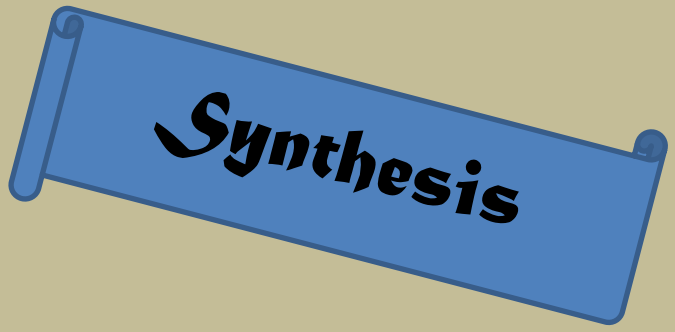


2012 Columbia River Estuary Conference

New Scientific Findings and their Management Implications

Diversity, Diversity, Diversity

- **Diversity of habitats** – including shallow water edge habitat, tidal shrub habitat
- **Diversity of hydrology and inundation patterns** - drive vegetation community assemblages, cover, and biomass
- **Diversity of vegetation** – greatest diversity in mid-river
- **Diversity of salmon stocks –**
  - greatest diversity in reaches F and G
  - Stock composition varies by reach and type
  - Stock diversity and composition vary by reach and throughout the year
- **Diversity of life history strategies –**
  - resilience
  - contribution to returning adults
  - Size of fish relate to estuary habitat use
  - Timing of estuary entry
  - Residence times – including energetic implications
- **Diversity needed in monitoring** – sample throughout year, not just peak migration times

Diversity Implications

- Estuarine restoration of diverse habitats has potential to help multiple stocks, especially lower river stocks
- What are consequences for loss of diversity? How does this affect resilience?
  - Reference wetlands are stable and resilient
- How will resilience relate to effects of climate change, sea level rise, and geologic events?
- How do invasive species contribute to the loss of diversity?
- What are implications for habitat restoration?

Landscape

- **Landscape processes** create habitat and template for diversity
- **Landscape planning**
  - Put projects into context, both spatially and temporally
  - Look at functional tidal systems to identify what to restore and why (i.e. remnant tidal shrub habitat)
  - Landscape Planning Framework using the Ecosystem Classification
- **Landscape prioritization**
  - Habitat Restoration Prioritization Strategy
- **Landscape project development**
  - Consider processes upstream such as sediment input and transport
  - Role of surrounding landscape in long-term function and maintenance of restoration projects
  - Consider up river management – >LWD->plants->beavers->pool habitat->salmonids
- **Landscape RME**

Multiple Management Considerations

Are habitat restoration objectives compatible with other management objectives?

- Hatchery management
  - Do hatchery fish limit the effectiveness of estuary restoration
  - Do hatchery fish change food webs, predation pressure, and capacity
  - How do hatchery and wild fish interact in the estuary
  - Hatchery practices confound geographic sources of genetic stocks
- Harvest management
  - Effects of hatchery and harvest intensity on escapement of fish into places like Youngs Bay
- Agricultural management
  - How to evaluate effectiveness of agricultural bmp's on water quality

Multiple Species Considerations

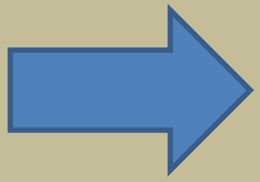
How to balance salmonid objectives with broader ecological and social community objectives?

- Beaver
  - More pools, deeper and longer pools in tidal shrub habitat
  - Interaction with food webs (detritus), fish communities, and salmon habitat
- Mollusks
  - How to incorporate needs of other species into restoration projects to minimize risks
  - Add cobble habitat to restoration plan
  - Careful monitoring
- Columbian white-tailed deer
- Waterfowl
- Smelt
- Turtles
- Culturally-significant species
- Maintain biodiversity



Emerging Tools and Potential Uses

- **Guidelines for beneficial use of dredge material**
  - Experimental – need for effectiveness monitoring and adaptive management
- **Habitat Restoration Prioritization Strategy**
  - Habitat change analysis
- **Landscape Planning Framework using the Ecosystem Classification**
  - Predict metrics for habitat restoration scenarios
- **Identified vegetation zones**
  - Stratify sampling
  - Inform restoration actions (elevations, predict vegetation communities, help with invasive treatment strategies, etc)
- **SATURN and Data Explorer**
  - water chemistry, circulation patterns, salinity intrusion, influence of river and ocean, effects of biological processes
  - Understanding of natural variability in the system
  - Potential areas of concern for benthic and migrating species



Strategic identification of restoration projects

Use of preliminary data in adaptive management

~Making decisions in an imperfect world

~How much certainty is enough

- Limited sample size and location for tying contribution of various life history strategies to adult returns
- Increasing sampling across year may produced different answers than just sampling at peak migration times
- Look at bioenergetic impacts across multiple habitat types in the estuary

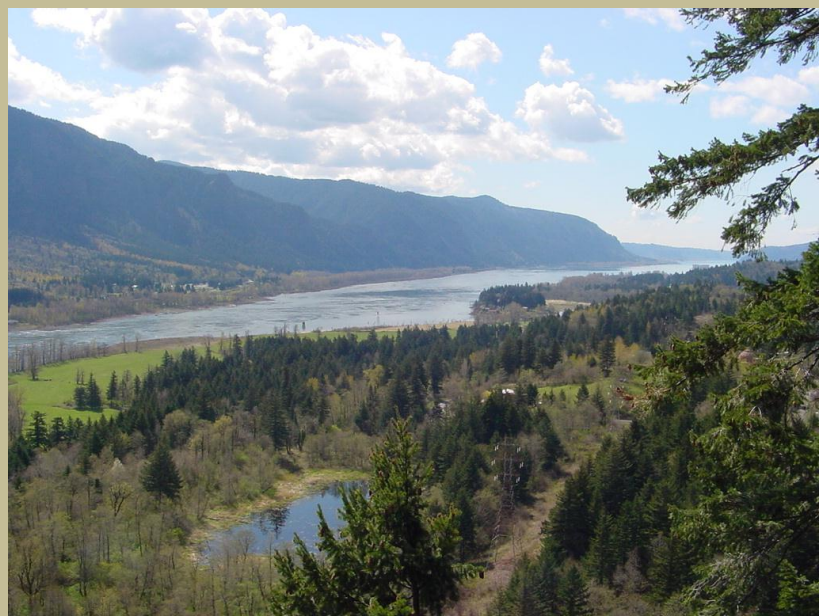
New findings with obvious management implications (examples)

- Modeling of dike breach to wetted area relationship
  - Synergistic effects up to certain point, then diminishing returns
  - Can it transfer to other basins; does it reflect actual on-the-ground response?
  - Is wetted area the correct metric – what other metrics should be considered?
  - Potential value of upstream habitat with less frequent inundation
  - Could inform restoration designs, cost-benefit analyses, estimate of restoration benefits
  - Would results differ if didn't select breaches randomly?

- Pile dikes protecting shallow water habitat
  - Need to maintain/repair existing pile dikes to maintain their dual function
  - How does this impact RPA recommendations?
  - How to improve or modify pile dikes to decrease predation, improve salmonid access, and improve complexity of shallow water habitats?
  - Combine with dredge material placement to create and maintain habitat?
  - Potential temperature and toxic contaminant issues would need to be considered

Social Engagement

- Importance of broadening social engagement
- Science/research exchange with other areas
- Landowner exchange
- Invite early public participation, results in better support and advocacy
- Better public support for diversity, improve resilience of populations
- Engage the public in trans-disciplinary science, build adaptive capacity, collaborate at a landscape scale
- Opportunities to influence political process (land use planning) through social engagement
- Awareness of water quality impacts
- Relationship to human health
- Tools for visualization



Where are we, and where do we go from here?

- Chum reintroduction efforts/strategies in OR
- ERTG uncertainties list and SBU estimates
- Longer-term effectiveness of restoration projects
- Hatchery interactions
- Program effectiveness

My favorite knowledge gaps and needs

- Role of invasive species
  - What is the ecological role of RCG in salmonid feeding behavior?
- Toxicity and synergistic effects of contaminants
  - What are the impacts of toxics and water quality on effectiveness of restoration?
- What is the impact of hatchery interactions with wild juvenile salmonids?
- Need to broaden monitoring base – more locations, across year(s), etc.
  - Life history strategy diversity year round
- Role of diversity in maintaining resiliency (human impacts, climate change, sea level rise, natural variation in conditions)
- Food web
  - Heard about its importance, and shift in dynamics from historic
  - How can we use this information to apply to restoration strategies?
  - Relate to landscape framework and couple with hydrodynamics

Discussion