

Expect the Unexpected: Salmon, Water, and Wind

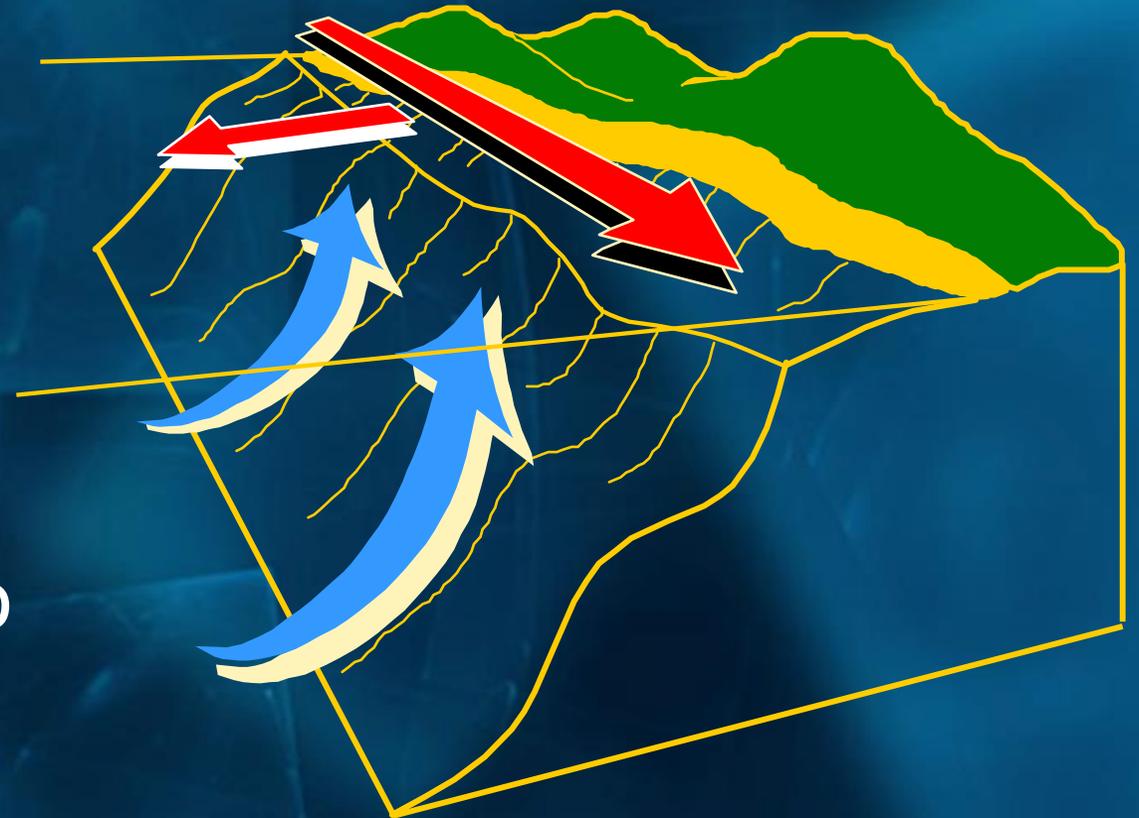
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Coastal Upwelling

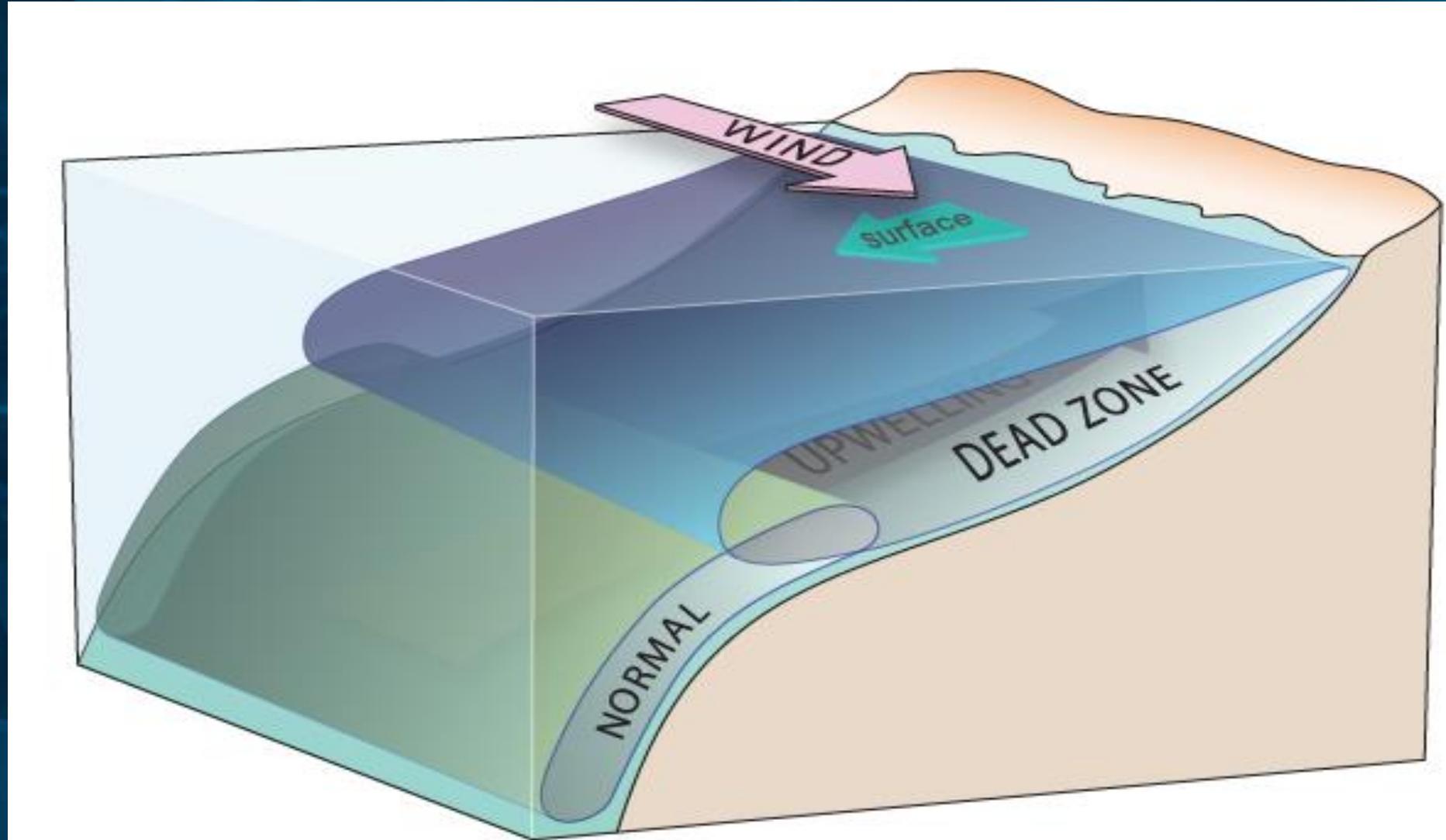
Equatorward Winds

Winds push surface water offshore

Cold, deep water moves to surface, bringing nutrients

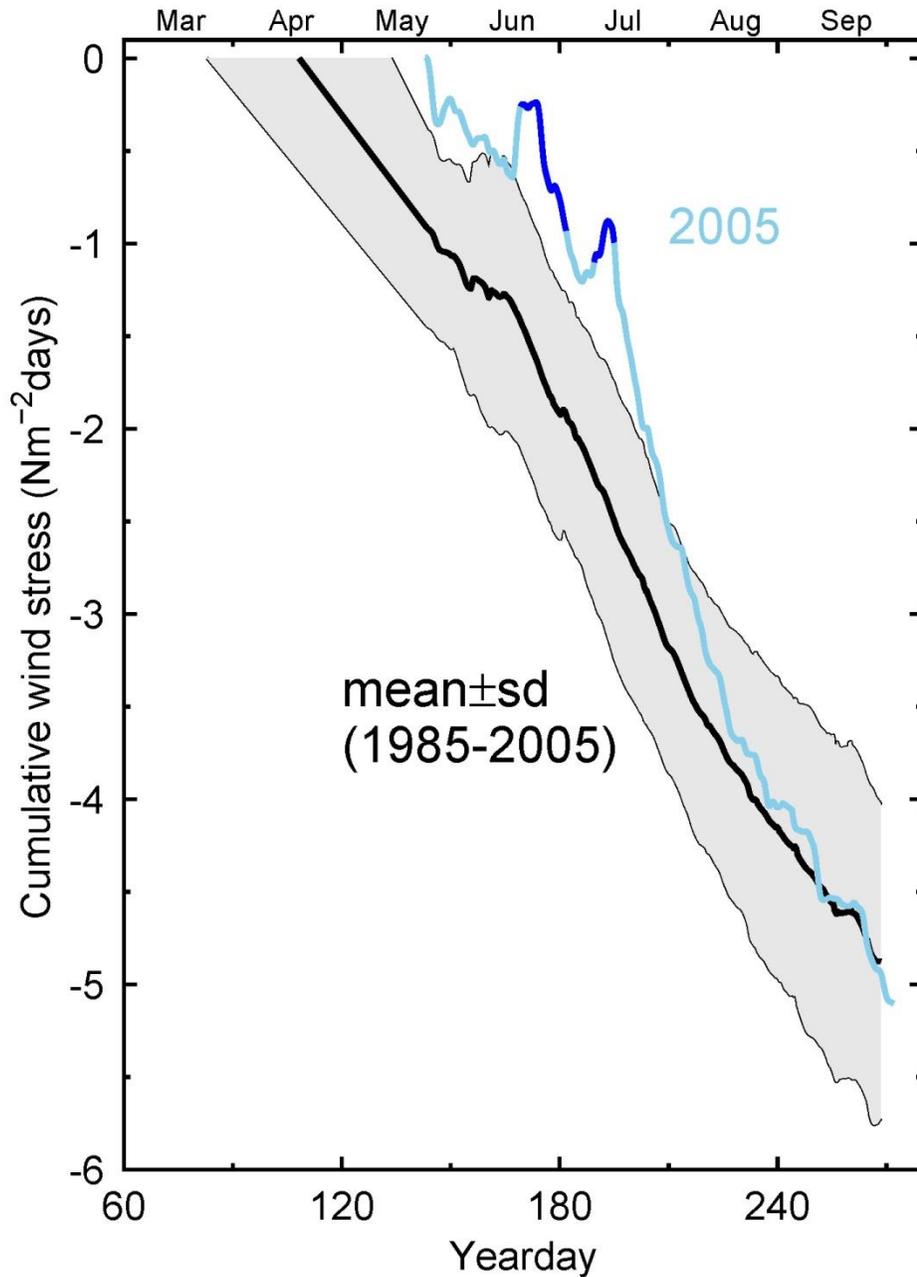


Conditions Leading to Low Oxygen Zones Microsoft Research



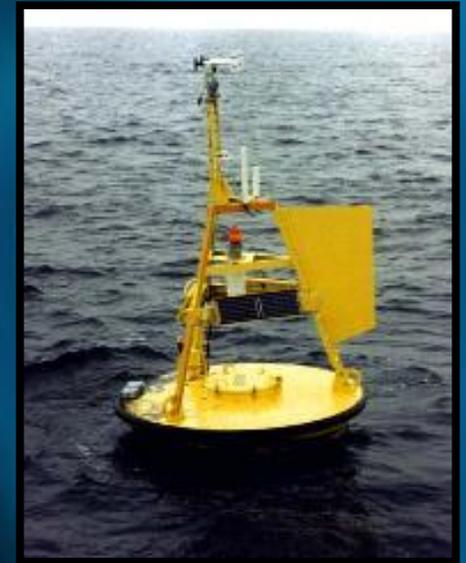
Interannual variability in wind stress

Cumulative wind stress since Spring Transition



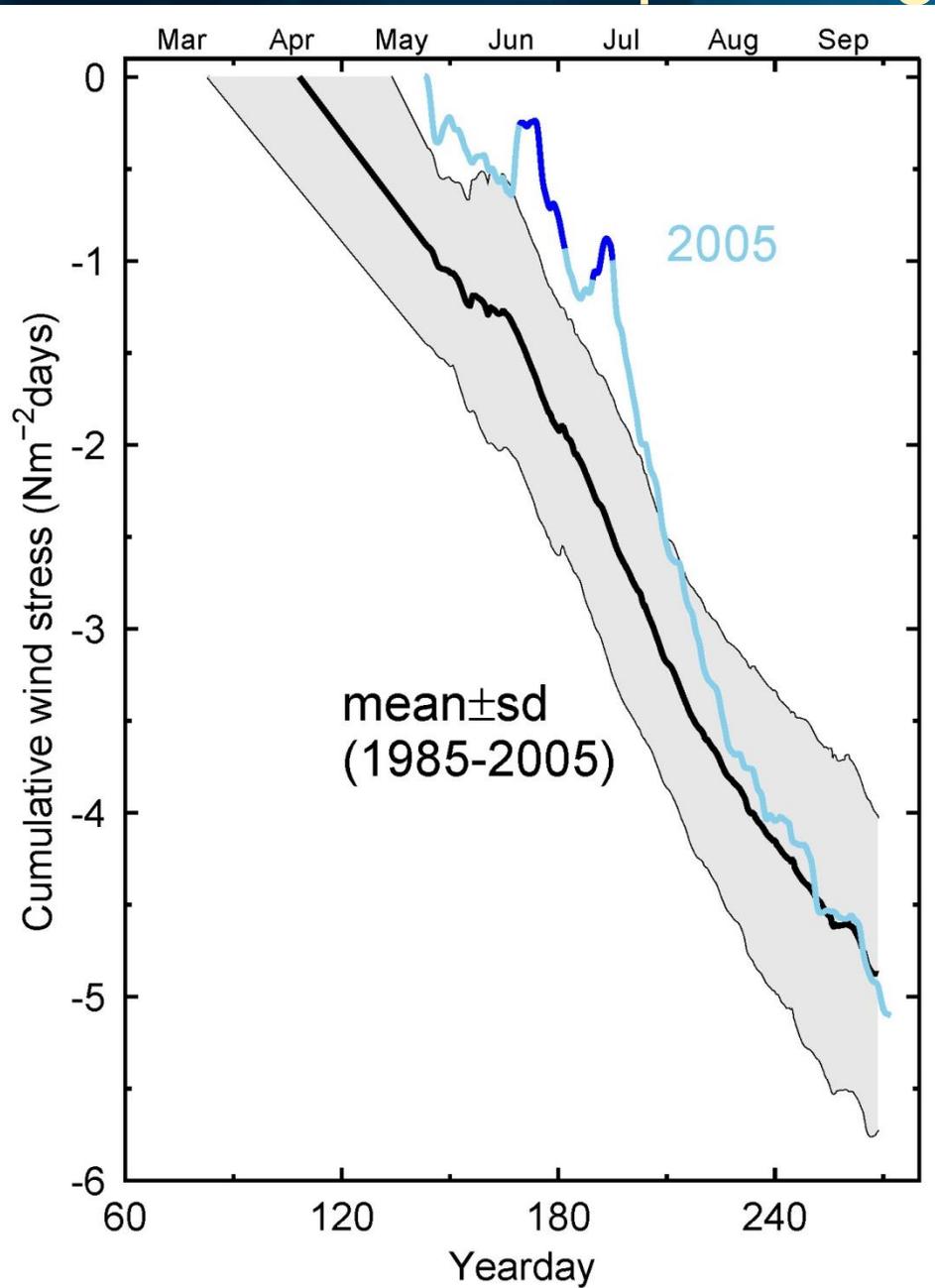
Equatorward, Upwelling favorable

Microsoft Research



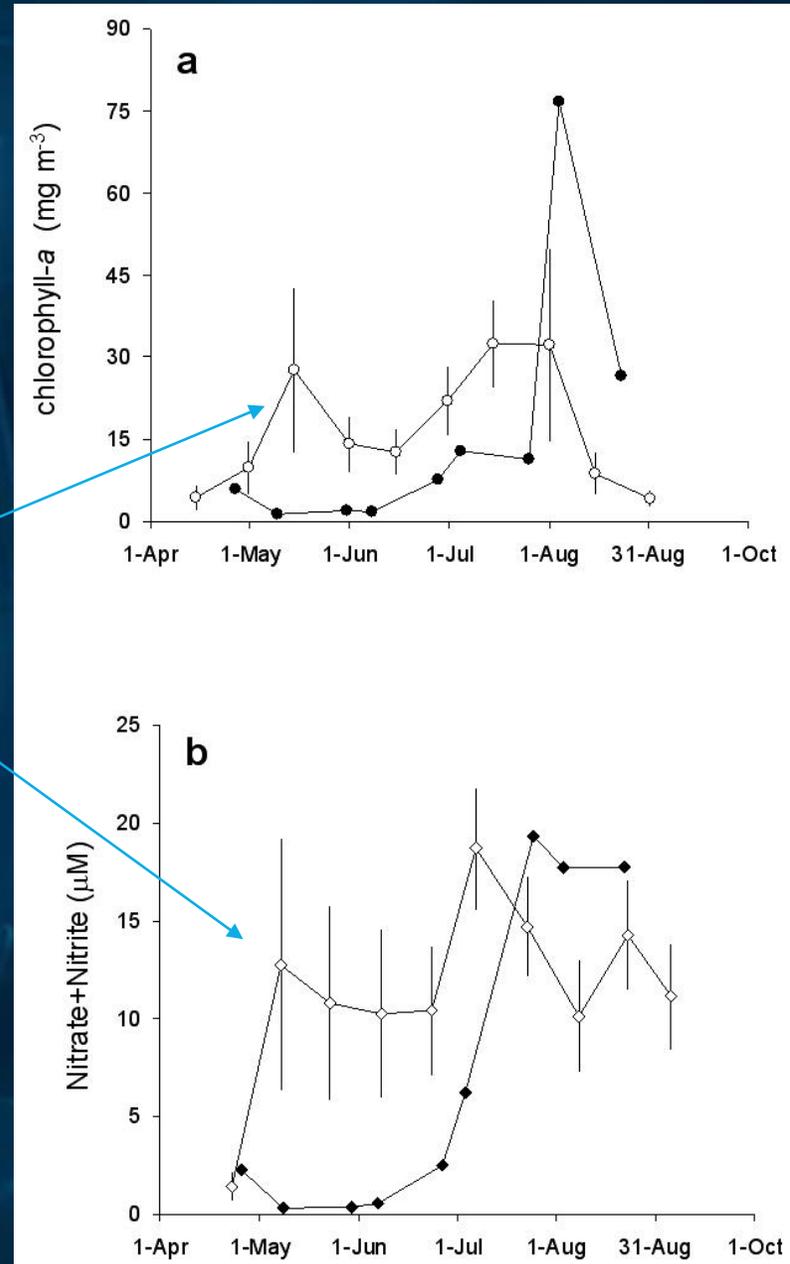
Barth et al. (2007)

Late, weak upwelling in 2005



led to low nutrients and chlorophyll

long-term average

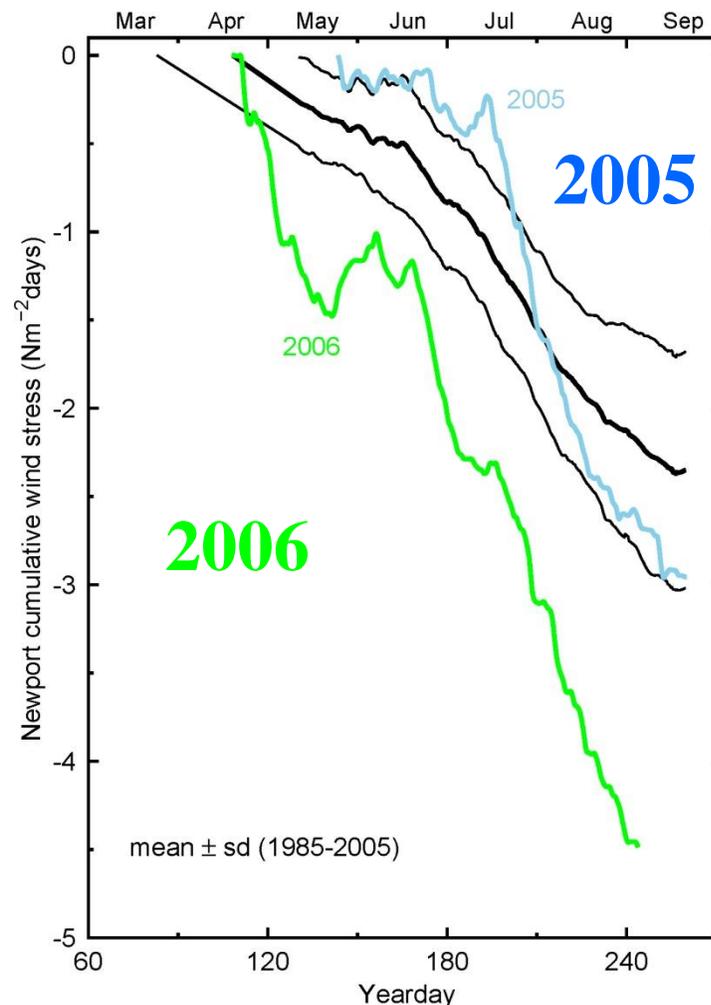


Barth et al. (2007)

Interannual variability – Supercharged upwelling of 2006

Cumulative wind stress
since Spring Transition

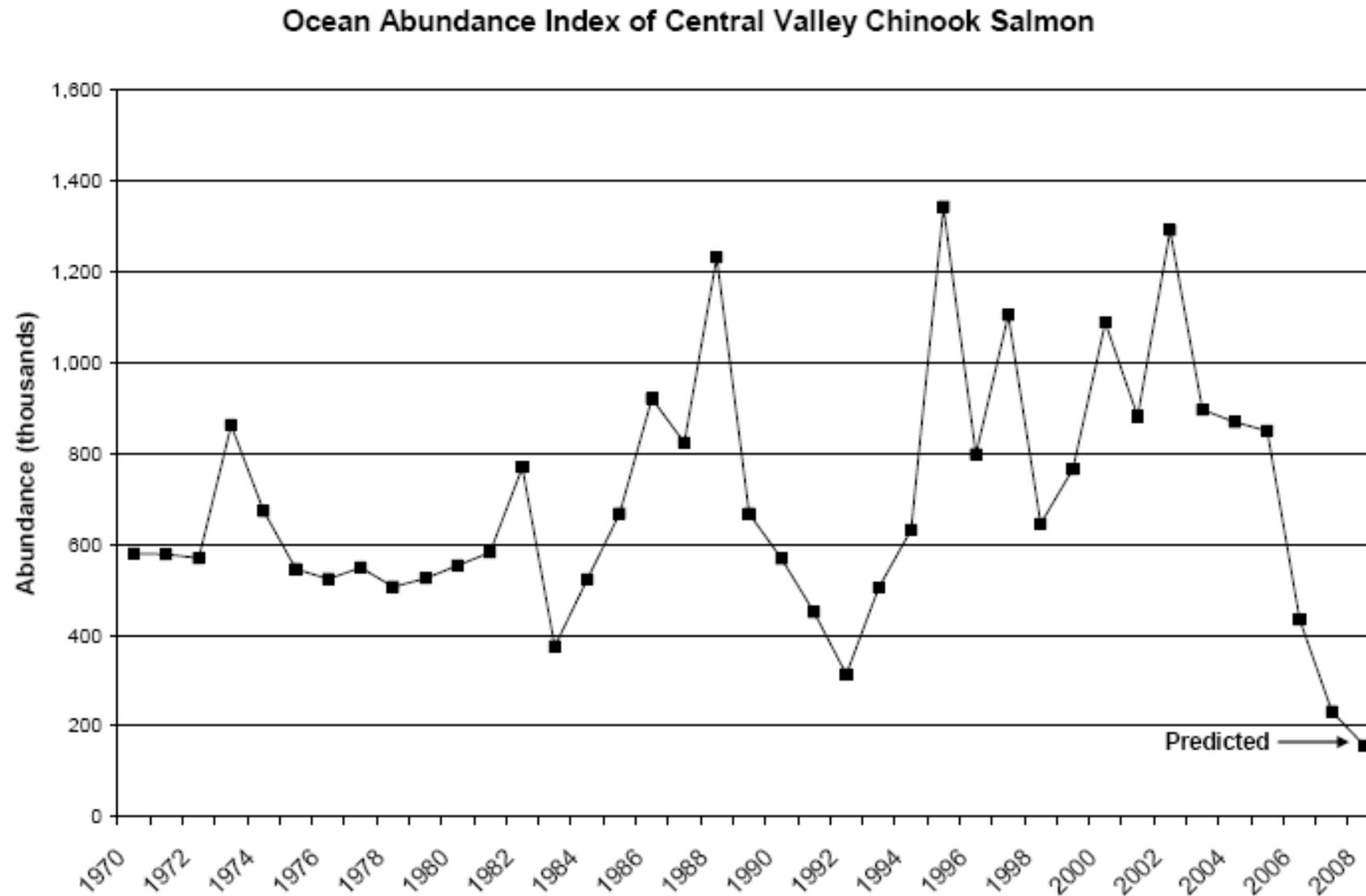
Equatorward,
Upwelling
favorable



Two extremes
in
two years !

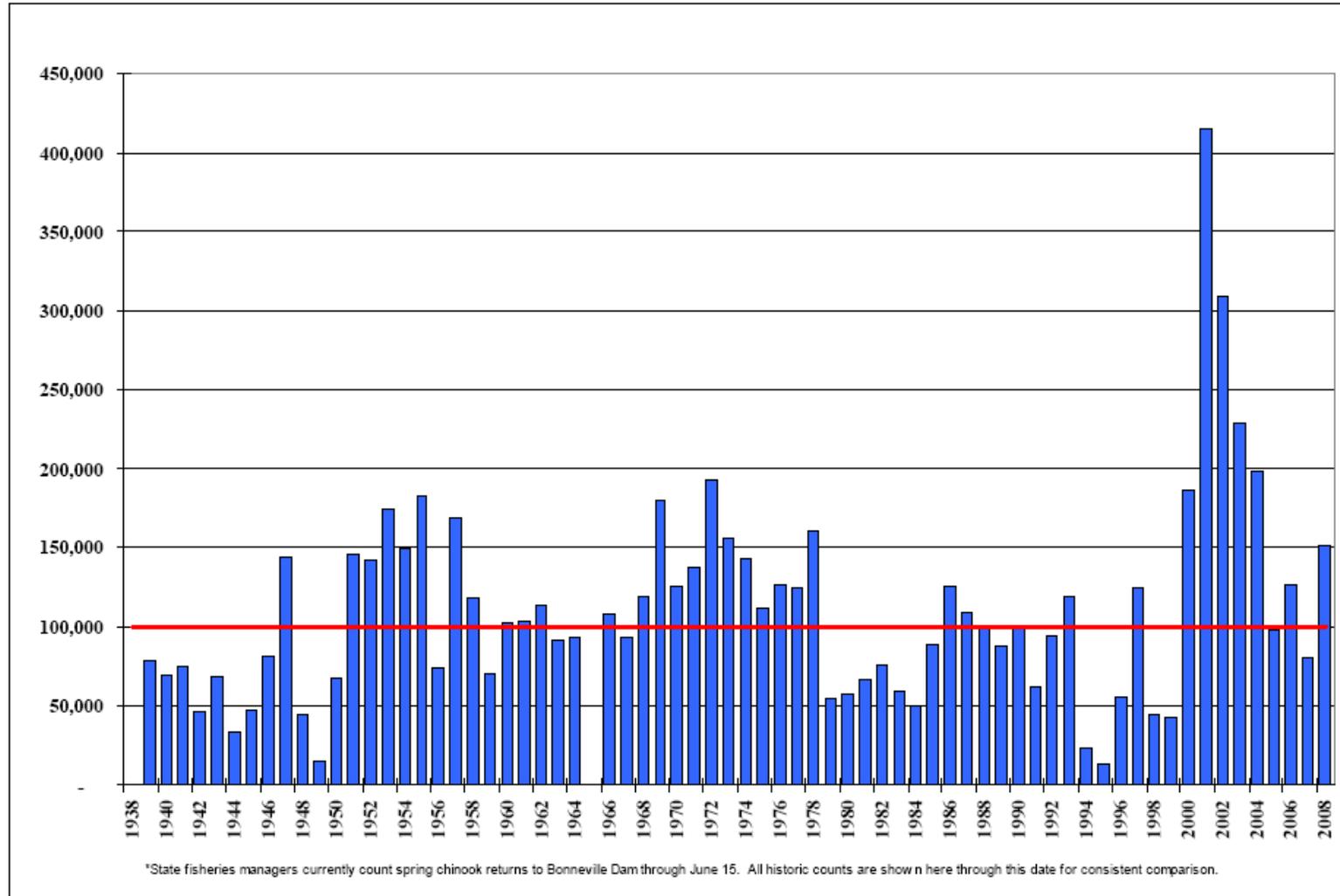


“This is a bleak year.” - NOAA

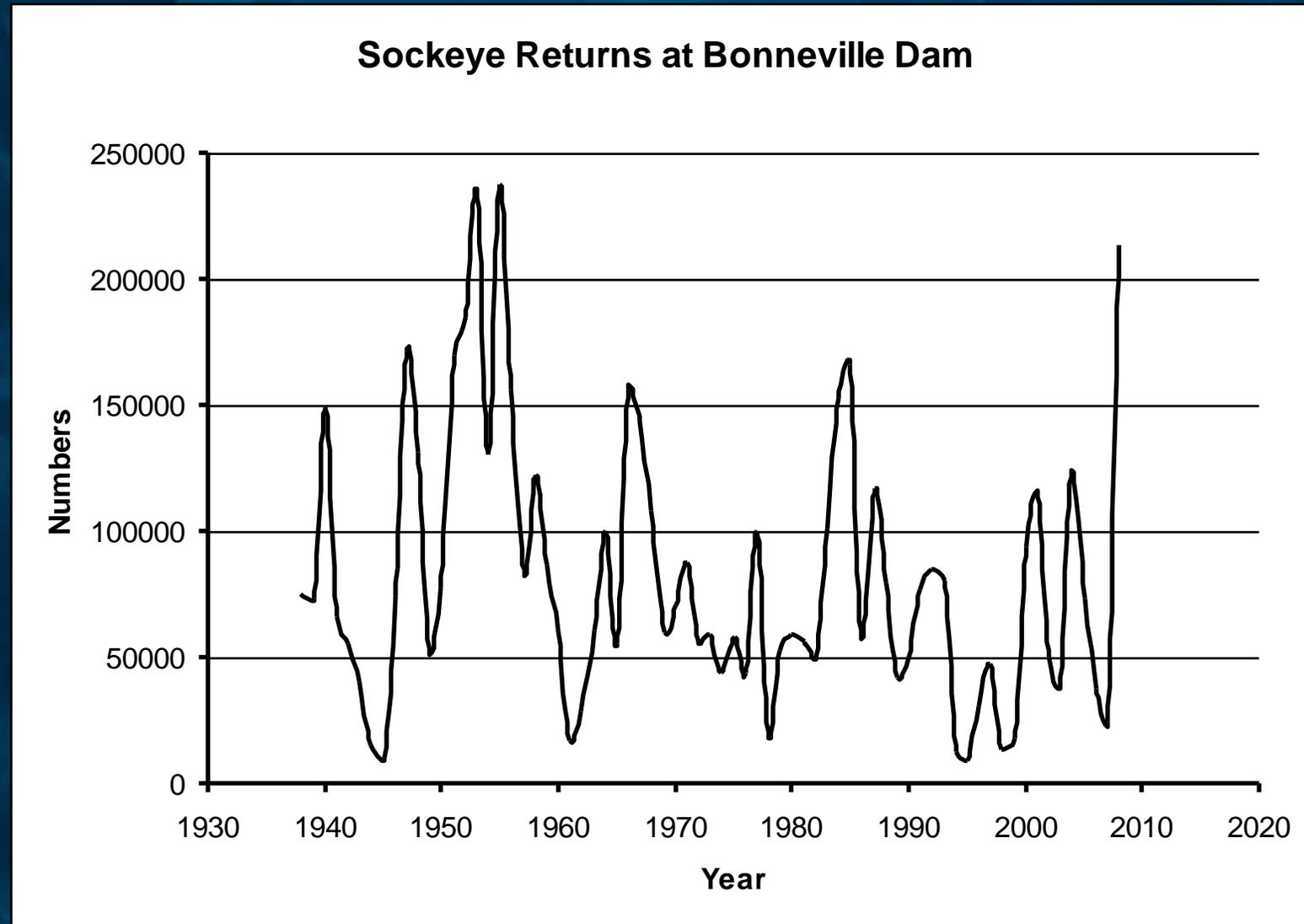


“Some of the highest numbers we’ve ever seen” - NOAA

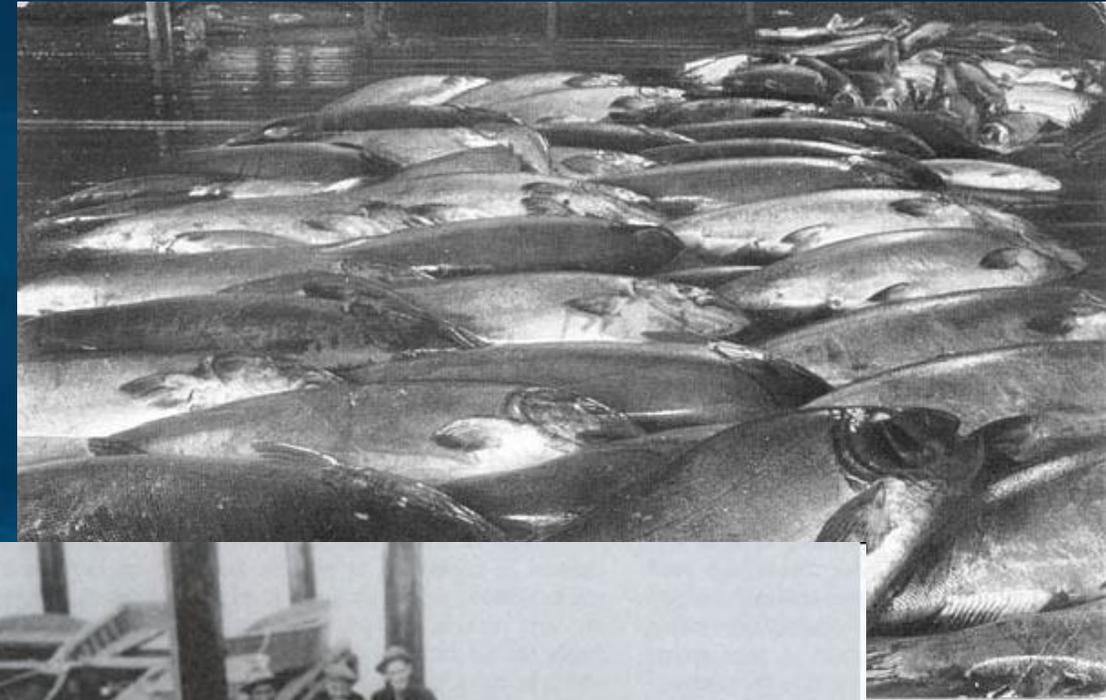
Spring Chinook Adult Returns @ Bonneville (no jacks)



“It’s a mystery. This is nothing like what was predicted.” - NOAA



Historic Runs of Salmon in the Columbia River



Native American Gillnetters



John Day Dam



Fish Ladder at John Day Dam



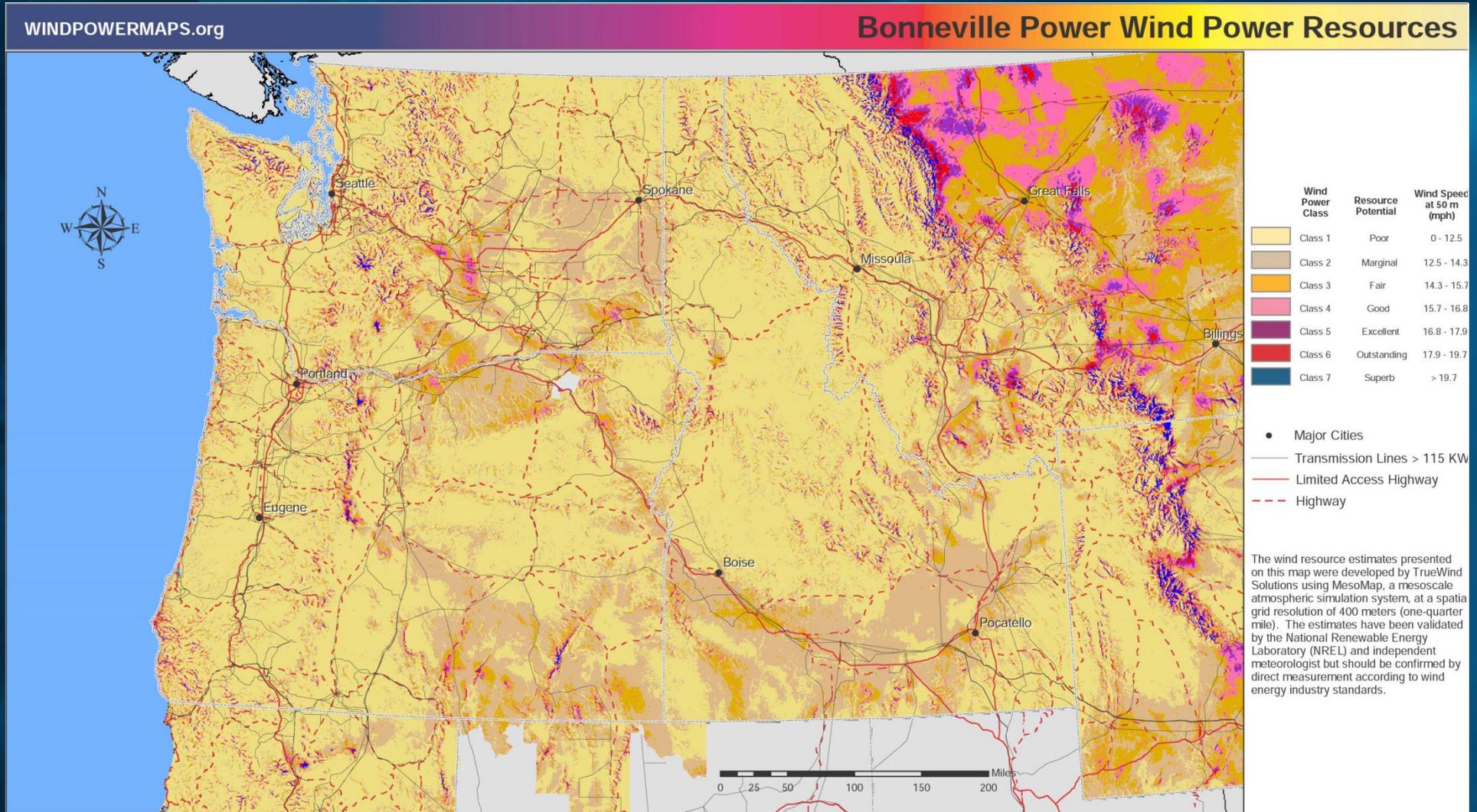
Irrigation in Hermiston



Wind Farm in the Gorge

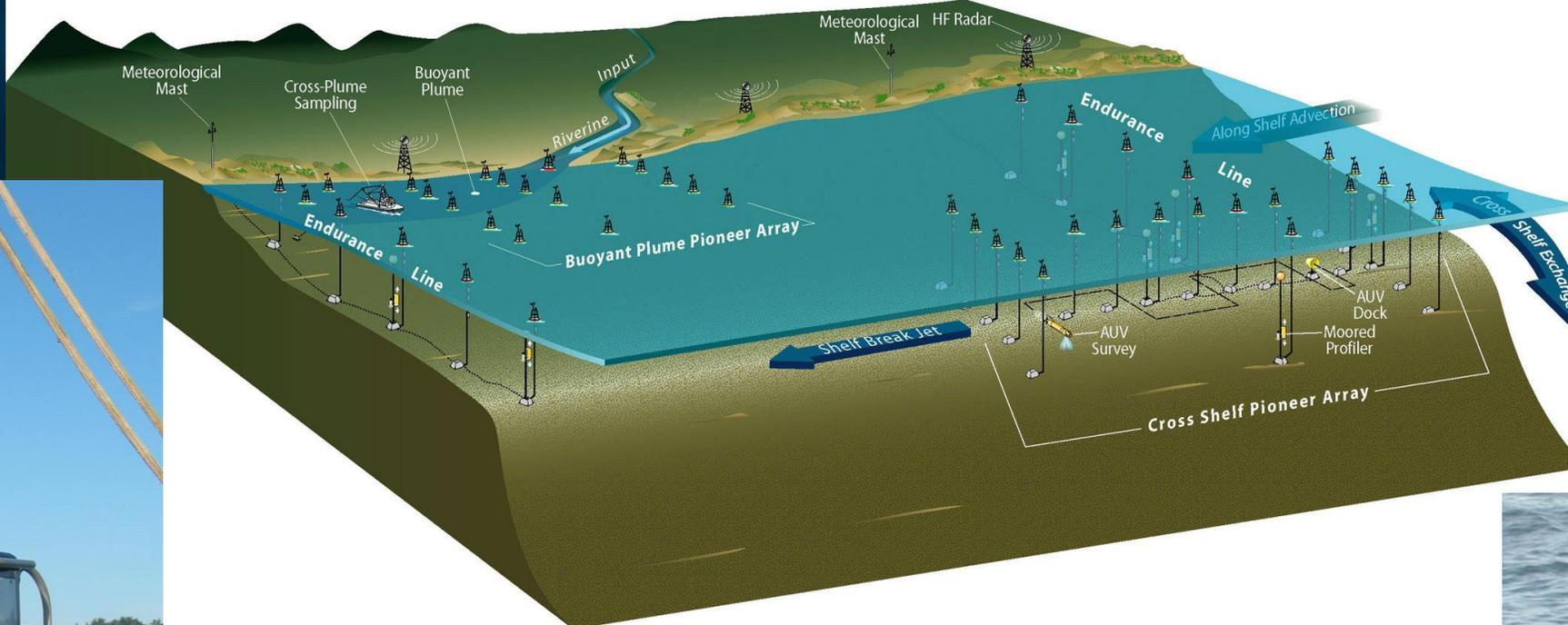


Potential Wind Resources in the Columbia Basin

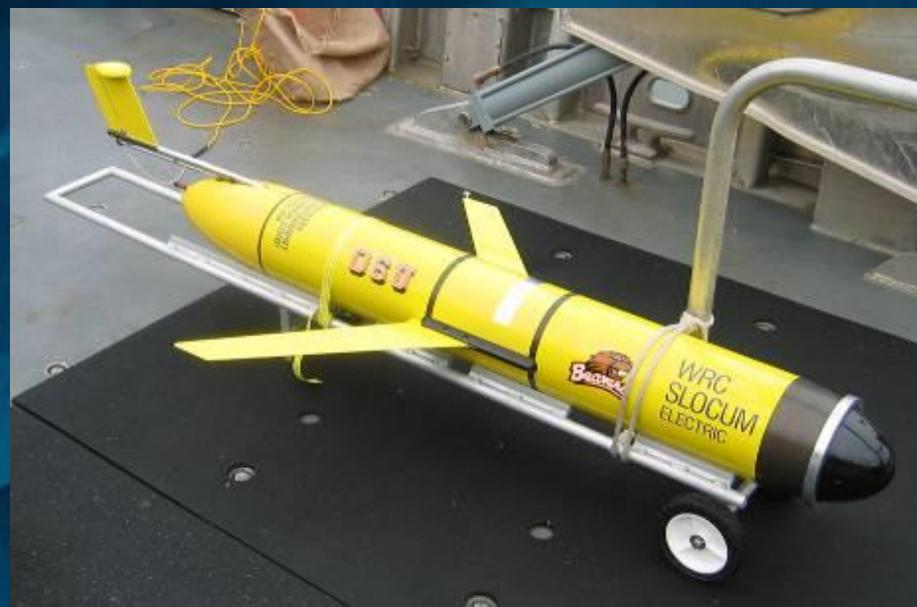


Project Sponsors

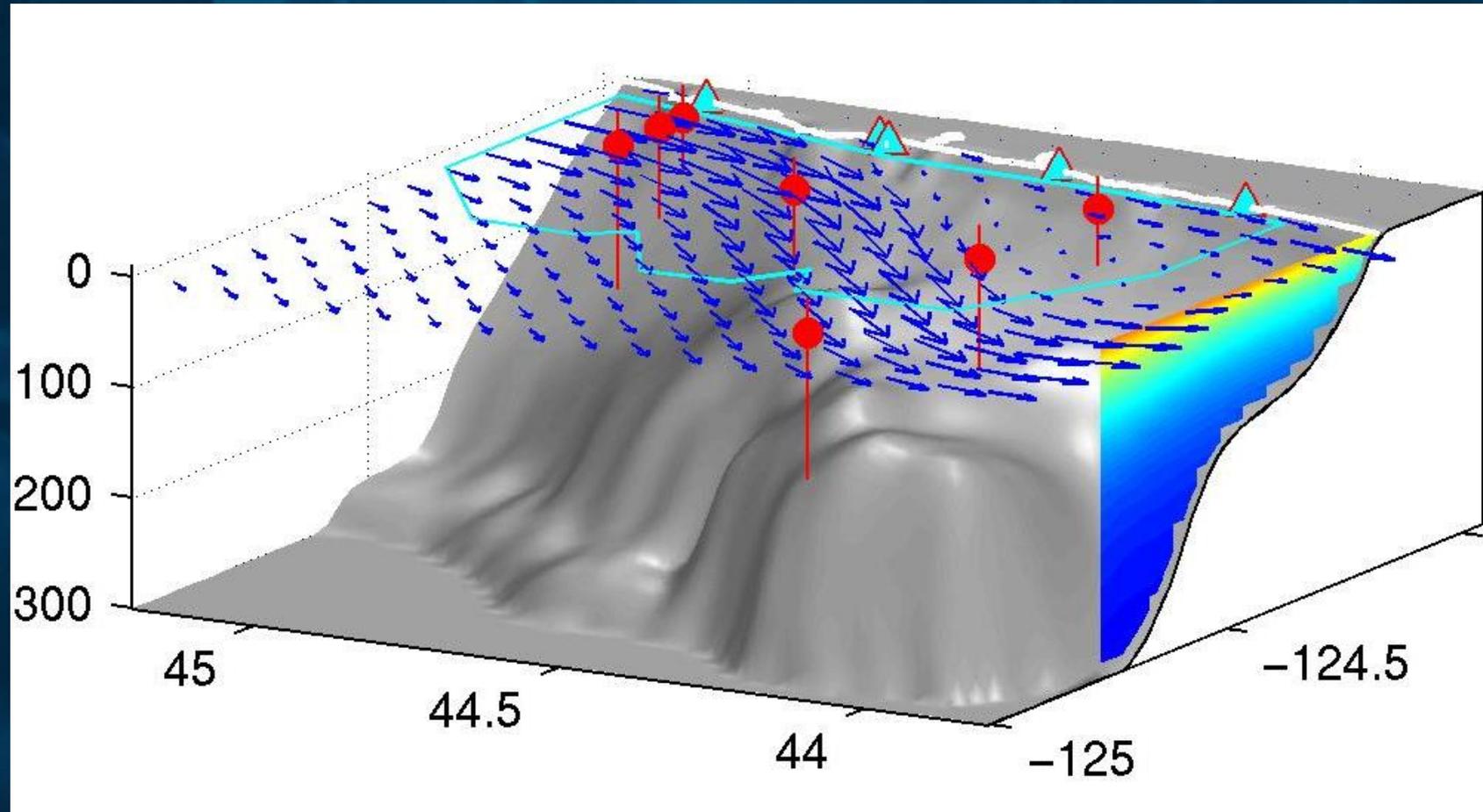
NREL, the Bonneville Power Administration, Northwestern Energy, the Wyoming Business Council, enXco, the Northwest Power Planning Council, Zilkha Renewable Energy, Klickitat County, EnronWind, ABB, Renewable Energy Systems (USA) Inc., Chelan Public Utility District, Idaho Power, Windland, Inc., WSACAA Energy Project, Vestas, Jones & Stokes, CH2M Hill, Suzlon Energy, Northwest Wildlife Consultants, Inc., and Cielo Wind Power.
For more information see www.windpowermaps.org



Coastal Ocean Observing



Data Assimilation System, Oregon Shelf, Summer 2001



Data Assimilation: Model + Data = Optimized Solution (3D+Time)

What types of IT do We Need?

- Data streams
 - Management, provenance
 - Knowledge extraction
 - Seeking patterns and relationships
- Computation
 - Scenarios, real-time predictions
- Communication
 - Diverse users – and two-way communications
 - Semantics and ontologies
 - Presentation and visualization
 - Distributed and mobile

Climate Change and Public Policy

- Regard people as a “keystone species,” not just extracting ecosystem services
- Require combination of social and ecological systems
 - Respond to new information and understanding
- Combination of adaptation and mitigation
 - Integrated and inclusive approaches to policy formulation and refinement