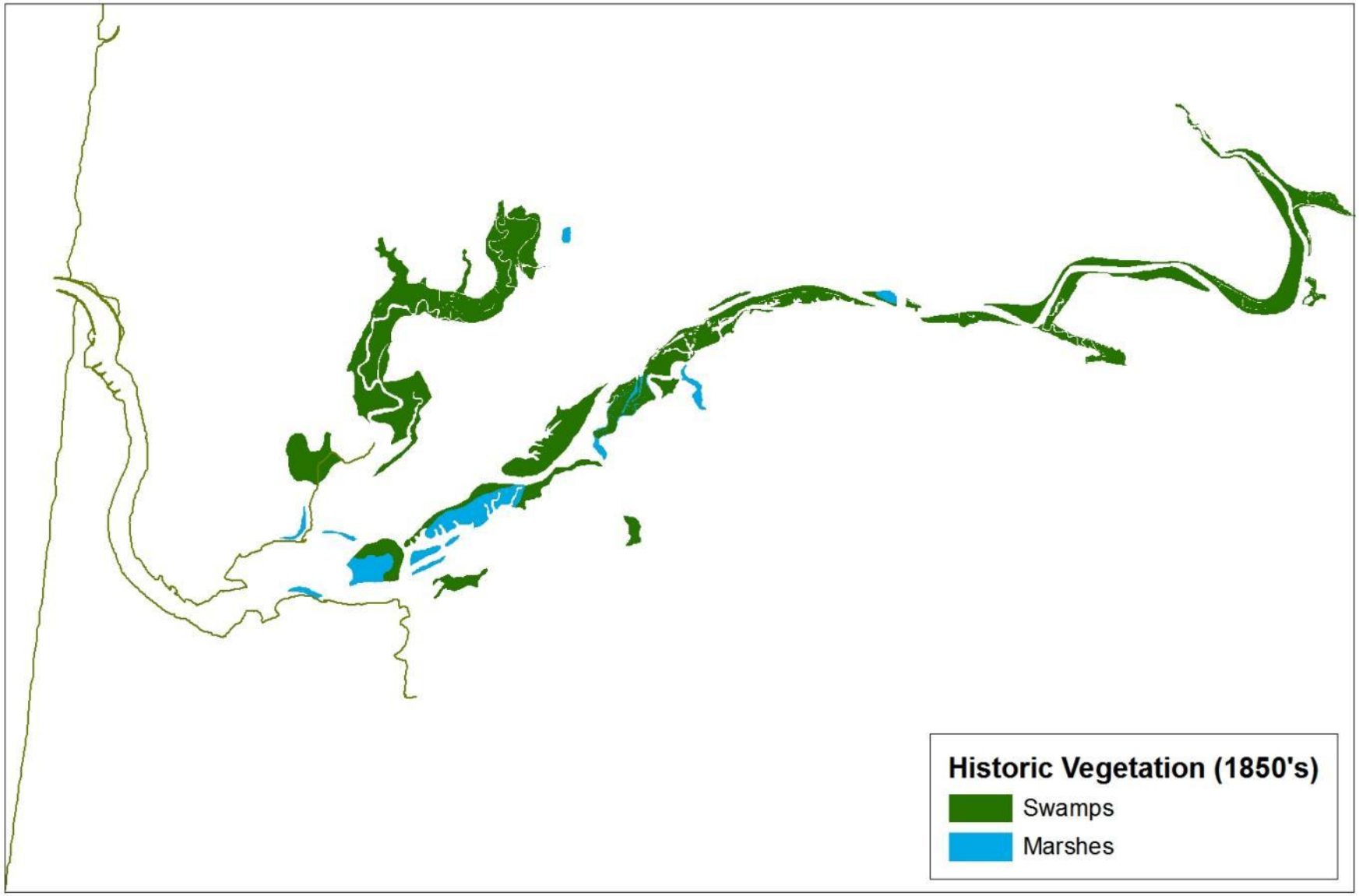
Remaining tidal marsh, Umpqua River estuary



Remaining tidal swamp, Umpqua River estuary



Siuslaw River Estuary, Oregon



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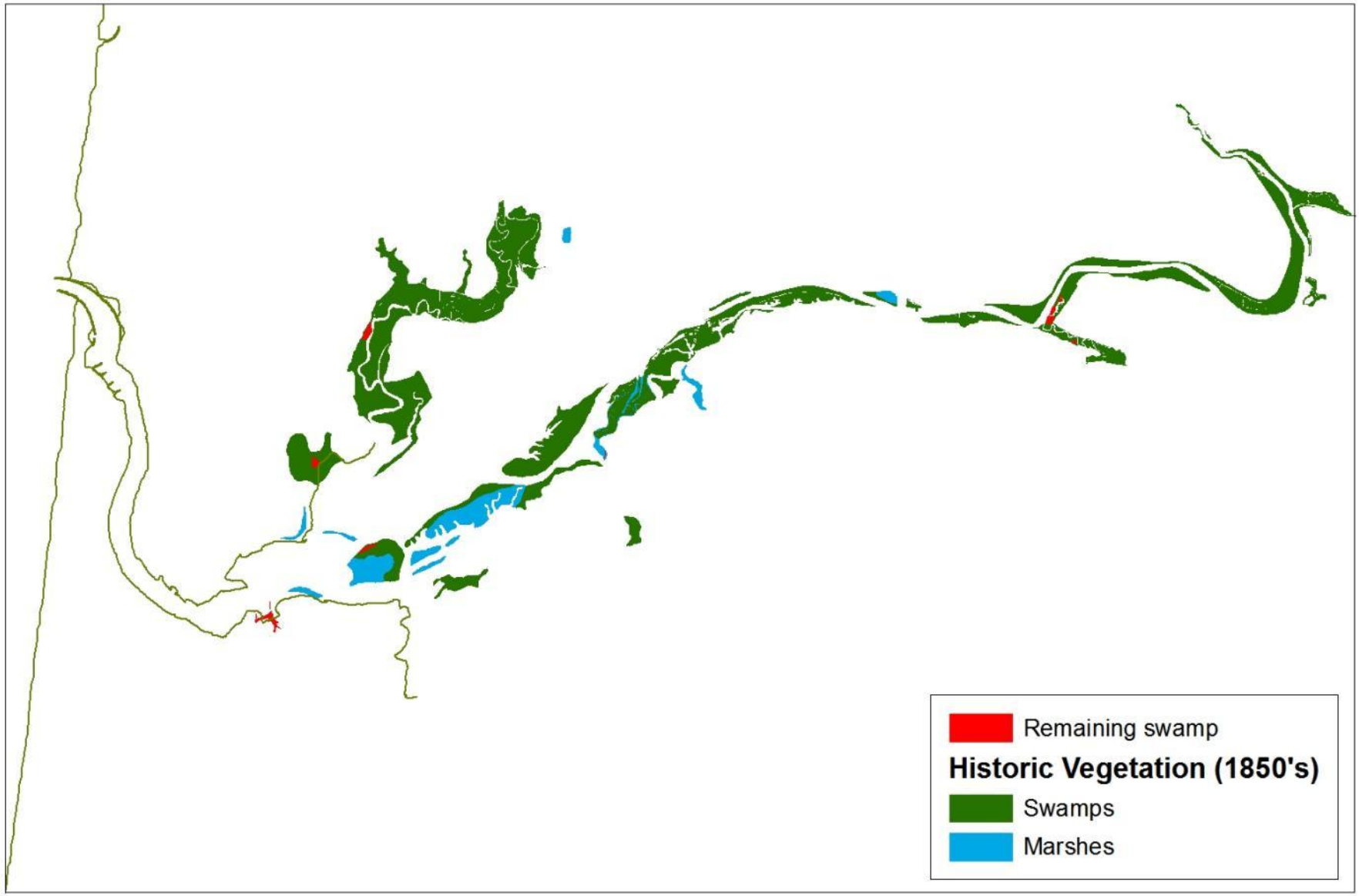
Siuslaw River Estuary, Oregon



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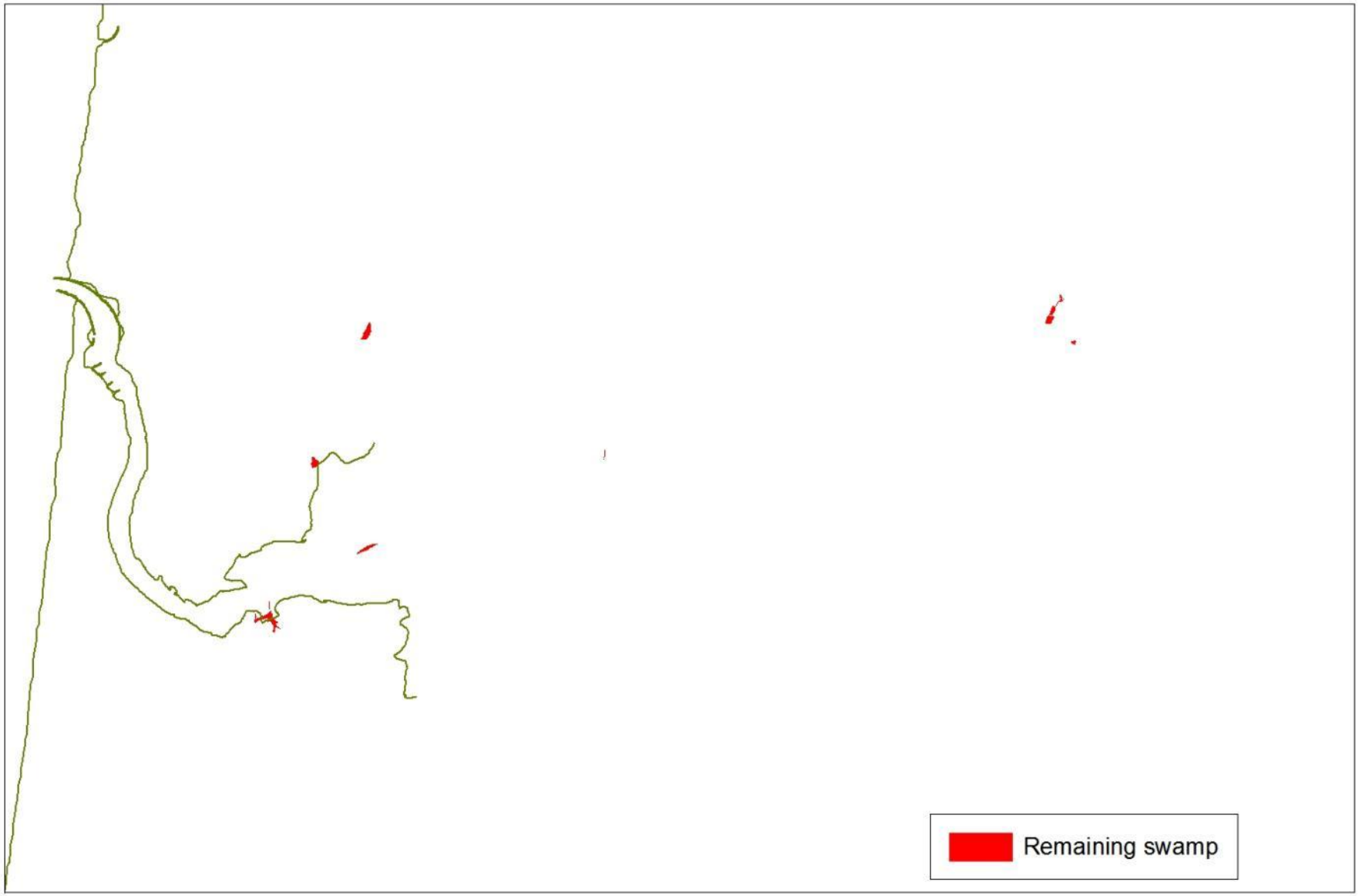

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Key elements of the method

1. Focus on ecological functions
2. Community-based
3. Intended for active use
4. Non-regulatory

1. Focus on ecological functions

- Landscape ecology approach
- Indicators of multiple wetland functions
- Focus on controlling factors ("drivers")
- Existing data →"first cut"
- New data → refined map & wetland characterization

2. Community-based and user-friendly

- Local watershed group involvement
- GIS or paper maps
- Straightforward method
- Clear linkages between inputs and results

3. Intended for active use

- Dynamic estuary database
- Provides a basis for immediate action
- Improves chances of funding projects

4. Non-regulatory

- Results provide strategic direction
- Willing landowners
- No wetland is excluded
- Uses existing wetland mapping
- Does not delineate wetlands

Steps in the method

1. Assessment
   - •Historic extent
   - •Alterations
   - •Current conditions

2. Prioritization
   - •Ecological factors

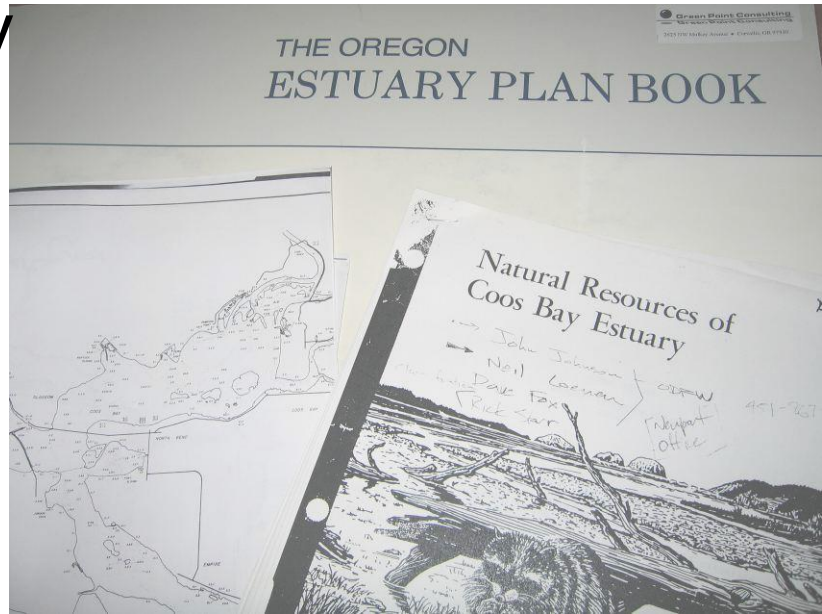
3. Supplementary analyses
   - Land ownership
   - Land use zoning

Prioritization protocol:
Requirements for criteria

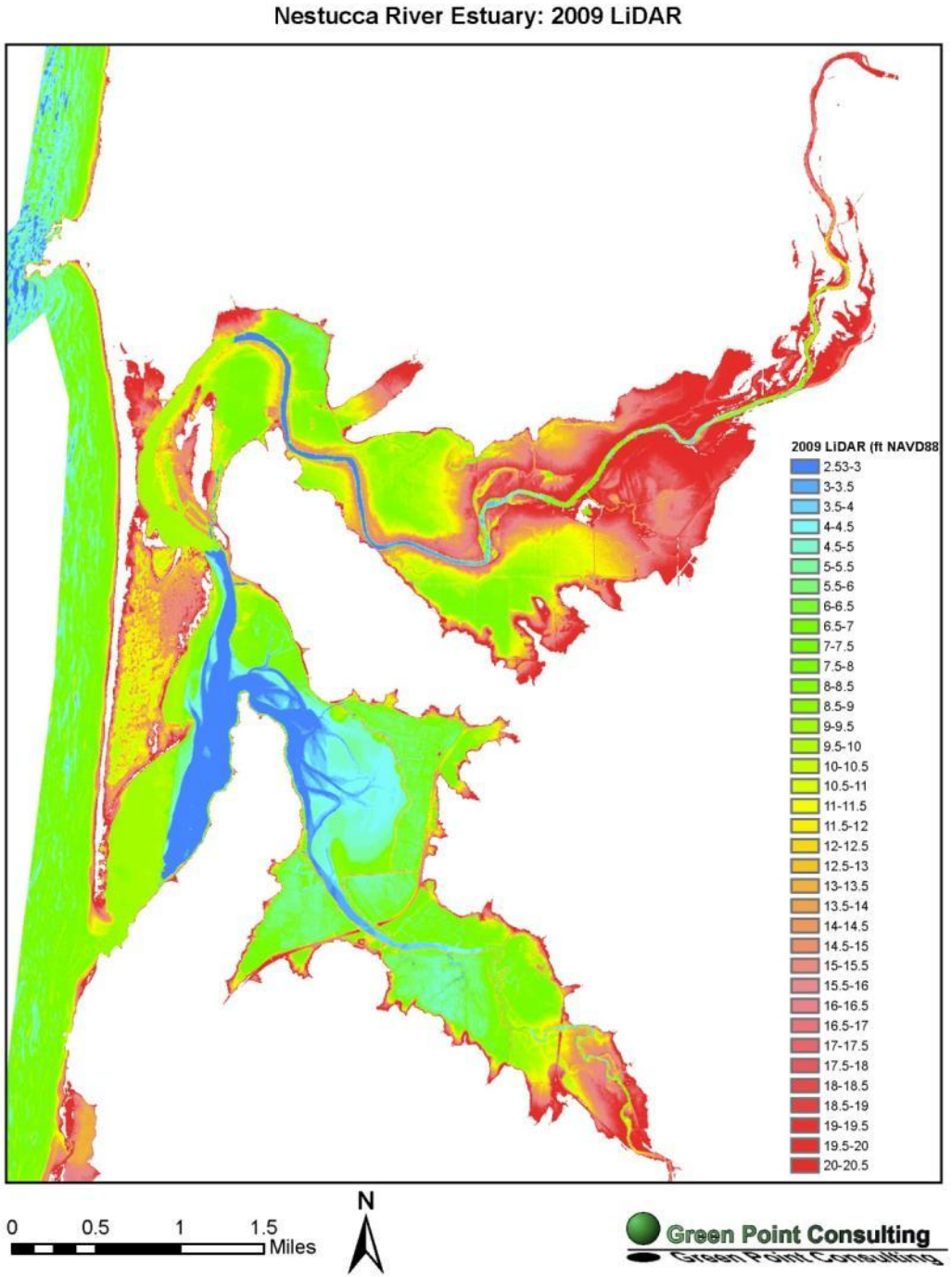
- Should indicate level/quantity of multiple wetland functions
- Should effectively discriminate among sites
- Interpretation of levels should be clear
- Data should be quantitative and accurate
- Coverage throughout study area should be complete and consistent

Existing data sources

- LiDAR
- Map of existing and “potential” tidal wetlands (Scranton 2004)
- Estuary Plan Book
- National Wetland Inventory
- Local Wetland Inventories
- Head of tide data
- Historic vegetation maps
- NRCS Soil Survey maps



LiDAR for assessment of historic extent



New data development

- Aerial photograph interpretation
  - Geomorphology
  - Alterations
  - Vegetation type

New data development

- Field reconnaissance and local input
  - Ground-truthing
  - Site details
  - Local involvement vital

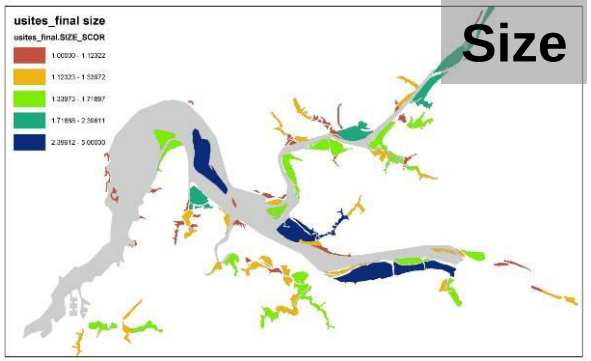
Supplementary analyses

- Land ownership
- Land use zoning/planning
- Potential further analyses
  - Economics
  - Community perceptions
  - Salmon habitat
  - Historic vegetation

Prioritization criteria

1. Site size
2. Tidal channel condition
3. Wetland connectivity
4. Historic wetland type
5. Diversity of vegetation classes
6. Number of salmon stocks

Umpqua Estuary: Sites (NOAA salinity zones in gray)



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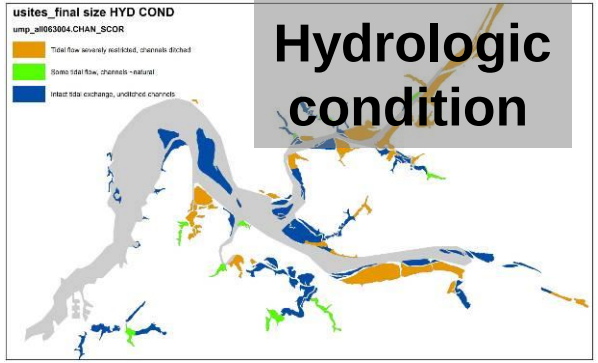

Hydrologic condition

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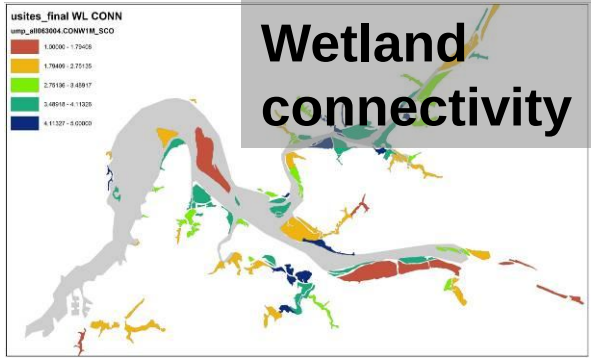

Wetland connectivity

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# of salmon stocks

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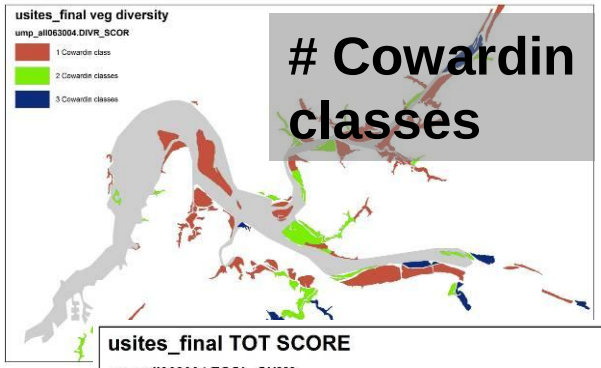

Cowardin classes

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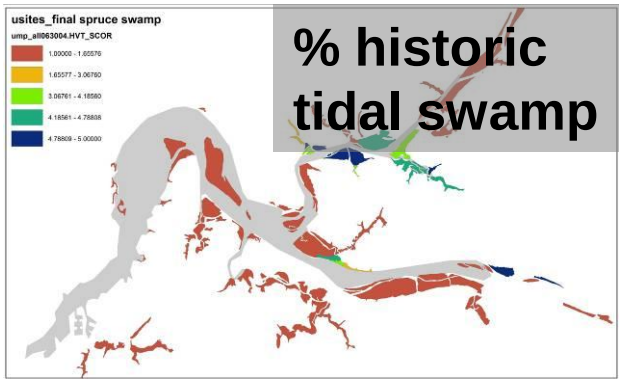

% historic tidal swamp

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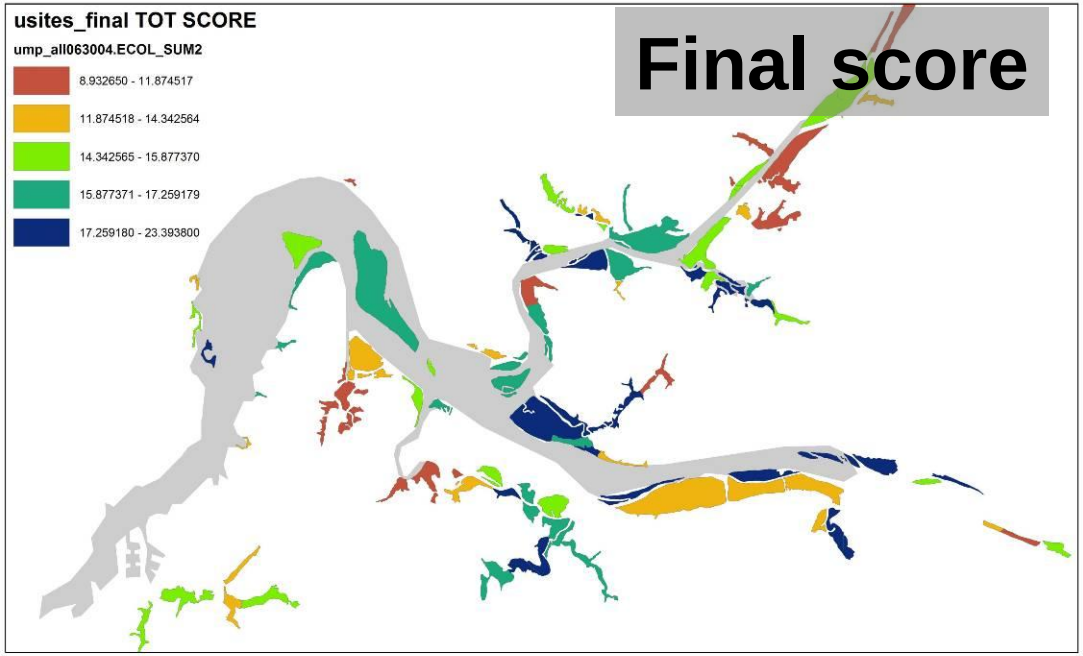
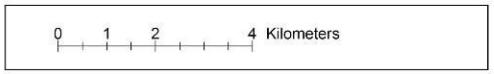


Final score



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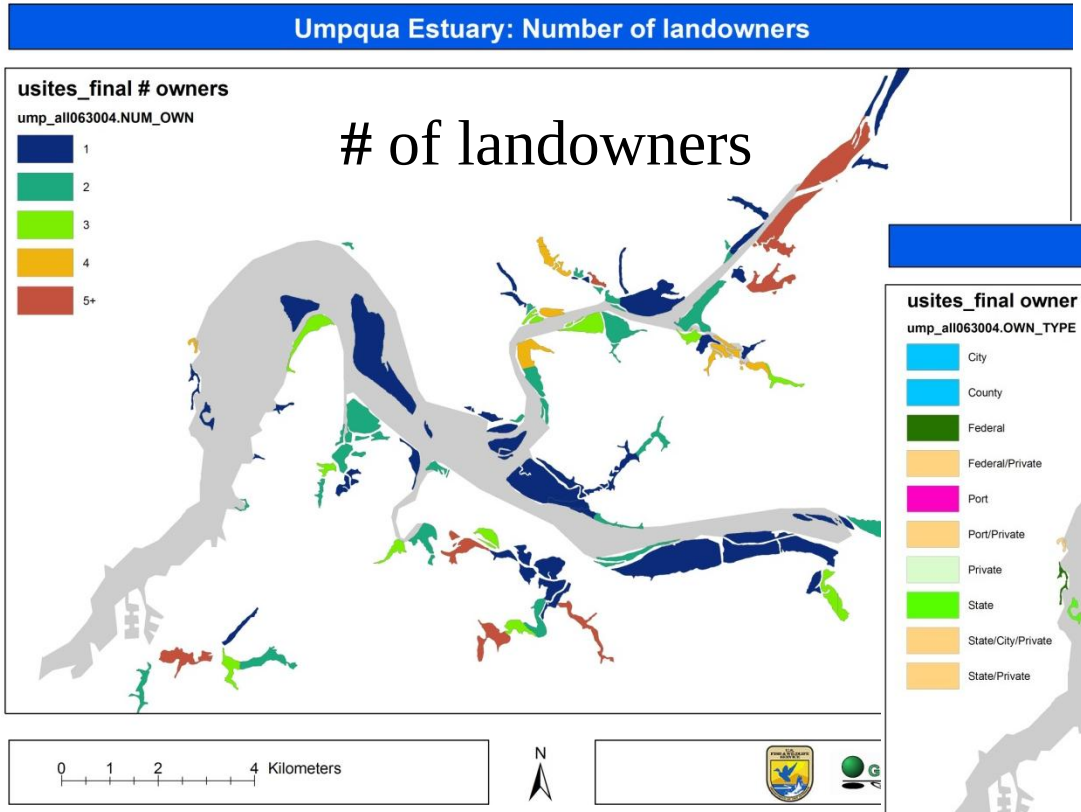
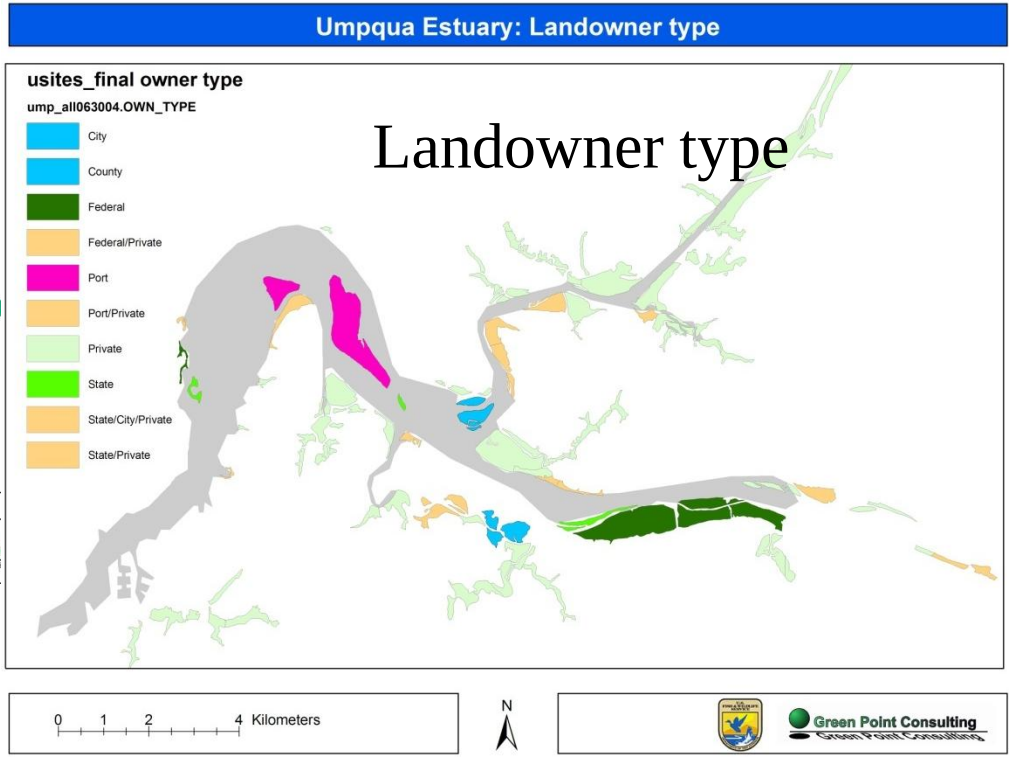
Adjunct data on opportunity



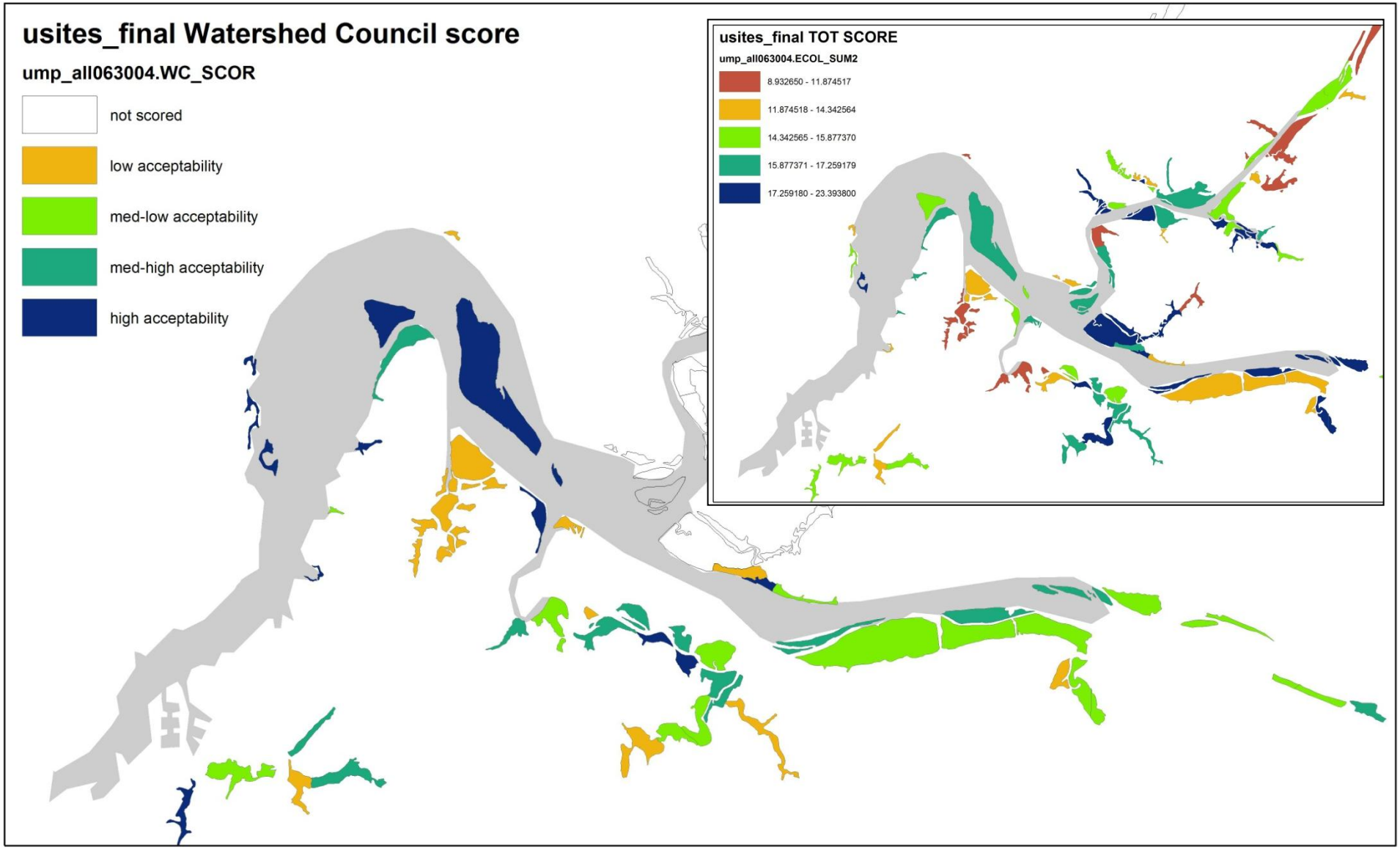


Public participation

Watershed Council Technical Teams contributed to protocol development and site characterization.

At public meetings, Council and community members ranked sites for acceptability of restoration/conservation.

Umpqua Estuary: Watershed Council scoring



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Umpqua & Nehalem:
Major results I

- Criteria chosen successfully discriminated among sites
  - Total score range 9 – 24 out of a possible 6 – 30
  - Studies provide guidance for future action planning
- Level of public interest is high
  - Good turnout at public meetings
  - Results already being used for action planning

Umpqua & Nehalem:
Major results II

Area of historic tidal wetlands is much greater than previously estimated.

Estuary	Past study	Current study	% increase
Umpqua	979 ha	1537 ha	57%
Nehalem	848 ha	1350 ha	59%

Umpqua & Nehalem: Major results III

Proportion of historic tidal wetlands that have been altered is greater than previously estimated, in some areas.

Estuary	Historic total	Relatively unaltered	Altered	Previous estimate*
Umpqua	1537 ha	348 ha 23%	1190 ha 77%	50% lost
Nehalem	1350 ha	343 ha 25%	1008 ha 75%	75% lost

*Good 2000

OREGON: 1999 vs. 2005 estimated losses

Estuary	1999 estimated tidal wetland % loss	1850's marsh + swamp (ha)	1850's marsh (ha)	2005 estimated marsh loss (%)	1850's swamp (ha)	2005 estimated swamp loss
Tillamook	79	2036	1163	91	873	91
Coos Bay	66	1617	1301	93	316	95
Umpqua	50	1241	790	75	451	90
Nehalem	75	917	357	81	560	73
Yaquina	71	793	686	84	107	96
Coquille	94	674	625	95	49	93
Siuslaw	63	645	184	40	461	97
Nestucca	91	454	230	91	223	98
Salmon	57	314	289	36	24	96
Siletz	59	302	290	47	12	84
Alsea	59	220	215	46	6	100
ALL	68	10267	6545	80	3722	90

1999 estimates from Good 1999. Losses estimated using Scranton 2004 and Hawes et al. 2008. Data exclude the Columbia River estuary.

Summary

- Straightforward, user-friendly approach
- Extensively reviewed and tested
- Detailed yet comprehensive
- Landscape-scale analysis
- Community-based
- Facilitates rapid action

Questions?

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