**TO:** Columbia River Gorge Commission

**FROM:** Jessica Olson, Senior Natural Resources Planner

**DATE:** June 8, 2021

**SUBJECT:** Progress Report: Climate Change Action Planning

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## PURPOSE

The purpose of this report is to update the Commission on progress toward developing a Climate Change Action Plan (CCAP), since the March 9, 2021 work session. It includes an overview of relative climate change vulnerabilities and risks for several resources and values in the National Scenic Area (NSA). The report explains how this evaluation of vulnerabilities will be combined with additional criteria to highlight priorities from among Commission options for adaption and mitigation actions in the CCAP.

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**BACKGROUND**

The NSA is unique and treasured for its biodiversity, intact natural areas, dramatic landscapes, cultures, ways of life, and quality of life. In 2020 the Columbia River Gorge Commission, together with the Forest Service, completed a four-year review and revision of its Management Plan, the document that sets goals and policies for resource protection in the NSA. During that process, it contracted a report to describe many of the impacts that climate change will have on these values (Wozniak 2019). The Commission decided to prioritize building climate change resiliency for the NSA and exploring its role in greenhouse gas reduction in the region. The revised Management Plan includes a new climate change chapter that commits the Gorge Commission to developing a Climate Change Action Plan. The plan will address mitigation and adaptation to the most pressing climate change impacts on natural, scenic, cultural, and recreation resources and to the economic vitality of NSA communities. The Commission's climate change vision:

> *The National Scenic Area is made up of a diversity of intact landscapes, living cultures, and communities that, while vulnerable to climate change impacts, also provide a vital foundation for climate resilience. The Gorge Commission is committed to leading and working with others to reduce the greatest drivers of climate change and adapt to changing conditions with the goal of sustaining a thriving, resilient National Scenic Area for future generations.*

The Commission, together with the U.S. Forest Service National Scenic Area Office, manages land use and resource protection in the NSA. The agencies use regulation (the Management Plan and approved county ordinances), education and landowner outreach, and strategic partnerships to protect and enhance the scenic, natural, cultural, and recreation resources in the NSA. The Forest Service has direct land management responsibility for National Forest System lands, allowing them to lead resource enhancement strategies such as habitat restoration. To address climate change, the Commission, and the Forest Service endeavor to build resiliency: to respond and adapt to the impacts of climate change; and to mitigate greenhouse gas emissions that contribute to climate change.

**FOR COMMISSION DISCUSSION**

Staff is seeking feedback on the initial vulnerability rankings presented in this report. We are also seeking input on proposed criteria for prioritizing actions to take in 2022. Specific discussion question:

1. *What feedback do Commissioners have about these initial relative rankings of climate change vulnerabilities in the NSA?*
2. *What input do Commissioners have on the suggested first filter criteria for prioritizing areas of focus (page 19)? What resources or values are rising to the top for you?*
3. *What do Commissioners most want to learn more about through summer meetings? Do you have suggestions for who to involve in discussions around these most vulnerable resources and highest impact mitigation opportunities?*

# Summarizing Climate Change Vulnerabilities and Risks
## National Scenic Area Resources and Values

## I. Approach to ranking climate change vulnerabilities in the NSA

This report describes staff's qualitative assessment of the vulnerabilities and risks to key resources and values protected by the Management Plan or otherwise of interest to the Gorge Commission. It will inform a Climate Change Action Plan, containing both adaptation and mitigation actions the Gorge Commission would like to lead or support. Staff evaluated sensitivity, adaptive capacity, and vulnerability for several resources and values in the National Scenic Area (See Table 1). The list incorporates the 2020 Commission priorities outlined in the revised Management Plan's Climate Change Chapter.

To assess vulnerabilities and risks, staff relied upon publications and reports and received input from a number of individuals. Most notably, staff referenced the Forest Service climate change vulnerability assessment for the Columbia River Gorge National Scenic Area, Mt. Hood National Forest, and Willamette National Forest (Halofsky et al. *in press*). The Forest Service worked with University of Washington and others, using the RCP 8.5 emission scenario (high emissions; "business as usual") to model climate change effects on vegetation, water resources, recreation, fish and wildlife, infrastructure, and ecosystem services.

### U.S. Climate Resilience Toolkit Rankings

The Columbia River Gorge Commission is adapting methods developed in the U.S. Climate Resilience Toolkit to summarize climate change vulnerability for resources and values of interest in the National Scenic Area (See Figures 1 and 2). The process entails several steps:

1. Explore climate threats, assets, stakeholders, and goals
2. Assess vulnerability and, for the most vulnerable resources, assess risk
3. Investigate options to reduce vulnerability and risk
4. Prioritize actions and create a plan
5. Take action (implement, track effectiveness, update)
6. Prioritize actions, communicate findings, implement, and evaluate results (repeat)

The Commission has completed Steps 1 and 2 of the Toolkit framework, and we are in the process of completing Steps 3 and 4. Next we describe the vulnerability rankings:

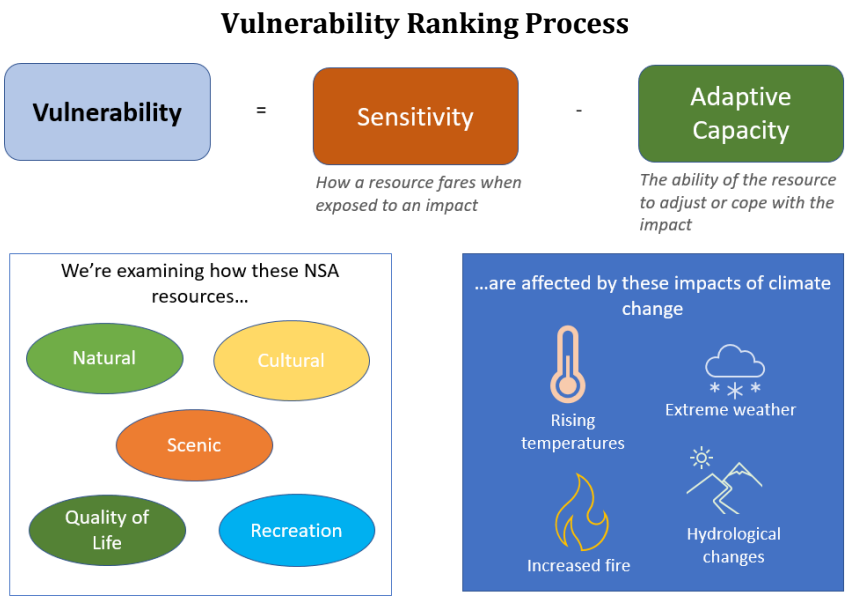



*Figure 1. The vulnerability ranking process. Graphic adapted from City of Flagstaff Climate Action and Adaptation Plan.*

**Sensitivity:** The degree to which a system, population, or resource is affected by climate impacts or changing climate conditions. Examples:

**High**: *Complete failure of resource or habitat function*
**Medium**: *Diminished health or function of resource*
**Low**: *Little to no impact*

**Adaptive Capacity:** The ability of a system, population, or resource to adjust to, or moderate, potential damages caused by climate-related impacts to preserve or enhance functionality.

**Low**: *Are there barriers that prohibit adaptation? Is the rate of climate change expected to be greater than the pace of adaptation?*
**Medium**: *Are there sufficient efforts underway to address climate impacts on this resource?*
**High**: *Can the resource accommodate changes naturally?*

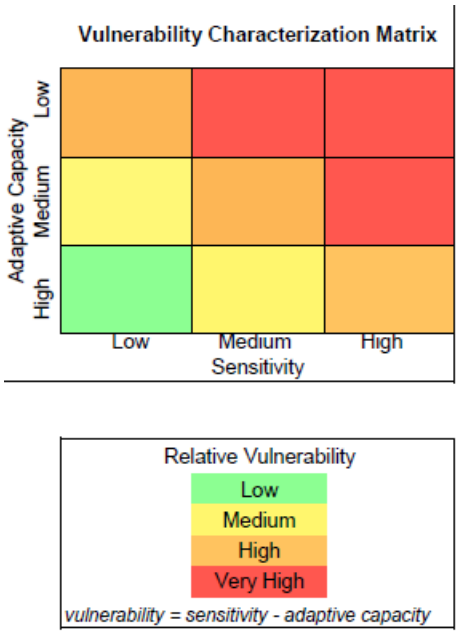



*Figure 1. Ranking matrix to assign relative vulnerability*

**Vulnerability** is the predisposition or tendency of an asset to be adversely affected by impacts. To assess vulnerability to climate change, we ranked sensitivity and adaptive capacity of protected resources and values in the NSA. Vulnerability is the combination of sensitivity and adaptive capacity from **Very High** to **Low**.

*Table 1. Full list of resources and values staff reviewed and ranked for climate change vulnerability. List updated June 2021.*

**List of Resources Reviewed for Climate Change Vulnerability**

June 2021

Priority Habitats protected by the Management Plan

- Water-related habitats: Riparian/streams, wetlands
- Forest types: Aspen stands, old-growth forests, Oregon white oak woodlands
- Other terrestrial habitats: Grasslands, shrub-steppe, dunes, winter range for deer and elk
- Habitat sites and features: Caves, snags and logs, talus, cliffs

Other natural resources protected in the Plan

- Rare and endemic plants
- Culturally important plants/First Foods
- Cold water refuge fish species
- Sensitive wildlife species: Western pond turtle, pika

Cultural Resources

- Cultural sites: historic and archaeological sites
- Cultural traditions and ways of life
- Cultural connections among the other resources

Scenic Resources

- Air quality (also relates to human health that is not necessarily addressed by the Plan)
- Scenic views from Key Viewing Areas

Recreation Resources

- Recreation opportunities, access, experience: warm-weather recreation, cold-weather recreation
- Recreation infrastructure

Other key assets and values affected by climate change

- Public and private infrastructure
- Agricultural uses and products
- Forestry and forest products
- Livability and workability (particularly related to heat)
- Drinking water

### Climate Change Resilience Models and Mapping

The Nature Conservancy has developed modeled spatial data layers that assign climate change resilience values to the landscape. Working closely with the Commission's GIS Manager and with colleagues who are also using the data in the Gorge, we overlayed the resilience layer with NSA land use designations (LUDs), priority habitats, and landscape settings to help answer several questions: *How many of the "above average climate resilience" areas are located in open space LUDs? Where are the remaining areas with "above average resilience," in terms of their LUD, landscape setting, resources, and development potential? How does this inform priority-setting for maintaining and increasing climate resilience into the future?*

This spatial analysis informed the final vulnerability snapshots and will be used to evaluate the Commission's opportunity to influence resilience for the resources described in this report. Staff will share more about this analysis and our findings during the Commission meeting and be able to answer questions then.

## II. Descriptions of resources and values with high vulnerability rankings

The following rankings and narratives provide vulnerability "snapshots" for the resources and values ranking highest in climate change vulnerability. In some of the descriptions, non-climate stressors are described because they exacerbate climate change impacts and prevent natural adaptation to those impacts.

### Streams, Riparian, and Cold Water Refuge Fish Species

**Sensitivity: High | Adaptive Capacity: Low | Vulnerability: Very High**

**Rationale:** Stream and riparian function is affected by reduced snowpack, warming air temperatures, drought, and flooding. Climate change will result in warmer water temperatures, altered hydrology, higher evaptransporation, and drier soils. Drought tolerant species including conifers may replace riparian hardwoods that provide unique habitat for insects, migratory birds, and other species.

Fall Chinook and adult summer steelhead are highly sensitive during mid-July through mid-September when Lower Columbia River temperatures often exceed 20°C. Survival rates decline at warmer temperatures, and disease, stress, and decreased spawning success are more prevalent. Cold water refuge habitats are limited.

Fish survival requires a certain temperature range (e.g., steelhead begin to use cold water refuge at 19°C or higher; Chinook at 20-21°C). The pace of temperature change is likely faster than species ability to adapt. While there are extensive recovery efforts and increasing focus on cold water refuge habitat work, salmon populations are in decline, requiring an "all-hands-on deck" approach to climate change adaptation. Non-climate stressors including dams, water diversion, and sedimentation exacerbate climate impacts.

## Wetlands and Wetland Species

**Sensitivity: High | Adaptive Capacity: Low | Vulnerability: Very High**

**Rationale:** Wetlands are sensitive to hydrological changes, including reduced precipitation and increased drought. Adaptation is limited, particularly for isolated surface water wetlands that are dependent on overland flows. Groundwater and surface water wetlands are affected by water diversions and withdrawal, as well as reductions to overland flows. Invasive terrestrial and aquatic species affect wetland function and native biodiversity. Wetland-associated rare plants and culturally important plants are among the most vulnerable plants under climate change. More information is needed on wetland condition and wetland change in the National Scenic Area.

## Culturally Important Plants

**Sensitivity: High | Adaptive Capacity: Low | Vulnerability: Very High**

**Rationale:** Traditional foods provide "physical health and well-being; sustenance; medicines for physical, spiritual, and mental health; ceremonies; community; and economic prosperity" (Dalton and Fleishman 2021). In general, plants in the NSA are sensitive to hydrologic changes (earlier runoff and drought), warming temperatures, frost events, and sun scorch. These impacts are expected to result in range shifts, reduced populations and increases in invasive species, and changes in the timing of green-up and flowering. Wetland and water-associated plant species are especially sensitive to these impacts. Tribal members and agency staff who we have spoken with emphasize the importance of access to land for gathering traditional foods, particularly those not found on reservation lands.

## Traditional Uses

**Sensitivity: High | Adaptive Capacity: Low | Vulnerability: Very High**

**Rationale:** Climate change affects the availability (timing and locations) of culturally important foods, medicines, and practices. There are spiritual, community, and economic impacts of the reduced availability of culturally important foods and traditional practices of fishing, hunting, gathering, trading, and ceremonies. The Oregon Climate Assessment (2021) describes “connections with traditional familial sites, homelands, and spaces, including burial grounds and sacred sites that generally are not disclosed outside the tribes, remain vital and sacred aspects of tribal identities. These connections and, often Tribe- and location-specific hunting, gathering, and cultural practices, are essential to each Tribe’s well-being and to Tribal members’ senses of place and self.” Reduced access and land development exacerbate climate change impacts on these traditions and on cultural, spiritual, and economic well-being.

## Talus

**Sensitivity: High | Adaptive Capacity: Low | Vulnerability: Very High**

**Rationale**: Talus slopes are limited and fairly isolated from one another in the NSA. Climate change impacts include thermal and moisture stress from rising air temperatures. Species

with specialized temperature and habitat needs, like the Larch Mountain salamander and American pika, are particularly sensitive to these changes. Talus slopes often occur in or near recreation hot spots, where they can be subject to trampling or disturbance. Other non-climate stressors include timber harvest and development.

### Snow-based Recreation

**Sensitivity: High | Adaptive Capacity: Medium | Vulnerability: Very High**

**Rationale:** Snow sports in the NSA (e.g., cross-country skiing and snowshoeing) are highly sensitive to warmer air temperatures and a shift from snow to rain during the winter months. Reduced snow-based recreation opportunities are expected, with developed sites able to create snow. Recreationists will need to choose different locations where snow-based recreation is possible or choose alternative activities. While recreationists and managers are capable of shifting their activities in response to impacts, there will be costs associated with these shifts and some recreation opportunities will be diminished. Climate impacts will increase the costs of maintenance for recreation infrastructure due to increased flooding, landslides, fires, and resource sensitivity.

### Grassland/prairie

**Sensitivity: Med-High | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale:** Grasslands in Oregon and Washington are sensitive to drought and warming air temperatures, hydrologic shifts, and changing fire dynamics. The consequences of these changes include conversion to invasive grasses like *Ventenata dubia* (wiregrass), with shallow roots that contribute to soil erosion. Studies show that *Ventenata* is likely to outcompete cheatgrass, a problematic invasive in other areas, under climate change conditions (Harvey et al. 2020). Grassland bird populations are in decline and grassland habitats are among the most threatened nationwide from non-climate stressors including wind, solar, and other development, and habitat fragmentation. Grasslands store significant carbon in soils and vegetation.

### Winter Range for Big Game

**Sensitivity: Med-High | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale:** Climate stress from drought and extreme winters will affect deer and elk during the taxing winter months, when they are feeding primarily on woody shrubs. Herds follow the green-up to access forage in springtime; in many cases the longer growing season will increase the availability of green plants. Compounded with habitat loss and fragmentation, disease, and invasive species (see grasslands above), big game populations are likely to shift their ranges and be reduced in number. These shifts will have socioeconomic effects on First Foods and tribal culture, wildlife management, hunting opportunities, wildlife viewing, and sense of place.

## Oregon White Oak Woodlands

**Sensitivity: Medium | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale:** Oregon white oak habitat and dependent wildlife are sensitive to climate change impacts, given reduced extent and fragmentation driven by non-climate stressors (land development, conifer encroachment, invasive species*, and recreation). Dispersal will become more difficult, and species such as Western gray squirrel, woodpeckers, and rare butterfly species may be especially sensitive to habitat changes. Oak systems are drought-tolerant and may benefit from increased fire frequency if other non-climate stressors are reduced and active management and restoration is increased. For these reasons, oak systems rank medium in both sensitivity and adaptive capacity.

*Many invasive species are more competitive in warming environments or under more frequent fire regimes and can be considered climate-related stressors. Staff also considers invasive species to be a non-climate stressor in cases where human caused disturbances promote the spread or proliferation of weeds (grading, new roads, some grazing practices, etc.).

## Aspen

**Sensitivity: Medium | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale:** Aspen are early-seral stage trees, meaning they tend to dominate sites following disturbances such as fires or wind blow-down events. Aspen typically occur in moist soils at high elevation. These habitats will experience reduced soil moisture from changes in precipitation, snowmelt, and drought. Aspen have limited opportunity to shift in range, given that they already occupy some of the highest, wettest, and coolest slopes. Other factors contributing to sensitivity are lack of regeneration, isolated populations, and disease in this clonal species. In some areas, where snowpack has protected aspen from deer and elk browse damage, herbivory will increase as snowpack decreases. Aspen may benefit from increased fire frequency, and prescribed burning is a common management approach to encourage sprouting. Staff from the Forest Service and Commission believe there to be only a few stands of aspen in the NSA, located on Forest Service lands.

## Forestry and Forest Products

**Sensitivity: Medium | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale:** Increased air temperatures, drought, and reduced snowpack will impact forests in the National Scenic Area. Forests are sensitive to the resulting wildfire and insect outbreaks and are predicted to have reduced yields. Fuels reduction and forest health projects could increase timber harvest in some places. Trees have some adaptive capacity to shift in elevation or in species composition over time, with more drought tolerant species increasing as others decrease. Improvements to forestry technologies may support adaptation. Hotter, drier conditions could result in some reductions in overall forested land cover. Global changes in supply and demand for timber influence local and regional prices.

## Forests and Carbon Storage

**Sensitivity: Medium | Adaptive Capacity: Medium | Vulnerability: High**

**Rationale**: In the U.S., forests are a net carbon sink, storing 11.5% of total annual carbon emissions, according to the Forest Service. Climate change affects the amount of carbon stored below and above ground in NSA forests through ecosystem function changes and from large wildfire events like the 2017 Eagle Creek Fire. The Forest Service estimates that above-ground carbon loss from forest restoration/fuels reduction efforts (thinning and prescribed burning) is short-term and promotes long-term tree growth while protecting lands from severe wildfires. Reduced forest cover under warmer, drier conditions results in vegetation types that store less carbon. Non-climate factors affecting carbon storage in forests include land use change, forest harvest and management.

## Agriculture

**Sensitivity: Medium | Adaptive Capacity: Medium | Vulnerability: Medium-High**

**Rationale:** Agricultural uses and products are sensitive to gradual and extreme weather changes including higher temperatures, shifting hydrology, and freeze and heat stress events. The average growing season for some crops will be extended, although crop damage from these extremes will be less predictable and more costly. Under warming conditions, insect pest activity and reproduction increase. Pollinator abundance and timing mismatches will affect tree fruits and other crops. Workable hours will decrease, as heat creates unsafe conditions for outdoor physical labor.

Water conservation and management strategies, frost mitigations, and shifting to hardier crop or livestock varieties are some adaptation strategies producers can use. Incentives and technical assistance programs may offer support to offset landowner operational costs and sustainable practices may be more cost-effective in the long term. Non-climate impacts that contribute to the vulnerability ranking include a growing demand for wine, cider, and farm-related tourism, and regional and global economic pressures.

## Public Roads

**Sensitivity: Med-High | Adaptive Capacity: Med-High | Vulnerability: Med-High**

**Rationale:** Roads and other public infrastructure in the NSA are sensitive to the effects of extreme weather events – flooding and landslides from rain-on-snow events or post-fire rains; freeze events; and high winds. Maintenance and emergency repair needs will increase for roadways, particularly the main ingress and egress arteries of I-84, SR-14, and the Historic Columbia River Highway. Oregon was declared a national disaster area for damage by extreme storms, floods, landslides in four of the five last years (OHA 2020). While adaptive capacity is considered high, adaptation will be limited by capacity and funds.

## Cultural Sites

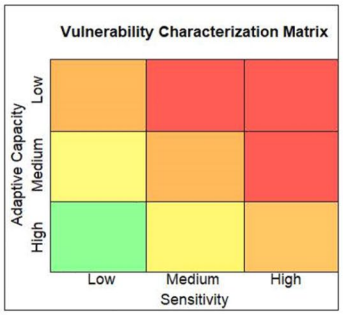
**Sensitivity: Medium | Adaptive Capacity: Med-High | Vulnerability: Medium-High**

**Rationale:** Both archaeological and historic sites are sensitive to damage from floods, wildfires, and extreme weather. Built structures and rock art are among the features most sensitive to damage and loss from these events (UCS 2014). Landowners and land managers can document and strive to protect cultural sites from damage with flood control methods and fuels reduction. There are social and cultural losses associated with damage to sites, as well as impacts to local economies from reduced visitation when sites are damaged or closed to the public. Multnomah Falls Lodge is an example of local impact and costs of repair following the Eagle Creek Fire.

## Summary of high vulnerability resources and values

**Vulnerability Summary**

| Most Vulnerable Resources/Values | Sensitivity (high, med, low) | Adaptive Capacity (low, medium, high) | Vulnerability Ranking |
|---|---|---|---|
| Riparian, streams | High | Low | Very High |
| Wetlands/associated rare plants | High | Low | Very High |
| Culturally important plants | High (mesic and cliff) | Low (mesic and cliff) | Very High |
| Traditional uses | High | Low-Med | Very High |
| Talus | High | Low | Very High |
| Cold weather rec | High | Medium | Very High |
| Prairie/grasslands | Med-high | Medium | High |
| Winter Range | Med-high | Medium | High |
| Oregon white oak | Medium | Medium | High |
| Aspen | Medium | Medium | High |
| Forestry | Medium | Medium | High |
| Agriculture | Medium | Medium | Medium-High |
| Public roads | Med-high | Med-High | Medium-High |
| Cultural sites | Medium | Med-High | Medium-High |



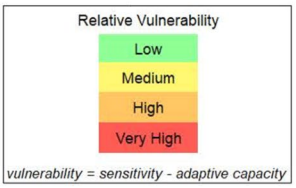




*Figure 3. Summary of resources and values ranking most vulnerable to climate change in the NSA, from among the full list in Table 1.*

For brevity and focus, staff is presenting only these higher-ranking resources and values at this time, corresponding to the snapshot descriptions on pages 6-11 in this report.

# III. Themes and takeaways

The process of summarizing and evaluating climate change vulnerabilities in the NSA provided staff insights about options for adaptation and mitigation actions, and about setting priorities. Some key takeaways are described below: interconnectedness of cultural and natural resources; Vital Sign Indicators and data needs; equity implications; and models, analyses, and assessments.

## Cultural and natural resources connections

The Gorge Commission recognizes that many of the scenic, natural, cultural, and recreation resources are interlinked. As an example, Columbia River Treaty Tribes have a reciprocal relationship with water, wildlife, and plants in the Columbia River Gorge. By engaging with members and agency staff from the treaty tribes, Gorge Commission staff are deepening our understanding and appreciation of these connections. Non-tribal land managers have limited knowledge about plants with traditional significance as food, medicine, and for other uses – called First Foods by some tribes. We are seeking ways to learn, while being respectful of concerns about confidentiality of specific locations and species information. Staff has gleaned broad lessons to inform the CCAP.

Many First Food plants are associated with wetlands, wet meadows, seeps, and riparian areas. Some members of the Review Committee suggest considering these water features to be on-the-ground indicators that First Foods might be present. This approach is supported by the information we have about rare plants. Staff referred to Department of Natural Resources sensitive plant species vulnerability assessments to inform this assessment. From among the plants DNR reviewed that are found in the gorge, the vulnerable species were plants associated with wetlands and waterfall spray zones. These discussions and studies support a focus on water resources as a way of protecting both natural and cultural resources and indicate new approaches to protecting rare and culturally important plants.

## Informing Vital Sign Indicators

Staff are working closely together on this CCAP effort and Vital Sign Indicators (VSI) long-term monitoring. The work of reviewing existing information about climate change vulnerabilities has informed VSI work to refine natural resources and climate change related indicators the Commission can track over time. Ideas that are feeding directly into the development of 2021 indicators:

- Information is lacking about the current condition of NSA wetlands and how they are changing over time. Spatial data could help Commission staff better understand how wetlands are faring under climate change and which have the best opportunity for improved resilience.
- As we continue to learn about the relationship between climate change and invasive species it would be helpful to know how invasive species have already impacted native systems, and where native plant communities persist.

- A climate change resilient landscape maintains ecosystem integrity and habitat connectivity. VSI offers an opportunity to examine spatial patterns of both habitats and development. We viewed spatial data about land use change, development potential, and habitat distributions across the NSA to better understand how non-climate factors are influencing sensitivity and adaptability. For habitats like Oregon white oak and grasslands/prairie, the combination of climate and non-climate stressors influenced the final climate change vulnerability ranking.
- Finally, as the Commission will hear from Lisa Naas Cook, ranking vulnerabilities offered staff an opportunity to review and discover existing datasets. This revealed spatial data needs that the Commission and Forest Service are working together on.

### Equity in action planning

The loss or degradation of any of these resources or values would have wide-reaching ecological, social, cultural, and economic implications. For example, native fish species have intrinsic value, maintain biodiversity, and serve ecosystem functions that would be lost if those species can no longer persist under future climate conditions. Loss of native salmon species would also affect many people, though not in equal ways. Anglers would suffer the loss of an important native fish for recreation and food. These groups may be able to adjust their activities and expectations to still enjoy the benefits of fishing if non-native fish species become dominant in Gorge streams. As described in the vulnerability snapshots above, tribes who have ties to the Columbia River, and particularly to salmon, would suffer incalculable and irreconcilable harm to cultural identities, spiritual well-being, subsistence, and livelihoods.

As the Commission is taking an equity focus in all aspects of its work, climate change action planning offers an opportunity to learn all we can about how climate change impacts all people, and particularly marginalized or underrepresented groups, and to prioritize actions that will address disproportionate effects on these groups or communities. To begin describing these impacts, staff evaluated "traditional uses" as a resource or value in the NSA. Staff suggests including effects on tribes and other underrepresented groups as a criterion to consider in prioritizing adaptation actions.

## IV. Considering relative risks

### Summary of risk rankings

For the resources and values that ranked Very High, High, or Medium-High in vulnerability, staff further evaluated the risk to those resources/values based on the probability and magnitude of losses associated with climate hazards. The Climate Resilience Toolkit encourages risk ranking to focus on asset-hazard pairs to evaluate the likelihood and magnitude of losses predicted in a changing climate. The "assets" are the resources/values, and the "hazards" are the impacts identified in the vulnerability assessment.

The **Probability of Loss** is the likelihood that a system, population, or resource will not persist given climate impacts or changing climate conditions. In quantitative risk assessments, likelihood can be defined numerically for a certain time period. For this qualitative assessment, probability is simply ranked on a scale from **Low** to **High**.

> **Low**: *The hazards are unlikely to affect the asset.*
> **Medium**: *The hazards may or may not affect the asset.*
> **High**: *The hazards are likely to affect the asset.*

The **Magnitude of (Potential) Loss** is the extent of the disruption to a system, population, or resource if it occurs, or the costs (financial or otherwise) of consequences from the event or impact. Magnitude is ranked on a scale from **Low** to **High**.

> **Low**: *The hazards would cause minimal disruption to the services or function of the asset or would require minimal cost to restore services or function of the asset.*
> **Medium**: *The hazards would cause moderate disruption to the services or function of the asset or would require some costs to restore the services or function of the asset.*
> **High**: *The hazards would cause maximal disruption to the services or function of the asset, or would require large amounts of money, time, or other resources to restore the services or function of the asset.*

## Example: Culturally Important Plants

Below is an example of this risk ranking process, focusing on culturally important plants.

- **Asset** - Plant species associated with water features
- **Hazards** - reduced runoff/flow/increasing temperatures

- **Asset** - Upland native plant species
- **Hazards** - invasive species and drought

- **Asset** - Plants found on exposed cliffs
- **Hazard** - weather stress with limited opportunity for range shifts

**Probability of Loss**: For culturally important plants the probability of loss of species without human intervention is **High**. Note that staff did not locate information to indicate a likely timeframe for species decline or loss; this is a qualitative summary of existing information.

**Magnitude of (Potential) Loss**: The magnitude of losing culturally important plant species and populations, and of the associated effects to cultural identity, histories, economies, and sovereignty for Treaty Tribes is **High**.

Staff identified asset-hazard pairs and ranked probability and magnitude of sustaining a loss for each of these pairs. Table 2 summarizes NSA resources and values ranking high risk under climate change.

*Table 2. List of asset-hazard pairs ranking high in risk, described by probability and magnitude.*

| Asset (resource or value) | Hazards potentially resulting in loss |
|---|---|
| Cold water refuge streams | • warming water temperatures |
| Native fish species | • warming temperatures<br>• invasive aquatic species |
| Aquatic habitat | • water quantity and quality change |
| Wetlands and obligate species | • reduced runoff and flow<br>• drought and warming |
| Native upland grasses and rare plants | • invasive plant species and fire regime change<br>• drought |
| Forests | • wildfire |
| Cliff plants | • warming air temperatures and drought |
| Talus habitats | • drying out and warming air temperatures |
| Archaeological and historic sites | • wildfire and flooding |
| Road infrastructure, public access and safety | • flooding, landslides, freezing and winds |

For the example of culturally important plants, the vulnerability and risk rankings exercises and several Review Committee conversations have highlighted options for Commission action that staff will present in more detail at a future meeting. Options for actions to build climate resilience for culturally important plants include:

- Work with tribes and other partners to explore developing a predictive model of locations that may be suitable for First Food plants or plant communities of interest to Treaty Tribes. Such a map could be used confidentially in a manner similar to the existing predictive layer for identifying places of high or low probability of cultural resources. It could also inform tribal members wishing to reach out to landowners to discuss voluntary access agreements for gathering plants. This is an approach that can work equally well for rare plants.
- Support tribes in completing ethnographic studies to learn from elders about plants and places that have been used for gathering.
- Compile and provide information to planners about culturally important plants that have local sources of seeds or plantings to provide to interested landowners. Plant lists and sources for planting could also inform rare plant surveys and mitigation plans, where those are required.
- Regularly convene a community of practice for individuals working on climate change and First Foods to share resources and ideas.
- Develop proposed revisions to the Management Plan, for consideration as an amendment or a future Management Plan update item, based on information gathered in completing previous items.
- Continue learning about opportunities to promote wetland creation or enhancement in place of built flood control structures. Support the Forest Service in restoring connected floodplains and associated plant species.

The asset-hazard framing and risk assessment help to create a focus on the most critical climate change hazards in the NSA – wildfire, invasive species (often expanding post-fire),

drought, and extreme weather events. They indicate the greatest potential resource losses if we do nothing. Just as helpful, the risk ranking exercise prompts consideration of the most immediate needs for action, as well as the Commission's greatest opportunities for influence over resilience to hazards. These considerations are reflected in the current draft prioritization criteria, described in the next section, that staff will present on June 8.

# V. From vulnerabilities to actions and priorities

Each of the resources and values listed in Table 1 will be carried forward in our work to identify potential future actions the Commission can take to build resiliency and reduce greenhouse gas emissions. Staff is recommending the Commission focus attention in 2021 on the resources and values with higher ranking vulnerabilities and risks as it begins prioritizing and specifying implementation steps for 2022. Staff will discuss additional prioritization criteria with Commissioners on June 8.

## Suggested first filter criteria for prioritizing resources and values to focus on:

- *Vulnerability and risk rankings*
- *Commission's ability to influence resilience and mitigation, informed by resilience mapping*
- *Existing opportunities to partner*
- *Impacts on underrepresented or marginalized groups and communities*
- *VSI priorities*
- *Others?*

## Suggested second filter criteria for prioritizing immediate actions for 2022:

- *Feasibility of achieving the action*
- *Benefit the action may have for underrepresented or marginalized communities*
- *Potential to inform Management Plan improvements*
- *Others?*

In summary, staff proposes that the resulting Action Plan will include strategies and actions linked to *all* the resources evaluated in Table 1 as well as mitigation approaches, described next in this report. Some of these actions will be prioritized, based on criteria the Commission discusses on June 8 and again at the September Commission meeting; the CCAP will provide implementation guidance for actions meeting the Commission's final prioritization criteria.

The CCAP will include:

I. Vulnerability snapshots: findings shared in this report, and additional information about the resources we evaluated.
II. Strategies and actions linked to *all* the resources evaluated in Table 1.
III. Priority actions based on the Commission's final set of criteria, determined in September.

IV. Implementation guidance for top priority actions to be completed in 2022-2023: *Who is responsible, what initial steps are required, what partners will be involved, what deliverables are expected (if known)*

## VI. Progress on mitigation action-planning

The vulnerability and risk ranking process informs our next steps in addressing both adaptation to climate change impacts as well as mitigation, or greenhouse gas reduction. Staff intends to focus on the greatest opportunities for Commission influence in the National Scenic Area. Based on our current understanding, those greatest opportunities are listed here. We will be working through the summer and presenting back to the Commission what we learn about these opportunities:

- Transportation-related emissions reduction;
- Protecting carbon storage in forests and grasslands from conversion and wildfire;
- Exploring options to increase energy efficiency in buildings and other development.

We will also be asking what we can do as an agency to mitigate our carbon emissions. While the Commission's carbon footprint may be small in comparison to these other opportunity areas, we have a chance to walk the talk of climate change mitigation and show our earnest commitment. In exploring what the Commission can do, we seek to incorporate emissions reduction into the way we do our work planning and day-to-day business. Actions will not take significant staff capacity away from pursuing high-priority and high-impact actions.

Simple tools exist to calculate, report, and reduce our footprint, including the widely used Climate Registry. Organizations who become members of the registry gain technical support and access to a nationwide reporting system. A tool like this may help us evaluate and improve post-COVID travel and meeting options, office space heating and cooling, remote work, and life cycle of supplies and equipment, as examples.

## VII. Next steps in developing the CCAP

### Discussion questions for June 8 Commission meeting:

1. *What feedback do Commissioners have about these initial relative rankings of climate change vulnerabilities in the NSA?*
2. *What input do Commissioners have on the suggested first filter criteria for prioritizing areas of focus (page 19)? What resources or values are rising to the top for you?*
3. *What do Commissioners most want to learn more about through summer meetings? Do you have suggestions for who to involve in discussions around these most vulnerable resources and highest impact mitigation opportunities?*

## Staff work:

- Working with the Review Committee, staff will refine a list of options for adaptation and mitigation actions associated with all the resources and mitigation topics identified in this report.
- Staff will host Review Committee meetings and at least one public forum to fill information gaps, refine actions, and fill in the criteria for prioritization.
- We look forward to the next Commission work session. This session will focus on applying the criteria to select priority actions from among a detailed list of options.

*Table 3. Tribes, agencies, and organizations, in addition to Commissioners and staff, who have contributed input to the vulnerability snapshots or reviewed sections of this report to date.*

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|---|
| Columbia Land Trust<br>Columbia River Gorge National Scenic Area – Forest Service Staff<br>Columbia River Intertribal Fish Commission<br>Confederated Tribes of the Umatilla Indian Reservation<br>East Cascades Oak Partnership<br>EcoADAPT<br>Friends of the Columbia Gorge Land Trust<br>Friends of the Historic Columbia River Highway<br>League of American Bicyclists<br>Lower Columbia Estuary Partnership<br>Multnomah County Bicycle & Pedestrian Advisory Committee<br>Nez Perce Tribe<br>Oregon Department of Transportation<br>Oregon Governor's Office<br>United States Forest Service Northwest Oregon Ecology Group<br>United States Geological Survey<br>Washington Department of Fish and Wildlife<br>Yakama Nation Fisheries |

# VIII. Ways to learn more

- U.S. Forest Service storymaps – short, interactive maps showing historic and predicted conditions, nationwide.
    - A Changing Climate: https://storymaps.arcgis.com/stories/7d3ce3089c1943689984f4fac8506fd9
    - Climate Change Pressures in the 21st Century: https://storymaps.arcgis.com/stories/9ee0cc0a070c409cbde0e3a1d87a487c
    - Forest Disturbances and Drought: https://storymaps.arcgis.com/stories/c384cf58659048958849e716471c0dd7
    - Snow Drought in the 21st Century: https://storymaps.arcgis.com/stories/41e443ccad054e49bcd06e00aeec8085

    - Stream Temperature and Native Trout: https://storymaps.arcgis.com/stories/252c90fbbf7f4559abd3953e2431dc4f
- Food sovereignty stories from several First Nations. *Gather*, the film, is available for rent and for organized screenings: https://www.nativefoodsystems.org/
- EPA Climate Indicators – state, national, and global trend data on a number of indicators: https://www.epa.gov/climate-indicators

## IX. Additional references


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