



**I would like to thank the Tribes of
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this opportunity to speak on their
ancestral lands**





Tribal Adaptation to Climate Change and Cultural Sustainability

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Tulalip Tribes Treaty Rights
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The Great Burden Shift

❁ **Globalization and Industrialization**

❁ **Scale of material and energy throughput**

- ❁ **Carbon Debt**

- ❁ **Ecological Debt**

❁ **Burden Shifting**

- ❁ **Externalities/Market Failure/Spillovers**

- **Carbon Centrism**

- **Embodied impacts/Virtual Impacts/Footprints**

- **Carbon**

Livelihoods

- **Ecological**

Water

- **Human Rights**





The Great Burden Shift

Wedges

Actions and Outcomes

Range of Outcomes

■ Scenarios

■ Uncertainty

■ Delay Costs/Inaction costs

■ Avoided costs

Climate Stabilization Wedges (Socolow and Pacala)

Adaptation Wedges (Hardison)

■ Ecosystem-based Adaptation Wedges

■ Ecological Thresholds (US Climate Science Programs)





Laws/Politics/Policy Approaches for Tribes

- ❁ **Federal Common Law of Public Nuisance**
 - ❁ **Dirty Hand Doctrine**
 - ❁ **Identification of Tortfeasors**
 - ❁ **Limits of Common Law Transboundary Damages**
 - **International nuisance law**
 - **Sovereignty**
- ❁ **Atmospheric Trust/Public Trust (Wood)**
- ❁ **Principle of Proportionality**
 - ❁ **Common but differentiated responsibilities**
- ❁ **Tribal Trust**
 - ❁ **Boldt Decision: U.S. v. Washington**
 - ❁ **Habitat Servitude**



What is Adaptation?

❁ Mitigation

- ❁ Actions to remove and sequester GHGs
- ❁ Actions to reduce emissions
 - Direct
 - Indirect (embodied/virtual)

❁ Not all impacts can be mitigated, and the nasty problem of debt

❁ Adaptation measures are actions to deal with climate change impacts



Tribal Adaptation Planning: Typology

❁ Approach

- ❁ Pro-active / Planned / Preventive / Anticipatory
- ❁ Ad hoc / Reactive/ Unplanned
- ❁ Adaptive / Surprise / Uncertainty

❁ Actions

- ❁ Abandon
 - Behavior / Culture / Place / Practices / Technology
- ❁ Change
 - Behavior / Culture / Place / Practices / Technology / Timing
- ❁ Defend
 - Soft barriers / hard barriers / construct barriers / natural barriers



Tribal Adaptation Planning: Typology

Endure

Escape

Technology bubbles/cocoons

Modify

Resist

Hard barriers

Retreat

Migrate/Move People



Migrate/Move Infrastructure

Managed Retreat



Tribal Adaptation Planning: Typology




Vector

-  **Increase / Decrease**
-  **Promote / Discourage**







Sector

**Agriculture / Education / Fishing / Gathering / Government /
Business / Health / Hunting / Transportation / Trapping**

Impacts

-  **Cultural Resources**
-  **Drought**
-  **Ecology (ecosystems, ecohydrology, phenology, species, invasive species)**

Impacts (cont.)

-  Extremes/Variability
-  Floods
-  Food (storage, pests, spoilage, security, First Foods)
-  Health (human, livestock, traditional medicines / wildlife)
-  Water (hydrology, flow extremes, quality, sources, supply)
-  Non-climate impacts







Scale

-  Local
-  Landscape
-  Global

Governance Structure

-  **Tribal Councils/Boards/Leadership**
-  **Tribal Agencies**
 - Natural Resources
 - Planning
 - Legal
 - Finance
 - Staff
-  **Tribal Organizations**
-  **Traditional Organizations/Elders/ TK Holders**

Governance (cont.)

-  **Exterior Relations (federal, state, other tribes)**
-  **Designation of Roles/Responsibilities/Lead Agencies**
-  **Tribal Codes/Ordinances**
-  **Cultural Adaptation Plans / Cultural Sustainability Plans**
-  **Investment scanning / portfolio scanning**
-  **Tribal Operations**
 -  **Enforcement, construction/building codes, infrastructure, land use planning (hazard-prone areas), procurement, tribal courts**

❁ Land Cooling / Land Watering

❁ Fishing

❁ Salmon

- Canopy closure/stream cooling
- Forest Duff
- Riparian buffer zones

❁ Shellfish

❁ Disease surveillance

- Paralytic shellfish poisoning
- *Vibrio parahaemolyticus* (coastal waters)





Forestry

-  Carbon sequestration
-  Co-benefits: combining mitigation and adaptation
 - Biodiverse sequestration : diverse biological carbon stocks
 - Markets for forest ecosystem services: Adaptation
Additionality
 - Credit bundling
-  Reducing overstocking/stand density
-  Reforestation/afforestation
-  Forest pest management (pine beetles: tree marking, bark exposure, sprays, stand diversity, stand structure)
-  Forest rotation management
-  Waste wood recycling
-  Wood product substitution for high-carbon materials (e.g concrete, aluminum)

❁ Cultural Ecosystem-based Adaptation

- ❁ Bioclimatology: Climate envelopes**
- ❁ Managing for resilience: Structural diversity, landscape heterogeneity, functional diversity**
- ❁ Adaptation matrix / Adaptation landscapes**
- ❁ Natural security**
- ❁ Ecohydrology**
- ❁ Climate refuges**
- ❁ Keystone cultural species**
- ❁ Expect ecological disturbance, ecological surprise**
- ❁ Reliance on federal landscape**
- ❁ Thresholds and bottlenecks**

Water

-  Creating/Protecting/Preserving/Enhancing/Restoring
 - Wetlands: beaver
 - Steams: flow maintenance
-  Supply side / demand side management
-  Infiltration
-  Water quality
 - Sedimentation
 - Acidification

- ✿ Identification of Critical Cultural Resources
 - ✿ Cultural Practices
 - ✿ Spiritual Practices
 - ✿ Ritual Practices
 - ✿ Cultural Identity
 - ✿ Cultural Heritage
- ✿ Use of Traditional Knowledge
- ✿ Protection of Traditional Knowledge
 - ✿ Access
 - ✿ Benefit Sharing
 - ✿ Prior informed consent
- ✿ Preparation for Change



Tribal Adaptation: Other Categories

✿ Health

- ✿ Traditional medicines
- ✿ Disease sources: water-borne, food-borne, vector-borne (rodent-borne, insect-borne)
- ✿ Traditional knowledge for identifying linkages between ecosystems and health
- ✿ Disease surveillance
- ✿ Non-climate related diseases

✿ Groups

- ✿ Elders
- ✿ Youth
- ✿ Children
- ✿ Men
- ✿ Families
- ✿ Clans





Tribal Adaptation: Final Thoughts

- ❖ **Lifestream Principle**
- ❖ **Rights vs. Obligations**
- ❖ **Tyranny of Small Decisions**
 - ❖ “every snowflake in an avalanche pleads not guilty”
Stanislaw Jerzy Lec, Polish poet (1909 - 1966).
- ❖ **Miracle of Small Decisions**
- ❖ **... and the necessity of large**



Tribal Adaptation: Final Thoughts

- ✿ **United States Forest Service - Climate Change Emphasis Area**
<http://www.fs.fed.us/climatechange/message.shtml>
- ✿ **United States Geological Survey -National Climate Change and Wildlife Science Center**
<http://nccw.usgs.gov/>
- ✿ **United States Fish and Wildlife Service - Tribal Wildlife Grant Program**
<http://www.fws.gov/nativeamerican/grants.html>

