# Adapting natural resource management to climate change on the Olympic Peninsula


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## Background

- Natural resource managers need concrete ways to adapt to climate change, and take advantage of opportunities to balance the negative effects of climate change.
- We initiated a climate change adaptation case study at Olympic National Forest and Olympic National Park to determine how to adapt management of federal lands on the Olympic Peninsula to climate change.
- We developed adaptation options in each of four focus areas, including vegetation; wildlife; hydrology and roads, and fish, through a vulnerability assessment and workshop process.

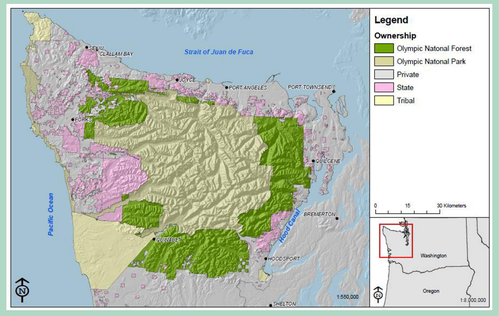


*Figure 1. Location of and land ownership on the Olympic Peninsula*

## Case Study Process

**1.** Review climate model projections to determine potential climate change exposure on the Olympic Peninsula

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**2.** Review relevant literature and climate impacts model projections to determine climate change sensitivities

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**3.** Identify management constraints at Olympic National Forest and Park to determine capacity to implement adaptive actions

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**4.** Develop adaptation strategies and actions through science-management workshops

## Adaptation Options for Vegetation Management

- Continue to **implement early detection/rapid response strategy for exotic species treatment**.
- **Develop a gene conservation plan** for *ex situ* collections for long-term storage, and identify areas important for *in situ* gene conservation.
- **Maintain a tree seed inventory** with high quality seed for a range of species, particularly species that may do well in the future under hotter and drier conditions.
- **Increase thinning** in young-growth stands and alter thinning prescriptions to reduce forest drought stress and fire hazard.
- **Use prescribed and wildland fire** to reduce stand densities and reduce drought stress and fire hazard.
- **Conduct integrated and consistent inventory and monitoring** of vegetation. Use feedback from monitoring to **implement adaptive management**.

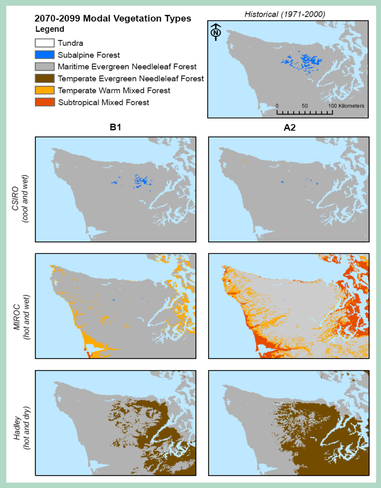


*Figure 2. Projected vegetation changes on the Olympic Peninsula from the MC1 dynamic global vegetation model. (Data source: R. Neilson, US Forest Service)*

## Adaptation Options for Wildlife Management

- Increase thinning treatments in young-growth forests to **promote late-successional forest conditions and connectivity**, and improve habitat quality and suitability for some wildlife species.
- Continue to **create and protect legacy structures** (e.g., snags).
- Continue to **restore degraded sites**, particularly headwater streams, wetlands, and alpine and subalpine meadows.
- **Conduct integrated surveys and monitoring for key species** to obtain baseline information and determine when population changes are occurring.

*Figure 3. Olympic marmot. Warming temperatures will likely reduce snowpack and alter forage species composition and phenology in the alpine and subalpine marmot habitats. Photo by B. Howell, USFS.*

## Adaptation Options for Road Management

- **Consider relocating high-risk roads** (e.g., valley bottom roads).
- **Prioritize treatment and decommissioning activities** on roads with the most sensitivities and that are most connected to streams.
- **Increase road maintenance preparation and response**.
- **Design more resilient structures** (e.g., larger culverts).
- **Use alternate methods to calculate future peak flows** (e.g., hydrologic models or the last 30 years of record).

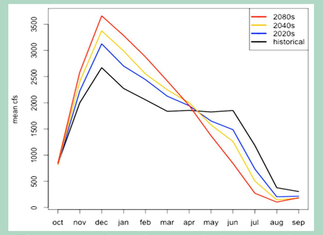


*Figure 4. Historical and simulated mean monthly flow for the Elwah River (Olympic Peninsula). Source: A. Hamlet, Climate Impacts Group.*

## Adaptation Options for Fish Management

- **Implement habitat restoration projects** that focus on recreating watershed processes and functions and create high-quality habitat.
- **Limit mortality associated with recreational fishing** through time and area closures as necessary.
- Monitor and **control exotic species**.
- Identify and **protect cold water refugia and wild fish strongholds**.
- Continue to **correct culvert fish passage barriers**, particularly in small streams with limited habitat.

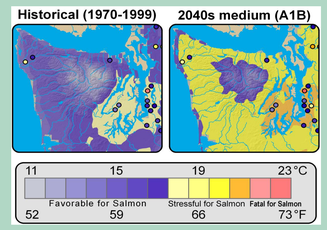


*Figure 5. August mean surface air temperature (shading) and maximum stream temperature (circles) for the Olympic Peninsula. Figure source: N. Mantua, Climate Impacts Group.*

## Conclusions

- Olympic National Forest and Olympic National Park produced concrete adaptation options and illustrated the utility of place-based vulnerability assessments and science-management collaboration in climate change adaptation.
- New potential management actions, and actions that could be increased and reprioritized were identified through the case study process.
- Strategies identified through this process can now be translated into actions or specific plans for other natural resource agencies in their climate change adaptation efforts.