



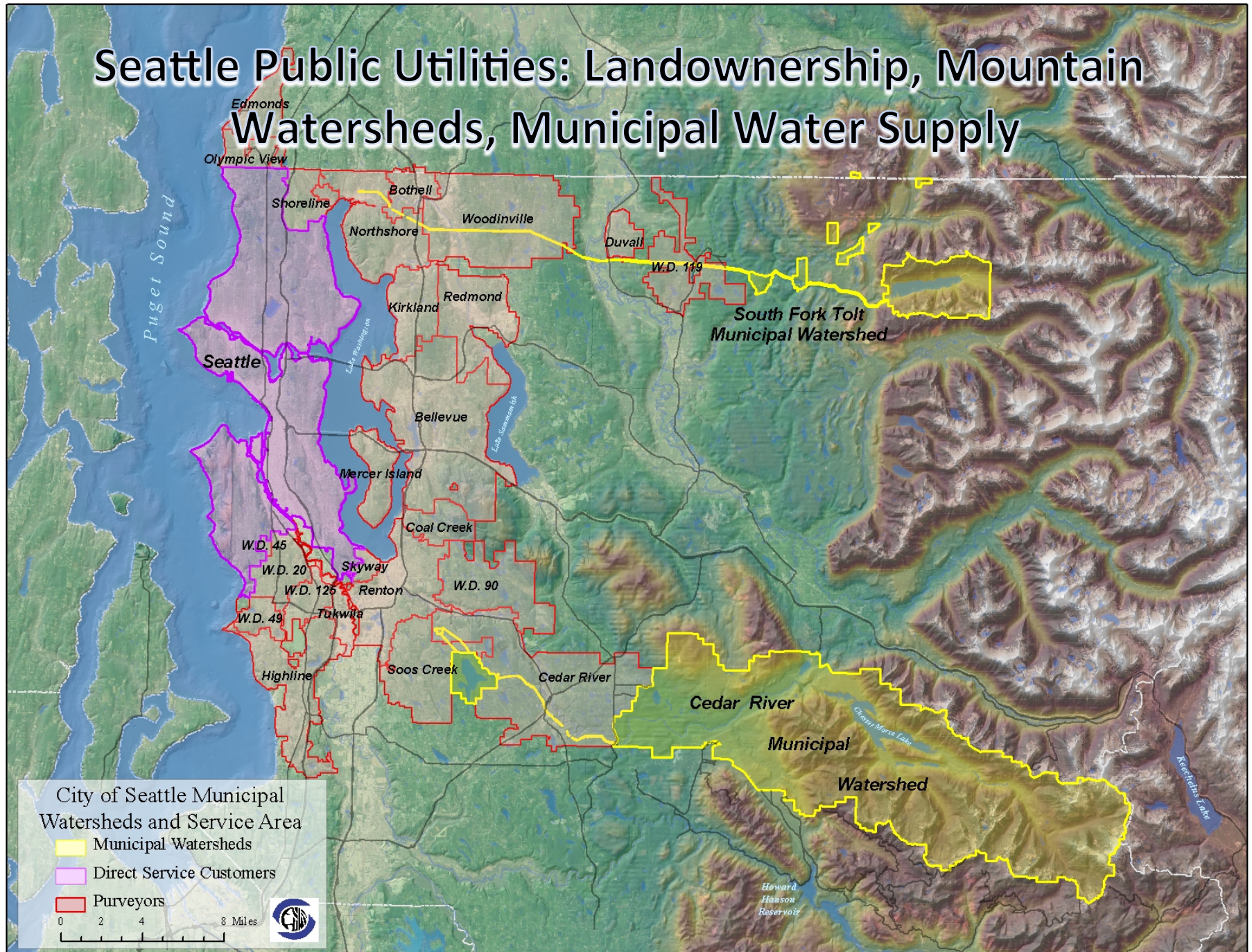
Climate Adaptation in Municipal Watershed Ecosystems

PNW Climate Science Conference
September 10, 2014

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SPU Watershed Services Division



Seattle Public Utilities: Landownership, Mountain Watersheds, Municipal Water Supply



Seattle's Municipal Watersheds:

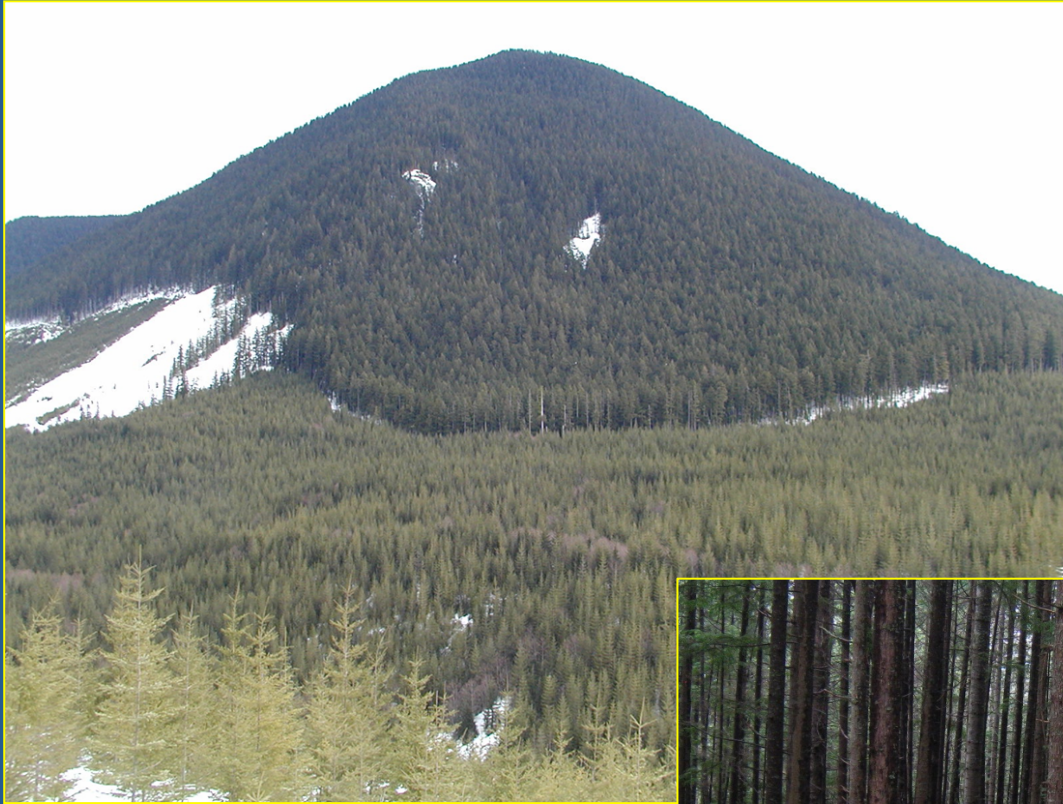
100,000 acres

Water Supply
Habitat provision
Biodiversity
Flood regulation
Ecosystem processes
Cultural values
Education
Research



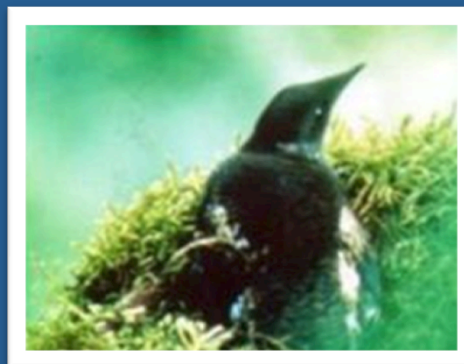
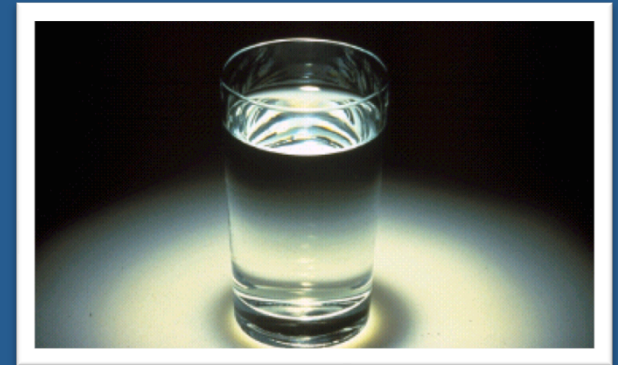
Snow dependent supply

Legacy from Previous Management



Current Management Approaches

- Protect water supply
 - Limited Alternative to Filtration
- Conduct watershed management and restoration
 - Habitat Conservation Plan
- Incorporate Tribal uses

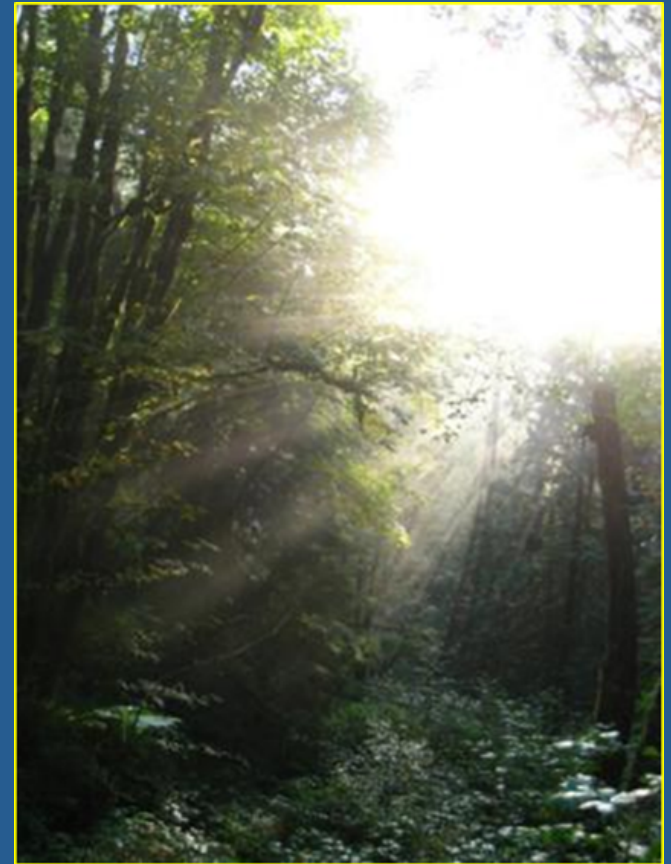


Forest Road Management



Stream Restoration

Improve fish habitat, channel stability, and riparian condition



Forest Restoration

Improve habitat and ecosystem functioning

- Thinning to maintain growth, increase complexity
- Planting to increase species diversity

Monitoring & Research

Overarching Questions

- Forest and stream condition change over time
- Restoration effectiveness

ADAPTIVE MANAGEMENT

- How effective is current management?
- How do approaches need to adjust to incorporate climate change??



Projected Climate Impacts

(just a sample)

Projected Change	Watershed Impact
Reduced snow pack	Water supply, stream flows, fish habitat
Extreme precipitation events	Water quality, fish habitat
Increased temperature	Water quality, fish habitat, tree stress
Increased moisture deficit and fire risk	Water quality, forest and stream habitats
Increased disturbances and vegetation change	Water quality, habitat loss

Watershed Impacts, Adaptation Priorities

Stream flows

Stream temperatures

Fire risk

Forest resilience

Change detection

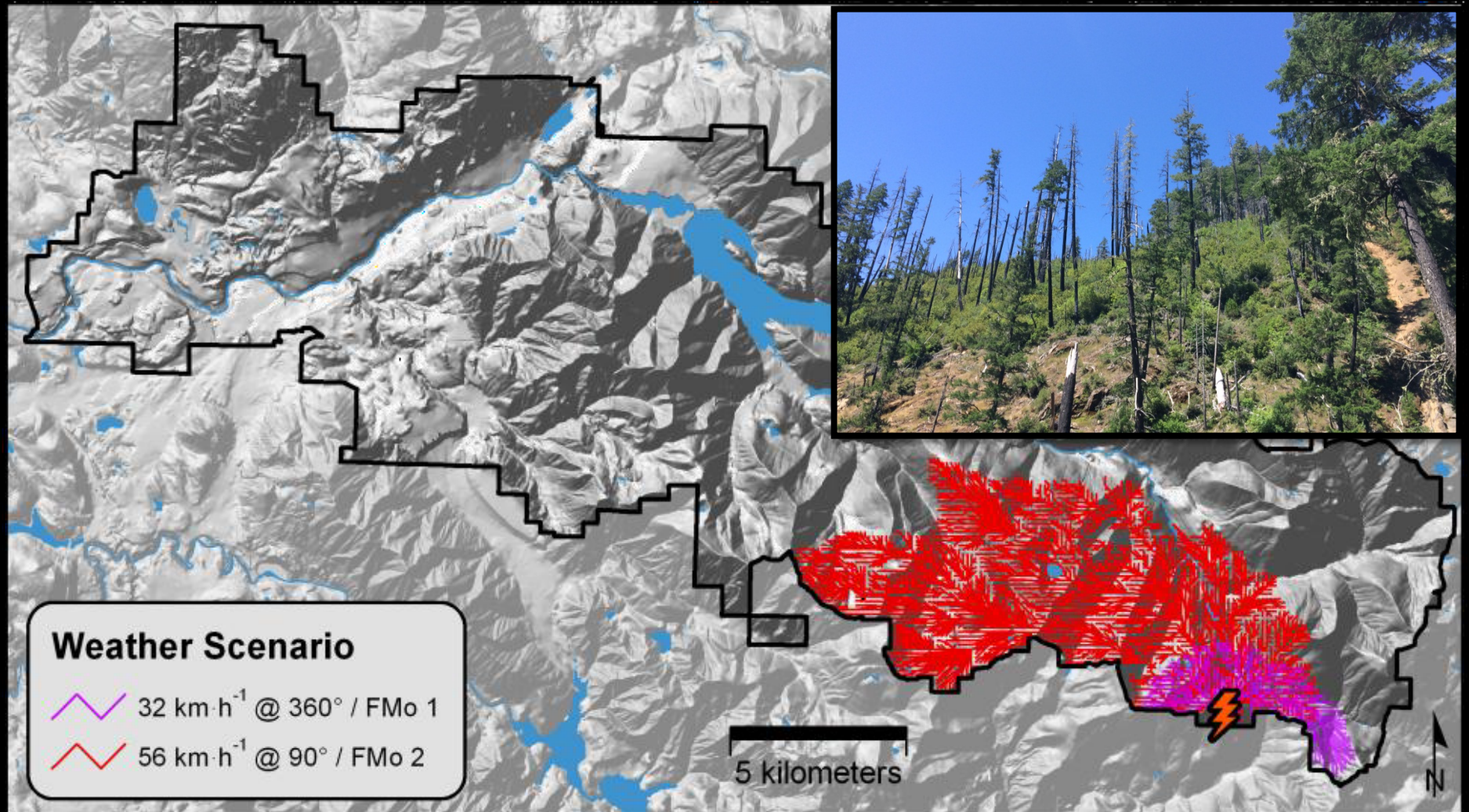
Ecosystem processes

Species impacts



Fire Risk Management

Preparedness, Prevention, Suppression, Recovery



Adaptation Challenges



What does it mean to manage for resilience?

- Composition
- Structure
- Landscape connectivity

West-side considerations
Changing disturbance regimes
Interacting variables



Managing Species Composition



Understanding disturbance interactions in a changing climate



Adaptation Challenges

- Fish habitat: flows, temperatures
- Amphibians: wetland and stream habitats



MUNICIPAL WATERSHEDS ECOSYSTEMS

Water supply

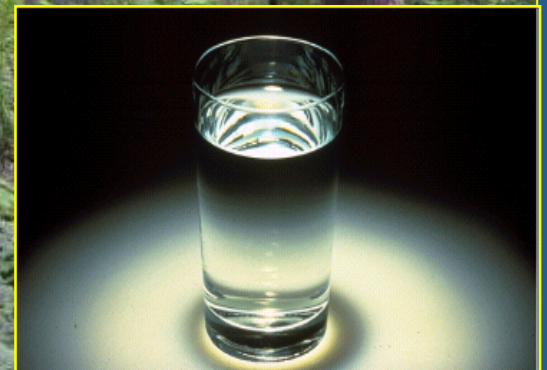
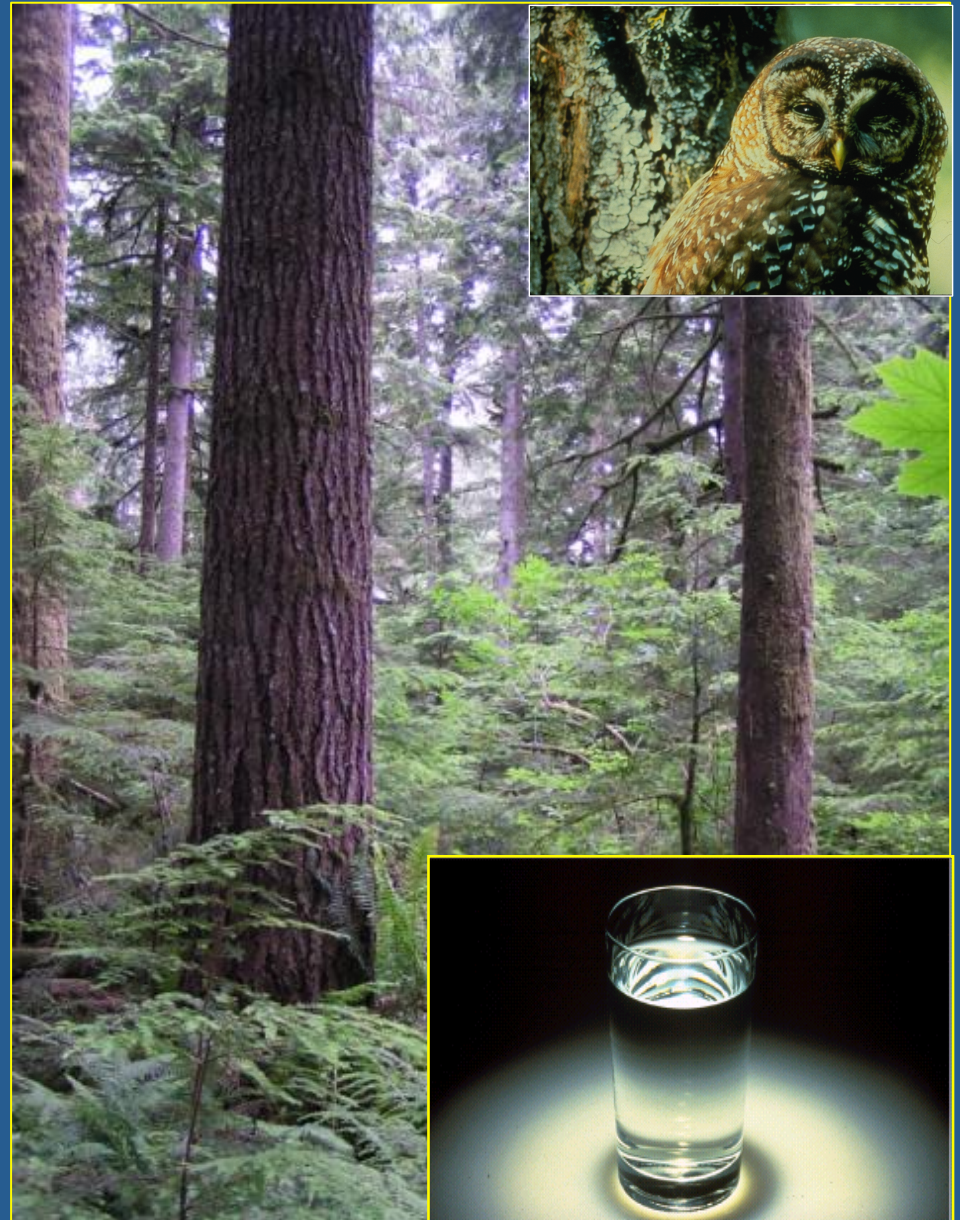
Habitat provision

Biodiversity

Carbon sequestration

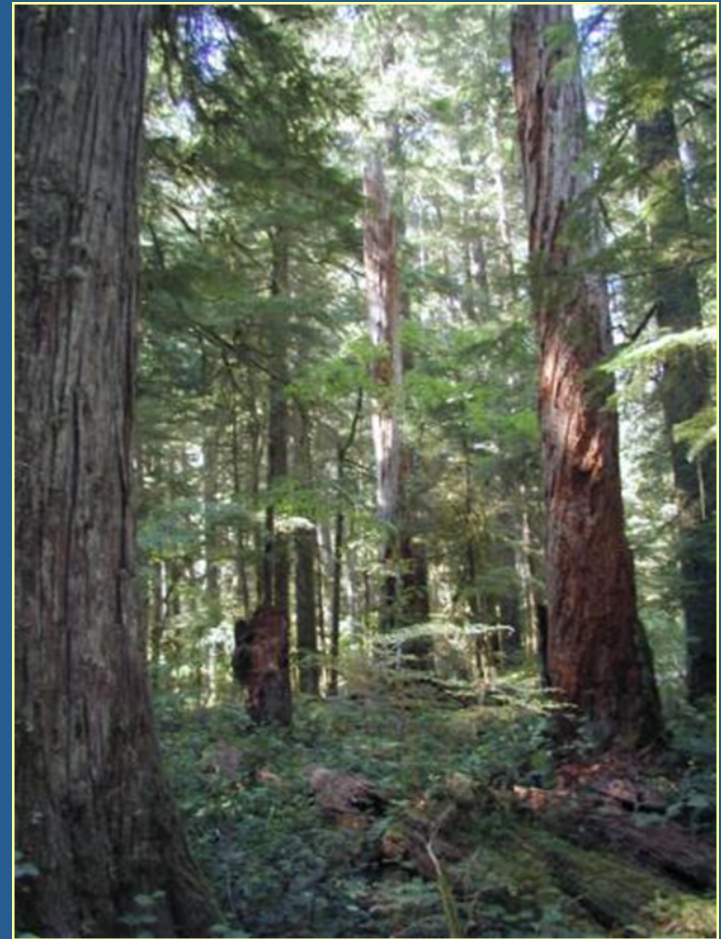
Cultural resources

Education



CLIMATE ADAPTATION

- Collaborate broadly
- Use best available science
- Question assumptions
- Acknowledge uncertainty
- Manage for resilience, transition
- Monitor changes over time
- Be adaptive





QUESTIONS?