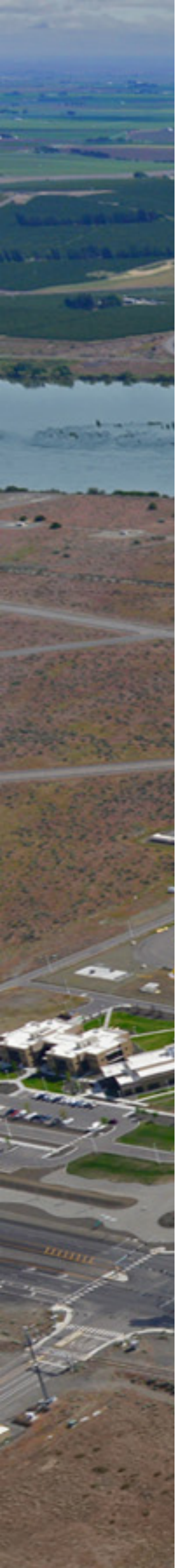

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PNNL FACET:
Framework for Assessment of Complex Environmental Tradeoffs

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Rajiv Prasad, Dave Goodman, Ann Miracle, and Tara O'Neil
Earth Systems Science Division
Energy and Environment Directorate
Pacific Northwest National Laboratory

U.S. DEPARTMENT OF ENERGY BATTELLE

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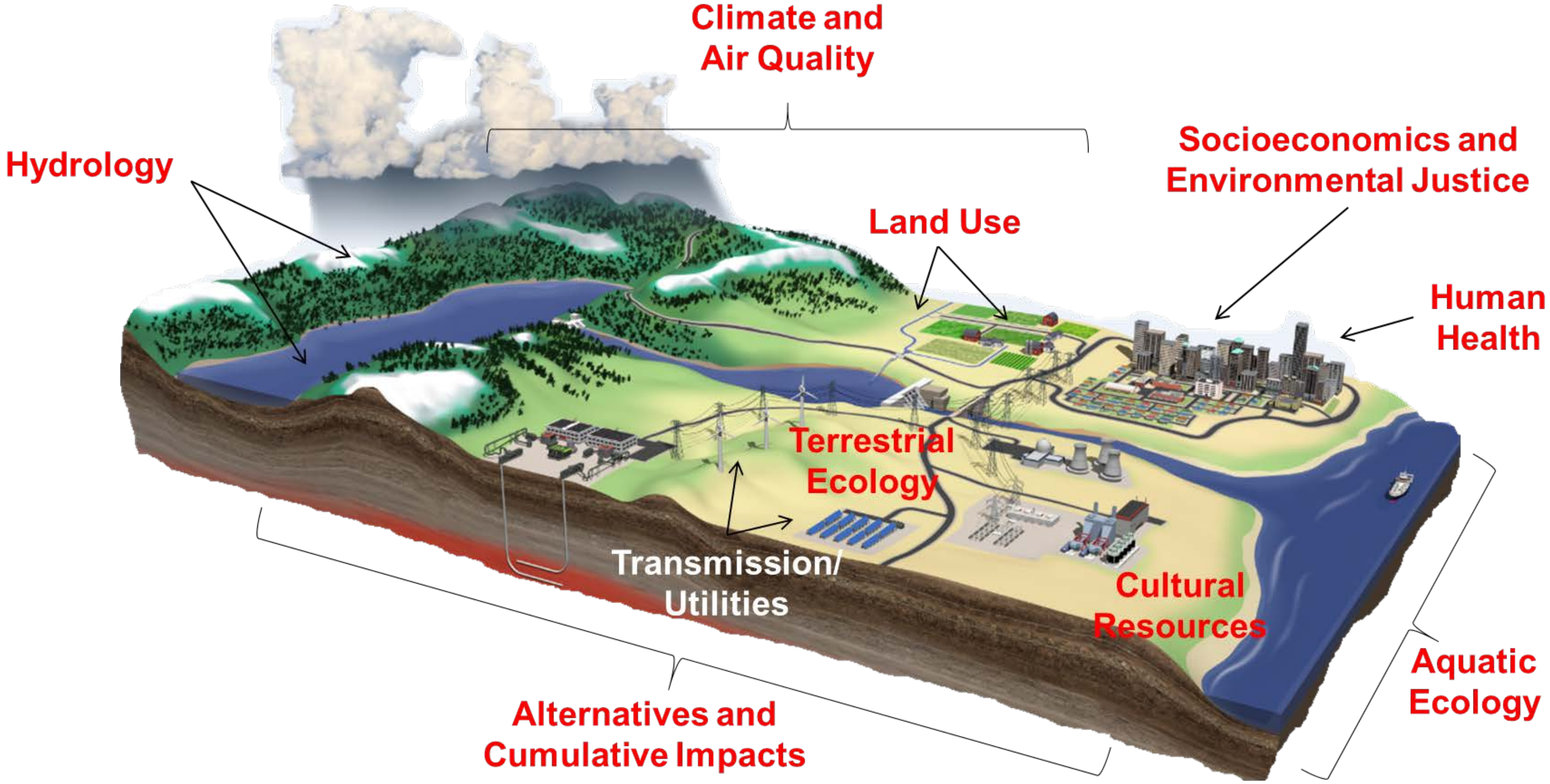
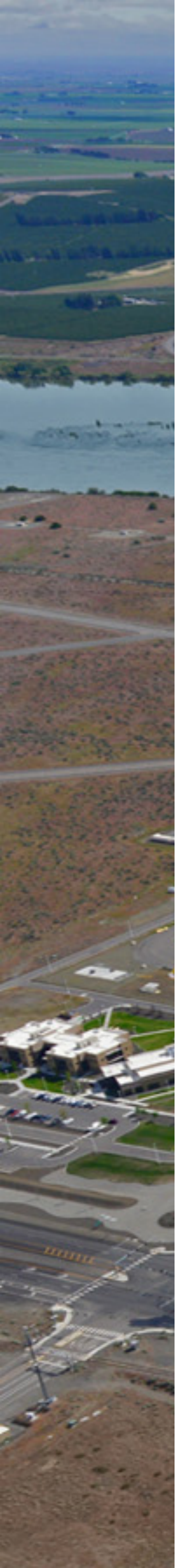
Background

- Leverage ~45 years of complex environmental assessment experience
- National Association of Environmental Professionals; collaborate internally at PNNL with Integrated Assessment capability group
- Next generation environmental analyses needed





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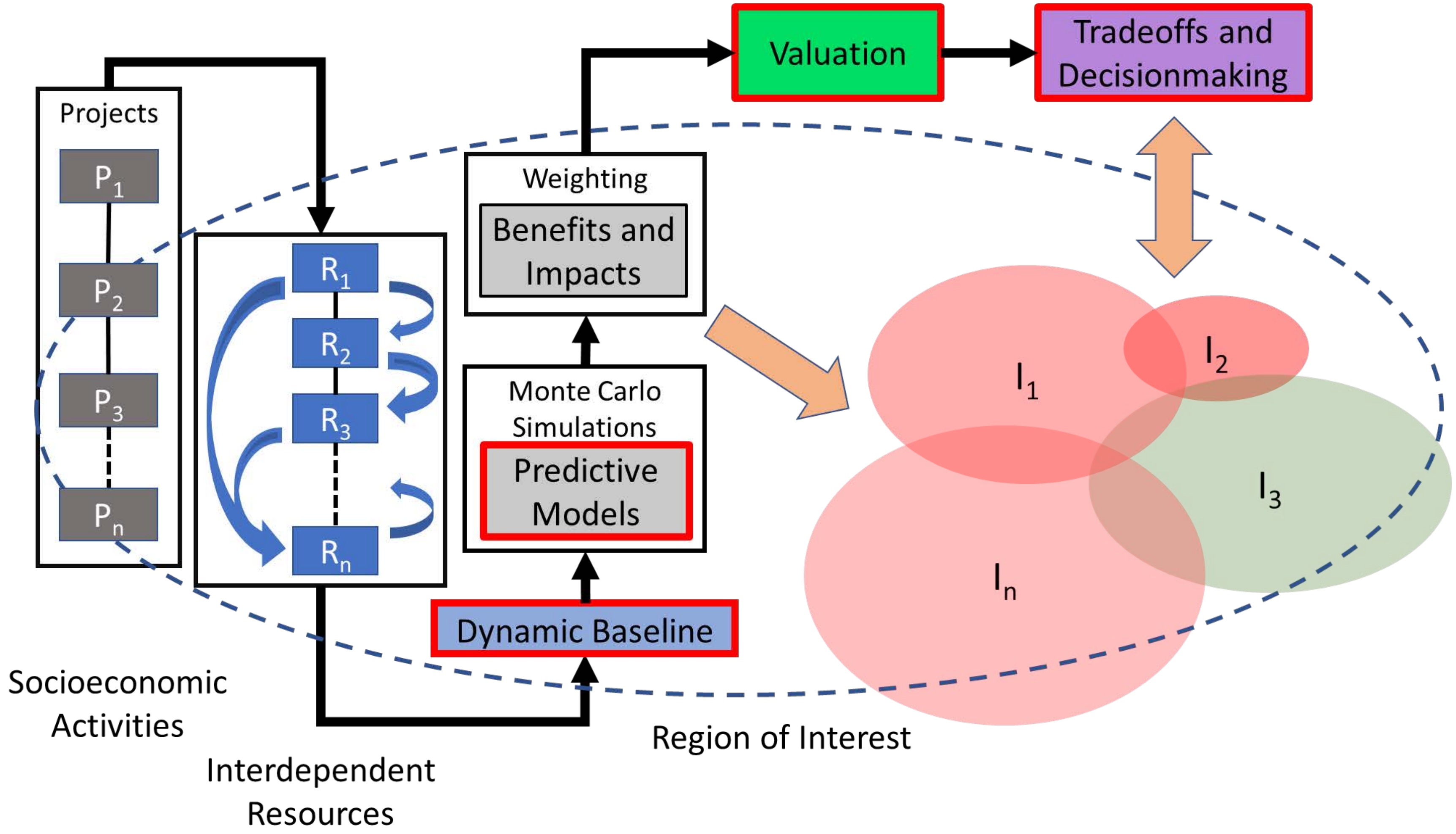
Framework for Assessment of Complex Environmental Tradeoffs (FACET)

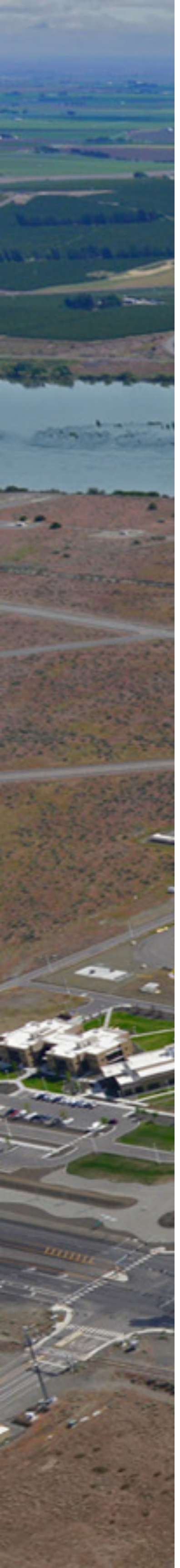
- FACET's goals are to:
  - Address the impacts of climate change, extreme events, competing socioeconomic demands, etc. that are limited in traditional NEPA processes
  - Reduce the uncertainty for decisions within an increasingly dynamic environment



Dynamic Baseline Challenge

- Account for climate change, extreme weather events, resource interactions, and impacts of socioeconomic activities as they affect resource conditions in space and time
- Examples:
  - The effects of climate change on snowpack levels, permafrost conditions, precipitation patterns, and flooding, which factor into infrastructure planning, are not fully understood
  - Competing Columbia River Basin fish models diverge wildly for determining existing percentages of juvenile fish survival, and which system/external factors affect survival

Missouri River floodwaters surround Nebraska's Fort Calhoun nuclear power plant, June 2011
(photo: New York Times)



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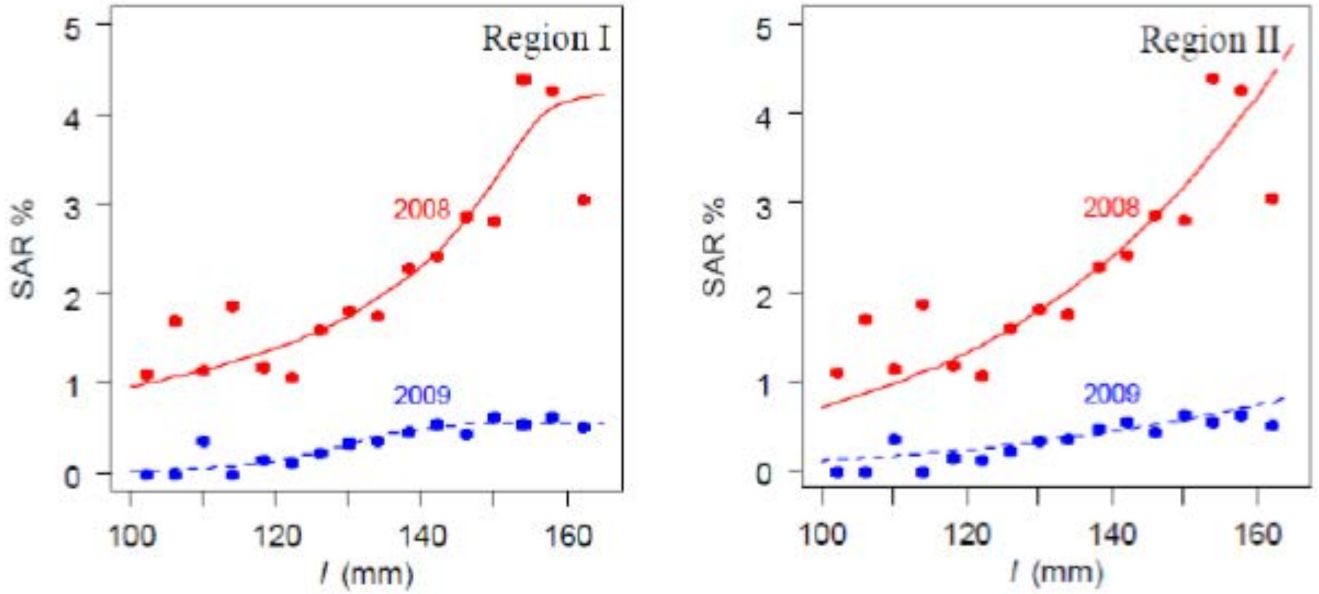
Multidisciplinary Predictive Modeling Challenge

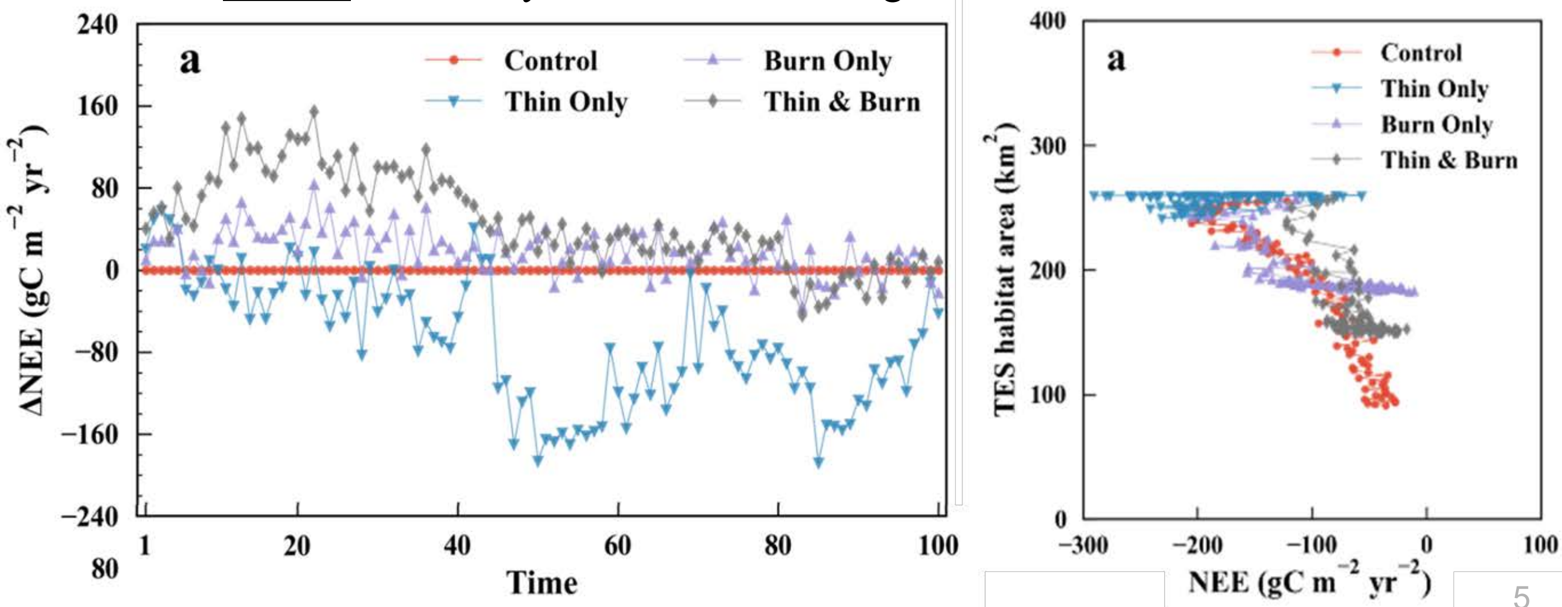
- Identify and apply resource models that rapidly and reliably capture resource interdependencies
- Examples:
  - Quantitative models to rapidly predict effects of natural changes and socioeconomic activities on resources
  - Models of fish survival to adult spawning based on predator gape sizing and nutrition factors during juvenile salmon growth
  - Forest succession models to characterize habitats for threatened and endangered species

Anderson, J.J., 2019



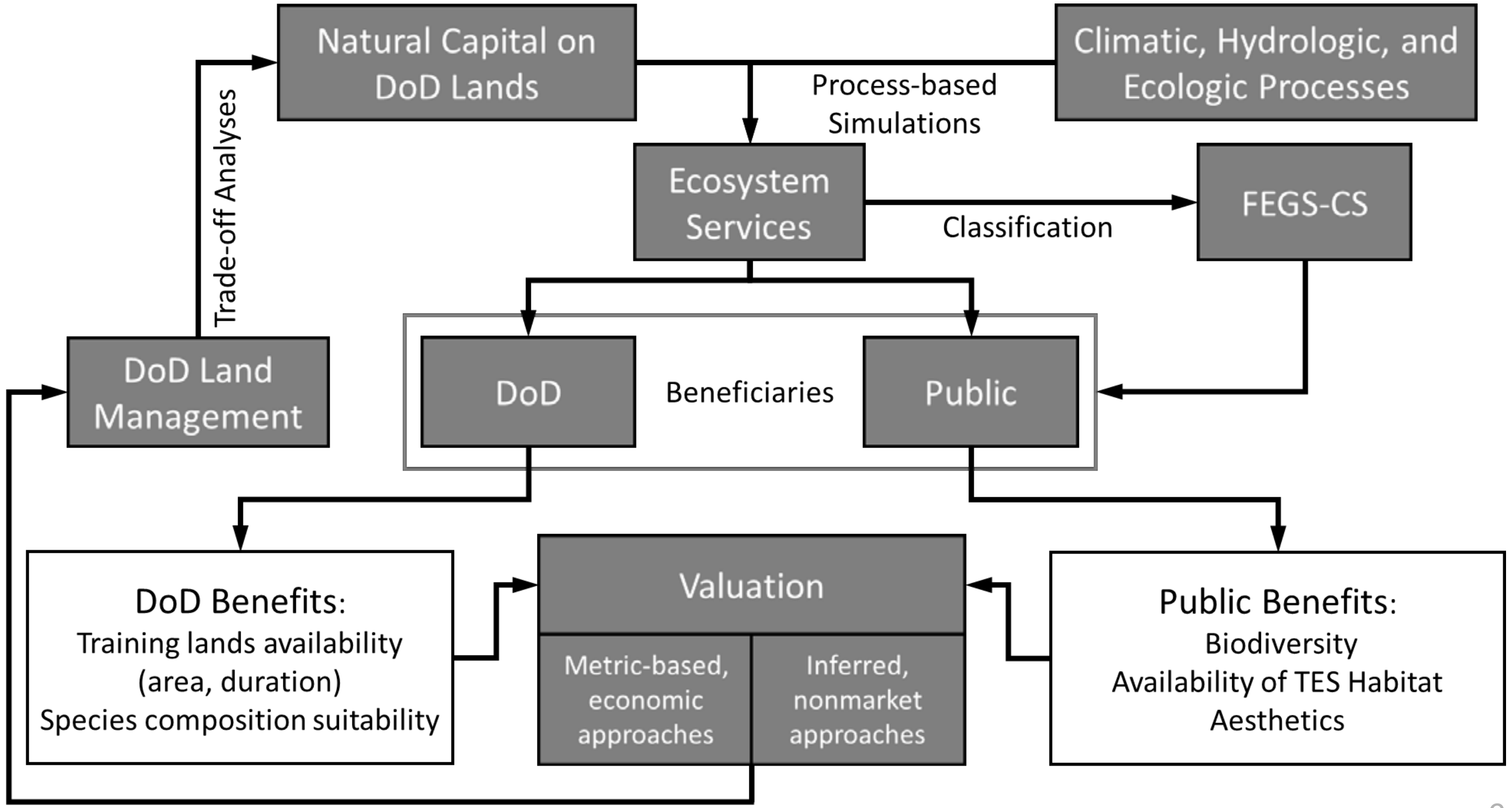
Top: Chinook salmon SAR vs. juvenile fish length binned in 4 mm intervals with lines using Region I and II parameters.
Bottom: Net ecosystem carbon exchange and TES habitat area.

McDowell et al., 2020



Uniform Valuation Challenge

- Common and equitable valuation of benefits and costs to stakeholders
- Examples:
  - Passive or nonuse values
    - Existence/bequest values for nonmarket benefits of ecosystems
  - Value of robust fish runs
    - Commercial, recreational, and tribal fisheries
    - Regulatory benefits associated with potential ESA delisting
  - Other values
    - Military, national defense



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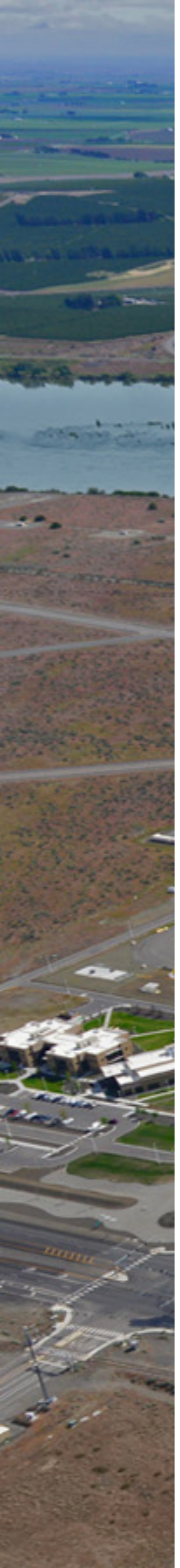

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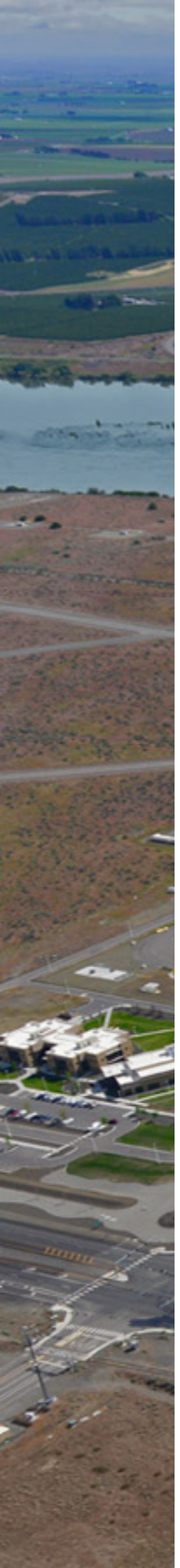
Multi-Stakeholder Tradeoffs Challenge

- Leverage resource relationships and valuation to enable informed, science-based, defensible tradeoffs
- Examples:
  - Hydroelectric dam breach or increased spill may have positive impacts on juvenile and adult anadromous fish survival and passive use values but negatively impacts river corridor users (e.g., navigators, transporters, irrigators) and may increase regional power rates
  - Native communities' interests and values may differ from quantifiable socioeconomic uses and impacts (overlap with Uniform Valuation)

Alternatives	Indicators				
	I_1	I_2	I_3	…	I_n
A_1					
A_2					
A_3					
…					
A_m					



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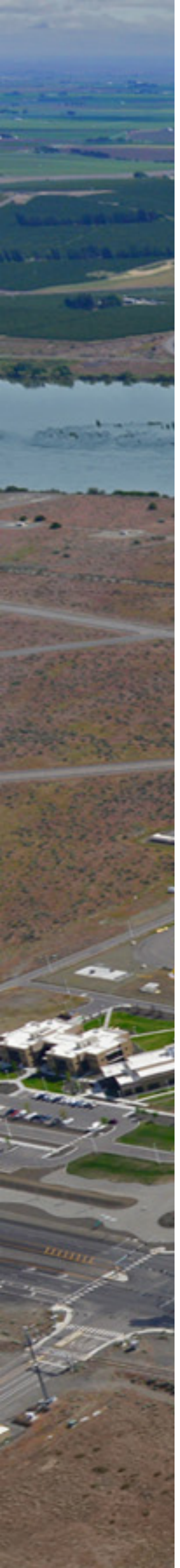
Benefits to DOE Arctic Energy Office

- Ability to address the unique and diverse mix of Arctic stakeholders
- Leverage expertise in complex environmental assessments and integration of predictive modeling, big data, and data analytics to enable a shared decision-making approach
- Enable science-based, multi-stakeholder tradeoffs for reducing decision-making uncertainty
- Provide a long-term, consistent, and adaptive environmental assessment and management tool.



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Thank you

Ann Miracle, PhD, Group Leader
Risk & Environmental Assessment
Ann.Miracle@pnnl.gov
(509) 372-4327

Rajiv Prasad, PhD
Earth Scientist
Rajiv.Prasad@pnnl.gov
(509) 375-2096