Draft Nez Perce–Clearwater National Forest Forest Plan Assessment

7.0 Ecosystem Services

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7. Ecosystem Services

The following key ecosystem services were identified as services contributed by the plan area (other services, including outdoor recreation, range, timber, watershed, and fish and wildlife, are discussed in the "Assessing Multiple Use" section):

- Provisioning Services
  - Clean Air
- Regulating Services
  - Clean Water (Filtration)
  - Flood Control
  - Carbon Sequestering
  - Climate Regulation
- Supporting Services
  - Nutrient Cycling
- Cultural Services
  - Cultural/Heritage Values
  - Recreation Experiences

7.1 PROVISIONING SERVICES

7.1.1 *Clean Air*

7.1.1.1 Existing Information

- Fire Ecology of Pacific Northwest Forest (Agee XXXX)
- South Fork Clearwater River landscape assessment
- Middle Fork Clearwater River Landscape Assessment
- Selway River Landscape Assessment
- Interior Columbia River Basin Environmental Impact Statement
- Clean Air Act (1962)
- National Environmental Policy Act

7.1.1.2 Informing the Assessment

Clean air is necessary for all life on earth, and air pollution has been associated with a range of adverse health and environmental effects, such as respiratory infections and acid rain. Trees absorb carbon dioxide through photosynthesis, intercepting airborne particles on leaf surfaces and producing oxygen for animals to breathe. The also play a critical role in capturing the six common air pollutants and toxic gases: ground-level ozone, particulate

matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. The pollutants come from dust, pollen, ash, motor vehicles, power plants, and other industrial sources.

A single tree in the forest can absorb 10 pounds of air pollution per year and produce 260 pounds of oxygen per year. The average person consumes 386 pounds of oxygen per year.

Trends and Drivers

Clean air will continue to be produced and filtered through the Nez Perce–Clearwater National Forests (Forests). The major impacts to air quality in the planning area are from agricultural burning and wood smoke. Both are highly regulated, and the regulations are expected to become even more stringent in the future. No large industrial complexes affect the planning area, and no additional industrial complexes are expected to impact air quality in the future.

Resource-Specific Information

The highly variable terrain on the Forests, coupled with high-pressure weather systems in the summer and fall, can heavily impact local air quality. Smoke from field burning and/ or forest fires can funnel into canyons and settle for days, producing unhealthy conditions in such locales. Usually, these conditions occur for only a few days.

7.1.1.3 Information Needs

None identified

7.2 REGULATING SERVICES

7.2.1 *Clean Water Filtration*

7.2.1.1 Existing Information

Drinking Water from Forests and Grasslands: A Synthesis of the Scientific Literature (Dissmeyer 2000)

Forest Service Watershed Condition Classification Technical Guide (Potyondy and Geier 2010)

7.2.1.2 Informing the Assessment

Current Condition

Providing clean water and filtration of clean water are accomplished naturally in the plan area at multiple scales, depending on the location of the point of diversion. Land-use practices in forests and grasslands can introduce contaminants to water. However, when these practices are applied over large areas, at low intensity, they can produce water that is cleaner than that produced by more-intensive land-use practices. At the local level, forest and grassland management may cause significant problems for drinking water sources. For example, high-intensity activities such as logging, mining, or urban-style development in

forests can cause considerable pollution, as can uncontrolled events such as floods, landslides, or accidental chemical spills. At the regional level, contaminants from forests and grasslands, even at low concentrations, are part of the overall, cumulative load of water pollution (Ryan 2000).[1]

Trends and Drivers

Numerous stressors have affected, currently affect, and are likely to continue to affect water quality in the plan area. In addition to natural sources of water pollution (e.g., landslides, erosion, wildfire, fish, and wildlife), many historic and ongoing activities can detrimentally affect water quality, including road building, timber harvesting, prescribed fire, pesticides, herbicides, recreation, grazing, and mining. In 2011, the Forests assessed watershed conditions, using the Watershed Condition Framework methodology (Potyondy and Geier 2010). Each Forest was found to have >100 watersheds with at-risk or impaired function (Table 1).

Table 1. Number of watersheds, by forest, with water quality issues assessed by watershed condition framework in 2011

Watershed Condition Framework Water Quality Indicators	Watersheds with Assessed Water Quality Issues	
	Clearwater National Forest	Nez Perce National Forest
303(d) listed	42	32
Flow diversions	4	31
Aquatic invasives	33	26
Roads	84	76
Soil erosion	22	59
Soil contamination	53	81
Fire	59	96
Range/grazing	31	38
Insects/disease	50	64
Other known problems (e.g., recreation, natural)	30	48
Total	103	117

The length of time that a particular activity affects water quality also varies with land use and site-specific characteristics. For example, sediment yields or concentrations following timber harvesting typically decrease, while changes in nutrient concentrations occur in relatively

[1] Chapter 22: Synthesis, *In* Dissmeyer, 2000.

brief pulses (Stednick 2000)[2]. Sediment yields from roads typically peak in the first few years but can remain elevated for decades, while contamination from roadside fuel spills can last for years (Elliot 2000, Swank 2000)[3]. Likewise, the residence time of fecal contamination in streams can be on the order of weeks to months (Scatena 2000)[4]. Mining debris can acidify surface and subsurface water for decades or longer (Wireman 2000a; Wireman 2000b)[5].

Past forest achievements meant to improve water quality conditions include riparian plantings to increase streamside shade; erosion control by decommissioning and reconstructing streamside roads; culvert replacement or removal; riparian area fencing; and mining reclamation. In 2011, 4 watersheds were designated as priority restoration watersheds: Upper Little Slate Creek, Upper Elk Creek, Upper Clear Creek, and Fishing Creek. A watershed restoration action plan (WRAP) was developed to designate the essential projects necessary for restoring each of these watersheds to a better condition. This effort is part of the Watershed Condition Framework, which provides the method to improve the way the Forest Service approaches watershed restoration by targeting the implementation of integrated suites of activities in those watersheds that have been identified as priorities for restoration. In addition to these priority restoration watersheds, the Forests have ongoing partnership restoration projects with the Nez Perce Tribe that include most of the Middle Fork Clearwater, South Fork Clearwater, Lochsa, and Selway River basins. The Forests also administer the Collaborative Forest Landscape Restoration Program (CFLRP), which includes most of the Middle Fork Clearwater and Selway River basins. These large-scale restoration efforts provide annual improvements to these watersheds.

There are 3 soil ecosystem services that contribute to clean water in the project area: soil hydrology, soil stability and support, and filtering and buffering. Soil hydrology is the ability of the soil to absorb, store, and transmit water, both vertically and horizontally. Soil can regulate the drainage, flow, and storage of water and solutes, which include nitrogen, phosphorus, pesticides, and other nutrients and compounds dissolved in the water. With proper functioning, soil partitions water for groundwater recharge and use by plants and animals. Changes in soil bulk density, soil chemistry, soil structure, soil pores, and ground cover can alter soil hydrology. The main impacts to soil hydrology on the Forests are compaction, erosion, loss of vegetation cover, and hydrophobicity from severe burns. Soil

[2] Chapter 10: Timber Management, *In* Dissmeyer, 2000.

[3] Chapter 9: Roads and Other Corridors, and Chapter 11: Forest Succession, respectively, *In* Dissmeyer, 2000.

[4] Chapter 2: Drinking Water Quality, *In* Dissmeyer, 2000.

[5] Chapter 18: Hardrock Mining, and Chapter 19: Coal Mining, *In* Dissmeyer, 2000.

impacts from past activities have affected soil hydrology, especially in areas where road densities are high.

Soil stability and support is necessary to anchor plants and buildings. Soil is flexible (it can be dug) and stable (it can withstand wind and water erosion). Soil also provides valuable long-term storage options (e.g., for archeological treasures or for garbage in landfills. Inherent soil properties, like soil texture and particle size distribution, play a major role in physical stability. The need for structural support can conflict with other soil uses. For example, soil compaction may be desirable under roads and houses, but it can be devastating for the plants growing nearby. Soil has a porous structure to allow passage of air and water, withstand erosive forces, and provide a medium for plant roots. The conflict of stability and support with plant growth capabilities is constant when dealing with roads, skid trails, recreation trails, and forest productivity. The main Forest impacts to structure and stability are mass wasting, erosion, and loss of organic matter.

In filtering and buffering, soil acts as a filter to protect the quality of water, air, and other resources. Toxic compounds or excess nutrients can be degraded or otherwise made unavailable to plants and animals. The minerals and microbes in soil are responsible for filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials, including industrial and municipal by-products and atmospheric deposits. Soil absorbs contaminants from both water and air. Microorganisms in the soil degrade some of these compounds; others are held safely in place in the soil, preventing contamination of air and water. Wetlands soils especially function as filters. Main impacts to the filtering and buffering function include those impacts to soil hydrology and soil biology.

Past forest practices have caused several impacts to soil functions (see section 1.1.2.2). Some of these impacts—including compaction, erosion, and loss of organic matter—can impair the majority of soil functions. The Forest Service has not eliminated these impacts, but Forest management practices have substantially decreased the negative effects on soil functions. This reduction of impacts, coupled with soil restoration activities, should show an increased capacity of the soils to provide multiple uses and ecosystem services in perpetuity.

Drivers

Population is expected to continue to increase, even in the rural areas for which the plan area provides water resources. With this increase, the demand for both consumptive and nonconsumptive uses is expected to increase. Changes in water availability are also likely, due to the effects of climate change. Although the total volume of water available will probably remain within the historic range of variation, the timing of availability is likely to change. Warmer climate would yield greater rainfall and less snowfall, leading to greater winter runoff but decreased sustained summer flow. This timing could be problematic since late summer and early fall are the times when water demand is greatest.

Stability or Resiliency

The hydrologic cycle is highly coupled, so modifying one part of the system is likely to affect other parts that may be far removed in time and space. Failure to recognize the close coupling of surface water and ground water systems and resources has created problems in

water allocation and environmental protection (Swanson et al. 2000).[6]. Natural and anthropogenic processes that severely disturb soils and vegetation, such as roads, fire, and harvesting of forests, can affect drinking water quality. Effects of these disturbances on downstream water quality depend on the severity of disturbance to vegetation and soil, the timing of precipitation in relation to vegetation disturbance, and the propensity of the landscape and ecosystem to produce compounds that degrade water quality (Swanson et al. 2000). Resiliency depends on the extent and severity of the disturbance, and the rate at which systems recover from disturbances. However, recovery rates are very difficult to define (MacDonald 2000). In most cases, the effect of a given management activity will diminish over time, and a more rapid recovery rate (natural through restoration projects, BMPs, or mitigation efforts) will affect resiliency. Unfortunately relatively few data are available on recovery rates for different processes and resources; therefore, multiple recovery rates may need to be defined to accurately assess the impact of various management activities. Recovery rates will also vary with site characteristics and extrinsic factors, such as climate, and this uncertainty directly limits the accuracy of recovery rate predictions (MacDonald 2000).

Influence of Non-National Forest Service lands

The 220 watersheds (6th field HUC) managed by the Forests contain approximately 4.8 million acres, of which approximately 85% are managed by the Forests. Within individual 6th field HUC watersheds, the Forests manage between 6% and 100% of the watershed area. Ownership of non-NFS lands is highly diverse, including State, County, and other federal agencies (e.g., BLM), timber companies, and individuals. Management objectives and practices on non-NFS lands are also highly diverse, ranging from conservation easements and active restoration to industrial land management.

The Forests have very limited authority to influence management practices on non-NFS lands within and adjacent to the plan area. Where appropriate, the Forests use partnerships (e.g., Nez Perce Tribe) and the Wyden authority in stewardship contracts to dedicate appropriated funding to accomplish projects that are consistent with the Forests' management objectives. Management activities on non-NFS lands within the plan area have influence on the types and extent of activities that the Forests can conduct on NFS lands. Every land management activity requires an environmental assessment according to NEPA; NEPA also requires that the assessment include activities on non-NFS lands within the cumulative watershed effects (CWE) area. These requirements limit the Forests' ability to conduct management activities to mitigate for expected CWEs, especially in areas where non-NFS lands occupy a substantial proportion of the watershed,

[6] Chapter 3: Watershed Processes—Fluxes of Water, Dissolved Constituents, and Sediment, *In* Dissmeyer, 2000.

7.2.1.3 Information Needs

Drivers

- Need more accurate information on the rates of effectiveness of best management practices at reducing pollutant delivery to waters
- Need scaled, site-specific information on the expected effects of climate change on water yield and availability
- Need more accurate information on population trends and likely demands for consumptive water uses

Stability or Resiliency

Better understanding is needed of the overall cycling and routing of water, dissolved constituents, soil, and sediment in natural and managed watersheds. Studies to gain this understanding need to be framed so that questions such as the following can be addressed: How has management of ecosystems and water systems altered natural, historical water flow regimes, biogeochemistry, and sediment routing? How have the types and degrees of these past and prospective future alterations of these systems altered the systems' ability to meet objectives for water supplies, ecosystem health, and other goods and services? How might climate change alter these systems (Swanson et al. 2000)?

Influence of Non-National Forest Service lands

- Need a more accurate database of management activities on non-NFS lands, with frequent updating
- Need an assessment of effectiveness of BMPs used on private lands(current assessments mostly look at implementation rates and relative effectiveness)

7.2.2 *Flood Control*

7.2.2.1 Existing Information

Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of-Science Report for Western Oregon and Washington (Grant et al. 2008)

7.2.2.2 Informing the Assessment

Geographic Scale

Exclusive of installing dams to regulate flow in river systems, management activities have a measurable effect on flood control at the watershed scale (5th field HUC or less), with the effect increasing with decreasing analytic area. Although construction of a series of dams on the large river systems in the plan areais technically feasible (in fact, several large hydropower facilities already exist on the river systems connected to the plan area), this assessment focuses on the inherent ability of the ecosystem to regulate flows rather than engineered solutions to do so.

Conditions and Trends

Intensive forest harvest, including clear-cutting, broadcast burning, road building, and riparian disturbance, has the potential to dramatically change the biophysical processes in watersheds. Changes in annual water and sediment yield, low flows, peak flows, and water quality metrics (e.g., temperature, chemical composition) have been observed after forest harvest and have been tied to resultant ecological effects (Grant et al. 2008).

Forest management practices are not the only causes of historical variations in peak flow and other pertinent hydrologic parameters. Urbanization, agriculture, and grazing can all influence drainage efficiency, defined as the routing and timing of water delivery to the channel and through a stream network (Tague and Grant 2004). Dam and reservoir operations also alter the natural hydrograph, thus complicating the interpretation of direct effects of forest management on peak flows and channels. Natural disturbances such as stand-replacing wildfires, or landslides and debris flows, can also dramatically alter hydrologic and geomorphic systems (Grant et al. 2008).

With dwindling water supplies, governments are turning to forest management as a possible means of augmenting water yield. Numerous paired watershed experiments have shown that forest harvest can increase water yields, particularly in areas where precipitation exceeds potential evapotranspiration. However, the increases in water yield from vegetation removal are often small and short-lived, and are smaller when the water is most needed, such as in dry years and in dry areas. Operationally, harvesting enough area frequently enough to cause a detectable change in water yields is difficult (Jones et al. 2009).

Drivers

Diverse components factor into hydrologic and geomorphic behavior; among them are climate, biotic and geophysical processes, natural disturbances, and management practices; storage and fluxes of water, sediment, and wood; and resulting channel and water column habitat for aquatic organisms (Grant et al. 2008). Drought, outbreaks of insects and pathogens, wildfire, and ecological succession are altering forests' ability to provide abundant clean water in the headwaters of the water supply systems (Jones et al. 2009).

Influence of Non-National Forest Service Lands or Conditions

On non-NFS lands within the boundaries of the plan area, continuing urbanization and increasing construction of second homes in forested settings have expanded the area of "urban–forest interfaces" or "wildland–urban interfaces," causing increased concerns about protection from forest disturbances such as wildfire and landslides (Jones et al. 2009). Management of these lands to reduce fire risk may influence flood control in some parts of the plan area, but this effect is likely to be small.

On non-NFS lands adjacent to the plan area, management activities could significantly affect flood conditions. This influence would likely increase as more watersheds are located on

non-NFS lands. In 29 of the 220 assessed 6th field HUC watersheds on the Forests, non-NFS ownership is significant, totaling >50% of the area.

7.2.2.3 Information Needs

Drivers

The potential for forest harvest to increase snowmelt rates in maritime snow climates is well recognized (Tonina et al. 2008). With potential changes in snowmelt rates, snow accumulation and distribution, and timing of snowmelt, all due to changing climate, vegetation management could create a synergistic effect that might substantially affect flood runoff rates.

Questions still exist about the magnitude of peak flow increases in basins larger than 10 km^2 and the geomorphic and biological consequences of these changes (Tonina et al. 2008).

The past century of forest hydrology has led to a clear understanding of the processes regulating water movement through forests and has produced general principles of hydrologic responses to harvest, roads, and application of chemicals. These principles can help manage forests for water; however, predicting the specific effects of forest management on water quantity and quality in unmonitored basins, over long time periods, or in large watersheds is difficult (Jones et al. 2009).

Stability or Resiliency

(Under development)

How large are the direct water yield and water quality responses to climate change (e.g., due to changes in temperature and timing, amount, and type of precipitation) compared to the indirect hydrologic responses to climate change (e.g., due to changes in wildfire and insect/disease outbreaks, or evapotranspiration) (Jones et al. 2009)?

What are the effects of past forest management and fire suppression on current and future water yields and water quality? How have changes in domestic and native grazer populations and grazing behavior in forests affected water quantity and quality from forests? What are the long-term, large-scale effects of road networks on water quantity and quality (Jones et al. 2009)?

Influence of Non-National Forest Service Lands or Conditions

(Under development)

How do changes in ownership affect forest management, and how do these changes affect water resources? What are the effects of the expansion of human settlements into forested areas, and the consequent changes in forest management, such as thinning for fuel reduction, on water quantity and quality (Jones, et al., 2009)?

7.2.3 *Carbon Sequestering*

7.2.3.1 Existing Information

This report summarizes the best available scientific information on the carbon stocks and fluxes of the Nez Perce and Clearwater National Forests. It provides estimates of existing carbon pools of the forest sector (live and dead aboveground biomass, soil carbon, and harvested wood products). These estimates are derived from local data collected during soil surveys, systematic forest inventory (the Forest Inventory and Analysis Program), and forest harvest records. For a complete list of available literature, see section 4, "Baseline Assessment of Carbon Stocks."

7.2.3.2 Informing the Assessment

Geographic Scale

On a global scale, prevention of large-scale conversion of forests to other land uses (deforestation), primarily in the Tropics, provides the greatest opportunity to mitigate the trend of increasing atmospheric concentrations of CO_2 (Nabuurs et al. 2007). In the United States, the largest and most effective mitigation opportunity has already been taken—in the creation of State and federal public forests that share the common objective of "keeping forests as forests" in perpetuity.

Within the context of public forests, individual land management actions are unlikely to have significant long-term effects on the atmospheric concentrations of CO_2 and other greenhouse gases. Without a substantial reduction in fossil fuel emissions, the impacts of projected climate change on disturbance regimes and species composition will likely overwhelm the short-term effects of land management actions. From this perspective, the best forest management action to mitigate increasing atmospheric CO_2 concentrations is the sustainable use of woody biomass to generate energy and biofuels and displace more fossil-fuel-intensive construction materials (Nabuurs et al. 2007). As the IPCC concluded; "In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit" (Nabuurs et al. 2007:543).

Conditions and Trends

Available information suggests that carbon stocks of the Nez Perce and Clearwater National Forests have been increasing over the last several decades as the Forests recover from extensive fires in the late 19th and early 20th century. The Nez Perce and Clearwater National Forests currently store approximately 312 million metric tons of carbon (excluding soil carbon stocks) and contain approximately 0.7% of total U.S forest carbon stocks. Wood products harvested from the Nez Perce and Clearwater National Forests store an additional 6 million metric tons of carbon, although the size of the harvested wood products carbon pool has been declining since 2000 as a result of declining harvest levels. Net annual growth (gross annual growth minus losses due to mortality) on the two National Forests combined is

estimated to be 216 million cubic feet, which equates to an average annual increase in live aboveground carbon stocks of roughly 1.16 million metric tons.

Current Carbon Stocks of the Nez Perce and Clearwater National Forests

(Under development)

Aboveground Forest Ecosystem Carbon—The Nez Perce and Clearwater National Forests store an estimated 306 million metric tons (Mt) of carbon (Heath et al. 2011). This represents about 0.7% of the total amount of carbon (approximately 42,654 Mt) in the forests of the coterminous United States (EPA 2008). The average density of forest carbon is about 196 mg of carbon per hectare (mg C/ha) (approximately 216 U.S. tons). The average carbon density of these National Forests is among the highest in the Northern Rockies and interior western United States (Hicke et al. 2007; Potter et al. 2008).

Soil Carbon—Forest soils on the Nez Perce and Clearwater National Forests store approximately…….

Harvested Wood Products—Wood products produced with timber from the Nez Perce and Clearwater National Forests store approximately 6 million metric tons of carbon (Table 2). Of this amount, an estimated 3.8 million metric tons is held by products in use, and 2.2 million metric tons is stored in solid waste disposal systems.

Table 2. Estimated current carbon stocks of major forest carbon pools for the Nez Perce and Clearwater National Forests. Total aboveground C estimate is from Heath et al. 2011. Estimates of carbon stored in harvested wood products in use and in solid waste disposal systems (SWDS) are calculated with the methods described by Stockmann et al. 2011. All units are teragrams (Tg), which equate to million metric tons.

National Forests	Total Aboveground C Tg C	Soil C Tg C	Harvested Wood Products C in use Tg C	Harvested Wood Products C in SWDS Tg C	Total Tg C
Nez Perce and Clearwater National Forests	306	—	3.85	2.19	312

The reservoir of carbon stored in U.S. forests is approximately 42,700 Mt–66,600 Mt (EPA 2008; Birdsey et al. 2007). Public forestlands contain approximately 37% of this carbon reservoir (Smith and Heath 2004). National Forest forestlands store an estimated 11,604 Mt of carbon, or from 17% to 27% of all forest carbon of the United States (Heath et al. 2011). The combined forest ecosystem (excluding soil carbon) and harvested wood products carbon pools of the Nez Perce and Clearwater National Forests store approximately

312 Mt of carbon. This represents approximately 0.5% (0.00459) to 0.7% (0.00716) of the total U.S. forest carbon reservoir.

The future of the terrestrial carbon sink of western U.S. forests is linked to multiple interacting factors that influence carbon stocks and fluxes (Lenihan et al. 2008a; Ryan et al. 2008; King et al. 2007; Pacala et al. 2007; Birdsey et al. 2007). These factors include climate variability and change; potential positive effects of increased atmospheric CO_2 concentrations on plant productivity; frequency, duration, and severity of moisture stress; changes in the rate and severity of natural disturbances; and land management practices (Canadell et al. 2007).

Projections of the future of the U.S. carbon sink based on national trends in land-use change and fire suppression indicate that the U.S. carbon sink will decline over the 21st century; a slowing of ecosystem recovery from 19th-century land use and vegetation response to 20th-century fire suppression are factors in this decline (Hurtt et al. 2002). The Hurtt et al. (2002) analysis, which does not include projected climate changes, also predicted that the U.S. will convert to a large carbon source if fire suppression is ineffective in the 21st century.

Modeling experiments based on projected changes in climate, but not land use, suggest that the future strength of the U.S. carbon sink is very sensitive to the degree of change in climate, particularly precipitation, and fire regimes (Bachelet et al. 2001; Lenihan et al. 2008a; Lenihan et al. 2008b). If precipitation increases and temperature increases are small or moderate, net ecosystem productivity and carbon stocks are expected to increase. Conversely, if climate changes result in decreased precipitation and soil moisture during the growing season, net ecosystem productivity is expected to decline due to drought stress, and may result in a net carbon source to the atmosphere (Lenihan et al. 2008a; Lenihan et al. 2008b). Increasing concentrations of atmospheric CO_2 may moderate these impacts by enhancing vegetation productivity and water use efficiency (Bachelet et al. 2001; Joyce and Nungesser 2000; Lenihan 2008a; Lenihan 2008b), at least up to a point where nutrient limitations and increasing temperatures overwhelm the beneficial effects of CO_2 concentrations (Fishlin et al. 2007). Increases in annual area burned may further reduce net ecosystem productivity and carbon stocks despite the potentially positive effects of increasing CO_2 concentrations (Lenihan et al. 2008a; Lenihan 2008b).

Empirical analyses of the growth rates of trees in the Pacific Northwest demonstrate the potential impacts of climate change on forest productivity and reveal that high-elevation and low-elevation forests respond differently to climate variability. Seasonal photosynthesis ("carbon uptake period") and annual growth rates of high-elevation forests (e.g., subalpine fir, mountain hemlock, and high-elevation lodgepole pine and Douglas-fir) are commonly limited by a relatively short growing season, low soil temperatures, and long periods of snowcover (Littell et al. 2008; Chinn et al. 2008; Case and Peterson 2007; Case and Peterson 2005; Peterson et al. 2002). Growth rates increase in these high-elevation forests during years with earlier spring snowmelt, abnormally warm annual temperatures, and longer growing

seasons. These results suggest that projected changes in regional climate will likely result in increased productivity and carbon stocks of high-elevation forests.

Conversely, growth rates of lower- and mid-elevation ponderosa pine, Douglas-fir, and lodgepole pine forests of the Pacific Northwest and Northern Rockies tend to be limited by low growing season precipitation and high growing season temperatures (Littell et al. 2008; Case and Peterson 2007; Case and Peterson 2005; Watson and Luckman 2002). During these conditions, the rate of water loss from evapotranspiration is greater than the rate of water absorption by roots, resulting in water stress (Case and Peterson 2007, citing Larcher 2003). Prolonged periods of water stress significantly reduce a tree's ability to photosynthesize (Kozlowskie and Pallardy 1997). As a result, climate projections with increased frequency of reduced snowpack, earlier spring snowmelt, increased temperatures during the growing season, and little or no significant increase in summer precipitation likely will result in reduced forest productivity and carbon sequestration in low- and mid-elevation forests of the Pacific Northwest and Northern Rockies (Boisvenue 2007; Boisvenue and Running 2010). Recent research suggests that regional warming and water balance deficit trends over the late 20th century are contributing to rapid and widespread increases in mortality rates, and slight decreases in forest density and basal area, in old-growth forests throughout the western United States (van Mantgem et al. 2009).

In addition to the gradual changes in forest productivity and carbon stocks resulting from directional climate change, episodic events such as large high-severity fires and large-scale insect outbreaks can significantly affect carbon stocks and flux of forest ecosystems. In the short term (decades), disturbances can convert regional carbon sinks to a carbon source (Kurz et al. 2008; Kurz et al. 2008a; Kurz et al. 2008b). Over the long term (centuries), the effects of disturbances on the regional carbon balance are neutral if 1) similar vegetation regrows on the disturbed area and 2) the long-term frequency and severity of disturbances does not change (Canadell et al. 2007; Kashian et al. 2006). The potential fertilization effect of atmospheric CO_2 concentrations may influence the rate of terrestrial carbon recovery (Balshi et al. 2009; Lenihan et al. 2008). One recent study of ponderosa pine stands in western Montana and eastern Idaho concluded that recent increases in atmospheric CO_2 concentrations increased growth rates in older trees (Knapp and Soulé 2010).

On the Nez Perce and Clearwater National Forests, carbon stocks and flux rates will vary over coming decades in response to complex and uncertain interactions between climate variability and change, forest age class distribution, disturbance-recovery processes, and possible effects of CO_2 concentrations on forest productivity (Smithwick et al. 2008; Hyvonen et al. 2007). The contribution of forest regrowth from past disturbances is expected to decline as the maturing forests grow more slowly and take up less CO_2 from the atmosphere. Projected climate changes for the region suggest that relatively high-elevation forests may increase in productivity and carbon sequestration, whereas these processes may decline in low-elevation forests and mid-elevation forests with south and southwesterly

aspects. Potential increases in the frequency and size of high-severity fires, bark beetle outbreaks, and root disease occurrence or severity could also have a significant impact on the carbon budgets of these forests over the 21st century. Extensive high-severity fires, large-scale tree mortality from bark beetles, and productivity losses due to root diseases could convert the Nez Perce and Clearwater National Forests from a net carbon sink to a carbon source for several decades (Kurz et al. 2008a; Kurz et al. 2008b; Bond-Lamberty et al. 2007). In addition, timber harvesting will affect the amount of carbon stored and the short-term net flux of carbon within the atmosphere. However, the net contribution to atmospheric CO_2 concentrations resulting from fire, insect-caused tree mortality, and timber harvest is expected to be approximately zero over the longterm so long as disturbed areas regenerate with similarly productive species and the disturbance frequency and intensity does not change (Kashian et al. 2006).

Using harvested forest biomass will continue to store carbon in wood products and landfills (EPA 2008; Skog 2008; Skog and Nicholson 2000; Skog and Nicholson 1998) and may reduce the demand for more fossil fuel intensive products such as steel and cement (Malmsheimer et al. 2008; Perez-Garcia et al. 2005). In addition, emerging markets in forest biomass for use in energy production could offset fossil fuel emissions (Nichols et al. 2009; Malmsheimer et al. 2008).

Key Sources of Uncertainty

Changes in Climate—Net ecosystem productivity is very sensitive to changes in temperature, precipitation, soil moisture, and other climate characteristics (Angert et al. 2005; Paio et al. 2009; Paio et al. 2008). Climate change also has a significant impact on the extent and severity of wildland fires, population dynamics of bark beetles and other forest insects, moisture stress on trees, and other disturbance processes. All global climate models project surface temperature warming in the Northern Rockies. Average annual temperatures are expected to increase by +1.5°F to 5.9°F by the 2040s, depending on the rate of GHG emissions. These projected temperature increases exceed observed 20th-century year-to-year variability. Annual mean temperature could change by -10% to +20% by the 2040s. Many climate models project increases in precipitation during the winter and decreases in summer; however, projected precipitation changes are comparable to 20th-century variability. These regional climate projections suggest increasing water deficits for forests, which would increase tree stress and mortality, tree vulnerability to insects, and fuel flammability. The severity of these potential climate change effects remains somewhat uncertain at local scales.

Disturbance Regimes—High-severity disturbance events have a substantial and rapid impact on forest carbon stocks and flux. Persistent changes in the frequency, extent, and severity of disturbances can alter long-term (decades or longer) regional net carbon balances. Yet knowledge of the future trajectory of wildfires, insect outbreaks, drought severity and duration, and other major forest disturbances is limited. The available scientific evidence

suggests that the average annual area burned by wildfires is likely to increase in coming decades in the Pacific Northwest and Northern Rockies. Similarly, higher temperatures and water stress may increase the susceptibility of trees to bark beetles and other insects and pathogens. Available scientific information suggests that risks of bark beetle mortality may increase in higher-elevation forests. However, there is greater uncertainty in these projections at finer spatial scales.

CO_2 Fertilization—CO_2 is a fundamental building block of photosynthesis. Trees and other plants grown in elevated CO_2 environments have increased growth rates, productivity, and water use efficiency compared to controls (Norby et al. 2005). Such evidence suggests that increasing atmospheric concentrations of CO_2 may increase forest productivity. However, the results of controlled experiments have not been widely confirmed in natural environments (Knapp and Soulé 2010). Additional studies have suggested that the potential CO_2 fertilization effect is limited to young plants and by water and nutrient availability (particularly nitrogen) (Norby et al. 2010). Additional evidence indicates that trees and other plants acclimate to elevated CO_2 concentrations over time, thus reducing the duration of the potential fertilization effect. In sum, considerable uncertainty exists about the potential of elevated $C0_2$ concentrations to increase net ecosystem productivity, carbon storage, and the carbon sink strength of forests.

Potential Changes in Forest Composition—Long-term projections of regional net carbon balances depend upon assumptions about the future vegetation composition of currently forested areas (Canadell et al. 2008; Kashian et al. 2006). In coming decades, climatically suitable habitats for many tree species may shift from their current locations (Rehfeldt et al. 2006). Some models suggest that changes in climatically suitable habitat combined with amplified disturbance regimes may result in some forests of the Northern Rockies converting to nonforest vegetation (Westerling et al. 2012). However, considerable uncertainty exists regarding the effects of climate change on the composition of forest vegetation. Uncertainties in future forest composition and structure contribute to the uncertainty in long-term projections of forest carbon stocks and flux, and regional net carbon balances (Smithwick et al. 2008; Rhemtulla et al. 2009).

Biomass Utilization Including Energy Production—Utilization of woody biomass for energy production and as a substitute for more greenhouse gas–intensive materials (e.g., steel and cement) has the potential to provide substantial global carbon benefits (Nabuurs et al. 2007). However, the capacity to realize these potential carbon benefits is uncertain due to current technological limitations, social and political issues, and reliability of feedstock supplies. At regional and local scales, limited and declining capacity in the wood products industry adds further uncertainty to projections of the size of the carbon pool in harvested wood products, and the use of woody biomass to displace fossil fuels.

The recent IPCC report identifies 4 general categories of options to reduce emissions by sources and/or increase carbon sequestration by forest sinks: 1) maintaining or increasing

forest area, 2) maintaining or increasing site-level carbon density, 3) maintaining or increasing landscape-level carbon density, and 4) increasing off-site carbon stocks in wood products and enhancing product and fuel substitution (Nabuurs et al. 2007).

Drivers

The future trajectory of carbon stocks on the Nez Perce and Clearwater National Forests is uncertain and will depend primarily on the spread of root diseases, the extent and severity of future fires, tree mortality caused by bark beetles and other forest insects, the rate of tree regeneration after disturbances, and potential changes in forest productivity. Projected changes in regional climate may exacerbate many of these change agents and thus reduce the carbon stocks on the Nez Perce and Clearwater National Forests. Forest management activities that reduce the potential for uncharacteristically large and severe natural disturbances, and promote rapid forest regeneration after disturbances, may reduce some of these potential risks to forest carbon stocks.

Influence of non-National Forest System Lands or Conditions

(Under development)

7.2.3.3 Information Needs

None identified.

7.2.4 *Climate Regulation*

7.2.4.1 Existing Information

There are also numerous references contained within these documents as well as the references cited at the end of this section that were used in this document.

West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections (BOR. 2011)

KIPZ Climate Change Report (Forest Service 2010)

7.2.4.2 Informing the Assessment

Geographic Scale

Climate change processes function at scales larger than the Forest-scale. Although the Forest plan area encompasses nearly 4.5 million acres, this area is small in comparison to the climate models used to assess changes in precipitation and runoff in the Columbia River Basin (USDI, Bureau of Reclamation, 2011). Therefore, for climate regulation, as well as climate change in general, the ecosystem service for the plan area will be evaluated as a whole, single unit that is a small part of a much larger, regional (multistate) process.

Conditions and Trends

Individual activities, or even the combined activities over an area as large as the Nez Perce and Clearwater National Forests, are unlikely to have significant long-term effects on atmospheric concentrations of CO_2 and other greenhouse gases. At the global scale,

prevention of large-scale conversion of forests to other land uses (deforestation), primarily in the Tropics, provides the greatest opportunity to mitigate the trend of increasing atmospheric concentrations of CO_2 (Nabuurs et al. 2007). In the United States, the largest and most effective mitigation opportunity has already been taken—in the creation of state and federal public forests that share the common objective of "keeping forests as forests" in perpetuity.

Drivers

Several potential drivers could affect the plan area's ability to regulate climate; these drivers include competing demands for carbon sequestration and extraction of forest products; the extent and severity of stressors that reduce or remove forest vegetation (e.g., wildfires, insect/disease outbreaks); the extent, severity, and rate of change of the climate; and the ability of the Forests to adapt to these changes and stressors.

Stability or Resiliency

(Under development)

This is highly uncertain. Climate projections are highly uncertain, with substantial disagreement between researchers, models, and empirical data. The role that individual Forests contribute to regulating climate change is highly uncertain.

Influence of non-National Forest System Lands or Conditions

Within the plan area are large, contiguous blocks of NFS-managed lands, with relatively minor inholdings of non-NFS lands. On the scale that we would evaluate climate regulation, these inholdings would be of insignificant influence. For the entire region that climate regulation would be evaluated, the vast majority of lands are non-NFS. The Forest Service has very limited, authority, if any, to influence the management of these lands. Therefore, even when activities on non-NFS lands adversely affect the Forests' ability to provide climate regulation, the Forest Service has very limited ability to change non-NFS management practices or the effects that those practices may have on NFS-managed lands.

7.2.4.3 Information Needs

Drivers

Significant uncertainty exists regarding the magnitude of climate change, its direction, and the effects it will have on the Forests' ability to regulate climate. Climate monitoring data that the Forests have collected over the last two decades need to be evaluated and then compared with regional climate data (and models). Continued monitoring of climate parameters across the Forests will likely be necessary. Existing local data may be insufficient for making adequate conclusions about climate change and regulation, necessitating expansion of the Forests' climate monitoring program.

Stability or Resiliency

(Under development)

As stated above, there is significant uncertainty regarding the plan area's ability to provide climate regulation for the regional scale. There is also uncertainty regarding the resiliency of the plan area to adjust to climate change, or for management activities to actively manage for resiliency on a measurable scale.

Influence of non-National Forest System Lands or Conditions

(Under development)

This has the same uncertainties as does the Forest's ability to manage for resiliency to climate change as does NFS managed lands.

7.3 SUPPORTING SERVICES

7.3.1 *Nutrient Cycling*

7.3.1.1 Existing Information

The list of science below is considered the best available science used to inform soil ecosystem services in the planning area.

Forest Soil Conservation and Rehabilitation in British Columbia (Ministry of Forestry 2002)

Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest (Brown et al. 2003)

Managing Coarse Woody Debris in Forests of the Rocky Mountains (Graham et al. 1994)

Decaying Organic Materials and Soil Quality in the Inland Northwest: A Management Opportunity (Harvey et al. 1987)

Wildland Fire in Ecosystems: Effects of Fire on Soils and Water (Neary et al. 2005)

Soil Quality Standards and Guidelines for Forest Sustainability in Northwestern North America (Page-Dumroese et al. 2000)

Soil Carbon and Nitrogen Pools in Mid- to Late-successional Forest Stands of the Northwestern United States: Potential Impact of Fire (Page-Dumroese and Jurgensen 2006)

Are We Maintaining Productivity of Forest Lands? Establishing Guidelines through a Network of Long-term Studies (Powers 1990)

Effects of Soil Disturbance on the Fundamental, Sustainable Productivity of Managed Forest (Powers 2002)

Detrimental Soil Disturbance Associated with Timber Harvest Systems on National Forests in the Northern Region (Reeves et al. 2011)

Managing Organic Debris for Forest Health (Schnepf et al. 2009)

A Review of Chemical and Physical Properties as Indicators of Forest Soil Quality: Challenges and Opportunities (Schoenholtz et al. 2000)

Soil Survey of the Nez Perce National Forest Area, Idaho (unpublished data available in the project record)

Land System Inventory: First Review Draft, Clearwater National Forest (Wilson et al. 1983)

7.3.1.2 Informing the Assessment

Geographic Scale

(Under development)

The plan area contributes to nutrient cycling at an ecoregional scale. Need more info here.

Conditions and Trends

Nutrient cycling is the movement and exchange of organic and inorganic matter back into the production of living matter. Soil stores nutrients and other elements, then moderates their release to sustain the cycling process. During these biogeochemical processes, analogous to the water cycle, nutrients can be held in the soil, transformed into plant-available forms, or lost to the atmosphere or water. Soil is the major switching yard for the global cycles of carbon, water, and nutrients. Carbon, nitrogen, phosphorus, and many other nutrients are stored, transformed, and cycled through soil. Decomposition by soil organisms is at the center of the transformation and cycling of nutrients through the environment. Decomposition liberates carbon and nutrients from the complex material making up life-forms and puts them back into biological circulation so they are available to plants and other organisms. Decomposition also degrades compounds in soil that would be pollutants if they entered groundwater or surface water. The major impacts to nutrient cycling are compaction and loss of organic matter and topsoil.

The complex process of decomposition and nutrient cycling requires a varied set of microorganisms to be present in the soil. Diversity of soil biology (the presence of roots, fungi, and microorganisms in the upper sections of the soil) is beneficial for several reasons: An intricate group of soil organisms can compete with disease-causing organisms and prevent a problem-causing species from becoming dominant. Several organisms are involved in creating and maintaining the soil structure important to water dynamics in soil. Many antibiotics and other drugs and compounds used by humans come from soil organisms. Most soil organisms cannot grow outside of soil, so it is necessary to preserve healthy and diverse soil ecosystems to preserve beneficial microorganisms. Loss of organic matter, loss of topsoil, and compaction are the three main impacts to soil biology.

Past forest practices have caused several impacts to soil functions (see Section 1.1.2.2). While these impacts have not been eliminated, the Forest Service has substantially decreased the negative effects through current management practices. This reduction of impacts

coupled with soil restoration activities should show an increased capacity of the soils to provide multiple uses and ecosystem services in perpetuity.

Drivers

Land-use practices, such as grazing, logging, and mining, have been occurring on the Nez Perce–Clearwater National Forests since their creation. Impacts of these uses are evident in the soils today. Long-term grazing of livestock has formed terraces on the steep slopes of grasslands in the White Bird area. Some early mechanized logging practices on the Forests include Idaho Jammer Logging. This style of logging involved building parallel roads across the hillslope at intervals of 100 to 500 feet. This resulted in harvest units with up to 40% of the area in roads. Many of these roads remain on the landscape today. Soil productivity in the Florence region has declined due to loss of topsoil and organic material, mixing of subsoil, and displacement from mining in the late 1800s. Over time, practices have evolved, reflecting an awareness of the impacts to soils. Livestock numbers have been adjusted to meet the capabilities of the land, logging practices have shifted to less-impactive equipment (e.g., cable and skyline methods), and mining operations are required to reclaim their areas of impact. In early 21st-century forest management, soil restoration is included in the majority of projects in order to meet the desired conditions for the land.

Fires are an important ecological driver for the Forests. Several landscape scale fires have occurred throughout the Forests since their creation. Such fires, if hot enough, can cause damage to soils. When the organic layers are removed through fire, the soil is susceptible to erosion. In some areas on the Forests, the majority of soils eroded after the fires of the early 1900s. These soils are found in brushfields recovering from those historic fires.Certain attributes associated with the soils in the Forests make them susceptible to decreased soil quality and productivity. Soils that have a topsoil containing ash are extremely susceptible to decreased soil quality due to compaction, erosion, and soil mixing. Compaction restricts plant rooting, lowers water-holding capacity, and decreases infiltration. Surface soil loss through displacement and mixing with less productive substrata decreases soil productivity. Displacement occurs during road construction, excavation of skid trails and landings, and ground-based harvest. The loss of the Mazama ash cap would reduce the water-holding capacity and increase the overall soil bulk density. These effects would decrease available soil moisture and tree root penetrability. Since volcanic ash is not replaced, the effects of erosional losses of the ash cap would be long-term. Areas with ground disturbance may become more favorable for weed invasion, which can reduce overall soil productivity.

Stability or Resiliency

(Under development)

Influence of non-National Forest System Lands or Conditions

(Under development)

7.3.1.3 Information Needs

7.4 CULTURAL SERVICES

7.4.1 *Cultural/Heritage Values*

7.4.1.1 Existing Information

The Forest Service manual (chapter 2360) was used to discern the ecosystem services of the plan area.

7.4.1.2 Informing the Assessment

Geographic Scale

The 4 cultural heritage values of the plan area are heritage tourism, interpretation, education, and public partnership programs. These cultural services primarily serve the local regional market, but national and international participation occurs in all aspects of the programs.

Conditions and Trends

Table 3 describes the current status and trends of cultural and heritage values on the Nez Perce–Clearwater National Forests.

Table 3. Conditions and trends of cultural and heritage values on the Nez Perce–Clearwater National Forests

Value	Condition	Trend
Heritage tourism	Fair	Declining
Interpretation	Good	Stable
Education	Fair	Declining
Public partnership programs	Good	Stable/declining

Drivers

Table 4 describes the cultural and heritage drivers on the Nez Perce–Clearwater National Forests.

Table 4. Cultural and heritage values and drivers on the Nez Perce–Clearwater National Forests

Value	Drivers
Heritage tourism	Funding, urban orientation, resource deterioration
Interpretation	Funding and public demand for historical interpretation (mining)
Education	Funding
Public partnership programs	Funding, urban orientation, resource deterioration

Stability or Resiliency

Cultural services are based on historic qualities, which are, by nature, nonrenewable. Thus, the stability and resiliency of this ever-aging, fragile resource class is constantly decreasing. The Forest Service Heritage Program— which maintains all ecosystem services—can ameliorate this trend, but only to the degree to which funding is available.

Influence of non-National Forest System Lands or Conditions

A considerable amount of central Idaho is composed of NFS lands. Thus, certain physiographic features, ecotones, and their associated resources are located only on NFS lands, and certain aspects of ecosystem services are only possible in the plan area.

7.4.1.3 Information Needs

No information needs were identified concerning the cultural heritage values of the plan area.

7.4.2 *Recreation Experiences*

7.4.2.1 Existing Information

(Under development)

7.4.2.2 Informing the Assessment

Geographic Scale

North Central Idaho–Include the Snake River/Hells Canyon in review.

See Recreation Opportunities North Central Idaho and adjacent National Forests map.

<u>Commercial Outfitter and Guide Opportunities</u>

A total of 33 outfitted operations provide services on the Nez Perce National Forest, and 26 outfitted operations provide services on the Clearwater National Forest. The following discussion of outfitted opportunities is grouped by ranger districts on the Nez Perce–Clearwater National Forests. All of these operations provide horseback, hiking, or floating/boating services; 2 operations provide snowmobile services on the Nez Perce National Forest, 6 provide snowmobile services on the Clearwater National Forest, and 1 operation provides hunting services with ATVs on a forest road (Idaho Fish and Game and Idaho Outfitter and Guide Licensing Board 2011).

All of the operations, described below, are licensed with the Idaho Outfitter and Guide Licensing Board. Each operation is assigned an operating area and licensed activities with seasons. The operating areas, activities, and seasons for each operation can be found at http://fishandgame.idaho.gov/ifwis/ioglb/outfitter.aspx. or at www.fs.usda.gov/nezperceclearwater.

Salmon River Ranger District

The Salmon River Ranger District administers special use permits for 12 Outfitter and Guide operations. Three of these operations provide river jet boat services on the Salmon River. One operation provides hiking, biking, and float trips, while 7 operations provide hunting services. One additional outfitter, operating out of Mackay Bar on the Salmon River, is administered by the Payette National Forest; this operation provides hunting, fishing, and jet boat services.

Red River Ranger District

The Red River Ranger District administers special use permits for 9 Outfitter and Guide operations. One operation provides river jet boat services on the Salmon River, another provides biking trips on the district, and the remaining 7 operations provide hunting services. Two of the hunting operations also provide day and overnight summer trail equestrian rides, with a third hunting operation providing equestrian trail rides and backpacking services.

Moose Creek Ranger District

The Moose Creek Ranger District administers special use permits for 12 Outfitter and Guide operations. Ten of these operations provide hunting services, 1 provides hunting trips and summer trail rides, and 1 provides backpacking trips. One of these operations accesses a hunting area in the Selway area using ATVs on a forest road.

Palouse/North Fork Ranger Districts

The Palouse Ranger District administers 2 hunting, fishing, and trail rides outfitter operations. The 10 operations located on the North Fork Ranger District provide hunting services (including fall and spring bear hunts and elk, deer, and moose hunts), fishing, and trail riding. An additional operation, administered by the Lolo National Forest, provides hunting opportunities on the Lolo and Nez Perce–Clearwater National Forests.

Lochsa Ranger District

Five operations provide river rafting services; filming of activities is included with all trips. Three operations provide hunting and trail ride services, while one operation provides services for mountain bikers.

Powell Ranger District

The Lochsa and Powell ranger districts administer a permit for an operation that provides interpretation of the Lewis and Clark Trail and hiking/biking tours. Three operations provide hunting services.

See listing and map of airstrips located on the Nez Perce–Clearwater National Forests in the Recreation Opportunities section.

Conditions and Trends

Table 5 and Table 6 illustrate the average actual use of outfitted opportunities offered on both Forests by activity.

Table 5. Clearwater National Forest Outfitter and Guide Program Actual Use Average Service Days 2005–2011 (Under development)

Activity Type	Actual Use							Average Actual Use 2005–2011 Service Days
	2005 Service Days	2006 Service Days	2007 Service Days	2008 Service Days	2009 Service Days	2010 Service Days	2011 Service Days	
Total/Average Hunting	2,975	3,232	3,704	3,024	2,542	2,528	2,158	2,880.43
Total/Average Hunting/Backpacking	162	193	62	24	5	0	48	70.57
Total/Average Hunting/Trail Rides	815	606	1,015	2,436	727	796	885	1,040.00
Total/Average Livery Services	0	0	0	0	109	150	107	52.29
Total/Average Hiking/Biking	308	0	180	60	24	79	54	100.71
Total/Average Rafting	3,022	3,064	3,189	3,429	2,741	2,520	2,539	2,929.14
Total/Average Van Tours/Biking	145	124	49	41	40	177	113	98.43

Estimated by primary activity for each operation
Snowmobiling and fishing were not broken out as separate activities

Table 6. Nez Perce National Forest Outfitter and Guide Program Actual Use Average Service Days 2004–2011

Activity Type	Actual Use								Average Actual Use 2004–2011 Service Days
	2004 Service Days	2005 Service Days	2006 Service Days	2007 Service Days	2008 Service Days	2009 Service Days	2010 Service Days	2011 Service Days	
Total/Average Hunting	5,451	5,210	5,121	5,199	4,631	4,127	3,613	2,965	4,539.63
Total/Average Hunting/Jet Boat	1,617	1,509	1,546	1,159	1,641	1,210	1,187	1,250	1,389.88
Total/Average Hiking/Biking	20	39	69	61	100	18	20	16	42.88
Total/Average River/Jet Boat	2,123	2,391	2,384	1,957	2,111	1,639	1,877	1,470	1,944.00
Total/Average Backpacking	0	0	0	270	210	234	319	171	150.50

Estimated by primary activity for each operation
Snowmobiling, trail riding, and fishing were not broken out as separate activities

(Remainder of section is under development)

Upper Selway Control Season May 15–July 31

Main Salmon June 20–September 7

Snake River Hells Canyon May 25–September 10

During the control seasons listed above, permits are required for the following rivers. This analysis will not review the current permit systems or the Wild and Scenic Rivers management plans. The information above is included to show trends in floating and jet boat use.

Interpretive Services

The Lolo Pass Visitor Center serves as one of the many historical landmarks off U.S. Highway 12, the Northwest Passage Scenic Byway, All-American Road. The visitor center displays information on the Lewis and Clark journey across the Bitterroot Mountains and the 1877 flight of the Nez Perce Indians. The visitor center also provides historical, natural, and general information about the area and hosts a small gift shop, featuring books on the local area and history. There are 24-hour restrooms available to visitors.

During the summer months, the Lolo Pass Visitor Center is open Wednesday through Monday. The hours of operation are 8:00–4:30 PST. On-site interpreters are available to provide information on the Lewis and Clark journey, the Nez Perce and Salish tribes, and the local area and its rich history. Visitors can watch videos on the local area, walk a short

wetland trail, or browse the bookstore run by Discover Your Northwest. North Central Idaho Audio Tour disks that interpret mile markers along the byway can be checked out at the visitor center.

Glade Creek State Park is a short drive from the visitor center, and an accessible trail leads to an overlook viewing the meadow where Lewis and Clark camped in 1805. Packer Meadows, a short walk from the visitor center, is well known for its abundance of camas flowers in June.

Beginning in December, the visitor center switches to a winter schedule: Thursday through Sunday, 8:00 am to 4:30 pm. The winter program is described in the Recreation Opportunities Settings Assessment.

Designated in 1978 on the National Register of Historic Places, the Lochsa Historic Ranger Station preserves the nostalgic character of a 1920s working ranger station. The visitor center, located on U.S. Highway 12, the Northwest Passage Scenic Byway, All-American Road, is open from Memorial Day through Labor Day. During the 2012 summer field season, staffing of the station was coordinated and implemented by volunteers. A printed brochure contains a self-guided walking tour that helps visitors gain a better understanding of the Forest Service's 100-year-old heritage.

7.4.2.3 Information Needs

Stability or Resiliency

In a statewide public opinion poll conducted by the Idaho Outdoor Business Council (IOBC), a statewide coalition of outdoor recreation businesses and retail outlets, 92% of Idaho voters agreed that recreation activities in Idaho's forests, wildlife areas, and parks are an "essential part of Idaho's economy." The poll also found that 95% of Idaho voters agree it is possible to have a balance between a healthy economy with good jobs and the protection of Idaho's natural environment. The poll echoes a finding from the National Outdoor Industry Association, which found that Idaho's active outdoor recreation economy supports 37,000 jobs and produces $2.2 billion annually in retail sales and service across the state.

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