Assessing and Mitigating Drought in Washington State

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The Water Center

Presentation Outline

- Motivation
- Methods
- Drought impacts
- Reducing vulnerability
- Future work

Motivation for the Study

- Irrigated crops make up 70% of harvest value
- Agriculture employs over 183,000 people
- Endangered fish populations are affected
- Municipal water suppliers lose millions during drought
- Hydropower generation decreases

The Drought Study Objectives

Investigate four aspects of drought

- Impacts of past droughts
- Vulnerability of different sectors and regions
- Indicators to monitor and forecast drought
- Responses to reduce drought impacts

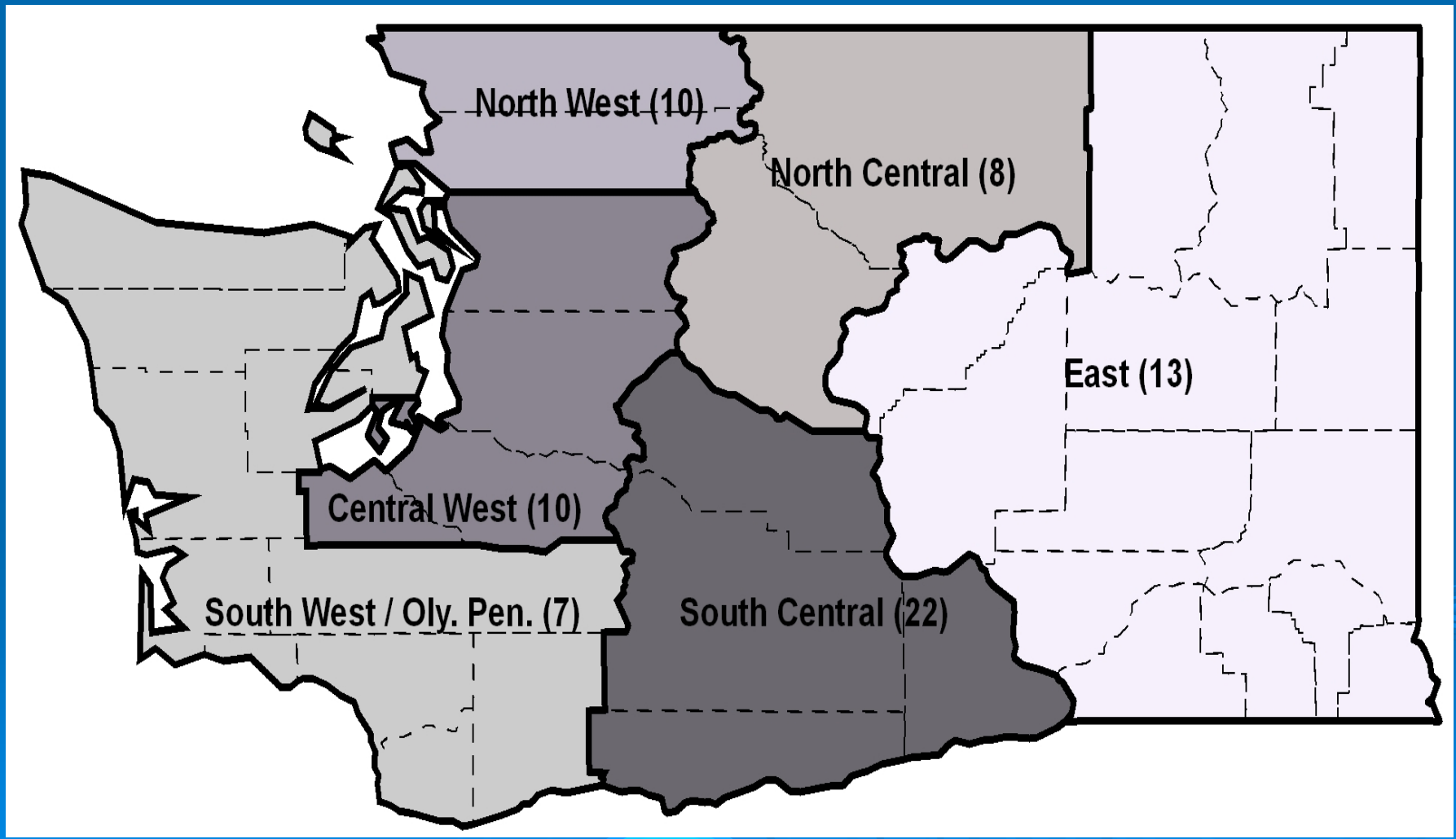
Investigation: Methods and Sectors

- Conducted over 60 interviews covering major regions and sectors

Interviewees:

- Agriculture – irrigated & dryland, crop scientists, and green industry
- Municipal and industrial water suppliers
- Fishery agency officials
- WRIA officials
- Power and recreation sector officials

Investigation: Regions and Interview Distribution

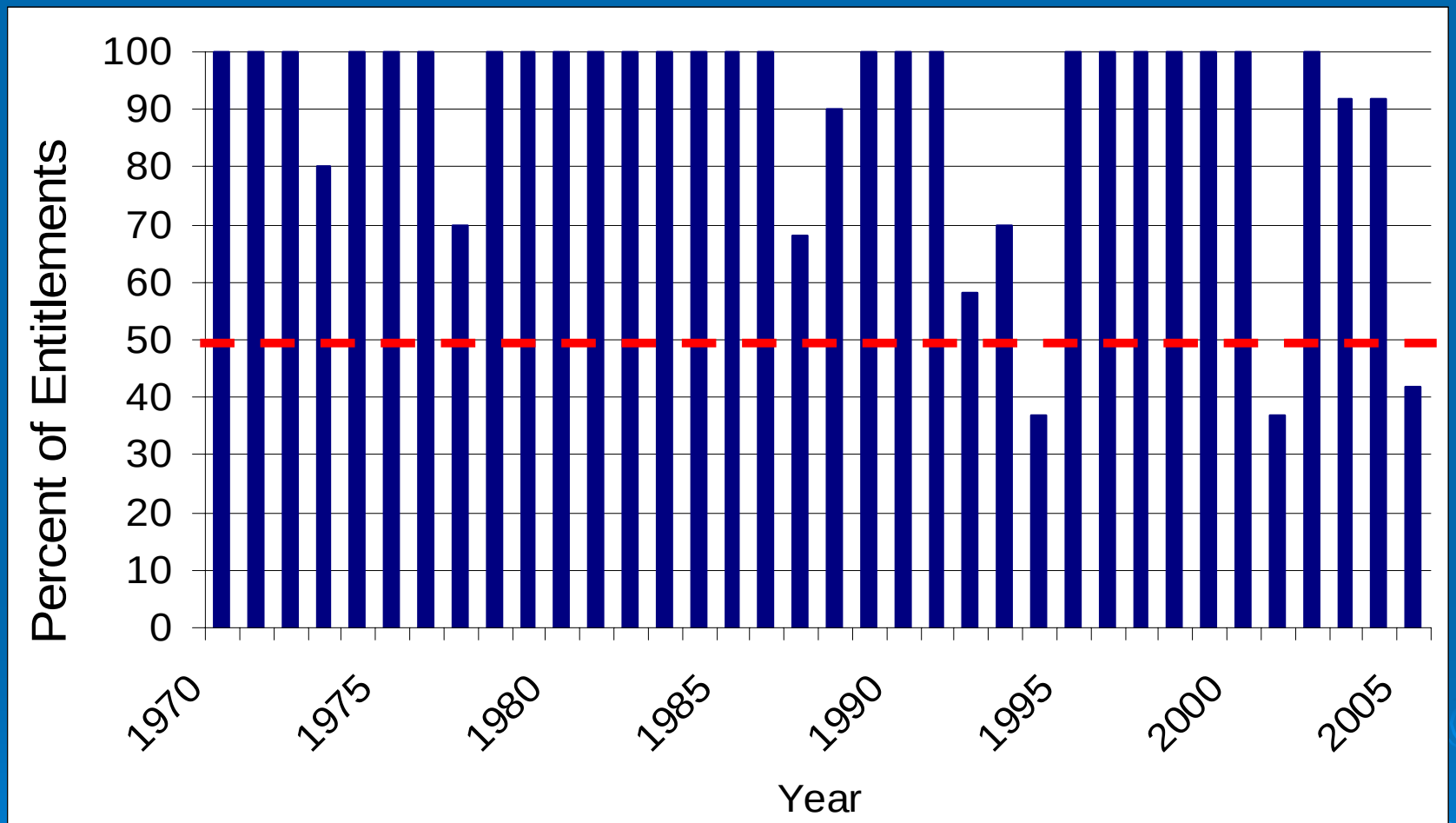


Primary findings of impact assessment

Agriculture: 2005

- Water supply was inadequate to meet crop demands
- Junior users received 42% supply in 2005
- Entire fruit crops were lost
- Dryland production was reduced by 70% in some cases

Junior Water Users



Yakima Basin Project - Percent Supply for Junior Water Users - Normal Supply is Approximately 3 Acre Feet per Acre

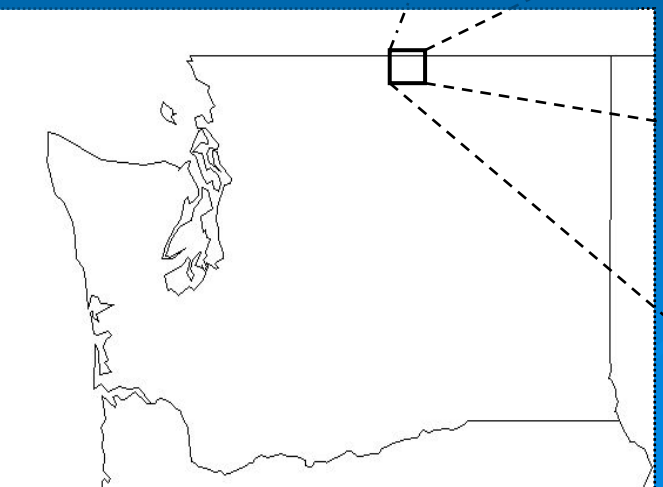
Primary Findings of Impact Assessment

Environment

- Increased prespawn and juvenile mortality
- Reduced habitat and decreased water quality
- Increased cost to fisheries agencies

The Okanogan River

- Warm reservoir spill water
- Tributary draw down
- Prespawn mortality of hundreds of Summer Chinook Salmon



Primary Findings of Impact Assessment

M&I

- $3M -$15M in lost revenue/increased costs

Hydropower Sector

- Lost generation in 2001 Drought: Several Billion

Recreation

- 1 million fewer ski area visits in 2005 (60% reduction)

Drought Responses and Adaptations

Junior water users

- Water law changes and education
- Conveyance inefficiencies can be reduced
- Earlier accurate supply estimates
- Increased Storage

Dryland farmers

- Farming practices can be altered
- Improved forecasts enable better decision making

Drought Responses and Adaptations

Green Industry

- Localized supply forecasts would be beneficial

Municipal and Industrial

- Rule curve may be managed dynamically
- System maintenance schedules can be altered
- Improved forecasts would enable better management

Drought Responses and Adaptations

Fisheries

- Fisheries agencies may purchase water rights
- Monitoring and maintenance can be increased
- Early drought declaration enables preparation
- Smart storage projects supply multiuse water

Recreation

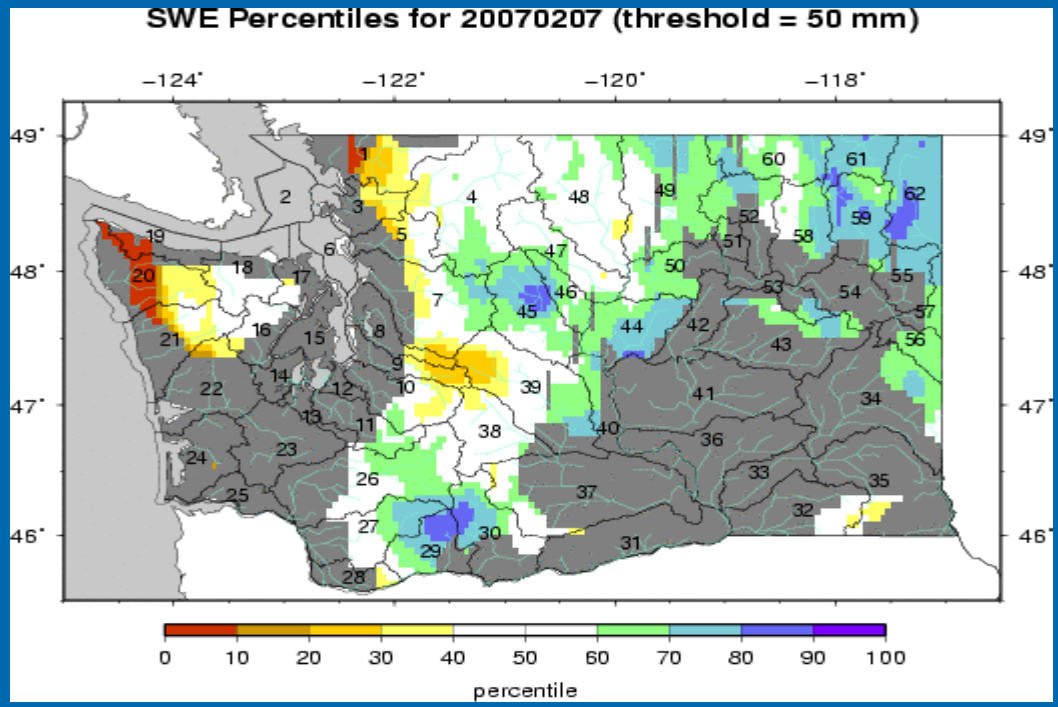
- Ski areas may decrease labor force
- Improved forecasts inform hiring decisions

Future and Ongoing Research

Leverage knowledge gained in this project to improve drought preparedness in Washington state

- Use lessons learned from other states
- Develop more specific indicators
- Declare drought in stages and by region
- Provide better information for water users

Future and Ongoing Research



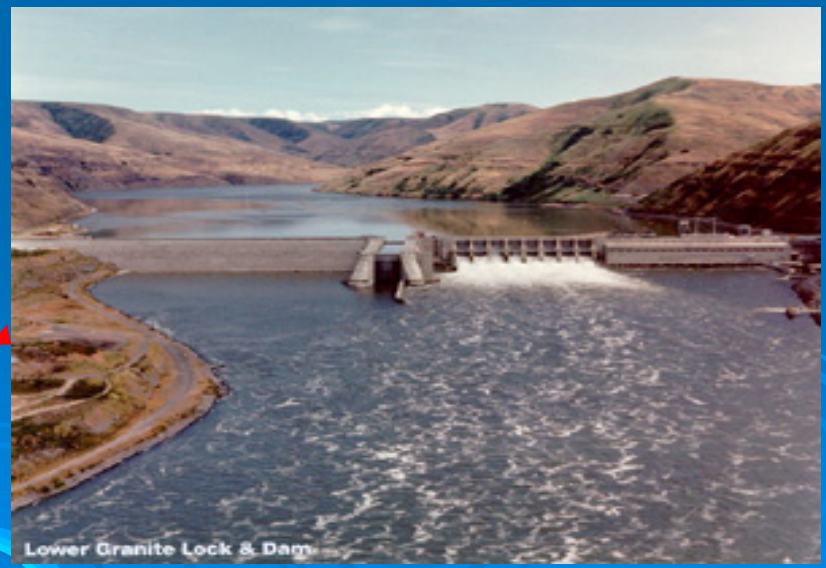
- Implement region specific streamflow forecasts
- Develop drought onset and recovery forecasts
- Provide 15-day spatial flood risk forecasts
- Work with stakeholders to maximize the value of decision making tools

Acknowledgements

- Washington Department of Community Trade and Economic Development
- Washington Department of Ecology
- National Science Foundation
- Project Advisory Committee

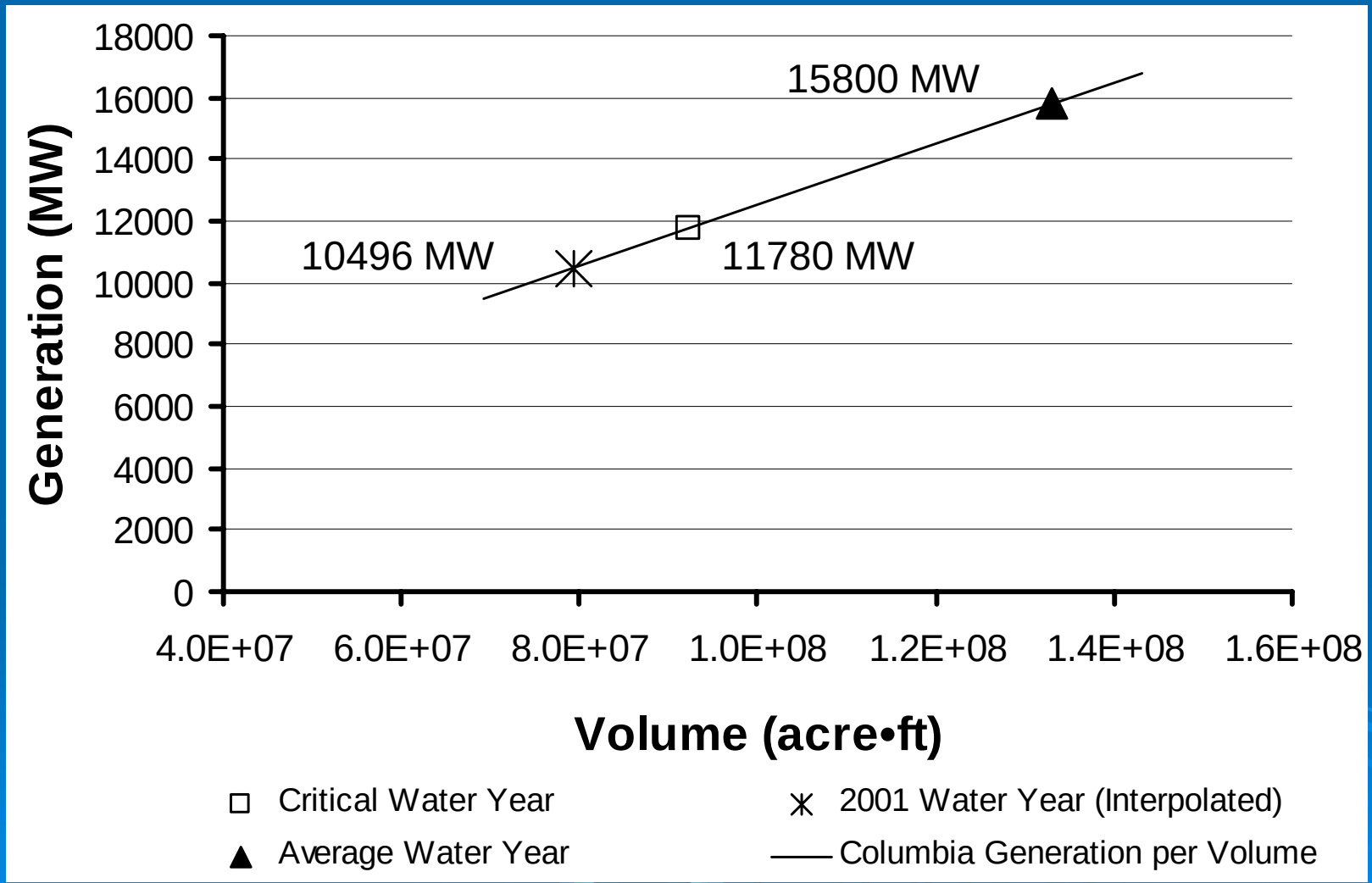
Questions?

Impact to the Hydropower Sector in 2001



U.S. Army Corps of Engineers

Hydropower Impacts Estimation

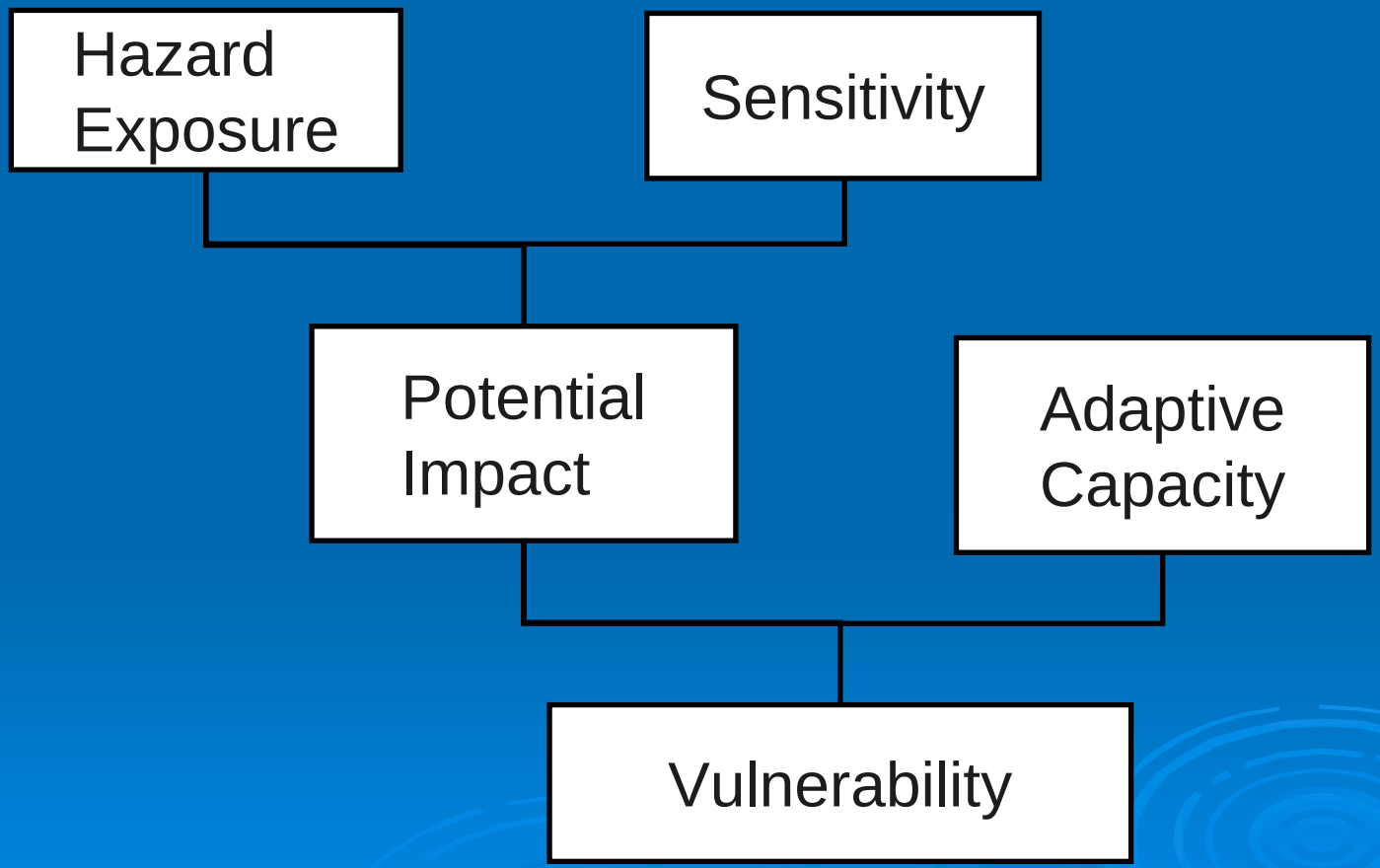


Hydropower Calculation

- 125$/MW hour x Generation Reduction x Time
- $5.8 B in NW Region
- $3.5 B in WA
- Doesn’t account for effect of CA shortages
- Doesn’t account for increased price due to drought

Assessing Vulnerability to Drought

- Conceptual Model of Vulnerability



Adapted from D. Schroter et al. 2004

Primary Findings of Vulnerability Assessment

High Vulnerability

- Junior water users (proratable)
- Fisheries (central regions)
- Dryland farmers
- Green industry
- Ski areas operators

Vulnerability of the Green Industry

- Vulnerability derived from consumer perception of drought
- State declaration of drought may reduce sales
- Media can increase impacts

Primary Findings of Vulnerability Assessment

Medium Vulnerability

- Municipal and industrial water suppliers
- Western berry farmers
- Senior water users (non-proratable)
- Fisheries (Western regions)
- Dairy farmers and beef cattle ranchers
- Golf courses

Vulnerability of Fisheries on the West Side of the Cascades

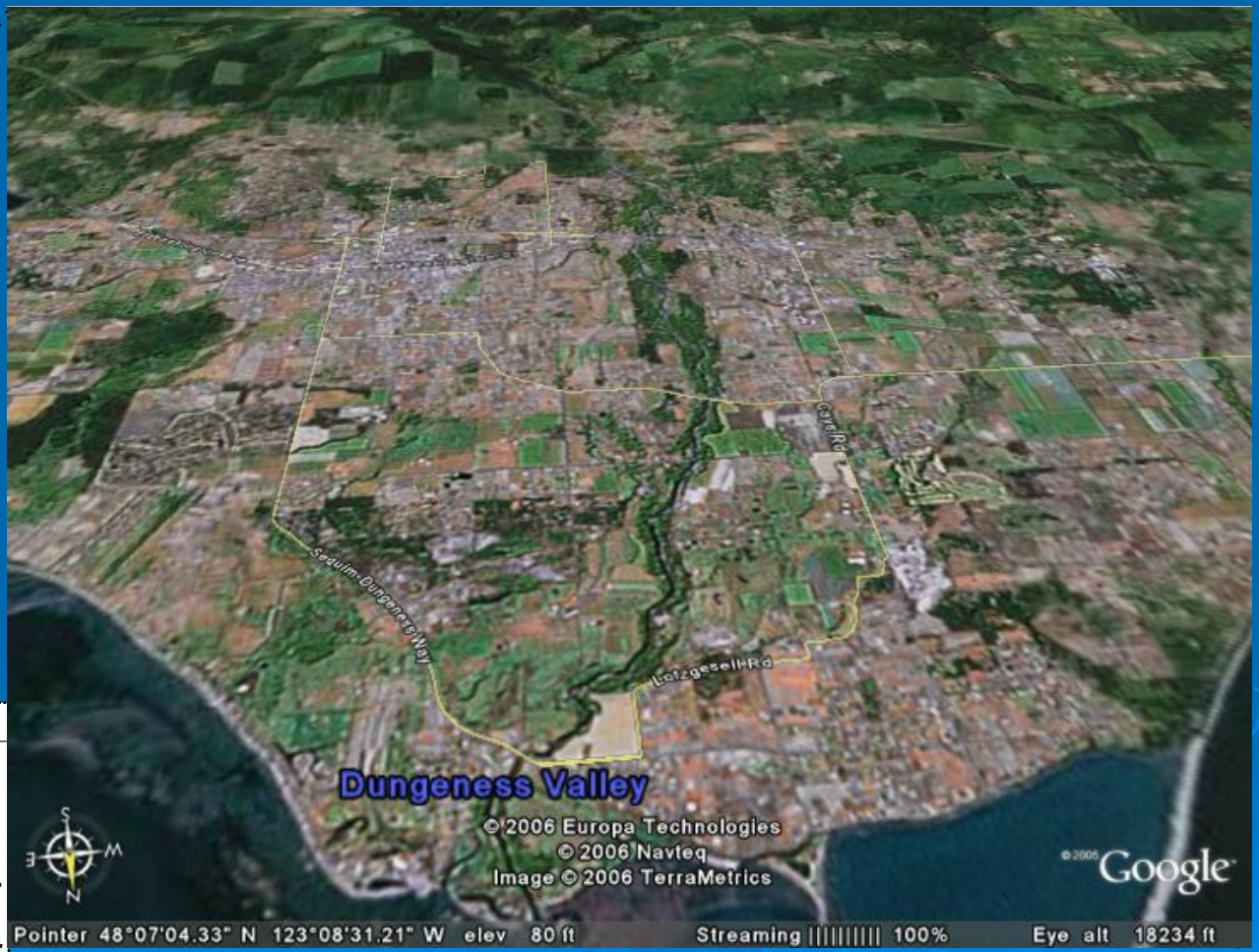
- Vulnerable to low flows
- Spawning, rearing, and out-migration
- 43% of annual flow enters Cedar above Chester Morse
- Cedar River Instream Flow Commission
- Shared Strategy for Puget Sound

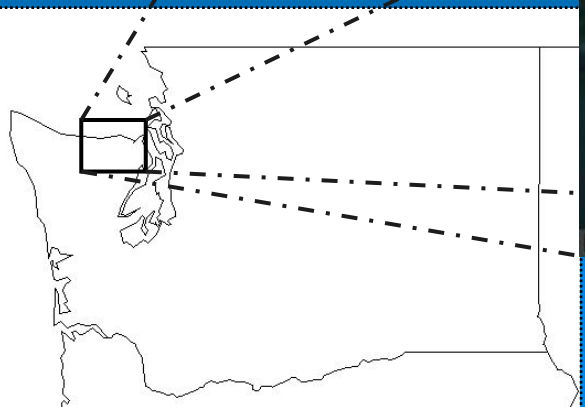
City of Seattle www.nwfsc.noaa.gov

WADFW

Adapting to Reduce Drought Impacts: Dungeness River

- Mean annual flow 380 cfs (USBR)





Adapting to Reduce Drought

Power

- Farmers may be paid not to irrigate
- Power can be purchased back from major users
- Improved supply and demand forecasts enable better management

Adapting to Reduce Drought Impacts: Dungeness River

- Low stream flows in 2005
- Cooperation between users minimizes impact to agriculture
- Ditch riders used to communicate with water users
- Coordinated shutdown allowed fish passage

UC Davis, Purdue

Tools for Reducing Drought Impacts

- Improved mid and long range forecasts
- Better current-conditions data for ag.
- Regionally specific drought monitoring and planning tools
- Education programs for water users
- Multibenefit storage projects
- More streamlined water transfer system