Nez Perce–Clearwater National Forests
Forest Plan Assessment

3.0 System Drivers

June 2014

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3. System Drivers

This section includes information regarding dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change, and the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change.

3.1 Climate Change

3.1.1 *Existing Information*

- The Forests prepared the first Climate Change Scorecard in 2011. This assessment, which now occurs annually, describes the current status of the Forests' integration of climate change knowledge into forest management and decision making.
- The Nez Perce Tribe prepared the *Clearwater River Subbasin (ID) Climate Change Adaptation Plan* (Clark and Harris 2011). This report was prepared in cooperation with the Nez Perce–Clearwater National Forests staff.
- A non-profit group, EcoAdapt, prepared the *Vulnerability Assessment for Resources of the Nez Perce-Clearwater National Forests* (EcoAdapt 2014). This report was prepared specifically for the Nez Perce-Clearwater National Forests by EcoAdapt, using input and analyses contributed by a Forest Service interdisciplinary team of resource management professionals.
- The Forest Service maintains a Web site[1] to disseminate climate change information, including research, education tools, and numerous assessment tools.

3.1.2 *Informing the Assessment*

This section provides the following background information relevant to the likely effects of climate change:

- Evaluate the description of natural disturbance regimes during the reference period and compare it with the type and frequency of current natural disturbances. Determine whether disturbance regimes have been disrupted to a degree that impairs ecological integrity.
- Consider changes in predominant climatic regimes, evaluating climate characteristics such as precipitation, temperature, growing season, or drought.
- Consider broadscale disturbance regimes, including wildfire, wind, and flooding, where applicable. Identify uncharacteristic conditions, such as locations where fire exclusion has resulted in unusually high levels of fuel buildup or where dams have impacted the hydrologic process.
- Evaluate natural vegetation succession, identifying human-caused changes in successional size class condition. Altered succession can impair pathways that may maintain vegetation in an uncharacteristic age or development of ecosystem processes (e.g., recruitment of large woody debris). Consider scarcity and abundance of successional states relative to the reference period.

[1] http://www.fs.fed.us/ccrc/

- Referring to the key ecosystem characteristics selected for evaluation, identify stressors that have already degraded or impaired ecological integrity or that may directly or indirectly do so in the future.
- Evaluate the ability of ecosystems within the plan area to adapt to changes imposed by the stressors while retaining their ecological integrity. Adaptation of ecosystems may occur through functional redundancies and/or evolutionary or behavioral adaptations of species.
- Where data are available, consider the influence of changing climate and other large-scale disturbances on the key characteristics of ecosystem integrity to evaluate their vulnerability to potential future conditions and ability to provide ecosystem services and other benefits to society. A forward-looking vulnerability assessment may be used to provide insight into ecosystem capabilities, opportunities for restoration, the ability to provide ecosystem services and other benefits to society, or reveal trajectories beyond the scope of restoration to any approximation of historical conditions.

Using the above bullets as guides to analyzing the observed and expected effects of climate change, the following results were documented in the vulnerability assessment for the Nez Perce–Clearwater National Forests (Ecoadapt 2014). Much of the text below was adapted from Ecodapt (2014).

Climate in the Western U.S., including the Nez Perce-Clearwater, is strongly influenced by naturally occurring climate cycles such as the 20–30 year Pacific Decadal Oscillation (PDO) and the 1–2 year El Nino-Southern Oscillation (ENSO). These large-scale climate patterns influence the local climate in the Nez Perce-Clearwater by causing warmer/cooler and drier/wetter conditions depending on the phase of the PDO and ENSO. Currently, there is relatively low ability to predict changes in the PDO and ENSO, and it has proven difficult to understand how climate change may influence these naturally occurring phenomena. Climate models are better at predicting general trends in climate rather than detailing year-to-year variability.

Over the past 30 years, air temperature has been increasing an average of 0.13 °C per decade (Isaak et al. 2011, cited in EcoAdapt 2014), with annual average minimum temperatures increasing 0.26 °C per decade and annual average maximum temperatures increasing 0.34 °C per decade (Littell et al. 2011, cited in EcoAdapt 2014). Precipitation trends for the region are mixed, with some areas showing declines in annual precipitation of –1 cm or greater and others showing increases in annual precipitation of +1 cm or greater (Littell et al. 2011, cited in EcoAdapt 2014). The following historic changes have also occurred:

- Increased snow water equivalent (SWE, amount of water contained in snowpack) of 0%–0.5% per year from 1916 through 2003 (Hamlet et al. 2005, cited in EcoAdapt 2014)
- Little-to-no shift in timing of snowmelt from 1916 through 2003 (90% of snowmelt occurred 0–5 days later) (Hamlet et al. 2005, cited in EcoAdapt 2014)
- Increased average in stream temperatures of 0.01 °C per decade over the past 30 years (Isaak et al. 2011, cited in EcoAdapt 2014)
- An average decrease in flow of 2.1% per decade over the past 30 years for unregulated streams, whereas regulated streams have seen a decrease in flow of 2.8% (Isaak et al. 2011, cited in EcoAdapt 2014)
- Increased wildfire frequency and greatest absolute increase in large wildfires has occurred in forests of the Northern Rockies (Westerling et al. 2006, cited in EcoAdapt 2014)

Over the next century, annual temperatures across the Nez Perce-Clearwater are expected to continue to increase by approximately +2 °C by 2040 and +4 °C by 2080 (Littell et al. 2011, cited in EcoAdapt 2014; Table 1-3). Exact precipitation patterns in the future are uncertain, but in general, summer is projected to be drier while spring, winter and fall will be wetter relative to historic averages (Littell et al. 2011, cited in EcoAdapt 2014). Precipitation will fall more often in the form of rain rather than snow, decreasing seasonal snowpack and increasing flood risk. Warmer temperatures in the summer and fall will increase evapotranspiration rates causing more severe summer low flows in rivers and reduced soil moisture. Warmer and drier conditions will increase the likelihood of wildfire across the Nez Perce-Clearwater. Climate models are better at predicting some climate-driven changes, such as higher temperatures and lower snowpack, than others (e.g., precipitation change). Specifically, the following changes are projected for the Nez Perce-Clearwater:

- By 2080, average annual temperature across the Nez Perce-Clearwater is expected to increase by 3.5 °C, with warmer seasonal temperatures generally occurring in the summers (Littell et al. 2011, cited in EcoAdapt 2014).
- By 2080, precipitation is generally expected to decrease in summer (–16%) and increase in spring (+8%), winter (+9%), and fall (+8%) (Littell et al. 2011, cited in EcoAdapt 2014).
- By 2080, combined flows (runoff + baseflow) are projected to increase in winter (+40%) and decrease in summer (–39%) (Littell et al. 2011, cited in EcoAdapt 2014).
- Annual snowpack is projected to decline ~42%–46% by 2080 (Littell et al. 2011, cited in EcoAdapt 2014).
- Historically snow dominated basins are projected to become transitional (i.e., those basins with between 10%–40% of winter precipitation entrained in April 1 snowpack) and transitional basins are projected to become rain dominated by the 2040s (Littell et al. 2011, cited in EcoAdapt 2014), which has the potential to cause large changes in the timing and magnitude of seasonal hydrographs (Elsner et al. 2010, cited in EcoAdapt 2014).
- July 1 soil moisture is projected to decline by up to 35% across the entire Nez Perce-Clearwater by 2040, with decreases especially strong over mountainous areas (Littell et al. 2011, cited in EcoAdapt 2014).
- In the summer, stream temperatures may warm at rates of 0.3–0.45 °C per decade, causing a net increase of 1.2–1.8 °C by mid-century (Isaak et al. 2011, cited in EcoAdapt 2014). Further, stream isotherms may shift 5–143 km upstream if air temperatures rise by 2 °C (Isaak and Rieman 2013, cited in EcoAdapt 2014).
- Warming winters with lower snowpack and increased proportion of rain to snow will likely lead to increases in area burned (Littell et al. 2009), and warming spring and winter conditions will likely continue to lengthen fire season (e.g., Westerling et al. 2006, cited in EcoAdapt 2014).

Table 3-1. Historic and projected climate changes for the Columbia Basin (Littell et al. 2011, cited in EcoAdapt 2014). Historic changes in temperature and precipitation are from 1950 through 2006. Projected changes for the 2040s and 2080s were calculated by comparing projections with baseline values (1916-2006). April 1 Snow Water Equivalent (SWE) is a measure of the amount of water contained in snowpack. Combined flow includes both runoff and baseflow.

Climate Variable	Historic change (1950–2006)	Projected change (2040s)	Projected change (2080s)
Tmin	+1.0˚C	—	—
Tmax	+1.0˚C	—	—
Average annual temp	—	+1.8 °C to +2.7 °C	+2.7 °C to + 4.6 °C
Precipitation	–3.6 mm	-2% to +4%	–5% to +2%
April 1 SWE	—	-21% to –36%	–42% to –46%
July 1 soil moisture	—	-36% to –42%	–28 to –35%
Combined flow: DJF	—	+9% to +46%	+7% to +40%
Combined flow: JJA	—	–23% to –27%	–34% to –45%
Combined flow: MAM	—	+0.7% to +15%	+1% to +17%
Combined flow: SON	—	-3.4% to +42%	–16% to +40%

Note: DJF: Period of December, January, and February; JJA: Period of June, July, and August; MAM: Period of March, April, and May; SON: Period of September, October, and November

Twenty-eight resources, including 8 ecosystems and 20 species, were identified as important by the Nez Perce-Clearwater National Forests as part of their forest plan revision process and are considered in this Assessment (Table 3-2). This Assessment centers on the Nez Perce-Clearwater region of Idaho (Figure 3-1).

Table 3-2. The final 28 ecosystems and species that were considered in the vulnerability assessment process

Ecosystems	Species
Aquatic	Bull trout
	Cutthroat trout
	Fall Chinook salmon
	Interior redband trout
	Spring Chinook salmon
	Steelhead
	Westslope cutthroat trout
Coastal disjunct	Red alder
Dry forest	Flammulated owl
	Lewis's woodpecker
	Pygmy nuthatch
	White-headed woodpecker
Grassland/shrubland	Spalding's catchfly
Mixed mesic	Fisher
Riparian	Coeur d'Alene salamander
	Giant salamander
Subalpine	Canada lynx
	Mountain goat
	Whitebark pine
	Wolverine
Wetlands, moist meadows, groundwater dependent ecosystems	None

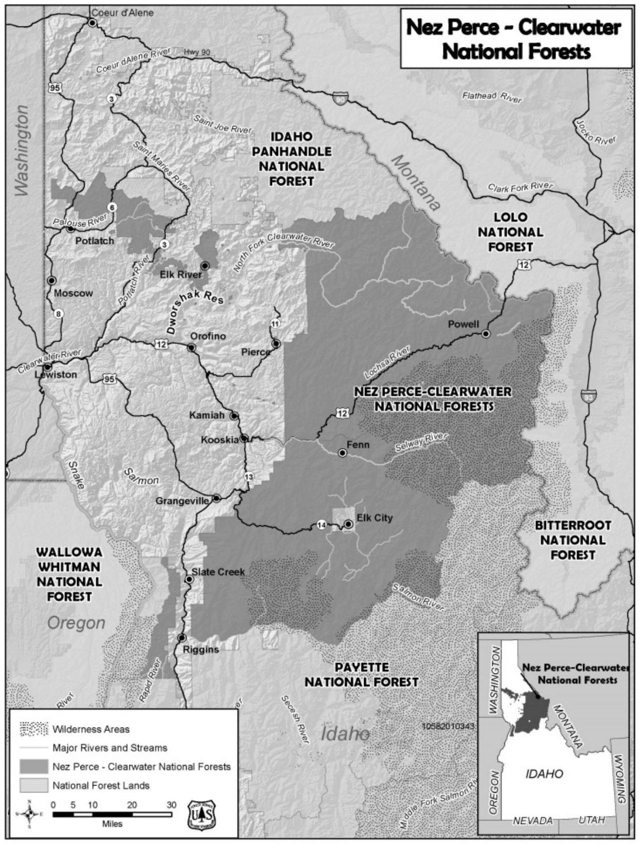

Figure 3-1. Nez Perce-Clearwater National Forests

The vulnerabilities for eight ecosystems (aquatic, coastal disjunct, dry forest, grassland, mixed mesic, riparian, subalpine, and wetlands/moist meadows/groundwater dependent ecosystems [GDEs]) are summarized in Figure 3-2. This figure is arranged such that ecosystems listed in the upper left region were judged to have less relative vulnerability than those listed in the lower right region. Relative vulnerability does not include an evaluation of future climate exposure, as exposure for each ecosystem was not ranked as part of this assessment[2]. Ecosystems assessed as having high sensitivity included aquatic, coastal disjunct, mixed mesic, riparian, and subalpine. Most ecosystems were assessed as having fairly moderate adaptive capacity (ranged from low-moderate to moderate-high; Figure 3-3).

The subalpine ecosystem was judged to be more sensitive than the other systems, having a combination of very high sensitivity to climate and climate-driven changes (temperature, reduced soil moisture and drought, wildfire), disturbance regimes (insects and disease outbreaks), and non-climate stressors (fire suppression). Grasslands and wetlands/moist meadows/GDEs were assessed as the ecosystems with the lowest sensitivity (low-moderate)—grasslands due to their lower sensitivity to climate and climate-driven changes and non-climate stressors, and wetlands/moist meadows due their moderate sensitivity to climate and non-climate stressors.

[2] While future climate exposure was not scored as part of this assessment, exposure factors were ranked in order of importance for each ecosystem. See Table 1-3 for an example.

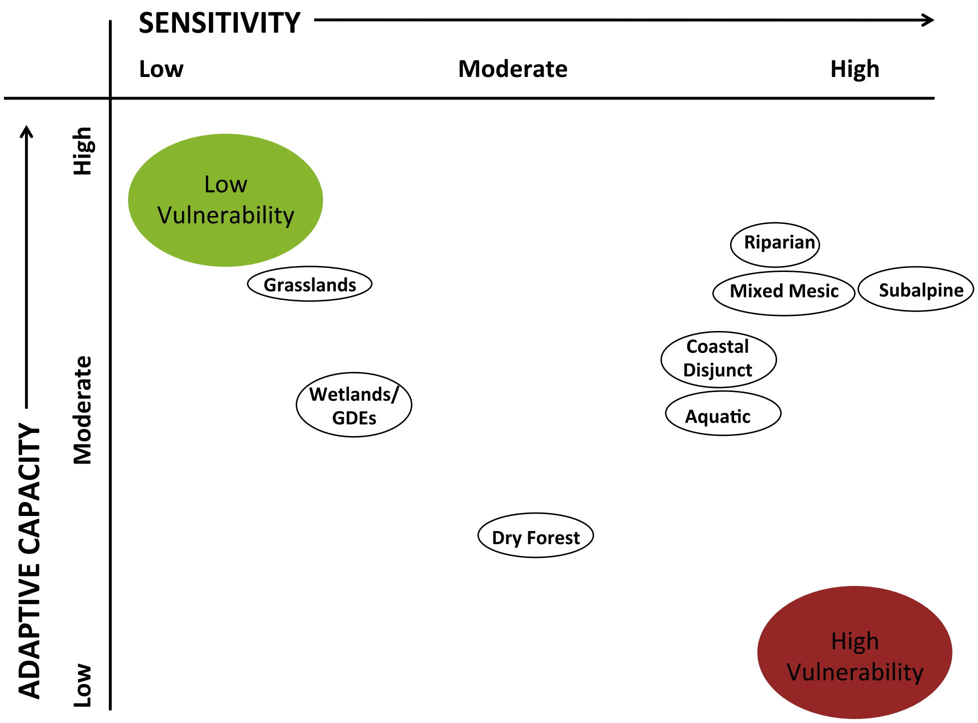

Figure 3-2. Relative vulnerabilities of eight Nez Perce-Clearwater ecosystems based on the climate change sensitivity and adaptive capacity assessment. Relative vulnerability, which does not include a measure of future climate exposure, increases with increasing sensitivity and decreasing adaptive capacity. Ecosystems listed in the upper left region were judged less vulnerable than those listed in the lower right region. Overall confidence for ecosystem sensitivities and adaptive capacities ranged from moderate to high.

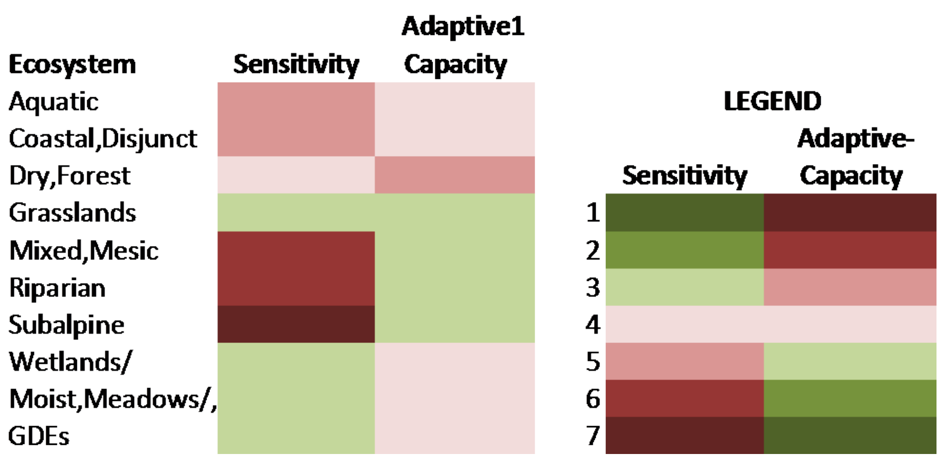

Figure 3-3. Sensitivity and adaptive capacity scores for eight Nez Perce-Clearwater ecosystems. Rankings for each element of ecosystem sensitivity or adaptive capacity were averaged to generate the overall ecosystem sensitivity or adaptive capacity score.

Dry forest ecosystems were judged to have the lowest adaptive capacity, due to degraded structural and functional integrity and its occurrence in isolated patches, likely influenced by timber harvest. More in-depth explorations of ecosystem vulnerabilities are presented in Table 1-3 below.

Figure 3-4 summarizes the vulnerability of seven species or species assemblages[3] considered including aquatic species[4], Canada lynx/wolverine (evaluated together), dry forest birds[5], fisher, mountain goat, red alder, Coeur d'Alene and Idaho giant salamanders[6], and Spalding's catchfly. This figure is arranged similarly to Figure 3-2 in that species listed in the upper left region were judged to be less vulnerable than species listed in the lower right region. Most species and species assemblages were ranked between moderate to high sensitivity, with red alder as the exception (low to moderate sensitivity). Similarly, the majority of species and species assemblages were also judged to have moderate adaptive capacity. The exceptions included aquatic species (assessed as having high adaptive capacity) and Spalding's catchfly (assessed as having low-moderate adaptive capacity; Figure 3-5).

Species and species assemblages with the highest sensitivity included Canada lynx/wolverine, dry forest birds, and Coeur d'Alene and Idaho giant salamanders. Canada lynx and wolverine sensitivity was ranked high, due to a combination of high sensitivity to indirect climate and climate-driven changes, dependencies on specific habitats and prey species, and sensitivity to non-climate stressors (e.g., logging). Dry forest bird species and salamanders were also judged to have high sensitivity, primarily due to habitat and forage/prey dependencies and non-climate stressors. Red alder was judged to have the lowest sensitivity of evaluated species. While their sensitivity to climate and climate-driven changes was ranked moderate-high, they are a disturbance-loving species that may benefit from warming temperatures, reduced snowpack, and increased frequency of low to moderate severity wildfires.

Aquatic species were assessed as having the highest adaptive capacity, likely due to a combination of habitat connectivity within the Nez Perce-Clearwater region, a diversity of life history strategies and phenotypic/behavioral plasticity, high societal value, and high potential to manage use conflicts within the region. Conversely, Spalding's catchfly was ranked as having the lowest adaptive capacity due to their small, fragmented populations, limited ability to disperse, and low genetic diversity.

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[3] Whitebark pine species were also considered as part of this assessment; however, the expert did not assign any scores or rankings. See Section 5 for a summary of whitebark pine vulnerability.

[4] Aquatic species considered as part of this assessment included: Fall and Spring Chinook salmon, steelhead, cutthroat trout, westslope cutthroat trout, bull trout, and interior redband trout.

[5] Dry forest bird species considered as part of this assessment included: flammulated owl, Lewis's woodpecker, pygmy nuthatch, and white-headed woodpecker.

[6] Coeur d'Alene and Idaho giant salamanders were not included in Figure 3-4 as the adaptive capacity of these species was not scored by experts.

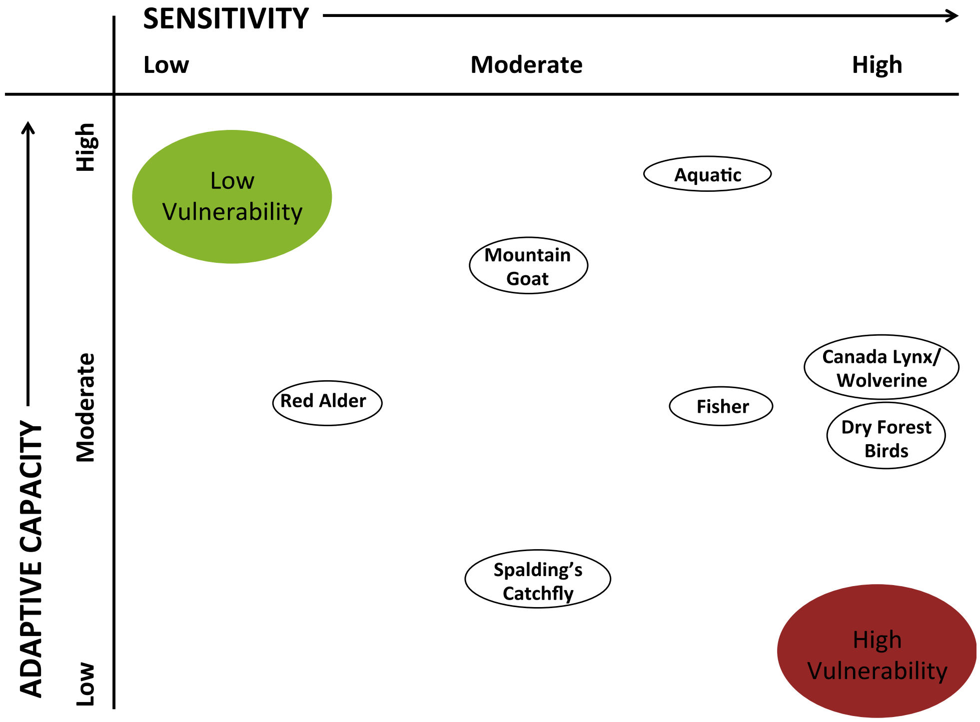

Figure 3-4. Relative vulnerabilities of seven Nez Perce-Clearwater species or species assemblages based on the climate change sensitivity and adaptive capacity assessment. Relative vulnerability, which does not include a measure of future climate exposure, increases with increasing sensitivity and decreasing adaptive capacity. Species listed in the upper left region were judged less vulnerable than those listed in the lower right region. Overall confidence for species sensitivities and adaptive capacities ranged from moderate to high.

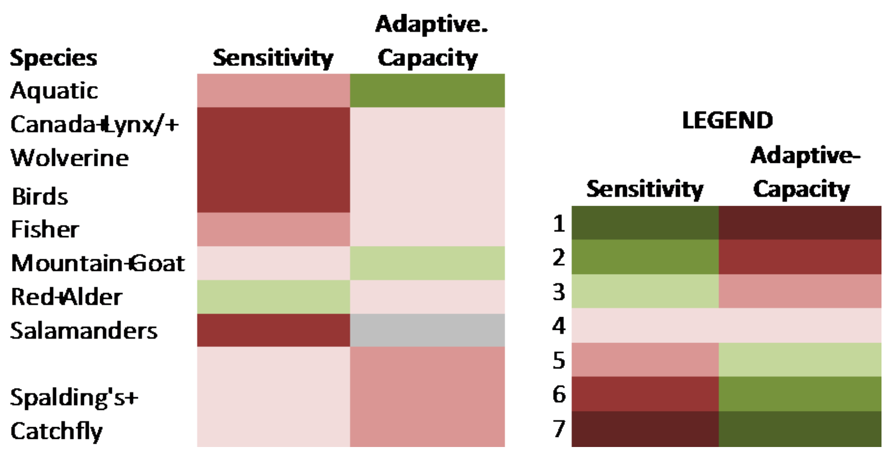

Figure 3-5. Sensitivity and adaptive capacity scores for seven Nez Perce-Clearwater species and species assemblages. Rankings for each element of species sensitivity or adaptive capacity were averaged to generate the overall species sensitivity or adaptive capacity score.

3.1.3 *Information Needs*

None at this time

Table 3-3. Key sensitivity, exposure, and adaptive capacity elements summarized for each of eight Nez Perce-Clearwater ecosystems. (+) indicates those factors that contribute positively to adaptive capacity. (-) indicates those factors that contribute negatively to adaptive capacity.

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY

Aquatic	**Overall Sensitivity: Mod-High**
	
	Sensitivities to Climate and Climate-Driven Changes:
	• Increased stream temperatures
	• Changes that affect hydrologic regimes including:
	  o Altered precipitation timing and amount
	  o Decreased snowpack and earlier snowmelt
	  o Shifts from snow to rain
	
	Sensitivities to Non-Climate Stressors:
	• Transportation corridors
	• Logging
	• Fire suppression
	• Dams and water diversions
		Key Exposure Factors*:
		• Warming air temperatures (leading to increased stream temperatures)
		• Changes in precipitation type, timing and amount that affect hydrologic regimes
		• Altered wildfire regimes
		
		*Listed in order of importance to consider for the system
			Overall Adaptive Capacity: Moderate
			
			Key Factors Influencing Adaptive Capacity:
			• (+) High physical and topographical diversity
			• (+) Moderate to highly continuous in the region
			• (+) High component species and functional group diversity
			• (+) Moderate-high societal value
			• (-) Features disruptions due to human-related activities (e.g., dams, habitat alteration)
			• (-) Degraded structural/functional integrity
			• (-) Significant use conflicts limit management potential

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Coastal Disjunct	**Overall Sensitivity: Mod-High** **Sensitivities to Climate and Climate-Driven Changes:** • Decreased soil moisture • Drought • Extreme temperature events • Wildfire **Sensitivities to Non-Climate Stressors:** • Logging • Fire suppression • Grazing • Recreation	**Key Exposure Factors*:** • Drought • Decreased soil moisture • High temperatures • Increased wildfire frequency and severity *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Moderate** **Key Factors Influencing Adaptive Capacity:** • (+) High component species and functional group diversity • (+) High societal value • (+) Moderate to high potential for managing use conflicts • (-) Exists in limited, “patchy” areas due to moist microclimate requirements • (-) Barriers to system continuity (e.g., logging, land use conversion) • (-) Currently degraded condition

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Dry Forest	**Overall Sensitivity: Moderate** **Sensitivities to Climate and Climate-Driven Changes:** • Decreased soil moisture • Precipitation changes and drought • Cold temperatures • Wildfire **Sensitivities to Non-Climate Stressors:** • Fire suppression • Insect and disease outbreak	**Key Exposure Factors*:** • Wildfire • Decreased soil moisture and drought • Increased temperatures *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Low-Mod** **Key Factors Influencing Adaptive Capacity:** • (+) High societal value • (+) High potential for managing use conflicts • (-) Exists in isolated patches, which is likely influenced by timber harvest • (-) Moderately degraded condition • (-) Low to moderate physical, topographic, and component species diversity

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Grasslands	**Overall Sensitivity: Low-Mod** **Sensitivities to Climate and Climate-Driven Changes:** • Altered wildfire regimes • Precipitation changes • Drought **Sensitivities to Non-Climate Stressors:** • Invasive species • Fire suppression • Grazing	**Key Exposure Factors*:** • Wildfire *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Mod-High** **Key Factors Influencing Adaptive Capacity:** • (+) Moderate to high physical, topographic, and component species diversity • (+) High societal value • (+) High potential for managing use conflicts • (-) Exists in isolated patches • (-) Altered structural/functional integrity

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Mixed Mesic	**Overall Sensitivity: High** **Sensitivities to Climate and Climate-Driven Changes:** • Decreased soil moisture • Drought • Wildfire **Sensitivities to Non-Climate Stressors:** • Insect and disease outbreaks • Fire suppression	**Key Exposure Factors*:** • Altered wildfire regimes • Drought • Decreased soil moisture *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Mod-High** **Key Factors Influencing Adaptive Capacity:** • (+) Features high system continuity and diversity • (+) Likely moderate to high societal value although there is reluctance to accept stand replacement as a restoration tool for the system • (-) Degraded structural and functional integrity

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Riparian	**Overall Sensitivity: High** **Sensitivities to Climate and Climate-Driven Changes:** • Altered precipitation (rain and snow) • Earlier snowmelt • Altered flow regimes • Reduced soil moisture • Drought • Wildfire **Sensitivities to Non-Climate Stressors:** • Invasive species • Grazing • Transportation corridors • Dams and water diversions	**Key Exposure Factors*:** • Changes in precipitation type, timing and amount that affect hydrologic regimes and water availability • Decreased soil moisture • Drought • Wildfire *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Mod-High** **Key Factors Influencing Adaptive Capacity:** • (+) Features high topographic, component species, and functional group diversity • (+) Likely high societal value • (-) Degraded structural and functional integrity • (-) Low to moderate management potential (e.g., due to conflicts with transportation corridors)

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Subalpine	**Overall Sensitivity: Very High** **Sensitivities to Climate and Climate-Driven Changes:** • Temperature increases • Reduced soil moisture • Drought • Wildfire **Sensitivities to Non-Climate Stressors:** • Insect and disease outbreaks • Fire suppression	**Key Exposure Factors*:** • Increased temperatures • Drought • Reduced soil moisture (e.g., due to earlier snowmelt and reduced snowpack) • Altered wildfire regimes *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Mod-High** **Key Factors Influencing Adaptive Capacity:** • (+) High component species diversity • (+) Likely high societal value and moderate potential to manage use conflicts (e.g., whitebark pine restoration in lynx habitat) • (-) Isolated at upper elevations with limited room to vertically migrate • (-) Moderately degraded integrity • (-) Low physical, topographic, and functional group diversity

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
Wetlands/Moist Meadows/GDEs	**Overall Sensitivity: Low-Moderate** **Sensitivities to Climate and Climate-Driven Changes:** • Decreased precipitation and drought • Decreased snowpack and earlier snowmelt • Reduced soil moisture • Decreased flows • Wildfire **Sensitivities to Non-Climate Stressors:** • Logging • Grazing • Invasive species	**Key Exposure Factors*:** • Altered precipitation • Decreased snowpack • Drought • Reduced soil moisture • Decreased flows *Listed in order of importance to consider for the system	**Overall Adaptive Capacity: Moderate** **Key Factors Influencing Adaptive Capacity:** • (+) Features high structural and functional integrity • (+) High ecological value • (+) Management potential for the system is likely high • (-) Low physical/topographical and functional group diversity • (-) Low to moderate social value

3.2 Insects and Disease

Insects and diseases are ongoing ecosystem drivers that have been discussed fully in section 1.1.

3.3 Invasive Weeds

3.3.1 *Existing Information*

- Interior Columbia Basin Ecosystem Management Project (ICBEMP 2000)
- Evaluation Report: Invasive Weeds: Clearwater National Forest (Dohmen 2006a)
- Evaluation Report: Invasive Weeds: Nez Perce National Forest (Dohmen 2006b)
- Invasive weed strategy, conserve/restore existing condition, Clearwater National Forest
- Invasive weed strategy, conserve/restore desired future condition (DFC), Clearwater National Forest
- Invasive weed strategy, conserve/restore existing condition, Nez Perce National Forest
- Invasive weed strategy, conserve/restore DFC, Nez Perce National Forest
- Invasive weed risk maps by dryland, mountain, meadow, and disturbance groups
- Draft Analysis of the Management Situation (Forest Service 2003a)
- Cooperative Weed Management Areas (Palouse, Clearwater Basin, Upper Clearwater, Joseph Plains, Salmon River, Frank Church River of No Return Wilderness), Strategic Plans, and annual reports
- Ecosystem Analysis at the Watershed Scale (EAWS) (see “Watershed” section of the Assessment)
- Planning Unit Assessments (PUA) (see “Watershed” section of the Assessment)
- Frank Church River of No Return Wilderness, Noxious Weed Treatments, Final Supplemental Environmental Impact Statement (Forest Service 2007)
- Selway-Bitterroot Invasive Plants Environmental Impact Statement (Forest Service 2009)

3.3.2 *Informing the Assessment*

An invasive weed is a plant species that is nonnative to an ecosystem and that, upon its introduction there, causes or is likely to cause economic or environmental harm or harm to human health. Noxious weeds are those plant species that have been designated by federal, State, or County officials as undesirable vegetation. The Idaho Noxious Weed Law defines a noxious weed as any exotic plant species that is established or that may be introduced in the State, which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial use and is further designated as either a statewide or countywide noxious weed. These species are generally new or not common to the United States (Forest Service 2003b; Executive Order 13112).

Noxious weeds present the most immediate and disruptive threat to ecosystem function and integrity nationally, regionally, and on the Forests. Noxious weed infestations are difficult to manage and can substantially change biological diversity by affecting the amount and distribution of native plants and animals. They can also negatively affect forest regeneration, wildlife and livestock forage, native plants associated with tribal rights, landscape and soil productivity, fire cycles, nutrient cycling, riparian and hydrologic function, water quality, and human recreational activities (ICBEMP 2000).

Invasive weed inventories for the Forests record 80 different invasive weed species, occupying 425,080 acres within or adjacent to the Forests. Invasive weed species that have the ability to infest and impact large areas are of particular concern (Table 3). Managers consider approximately 500,000 acres within the Forests to be "weed free." Early detection and treatment of invasive weeds in these relatively weed-free areas is a significant management priority.

Table 3-4. Invasive plant species of management concern

Common Name	Scientific Name	Infested Acres Clearwater National Forest	Infested Acres Nez Perce National Forest
Spotted knapweed	*Centaurea biebersteinii*	53,830	145,991
Rush skeletonweed	*Chondrilla juncea*	414	14,033
Yellow star-thistle	*Centaurea solstitialis*	303	96,382
Meadow hawkweed	*Hieracium caespitosum*	21,762	292
Orange hawkweed	*Hieracium aurantiacum*	2,421	1,222
Common curpina	*Crupina vulgaris*	0	11,550
Dalmatian toadflax	*Linaria dalmatica*	183	2,128
Scotch thistle	*Onopordum acanthium*	17	6,678

Some landscapes are more susceptible to weed invasion than others, due to the similarity of environmental conditions in the area where the invading plant originated and the productivity of the site being invaded. The dry low-elevation grasslands and open pine timber stands of the Salmon River and Clearwater River canyons are particularly prone to invasive weed establishment. This susceptibility can affect the rate of spread and the extent or size of infestations. Susceptibility evaluations identify at-risk landscapes or habitats most vulnerable to invasion (ICBEMP 1997; Forest Service 2003b).

Invasive weeds pose a serious threat to the diversity, integrity, and health of native plant communities on the Nez Perce–Clearwater National Forests. The Nez Perce and Coeur d'Alene Indian Tribes have historic and current interests. Managing invasive weeds has significant implications to their cultural and resource values and needs.

Watershed conditions on the Clearwater National Forest have been influenced by the introduction of invasive species into the area. All 5th field HUC watersheds on the Clearwater National Forest contain invasive weed populations. New infestations along roads and trails, on National Forest System lands, and on other landownerships are occurring. In some areas, expansion is outpacing containment and control efforts (Dohmen 2006a,b). Various methods of dispersal have led to the establishment of invasive weed infestations, which are particularly likely to occur after ground disturbances (e.g., timber harvest, prescribed burning, and wildland fire events). These types of ground-disturbing events have provided favorable conditions for invasive weed establishment by clearing vegetation and/or exposing mineral soils. Roads, trails, and rivers have been identified as the primary conduits or vectors for invasive plant establishment and spread (ICBEMP 1997; Forest

Service 2003b). In addition, the failure to integrate prevention and early detection in past project development and implementation has allowed invasive weeds to spread. Managers face a continued threat from potential new invasive species. Using recreational vehicles and watercraft, riding and pack stock, and fire suppression may exacerbate the spread of potential new nonnative weed species.

The introduction of invasive weeds has highly altered grassland steppe communities within the South Fork Clearwater Subbasin. Annual grasses and noxious weeds are well established at low elevations. Fire behavior and soil productivity may change in response to these altered plant communities (Forest Service 1998).

The occurrence of invasive weeds within the Salmon River Canyon, including the Frank Church River of No Return Wilderness, is a significant concern to managers and Wilderness users due to the potential adverse ecological effects of these weed species. Noxious weeds and nonnative invasive species threatens every aspect of ecosystem health and productivity, in forests and on rangelands, on public lands and private lands (Forest Service 1998). Many exotic plants are aggressive and can invade new areas at an alarming rate because of explosive seed production and physiological adaptations to disturbed or droughty sites. Aggressive invasive species, such as yellow star-thistle, rush skeletonweed, and spotted knapweed, are capable of outcompeting native plants and altering ecosystem conditions and processes. These weed species dominate many sites in the Salmon River Canyon and the Frank Church River of No Return Wilderness, affecting native wildlife and plants (Forest Service 2007).

Nonnative invasive plants are a growing concern in the Selway-Bitterroot Wilderness and surrounding areas. Without efforts to control these weeds, they will continue to expand into new areas, and the number of new weed species will increase. Weeds threaten wilderness values in the Selway-Bitterroot Wilderness, namely, native plant communities and natural ecosystems. Invasive species are a threat to the flora and fauna associated with or dependent upon the native plant communities being displaced; in addition, physical regimes such as those associated with fire and hydrology, may be altered. These natural functions and features of the landscape are a cornerstone of wilderness values (Forest Service 2009).

3.3.3 *Information Needs*

None identified at this time

3.4 Road Systems

Please see more information about road systems in section 10.1, “Transportation.”

3.5 Wildland Fire

3.5.1 *Existing Information*

- South Fork Landscape Assessment
- Middle Fork Landscape Assessment
- Fire’s Influence on ecosystems of the Clearwater National Forest: Cook Mountain fire history inventory (Barrett 1982)
- Fire history of the Clearwater–Nez Perce National Forests (Barrett 1995)

- Fire history of the River of No Return Wilderness: River Breaks Zone (Barrett 1984)
- Fire history of the Rapid River Drainage (Barrett 1987)
- Fire history and fuels assessment, South Fork Salmon River (Barrett 1988)
- Clearwater Land Management Plan (USDA Forest Service 1987a)
- Interior Columbia River Basin Assessment (USDA Forest Service 1994)
- Nez Perce Land Management Plan (USDA Forest Service 1987b)
- Clearwater/Nez Perce Fire History Atlas
- Review and update of the 1995 Federal Wildland Fire Management Policy (USDA Forest Service 2001)

3.5.2 *Informing the Assessment*

Studies performed for the Interior Columbia River Basin Assessment document an extensive fire history since the glaciers retreated and changes in vegetation composition (USDA Forest Service 1994). Climate has fluctuated from cool and moist to warm and dry, as indicated by the vegetation composition over the centuries. Studies indicate that fire behavior—low-intensity or stand-replacing—is responsive to these fluctuations in climate.

Fire suppression efforts since 1935 have been relatively successful. In recent years, however, the number and size of fires have increased throughout the west (Keane et al. 2002). This pattern is evident on the Nez Perce–Clearwater National Forests. Fuel accumulation in short, moderate, and long fire interval groups has occurred, with the potential result being more acres burning at higher fire intensities. The historic pattern of disturbance has also been altered, particularly in long fire interval areas. Fuel accumulations coupled with the warmer, drier weather of the past decade, has resulted in the current trend toward high-intensity fires. This is a departure from the historic pattern where fire intensities varied on the landscape.

Forest Service policy has encouraged use of natural fires where resource objectives are compatible—usually in designated wilderness areas or roadless areas adjacent to wilderness. Fuel loads have increased; with 60 to 70 years of fire exclusion and climatic conditions favorable to tree and shrub growth we’re seeing more evidence of fuel arrangements conducive to severe fires (ladder fuels). Even with increased use of natural fires, fewer acres are being burned today (both planned and unplanned ignitions) than burned historically (before fire exclusion policies began). Common recommendations from subbasin assessments and watershed analyses are for increased prescribed fire and/or natural fire in most ecosystems. This need is especially great where short fire return intervals were the norm historically.

3.5.3 *Information Needs*

No information needs

Literature Cited

Barrett, S. W. 1982. Fire's influence on ecosystems of the Clearwater National Forest: Cook Mountain Fire history inventory. Available at: USDA Forest Service Nez Perce-Clearwater National Forest. Supervisor's Office, Grangeville, ID.

Barrett, S. W. 1984. Fire history of the River of No Return Wilderness: River breaks zone. Available at: USDA Forest Service, Nez Perce-Clearwater National Forests, Supervisor's Office, Grangeville, ID.

Barrett, S. W. 1987. Fire history of the Rapid River Drainage. Available at: USDA Forest Service, Nez Perce-Clearwater National Forests, Supervisor's Office, Grangeville, ID.

Barrett, S. W. 1988. Fire history and fuels assessment, South Fork Salmon River. Available at: USDA Forest Service, Nez Perce-Clearwater National Forests, Supervisor's Office, Grangeville, ID.

Barrett, S. W. 1995. Fire History of the Clearwater–Nez Perce National Forests. Available at: USDA Forest Service, Nez Perce-Clearwater National Forest Supervisor's Office, Grangeville, ID.

Clark, K., and J. Harris. 2011. Clearwater River subbasin (ID) climate change adaptation plan. Lapwai, ID: Nez Perce Tribe, Water Resources Division.

Dohmen, A. R. 2006a. Evaluation report: Invasive weeds: Clearwater National Forest. Orofino, ID: U.S. Department of Agriculture, Forest Service, Clearwater National Forest.

Dohmen, A. R. 2006b. Evaluation report: Invasive weeds: Nez Perce National Forest. Grangeville, ID: U.S. Department of Agriculture, Forest Service, Nez Perce National Forest.

Douglas, J., T. J. Mills, D. Artly, D. Ashe, A. Bartuska, R. L. Black, S. Coloff, J. Cruz, M. Edrington, J. Edwardson, R. T. Gale, S. W. Goodman, L. Hamilton, R. Landis, B. Powell, S. Robinson, R. J. Schuster, P. K. Stahlschmidt, J. Stires, and J. van Wagtendonk. 2001. Review and update of the 1995 Federal wildland fire management policy. U.S. Department of Interior and U.S. Department of Agriculture. 78 p.

EcoAdapt. 2014. Vulnerability assessment for resources of the Nez Perce–Clearwater National Forests. Bainbridge Island, WA: EcoAdapt.

Interior Columbia Basin Ecosystem Management Group (ICBEMP). 1997. Interior Columbia Basin draft environmental impact statement. Washington, DC: U.S. Department of the Interior, Bureau of Land Management, and U.S. Department of Agriculture, Forest Service.

Interior Columbia Basin Ecosystem Management Project (ICBEMP). 2000. Interior Columbia Basin final environmental impact statement. Washington, DC: U.S. Department of the Interior, Bureau of Land Management, and U.S. Department of Agriculture, Forest Service.

Keane, R. E., K. C. Ryan, T. Veblen, C. D. Allen, J. Logan, and B. C. Hawkes. 2002. Cascading effects of fire exclusion in Rocky Mountain Ecosystems—A literature review. USDA Forest Service, Rocky Mountain Research Station. General Technical Report. RMRS-GTR-91.

Quigley, T. M., R. W. Haynes, and R. T. Graham. 1996. An integrated scientific assessment for ecosystem management in the Interior Columbia Basin and portions of the Klamath and Great basins. General Technical Report PNW-GTR-382. Portland, OR; USDA, Forest Service, Pacific Northwest Research Station. 303 pp

USDA Forest Service. 1987a. Clearwater National Forest Land and Resource Management Plan. Orofino, ID: USDA Forest Service, Clearwater National Forest.

USDA Forest Service. 1987b. Nez Perce National Forest Land and Resource Management Plan. Grangeville, ID: USDA Forest Service, Nez Perce National Forest.

USDA Forest Service. 1998. South Fork Clearwater landscape assessment: Executive summary. Grangeville, ID: U.S. Department of Agriculture, Forest Service, Nez Perce National Forest.

USDA Forest Service. 2003a. Draft analysis of the management situation. Orofino, ID: U.S. Department of Agriculture, Forest Service, Clearwater National Forest; Grangeville, ID: U.S. Department of Agriculture, Forest Service, Nez Perce National Forest.

USDA Forest Service. 2003b. Final environmental impact statement southwest Idaho Ecogroup land and resource management plans. Revised. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region.

USDA Forest Service. 2007. Frank Church-River of No Return Wilderness noxious weed treatments final supplemental environmental impact statement. Salmon, ID: U.S. Department of Agriculture, Forest Service, Salmon–Challis National Forest.

USDA Forest Service. 2009. Selway-Bitterroot invasive plants final environmental impact statement. U.S. Department of Agriculture, Forest Service, Clearwater, Nez Perce, Bitterroot, and Lolo National Forests; Idaho County, Idaho; and Ravalli County, Montana.