Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Project Overview

Above: Project area (outlined in blue) and Shoshone-Bannock Tribes reservation (area in green)

The climate around the Shoshone-Bannock Tribes' reservation in South Eastern Idaho is changing. Tribal members and staff have noticed warming air and stream temperatures, drying sagebrush steppe habitat, cheatgrass encroachment, a higher frequency of wildfires, changing species distributions, and shifts in the ideal harvest times for nuts and berries. In response to concerns over these changes, the Tribes brought together a diverse multi-departmental group of tribal staff to address these issues and plan for the future.

Project Process

This collaborative vulnerability assessment and adaptation plan combines the best available climate science with local knowledge and expertise. This project brought together Shoshone-Bannock Tribal staff, Adaptation International, the University of Washington's Climate Impacts Group, and the Oregon Climate Change Research Institute.

Together, the group:

1. Identified key concerns.
2. Analyzed localize temperature and precipitation projections for two different climate scenarios over two time periods across the project area.
3. Used the Climate Change Vulnerability Index to determine relative vulnerability rankings for each selected species and habitat.
4. Identified and refined adaptation actions to reduce climate change vulnerability.

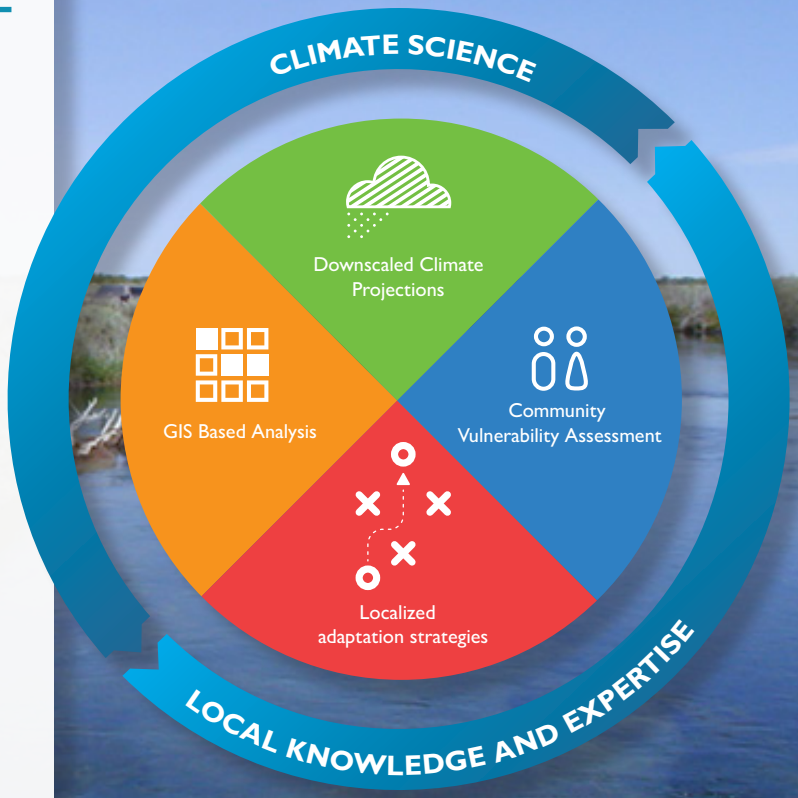

Photo by: Preston Buckskin

Vulnerability Table

This project focused on 34 species and assessed their relative vulnerability to climate change based on two climate scenarios: RCP 4.5 (less warming scenario) and RCP 8.5 (more warming scenario). Below is a table that captures the vulnerability of each species.

	Common Name	2050s RCP4.5 (Less Warming)	2050s RCP8.5 (More Warming)
Sagebrush Steppe	Greater Sage-Grouse	EV	EV
	Wyoming Sage	HV	EV
	Black-tailed Jackrabbit	MV	HV
	Big Sagebrush	MV	HV
	Rubber Rabbitbrush	MV	HV
	Cheatgrass	LV	LV
Riparian	Bald Eagle	MV	MV
	Black Cottonwood	MV	MV
	Yellow-billed Cuckoo	LV	LV
	American Beaver	LV	LV
	Redosier Dogwood	LV	LV
	Geyer's Willow	LV	LV
	Coyote Willow	LV	LV
Forest	Single-leaf Pinyon	MV	EV
	Moose	MV	HV
	Quaking Aspen	LV	MV
Aquatic	Columbia Spotted Frog	EV	EV
	Pacific Lamprey	EV	EV
	Bull Trout	EV	EV
	Chinook Salmon	EV	EV
	Steelhead	EV	EV
	Yellowstone Cutthroat Trout	EV	EV
	Northern Leopard Frog	HV	HV
	Mallard	LV	LV
Generalists	Elk	MV	HV
	Mule Deer	LV	MV
	Serviceberry	LV	MV
	Russian Olive	LV	MV
	Mountain Lion	LV	LV
	Golden Eagle	LV	LV
	Gopher Snake	LV	LV
	Common Chokecherry	LV	LV
	Thistle	LV	LV
	Spotted Napweed	LV	LV

Less Vulnerable (LV), Moderately Vulnerable (MV), Highly Vulnerable (HV), Extremely Vulnerable (EV)

Adaptation Strategies

For each species, a suite of adaptation actions was developed. Below are selected adaptation actions for the sagebrush steppe habitat with time-frame for implementation.

Climate Concern	Select Adaptation Action	Timeframe
Wildfire	Incorporate climate change into fire-management plans (wildfire projections); anticipate more opportunities to use wildfire for resource benefit.	Immediate
Species Range Shifts	Coordinate among/across states and their federal counterparts to protect habitat core areas to promote large-scale, continuous sage grouse habitat protected from further development.	Immediate
Increase in Invasive Species	Rehabilitate burned areas using native plants that encourage the long-term sustainability of native species as approved by Resource Managers.	Immediate
Reduce non-climate Stressors	Install fence markers or remove fences where sage-grouse mortality due to collision with fences is documented or likely to occur due to new fence placement (avoid new fences within 0.5 mile of a lek).	Immediate
Outreach and Education	Develop and expand education efforts for the public regarding invasive species impacts, such as improving identification of non-native species and promoting the use of strategies to prevent and remove invasive species.	Immediate
Wildfire	Identify areas important for Wyoming Sage *in situ* gene conservation to provide a baseline for measuring fire impacts and informing post-fire planting/rehabilitation.	Medium-Term

Part of a Bigger Project: Vulnerability Assessment and Adaptation Planning Results

The result of this collaborative process is a suite of more than 170 locally relevant adaptation actions the Tribes can take to continue building the climate resilience of the region's habitats. Ultimately, this habitat-focused approach will help support and protect the key species that are critically important to sustaining the culture, wellbeing, and lifeways of the Tribes. You can find more details on the project, the full project report, and a video produced on the project at www.sbtribes.com.

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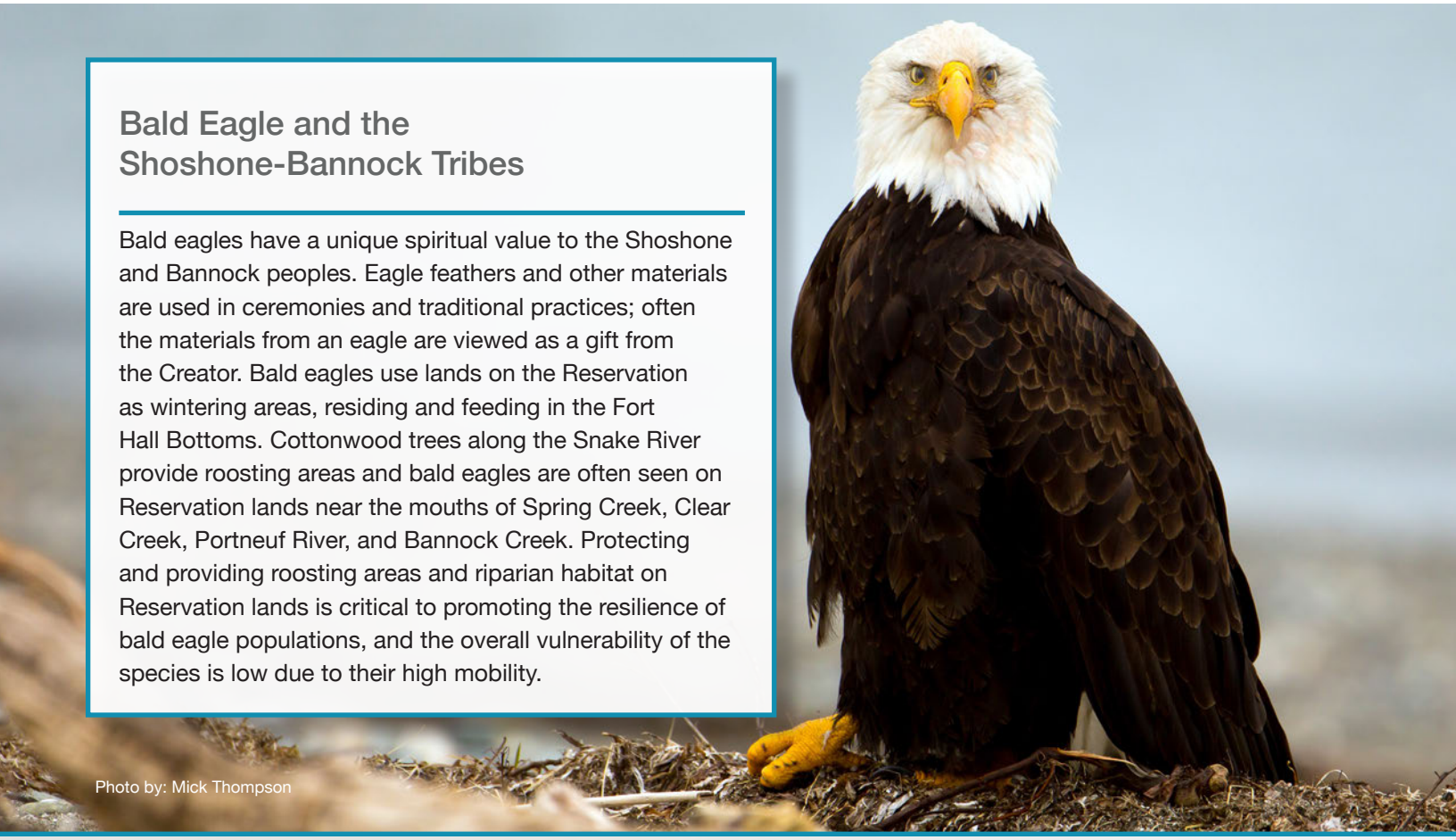
Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Bald Eagle



Bald Eagle and the Shoshone-Bannock Tribes

Bald eagles have a unique spiritual value to the Shoshone and Bannock peoples. Eagle feathers and other materials are used in ceremonies and traditional practices; often the materials from an eagle are viewed as a gift from the Creator. Bald eagles use lands on the Reservation as wintering areas, residing and feeding in the Fort Hall Bottoms. Cottonwood trees along the Snake River provide roosting areas and bald eagles are often seen on Reservation lands near the mouths of Spring Creek, Clear Creek, Portneuf River, and Bannock Creek. Protecting and providing roosting areas and riparian habitat on Reservation lands is critical to promoting the resilience of bald eagle populations, and the overall vulnerability of the species is low due to their high mobility.

Photo by: Mick Thompson

Bald Eagle Climate Change Vulnerability in the 2050s

More Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

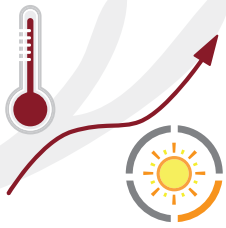
Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

Despite a low vulnerability to climate change, the breeding and nesting habitats of bald eagles are sensitive to climate impacts. By the 2050s, winter precipitation in the Upper Snake River Plains is projected to increase 8%–11%, which may in turn, increase the risk of rain-on-snow events. These events can cause higher streamflows that scour streams, increase sedimentation, alter habitat suitability, and reduce the survival of fish, a critical food source for bald eagles. Changing precipitation patterns can decrease the suitability of bald eagle breeding habitat, typically areas close to rivers, lakes, and reservoirs where their primary food sources reside. Bald eagles typically nest in the tallest trees alongside water sources. These trees can be destroyed by wildfires, and warmer temperatures and drought conditions may further dry soils and increase wildfire risk.



Maximum summer temperatures are projected to increase 6.5 to 8.5ºF by the 2050s.

Winter precipitation is projected to increase 8% to 11% by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of the riparian habitats that are critical for bald eagle survival. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Maintaining Suitable Habitat	Continue to create, promote, and protect legacy structures in riparian forests which will provide current or future nest structure for the bald eagle.	Immediate
Drought	Increase beaver populations to create more wetland habitat.	Immediate
Potential Increase in Invasive Species	Implement early detection and rapid response for invasive species and insects in riparian areas both on and off Tribal lands.	Immediate
Outreach and Education	Develop and expand education efforts for the public regarding invasive species impacts, such as improving identification of native species, and promoting strategies to prevent and remove invasive species.	Immediate
Species Range Shifts	Protect critical riparian areas and promote connectivity.	Medium-Term
Flooding and Sedimentation	Increase channel to floodplain connectivity to allow for sediment deposition to enhance riparian habitat and decrease impacts to food sources.	Medium-Term

PART OF A BIGGER PROJECT: These findings are part of a broader Climate Change Vulnerability Assessment and Adaptation Plan completed in 2017. They are the result of a unique collaboration that brought together local knowledge and expertise with the best available science for the region. The collaboration involved the Shoshone-Bannock Tribes, Adaptation International, the University of Washington's Climate Impacts Group, the Oregon Climate Change Research Institute, and the Upper Snake River Tribes Foundation.

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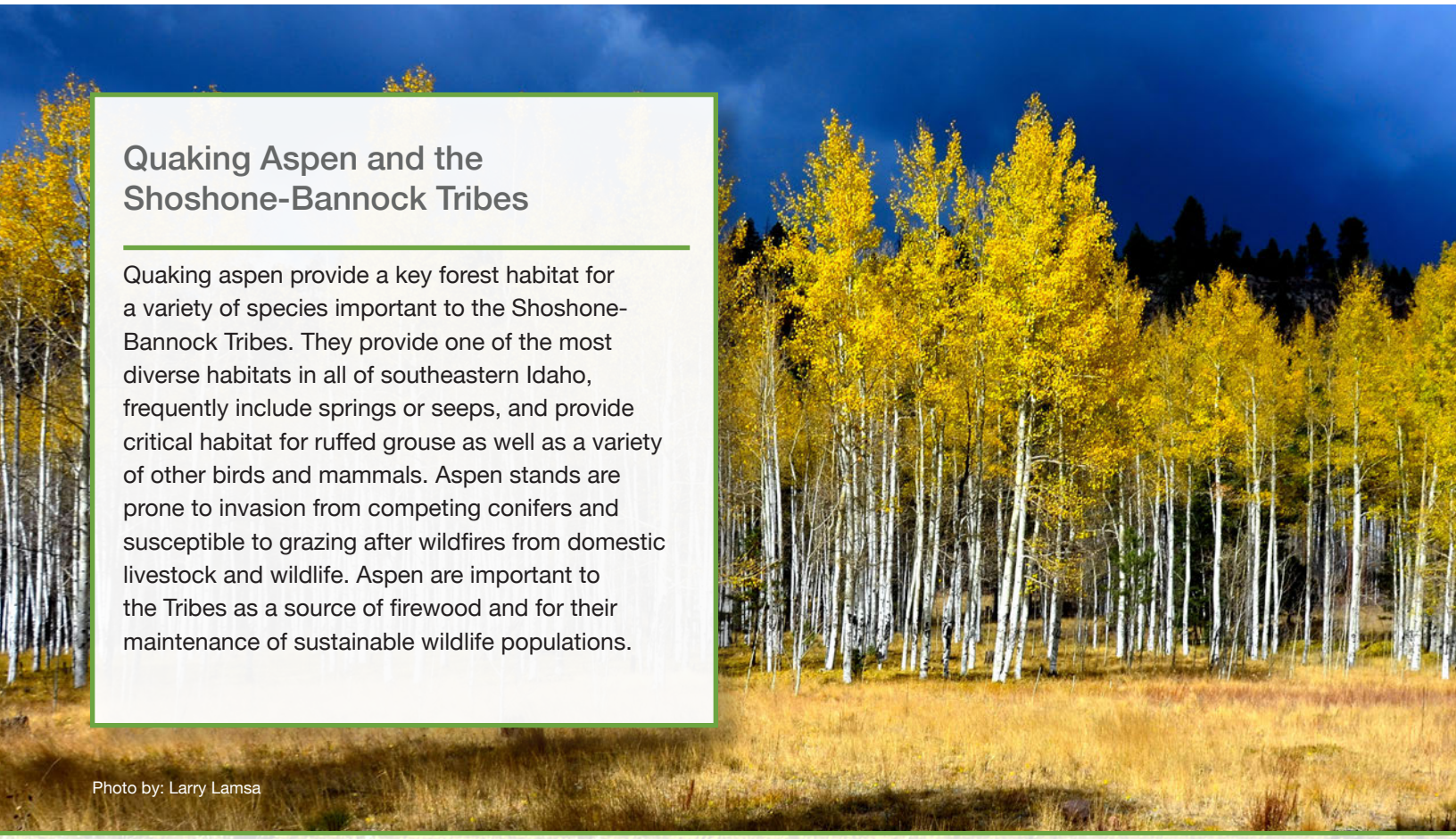
Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Aspen



Quaking Aspen and the Shoshone-Bannock Tribes

Quaking aspen provide a key forest habitat for a variety of species important to the Shoshone-Bannock Tribes. They provide one of the most diverse habitats in all of southeastern Idaho, frequently include springs or seeps, and provide critical habitat for ruffed grouse as well as a variety of other birds and mammals. Aspen stands are prone to invasion from competing conifers and susceptible to grazing after wildfires from domestic livestock and wildlife. Aspen are important to the Tribes as a source of firewood and for their maintenance of sustainable wildlife populations.

Photo by: Larry Lamsa

Quaking Aspen Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	**MEDIUM VULNERABILITY**	High Vulnerability	Extreme Vulnerability

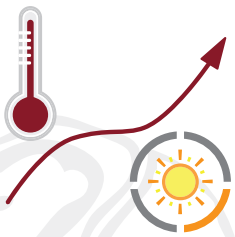
Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit while precipitation is not projected to change. Quaking Aspen are sensitive to changes in temperature and precipitation as they depend on high levels of soil moisture and cooler temperatures to thrive. Aspen stands generally have higher levels of moisture and can act as fire breaks. They are also susceptible to wildfire and warmer temperatures and drought conditions may further dry soils and increase wildfire risk.



Maximum summer temperatures are projected to increase 6.5ºF to 8.5ºF by the 2050s.

Summer precipitation is not projected to change by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of Quaking Aspen. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Species Range Shifts	Prepare for tree species migration by managing for multiple species across large landscapes.	Immediate
Reduce Non-Climate Stressors	Continue to create exclosure using fencing or jackstraw (heavy tree-fall) to limit grazing and encourage aspen regeneration.	Immediate
Increase in Invasive Species	Maintain permits for aggressive treatment of invasive species (e.g., burning and herbicide).	Immediate
Outreach and Education	Conduct outreach and education to all land users (e.g., ranchers) about the Adaptation Planning efforts.	Immediate
Species Range Shifts	Protect, restore, connect, and enhance climate refugia (e.g., colder north-facing aspects of hard to access areas).	Medium-Term
Species Range Shifts	Continue to aquire new tribal properties for conservation and where possible, expand or adjust protected areas to incorporate greater diversity of topographic and climatic conditions to allow for shifts in species distributions in response to climate change.	Medium-Term

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Black Cottonwood

Black Cottonwood and the Shoshone-Bannock Tribes

Black cottonwood provides critical habitat for a variety of bird species important to the Shoshone-Bannock Tribes. It also provides shade, fuel, and shelter associated with winter camps for the Tribes. The cottonwood forest on the Fort Hall Bottoms is one of the largest intact habitat features remaining on the Snake River. Black cottonwood forests require flood conditions and scouring flows to maintain sustainable conditions, with the large wood from legacy cottonwoods often forming the dynamic river conditions necessary for healthy populations of Yellowstone Cutthroat Trout and other riparian obligate species. These trees and the habitat they provide are in dire need of conservation due their place in the flyway for migratory waterfowl, neotropical birds, and other sensitive or threatened wildlife.

Photo of cottonwood pod by: Brenda Dobbs

Black Cottonwood Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	**MEDIUM VULNERABILITY**	High Vulnerability	Extreme Vulnerability

Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

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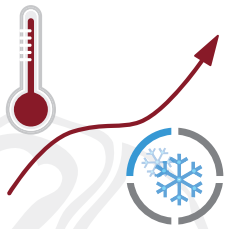
Key Climate Concerns

By the 2050s, maximum winter temperatures in the Upper Snake River Plains are projected to increase up to 9.5° Fahrenheit. Black cottonwood is susceptible to parasites, including wood-decaying fungi and canker. Rising winter temperatures are expected to increase the effects of pests on trees as warm winters do not kill off pests, increasing their presence for longer periods of time. By the 2050s, maximum spring precipitation is projected to increase by up to 10%. Seed dispersal for black cottonwood occurs when river flows begin to decline after spring peak flows; if spring flows are too high, seeds may be carried for so long that they lose viability before they reach a favorable microsite.



Maximum winter temperatures are projected to increase 8 to 9.5ºF by the 2050s.

Spring precipitationis projected to increase 7% to 10% by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of black cottonwood. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Species Range Shifts	Identify important habitat manipulations for promoting late-successional stage (e.g., thinning and prescribed burns on the Fort Hall Bottoms) based on monitoring.	Immediate
Outreach and Education	Develop and implement education efforts for the public regarding irrigation efficiencies. Identify restoration areas and promote best practices for irrigation methods in those areas.	Immediate
Flooding and Sedimentation	Restore and revegetate riparian plant communities where needed to store sediment and maintain channel geomorphology.	Medium-Term
Increase in Invasive Species	Survey and map invasive riparian and aquatic species.	Medium-Term
Maintaining Suitable Habitat	Work with private, state, and federal agencies to promote the restoration of natural stream and river flooding to maintain riparian areas and provide flow rates high enough for cottonwood germination.	Medium & Long-Term

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Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Mule Deer

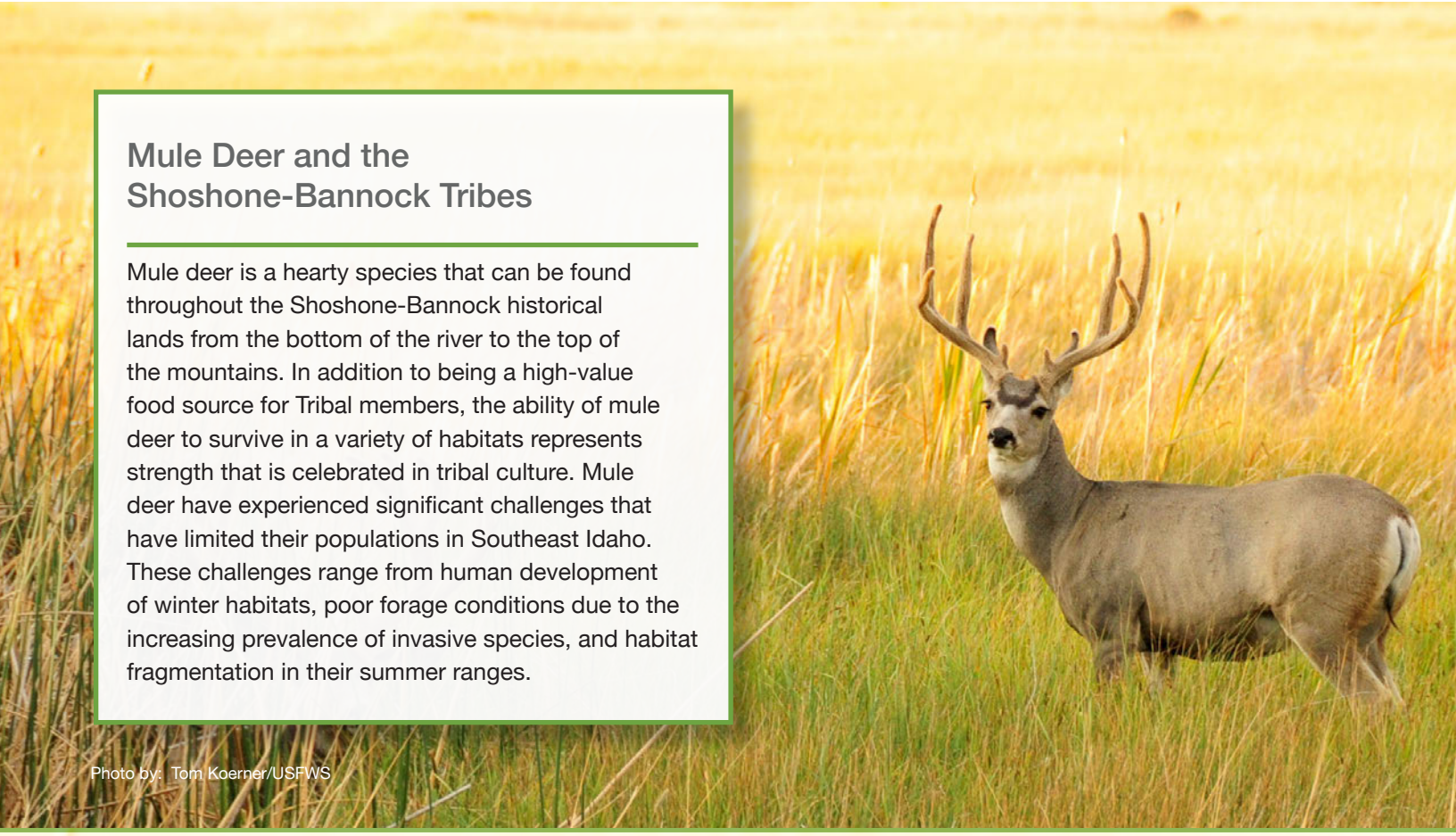


Photo by: Tom Koerner/USFWS

Mule Deer and the Shoshone-Bannock Tribes

Mule deer is a hearty species that can be found throughout the Shoshone-Bannock historical lands from the bottom of the river to the top of the mountains. In addition to being a high-value food source for Tribal members, the ability of mule deer to survive in a variety of habitats represents strength that is celebrated in tribal culture. Mule deer have experienced significant challenges that have limited their populations in Southeast Idaho. These challenges range from human development of winter habitats, poor forage conditions due to the increasing prevalence of invasive species, and habitat fragmentation in their summer ranges.

Mule Deer Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	**MEDIUM VULNERABILITY**	High Vulnerability	Extreme Vulnerability

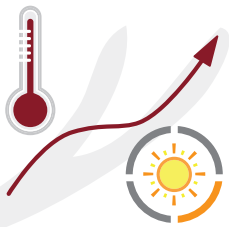
Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit while precipitation is not projected to change. Mule deer is a hearty species, though it does require water which may become harder to find during the summer if droughts become more frequent and/or more severe. Hotter and drier summers favor biting gnats that can transmit the potentially deadly bluetongue virus through deer populations.



Maximum summer temperatures are projected to increase 6.5 to 8.5°F by the 2050s.

Summer precipitation is not projected to change by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of Mule deer. Mule deer are habitat generalists, have a relatively low vulnerability to changing climate conditions, and overall are expected to do well in a changing climate. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Increase in Invasive Species	Use a variety of mechanical, cultural, chemical, and biological control methods to reduce the threats of invasive plant species and improve habitat for mule deer.	Immediate
Outreach and Education	Develop a landowner's guide to mule deer management and disseminate across the reservation.	Immediate
Species Range Shifts	Ensure that security cover requirements for mule deer are incorporated in all restoration plans developed to improve mule deer habitat.	Immediate
Species Range Shifts	Identify and map critical mule deer habitat (including calving, winter, summer, and yearlong) and work with public and private land managers to protect and enhance those areas.	Medium-Term
Drought	Ensure that water distribution is maintained in areas where freestanding water is documented to be important to mule deer.	Medium-Term

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Serviceberry

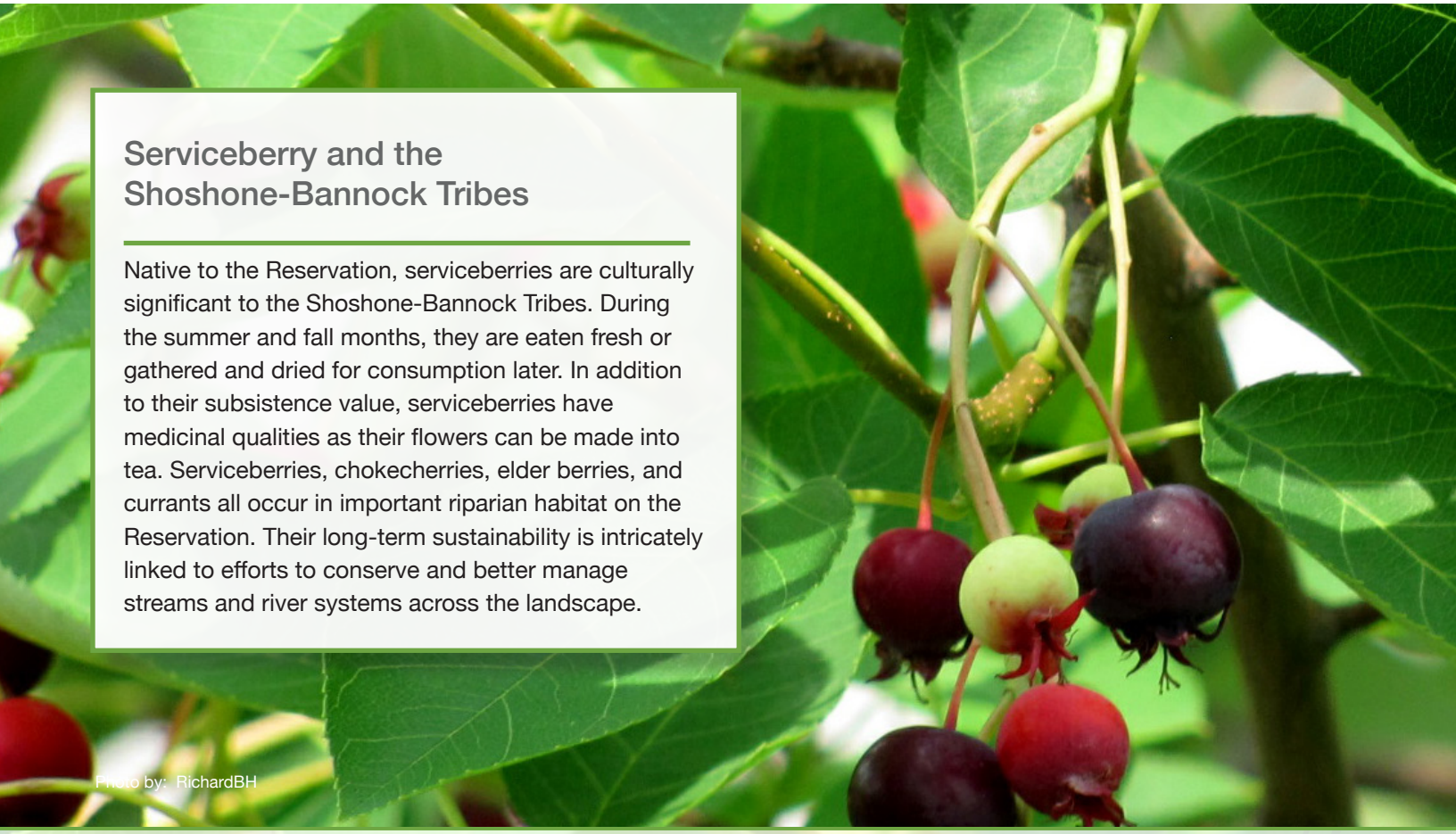


Photo by: RichardBH

Serviceberry and the Shoshone-Bannock Tribes

Native to the Reservation, serviceberries are culturally significant to the Shoshone-Bannock Tribes. During the summer and fall months, they are eaten fresh or gathered and dried for consumption later. In addition to their subsistence value, serviceberries have medicinal qualities as their flowers can be made into tea. Serviceberries, chokecherries, elder berries, and currants all occur in important riparian habitat on the Reservation. Their long-term sustainability is intricately linked to efforts to conserve and better manage streams and river systems across the landscape.

Serviceberry Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	**MEDIUM VULNERABILITY**	High Vulnerability	Extreme Vulnerability

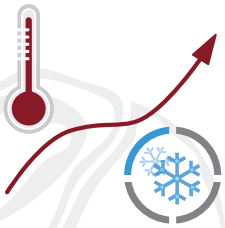
Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

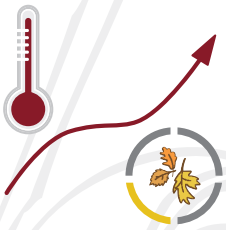
Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

Serviceberry is a robust plant that grows in a variety of habitats, can spread to more favorable habitats as climate conditions change, and has limited dependence on other species that may be affected by climate change. Its only real climate sensitivity comes from a decrease in cold winters. By the 2050s, maximum winter temperatures in the Upper Snake River Plains are projected to increase by up to 9.5° Fahrenheit. Serviceberries grow in areas with cold winters as their seeds require cold temperatures to germinate. This dependence on cool temperatures increases the species' vulnerability.



Maximum winter temperatures are projected to increase 8 to 9.5ºF by the 2050s.



Maximum fall temperatures are projected to increase 5 to 7ºF by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and of serviceberries. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Wildfire	Use traditional species mix including serviceberries for reseeding and restoration.	Immediate
Outreach and Education	Develop or enhance education efforts for tribal members regarding invasive species impacts and what they could do to help prevent and remove invasive species.	Immediate
Species Range Shifts	Determine if a program supporting assisted migration of serviceberry is necessary and develop one if it is.	Immediate
Species Range Shifts	Increase extent of protected areas; collaborate with neighbors regarding priority areas for treatments (e.g., removing dispersal barriers) and land acquisitions.	Medium-Term
Species Range Shifts	Aquire new tribal properties for conservation and, where possible, expand or adjust protected areas to incorporate greater diversity of topographic and climatic conditions to allow for shifts in species distributions in response to climate change.	Medium-Term
Non-Climate Stressors	Create protected areas for serviceberry growth, removed or fenced off from cattle and range land.	Medium-Term

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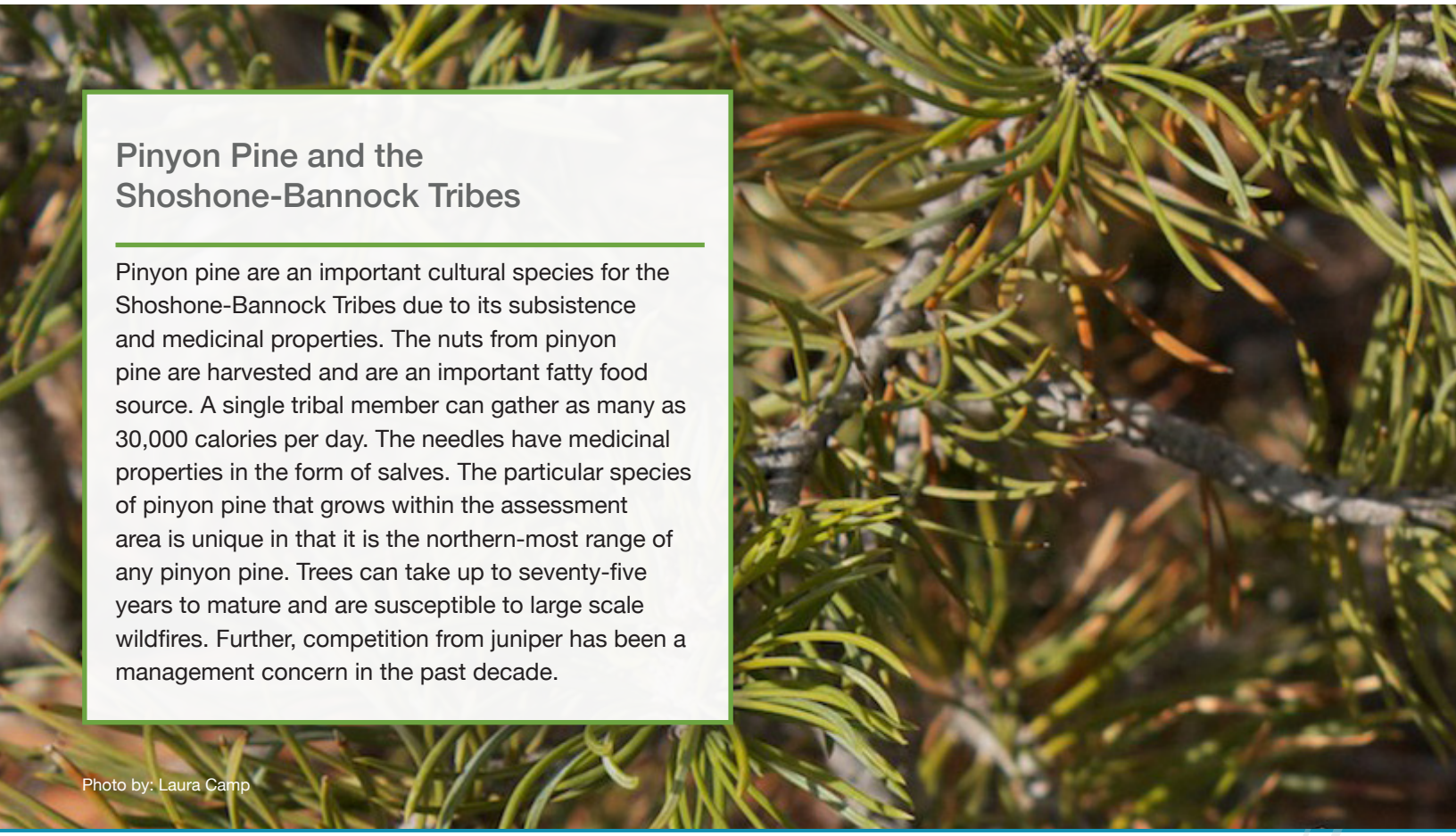
Single Leaf Pinyon Pine



Pinyon Pine and the Shoshone-Bannock Tribes

Pinyon pine are an important cultural species for the Shoshone-Bannock Tribes due to its subsistence and medicinal properties. The nuts from pinyon pine are harvested and are an important fatty food source. A single tribal member can gather as many as 30,000 calories per day. The needles have medicinal properties in the form of salves. The particular species of pinyon pine that grows within the assessment area is unique in that it is the northern-most range of any pinyon pine. Trees can take up to seventy-five years to mature and are susceptible to large scale wildfires. Further, competition from juniper has been a management concern in the past decade.

Photo by: Laura Camp

Single Leaf Pinyon Pine Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	**MEDIUM VULNERABILITY**	High Vulnerability	Extreme Vulnerability

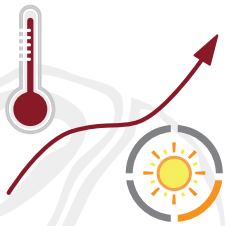
Less Warming Scenario

LOW VULNERABILITY	Medium Vulnerability	High Vulnerability	Extreme Vulnerability

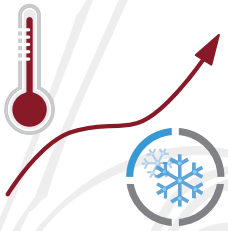
Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit and maximum winter temperatures are projected to increase up to 9.5° Fahrenheit. Due to thick bark and the absence of self-pruning, pinyon pine is vulnerable to wildfire. Warmer temperatures and more frequent or severe drought conditions may further dry soils and increase wildfire risk. Pinyon pine is susceptible to bark beetles and parasitized by the pinyon dwarf mistletoe; increasing winter temperatures are expected to increase the effects of pests on trees as warm winters do not kill off pests, increasing their presence for longer periods of time.



Maximum summer temperatures are projected to increase 6.5 to 8.5ºF by the 2050s.



Maximum winter temperatures are projected to increase 8 to 9.5ºF by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of pinyon pine. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Increase in Invasive Species	Coordinate invasive species management, funding, and support among other tribes and natural resource managers/agencies in the region.	Immediate
Outreach and Education	Conduct outreach and education to policy-level tribal decision-makers about the Adaptation Planning efforts.	Immediate
Species Range Shifts	Prepare for tree species migration by managing for multiple species across large landscapes.	Immediate
Enhancing Forest Health	Instead of thinning for late-successional forest conditions, also consider thinning/creating gaps to promote a more complex vertical forest structure that allows for native understory development and increases in diversity.	Medium-Term
Drought	Experiment with native species from other elevations/latitudes, and/or introduce drought tolerant species for reseeding and restoration.	Long-Term
Species Range Shifts	Continue to acquire new tribal properties for conservation and where possible, expand or adjust protected areas to incorporate greater diversity of topographic and climatic conditions to allow for shifts in species distributions in response to climate change.	Medium-Term

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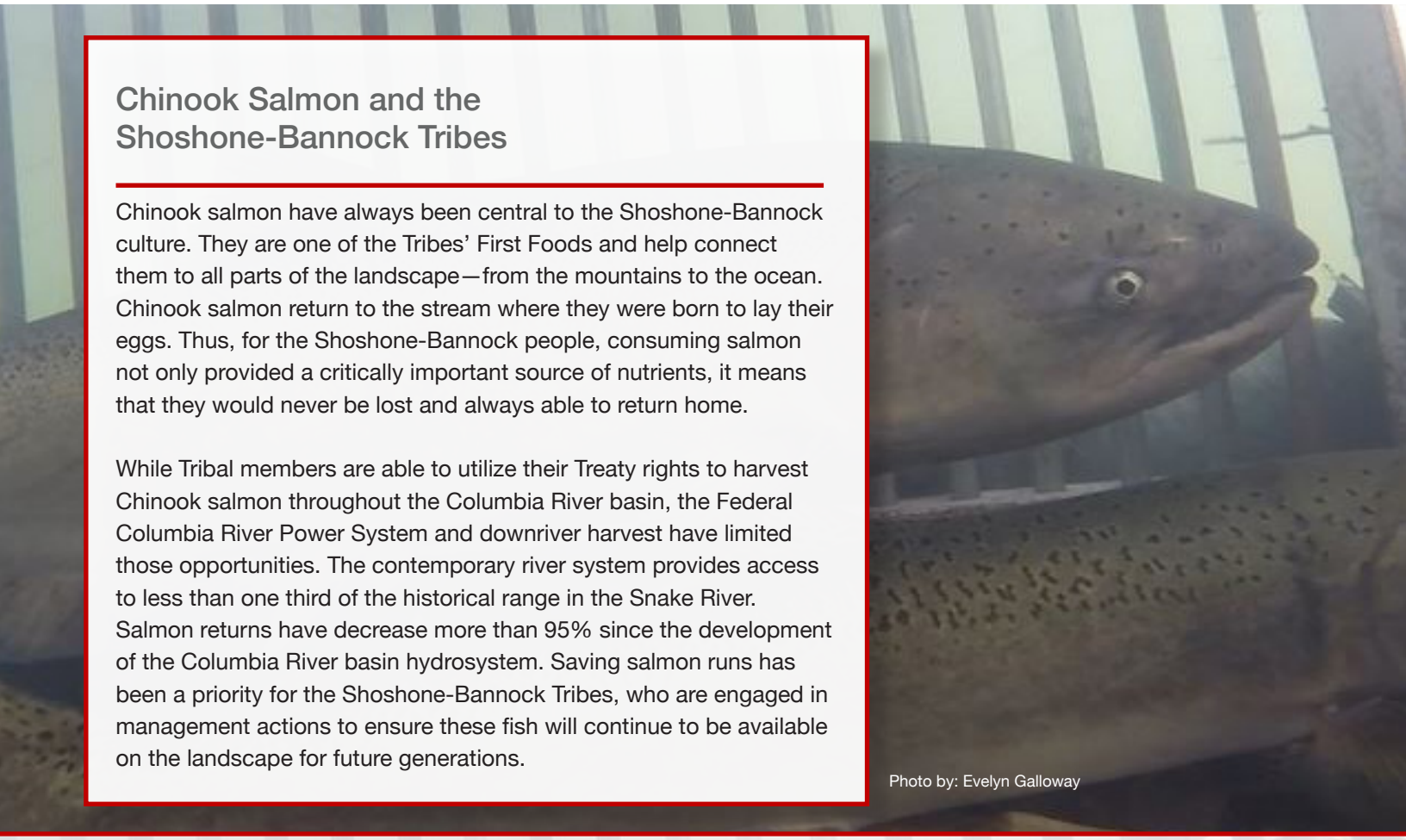
Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Chinook Salmon



Chinook Salmon and the Shoshone-Bannock Tribes

Chinook salmon have always been central to the Shoshone-Bannock culture. They are one of the Tribes' First Foods and help connect them to all parts of the landscape—from the mountains to the ocean. Chinook salmon return to the stream where they were born to lay their eggs. Thus, for the Shoshone-Bannock people, consuming salmon not only provided a critically important source of nutrients, it means that they would never be lost and always able to return home.

While Tribal members are able to utilize their Treaty rights to harvest Chinook salmon throughout the Columbia River basin, the Federal Columbia River Power System and downriver harvest have limited those opportunities. The contemporary river system provides access to less than one third of the historical range in the Snake River. Salmon returns have decrease more than 95% since the development of the Columbia River basin hydrosystem. Saving salmon runs has been a priority for the Shoshone-Bannock Tribes, who are engaged in management actions to ensure these fish will continue to be available on the landscape for future generations.

Photo by: Evelyn Galloway

Chinook Salmon Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

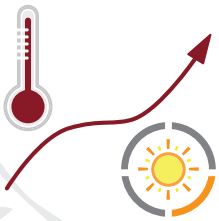
Less Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled "More Warming" and the lower climate change scenario (RCP 4.5) is labeled "Less Warming". Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit, warming both air and stream temperatures. Chinook Salmon depend on cool clean water and appropriate stream habitat conditions for survival. Constant water temperatures above 50° Fahrenheit may reduce the survival of Chinook embryos and alevins, and stream temperatures above 69.8° Fahrenheit may block migration. Winter temperatures will also increase and precipitation is projected to increase by 8%–11%. These changes are likely to increase the risk of rain on snow events and higher streamflows that can scour streams, increase sedimentation, alter habitat suitability, and reduce the survival of developing embryos.



Maximum summer temperatures are projected to increase 6.5 to 8.5°F by the 2050s.

Winter precipitation is projected to increase 8% to 11% by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of Chinook Salmon. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Low Summer Streamflow	Restore beaver habitat and beaver populations to maintain summer base flows and reduce water temperatures.	Immediate
Increase in Invasive Species	Maintain or construct cleaning and inspection stations to prevent spread of invasive species, where appropriate.	Immediate
Outreach and Education	Develop and expand education efforts for the public regarding aquatic invasive species impacts, such as improving identification of non-native species, encouraging use of native species and promoting strategies to prevent and remove invasive species.	Immediate
Enhance Habitat	Restore mainstem, floodplain, and estuary habitats to more natural conditions where possible, which will reduce predation rates on migrating juvenile salmon and provide more rearing and resting habitat.	Medium-Term
Stream Temperature	Maintain or restore riparian vegetation to limit channel exposure to solar radiation. Incorporate these changes into the “Tributary Management Plan”.	Medium-Term
Streamflow Changes	Increase stream complexity to provide refugia during low-flow and high-flow events (e.g., maintain woody material and/or bolders in the stream reach). Include this action in the “Tributary Management Plan”.	Long-Term
Reduce Non-climate Stressors	Improve mainstem and tributary water quality by eliminating sources of toxic pollution and by reducing discharges of other contaminants to meet water quality criteria for salmonids across all life stages.	Long-Term

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Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Greater Sage Grouse

Photo by: Pacific Southwest Region USFWS

Greater Sage Grouse and the Shoshone-Bannock Tribes

Greater sage grouse once enjoyed a massive range across the intermountain west, abundant in virtually every major river basin with good sagebrush stands. As a sage brush obligate species, the sustainability of this bird depends on our ability to conserve and appropriately manage the remaining shrub-steppe habitats. This bird is native to the Reservation and holds a culturally significant place in Tribal traditions that include dances honoring the bird and regalia made from their feathers. These upland birds were hunted for subsistence by the Tribes, however, populations are dwindling and recent surveys show breeding grounds, or “leks,” with no birds present.

Greater Sage Grouse Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

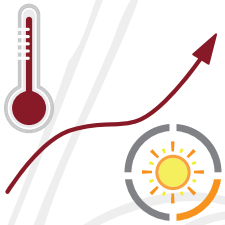
Less Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit. The greater sage grouse is a sagebrush obligate, making sagebrush habitat critical for breeding, feeding, protection, and survival. Large swaths of sagebrush habitat have been lost through conversion to grasslands due to an increase in wildfire size and frequency. Warmer temperatures and drought conditions may further dry soils and increase wildfire risk. Increasing temperatures may also lead to expansion of the timing for West Nile virus exposure, a mosquito-borne infection, as well as spread the virus to higher elevations.



Maximum summer temperatures are projected to increase 6.5 to 8.5°F by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of greater sage grouse. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Species Range Shifts	Coordinate among/across states and their federal counterparts to protect habitat core areas to promote large-scale, continuous sage grouse habitat that would be protected from further development.	Immediate
Increase in Invasive Species	Rehabilitate burned areas by using native plant materials or introduced materials, that encourage the long term sustainability of native species, and as approved by Resource Managers.	Immediate
Reduce non-climate Stressors	Install fence markers or remove fences where sage-grouse mortality due to collision with fences is documented or likely to occur due to new fence placement (avoid new fences within 0.5 mile of a lek).	Immediate
Outreach and Education	Develop and expand education efforts for the public regarding invasive species impacts such as improving identification of non-native, encouraging use of native species, and promoting strategies to prevent and remove invasive species.	Immediate
Wildfire	Incorporate climate change into fire-management plans (wildfire projections); anticipate more opportunities to use wildfire for resource benefit.	Immediate

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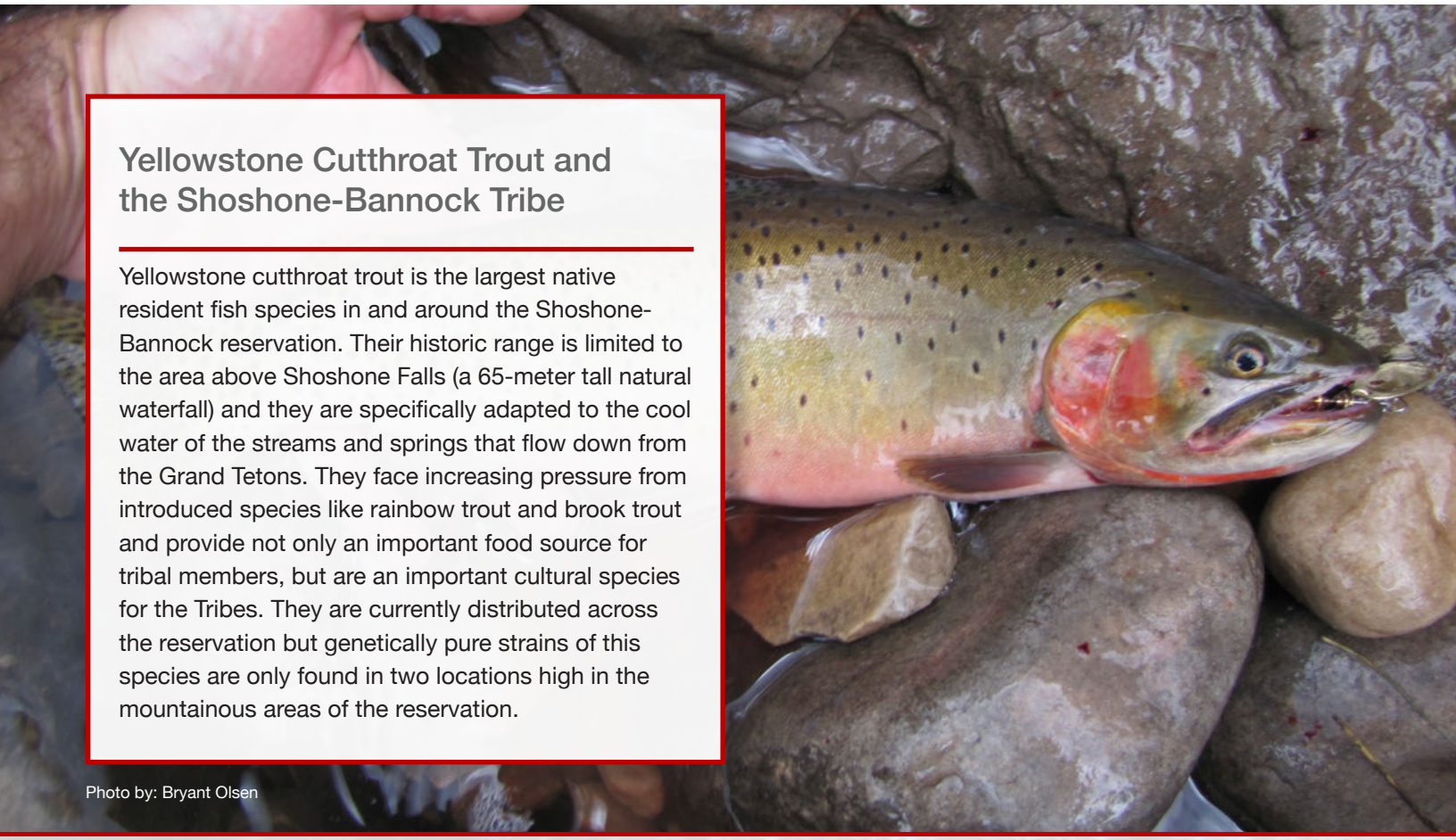
Climate Change Assessment and Adaptation Plan for the Shoshone-Bannock Tribes

Yellowstone Cutthroat Trout



Yellowstone Cutthroat Trout and the Shoshone-Bannock Tribe

Yellowstone cutthroat trout is the largest native resident fish species in and around the Shoshone-Bannock reservation. Their historic range is limited to the area above Shoshone Falls (a 65-meter tall natural waterfall) and they are specifically adapted to the cool water of the streams and springs that flow down from the Grand Tetons. They face increasing pressure from introduced species like rainbow trout and brook trout and provide not only an important food source for tribal members, but are an important cultural species for the Tribes. They are currently distributed across the reservation but genetically pure strains of this species are only found in two locations high in the mountainous areas of the reservation.

Photo by: Bryant Olsen

Yellowstone Cutthroat Trout Climate Change Vulnerability in the 2050s

More Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

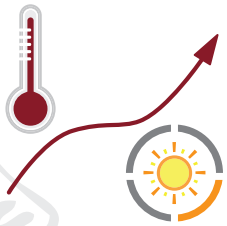
Less Warming Scenario

Low Vulnerability	Medium Vulnerability	High Vulnerability	EXTREME VULNERABILITY

Relative vulnerability rankings were determined by combining the best available climate change science with the local and traditional knowledge of the Shoshone-Bannock Tribes. These rankings are based on climate change projections, species-specific sensitivities, and the ability of species to adapt and respond to the projected changes. The higher climate change scenario (RCP 8.5) is labeled “More Warming” and the lower climate change scenario (RCP 4.5) is labeled “Less Warming”. Generally, more greenhouse gas emissions over a longer time will lead to more severe impacts from climate change.

Key Climate Concerns

By the 2050s, maximum summer temperatures in the Upper Snake River Plains are projected to increase up to 8.5° Fahrenheit warming both air and stream temperatures. For Yellowstone cutthroat trout, optimum water temperatures are below 60°F; warmer air temperatures (especially during lower periods of streamflow in the summer) have the potential to increase water temperatures above that limit. Winter temperatures will also increase and winter precipitation is projected to increase 8%–11% by the 2050s. Taken together these changes will increase the risk of rain on snow events and result in higher streamflows that can scour streams, increase sedimentation, alter habitat suitability, and reduce the survival of eggs.



Maximum summer temperatures are projected to increase 6.5 to 8.5ºF by the 2050s.

Winter precipitation is projected to increase 8% to 11% by the 2050s.

Actions to Build Resilience

The Tribes identified a wide variety of actions they can use both internally and with partners to build the climate resilience of Yellowstone cutthroat trout. These actions range from outreach and education to changing policies and further strengthening programs to address the potential impacts of climate change. A complete list of strategies can be found in the full project report.

CLIMATE CONCERN	SELECT ADAPTATION ACTION	TIME FRAME
Increase in Disease	Certify releases of fish from artificial production as disease free.	Immediate
Summer Streamflow and Temperature	Identify and monitor stream temperatures, cold water refugia, springs, and groundwater input to springs in the Upper Snake watersheds and identify river stretches with highest potential for thermal blockages and reduce potential for blockage where possible.	Immediate
Enhance Habitat	Restore mainstream, floodplain, and estuary habitats to more natural conditions where possible, which will reduce predation rates and provide more rearing and resting habitat.	Medium-Term
Stream Temperature	Restore riparian areas to maintain summer base flows and reduce water temperatures, and consider riparian treatments that enhance these benefits in the Tributary Management Plan.	Medium-Term
Streamflow Changes	Increase use of logjams where feasible to provide refugia during high flow events.	Medium-Term
Outreach and Education	Consider program to engage citizen scientists to help with invasive species monitoring, detection, and response efforts (e.g., LEO network).	Medium-Term

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