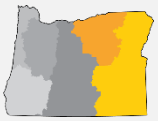


EASTERN & COLUMBIA BASIN

REGIONS 5 & 6 Observed & Projected Changes for Habitats & Fish Species

OREGON WATERSHED ENHANCEMENT BOARD

Habitats

Subalpine & Alpine

credit: Araddon

- Potential increase in productivity in response to warming and elevated atmospheric CO_2.
- Increased tree growth within the treeline ecotone and an upward advancement of treeline in some locations.
- Reduction in climatically suitable habitat for most cold upland tree species.
- Potential conversion to herbaceous parklands with ponderosa pine.
- High-elevation mountains (e.g., Wallowa Mtns., Seven Devils) may serve as refugia for some subalpine species.
- Longer summer dry periods may make wildfire events more common.
- Increased potential for insect and disease outbreaks, increasing stress and mortality in these forests.

Moist Upland Forests

credit: BLM

- Moderate warming may lead to increased productivity however, more extreme warming and increased drought stress in lower elevations and Malheur National Forest will likely cause decreased tree growth and forest productivity.
- Potential expansion into new available habitats.
- Increased summer drought stress may make these forests more vulnerable to other stressors.
- Increased wildfire activity and insect and disease outbreaks, potentially leading to reduced distribution of these forests.

Dry Upland Forests

credit: BLM

- Decreased tree growth and forest productivity in a warmer, drier climate.
- Shifts to woodland or steppe vegetation in the hottest and driest sites.
- Ponderosa pine is likely less vulnerable than Douglas-fir.
- More large and severe wildfires, which could cause conversion to shrublands or grasslands at lower elevations.

Woodlands

credit: Nick Perla

- Higher spring and summer temperatures may negatively affect hot and dry juniper woodlands at lower elevations.
- Years with increased spring and summer precipitation will likely facilitate expansion of juniper.
- Increased fire frequency and severity will likely lead to the conversion of some woodlands to persistent grasslands.

Shrublands

credit: OWEB

- Increased warming is likely to result in expansion of shrublands as they are better adapted to arid conditions.
- Increased fire frequency could result in conversion to nonnative annual grasslands.

Grasslands

credit: Karen Allen

- In a warmer climate, grasslands at lower elevations may shift towards more drought-tolerant species.
- With increased warming and fire occurrence, grasslands will likely expand, particularly in areas where shrublands and woodlands are no longer able to support woody species.
- Increased abundance and extent of nonnative annual grasses.

Riparian

credit: Sue Greer

- Conifer-dominated riparian areas will become more susceptible to drought, wildfire, and insect outbreaks; conifer-dominated communities will increase, particularly at lower elevations, encroaching on shrub-dominated riparian areas and herbaceous-dominated meadows.
- Riparian and wetland aspen communities will likely decrease in extent and decline in vigor due to drought and reduced water availability; some populations may be lost because of altered local hydrology.
- Cottonwood-dominated riparian areas likely to decrease in extent; reductions in late summer baseflows likely to impact persistence of existing stands and changes in timing and magnitude of spring runoff likely to influence recruitment and establishment of new individuals.
- Willow-dominated riparian areas likely to decrease in extent due to changes in frequency and magnitude of flooding and lower water table late in the growing season; species composition likely to shift, favoring more drought-tolerant willows and other shrub species.
- Other woody-dominated riparian areas will increase in extent in some areas, displacing more mesic willow species and communities and favoring drought-tolerant species; communities dominated by more drought-tolerant species could see increased conifer encroachment and potential replacement of some shrub species.
- Herbaceous-dominated riparian areas likely to decrease in extent due to decreased water availability and changes in the magnitude, duration, and extent of flooding; some sedge species may be replaced by more drought-tolerant native and nonnative grasses and invasive species will likely increase.

Groundwater-Dependent Ecosystems (GDE)

credit: BLM

- Drier summers, earlier onset and faster rate of snowmelt, and decreased snow-water equivalent (SWE) will affect groundwater recharge rates, which will influence groundwater levels and the amount of water available to support springs, groundwater-dependent wetlands, stream baseflows, and soil moisture.
- Aquifers in sedimentary or basalt formations are likely more sensitive to altered climate conditions; similarly, GDEs supported by small, local groundwater systems will likely be more sensitive (e.g., exhibit more variation in temperature and nutrient concentrations).
- Some GDEs will likely contract in response to decreasing surface water and groundwater and warming temperatures.
- Reduced productivity of GDEs, including springs and wetlands.

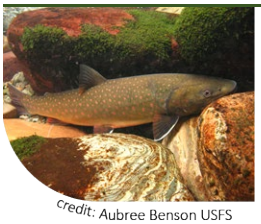
Fish Species

Steelhead & Redband Trout

credit: Greg Shields, cc

- Both species have relatively warm thermal niches, which makes them less affected by future stream temperature increases than bull trout and spring Chinook.
- Possible expansion of suitable habitat as upstream distributions are currently limited by cold temperatures in many streams.
- Some flexibility to adapt to warmer temperatures through different life histories, phenology, and distribution shifts.

Bull Trout



Credit: Aubree Benson USFS

- Sensitive to future temperature increases, with spawning and juvenile rearing likely the most constrained by warmer water temperatures.
- Colonization of new upstream habitats unlikely due to stream slope and small flow volumes.

Spring Chinook Salmon

Credit: Greg Morgan, BLM

- In the Blue Mountains, populations of spring Chinook are sensitive to future temperature increases as their primary spawning and rearing streams occur at low elevation and are relatively warm.
- Potential loss of habitat due to large body size and preference for spawning in unconfined valleys with gravel substrate (i.e., these factors may preclude colonization of new upstream habitats).

Information from the following references and the citations therein:

1. Halofsky, J.E. and D.L. Peterson, eds. 2017. Climate change vulnerability and adaptation in the Blue Mountains. Gen. Tech. Rep. PNW-GTR-939. U.S. Dept of Ag., Forest Service, Pacific Northwest Research Station. 331 p.