

Appendix B. Methodologies

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Introduction

This appendix includes the methodologies used by all of the resource areas analyzed, except for vegetation and timber (which are found in Appendix H). They are arranged in the same order as the resources in chapter 3. The acronyms from the main body of the FEIS apply here, as well as the following:

- CWPP Community Wildfire Protection Plan
- HFRA: Healthy Forest Restoration Act
- LSRS: Land Status Record System
- PRISM: Plan-level foRest activity Scheduling Model
- SUDS: Special Uses Data System

Aquatic Ecosystems

The approach used in this analysis was to take a programmatic look at the outcomes that could result from implementing the proposed management direction in each alternative. For estimating the effects at the programmatic-forest plan level, the assumption was made that the kinds of resource management activities allowed under the 2020 Forest Plan direction are reasonably foreseeable future actions to achieve the goals and objectives. However, the specific location, design, and extent of such activities are not known at the time forest plans are revised. Project-level decisions are made based on site-specific analysis (project level) basis. Therefore, the discussions here refer to the potential for the effects to occur and are in many cases only estimates. The effects analyses are useful when comparing and evaluating alternatives but are not intended to be applied directly to specific locations on the Forest.

The 2020 Forest Plan prescribes no specific activity in any location; potential spatial and temporal effects to water quality cannot be attributed to any specific watershed. In other words, the cumulative effects of a program at the Forest Plan scale as opposed to the effects from a project at the project scale can only be discussed in terms of general programmatic tendencies either toward improved or declining water quality or fisheries habitat at no specific site. Therefore, the potential cumulative effects from forest programs to water quality are generally discussed at the basin or HLC NF level. The temporal scale for this analysis is limited to the expected life of this plan (15 years).

Analysis Area

The analysis area for the watershed, soils and aquatic species include all the lands within the boundary of the HLC NF and connected waterways. The connected river systems are included because migratory bull trout and westslope cutthroat trout that emerge from Forest streams move downstream to reach sexual maturity and then return to their natal streams to complete the spawning cycle and depend on connectivity for their survival.

The Forest Plan area is located within two HUC Regions:

- The Missouri Region (HUC = 10) is on the eastern side of the Continental Divide. Within this region, the plan area is located in 3 subregions: Missouri Headwaters (HUC=1002), Missouri-Marias (HUC=1003), and Missouri-Musselshell (HUC=1004). Within these subregions, the plan area is located in 14 fourth level watersheds. Within these fourth level watersheds the plan area is located within 88 fifth level watersheds which are further broken down into 301 sixth level watersheds.
- The Pacific Northwest Region (HUC = 17) drains to the west. Within this region, the plan area is located in one subregion, the Kootenai-Pend Oreille- Spokane (HUC=1701). Within this subregion,

the plan area is located in two fourth level watersheds: Upper Clark Fork and Blackfoot River. Within these fourth level watersheds, the plan area is within 16 fifth level watersheds which are further broken down into 72 sixth level subwatersheds.

The analysis scale varies by resource and uses the fourth, fifth and sixth level watershed scales to assess current conditions across the HLC NF.

Air Quality

The air quality analysis relies on existing and most current analysis, research, and planning documents. We used information from several government, academic, and private partnership consortiums that have conducted air quality emissions inventories, modeled pollution impacts and work on air quality planning on a regional scale in and around the HLC NF area. There is a great deal of extensive and complex data available and this assessment only summarizes information relevant to the HLC NF Forest Plan revision.

Quantitative values for wildland fire smoke impacts are difficult to predict. Potential emissions from wildfires are difficult to predict as they would vary depending upon site-specific vegetation and fuels conditions, ignitions, weather, and available suppression resources. Emissions estimate models are available for estimating smoke emission from prescribed fire.

Fire and Fuel Management

Fire is a primary natural disturbance process within the HLC NF ecosystems that changes vegetation. Fuels management consists of management activities designed to alter vegetation conditions to achieve desired results. Therefore, the analysis process for determining vegetation conditions (past, present and future) provides the basis for the analysis of fire and fuels treatments within the FEIS. This process is briefly discussed below. Please refer to the Terrestrial Vegetation section of the FEIS and appendix H for greater detail.

The vegetation management strategy for the HLC NF is to manage the landscape to maintain or trend towards vegetation desired condition. Modeling was used to estimate extent and effects of disturbance processes (such as fire) into the past to develop a natural range of variation (NRV) and into the future (to project future wildfire). Fire (planned and unplanned), insects (e.g., bark beetles), weather (drought), and harvest treatments are the main drivers of vegetative change, interacting with climate and vegetative succession. The main analytical models used were the SIMPPLLE model (SIMulating Patterns and Processes at Landscape scaLEs) (Chew, Moeller, & Stalling, 2012) and the PRISM model.

SIMPPLLE was used to estimate wildfire activity on the HLC NF for five decades into the future. Best available information was used to build the fire suppression logic and assumptions within the model, including corroboration with actual data, and professional experience and knowledge.

All alternatives contain objectives for treating (mechanical and wildland fire) vegetation to improve structure and composition, including reducing surface fuels, ladder fuels, and canopy density.

For the HLC NF analysis, the wildland urban interface (WUI) is mapped based on County Wildland Protection Plans (CWPPs) where available, and standard Hazardous Fuels Reduction Act (HFRA) definitions where CWPP maps are unavailable. The WUI will change over time as human developments and land use change.

Terrestrial Vegetation, Old Growth, Snags and Downed Woody Debris, and Timber and Other Forest Products

Please refer to appendix H of the FEIS.

Plant Species at Risk (threatened, endangered, proposed, and candidate species and plant species of conservation concern)

The USFWS is responsible for determining species recognized under the ESA as threatened, endangered, and proposed or candidate. Once identified, the FS is responsible to manage for the ecological conditions that would contribute to the recovery of the listed species and conserve proposed and candidate species. Determining effects to federally-recognized species by alternative considers the degree of management activities or natural conditions that may pose potential stress or threat to the species.

The 2012 Planning Rule provides direction for determining which species are species of conservation concern (SCC), as described in the body of the FEIS. The list of SCCs must meet the following mandatory requirement (FSH 1909.12 Section 12.52): The best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area. This information may be derived from the scientific literature, species studies, habitat studies, analyses of information obtained from a local area, and/or the result of expert opinion or panel consensus. Additional information is available in the Assessment, the supplemental botany report in the project record, and the Region 1 Species of Conservation Concern Planning webpage:

<https://www.fs.usda.gov/detailfull/r1/landmanagement/planning/?cid=FSEPRD500402&width=full>

Once SCC were defined, key ecosystem characteristics for species were evaluated and determinations made on whether forestwide components maintained habitat quality needed by associated SCC by considering known locations of species and their habitats, as well as key drivers/stressors. Additional species-specific plan components were then considered and developed if needed. In other words, the extent and condition of each ecosystem or special type served as the habitat indicator for individual species, and for assemblages of at-risk species and overall floristic diversity. For most species, extent and condition of habitat typically constitute the best available scientific information indicating whether such populations would continue to persist with sufficient distribution in the planning area (2012 Rule Sec. 219.19), though known occurrences, trend data and known threats to species viability and used when available to compare each alternative.

Determinations for each species consisted of a viability evaluation, which examined whether plan components provide ecological conditions necessary to maintain a viable population of each species of conservation concern in the plan area. The viability evaluation was conducted using both a coarse filter and a fine filter approach, again using known populations, habitat extent and condition, and known threats as indicators. For the coarse filter approach, species were grouped by habitat guilds. This coarse filter approach assumes that viability of SCC is broadly dependent upon the integrity of the coarse ecosystems where they currently occur. We made qualitative, rather than quantitative, evaluations to compare the action alternatives to the no-action alternative forestwide plan components. The coarse filter approach was used to compare forestwide plan components of the 1986 Forest Plans (alternative A) and the 2020 Forest Plan (alternatives B-F) using habitat guilds and considering species in a broader context. However, the habitat guilds outlined below are roughly, but not exactly aligned with floristic geographic subdivisions, to which at-risk plant populations are often associated. Since the integrity of whole ecosystems does not necessarily ensure persistence of all species of conservation concern, particularly those with very limited distribution, we conducted additional fine filter analyses (by quantitative species-specific population and habitat indicators) to ensure that persistence is provided for all plant SCC to compare each alternative.

The fine filter viability evaluation focuses on species-specific data rather than habitat guilds and was conducted to compare the analysis of (1) percentage of known occurrences within different management areas, such as designated wilderness, recommended wilderness or lands suitable for timber production, (2)

estimated percentage of available potential habitat for each species in those areas, and (3) known threats to each individual SCC. Each alternative was considered using the fine filter approach. The habitat guilds are not used to quantitatively compare alternatives. For whitebark pine, a species that is a candidate species for federal listing, an additional indicator, population trend, was also evaluated. For this species, where trend information related to management activities has been documented in the plan area, quantitative, species-specific information was available for analysis. The adjustment of indicators was selected between the coarse and fine filter analysis because relative differences among alternatives could be readily compared. An overview of all at-risk species known in the plan area and species' respective determination rationale are presented in the Botany supplemental report in greater detail.

Invasive Plants

Programmatic effects to invasive species are indicated by evaluating the difference in frequency, intensity, or type of management activity or natural processes by alternative, insofar as they may potentially disturb the ground and result in greater risk of weed spread or invasion. The process for identifying risk and impacts resulting from invasive species is completed by FS botanists and vegetation specialists.

The geographic scope of the analysis for non-native invasive plants are the NFS lands of the HLC NF. This area represents the lands where changes may occur to vegetation as a result of management activities or natural events. For cumulative effects, the analysis area also includes the non-NFS lands within and adjacent to the administrative boundary of the HLC NF.

Two temporal scales were chosen to assess the current condition of invasive plants:

- Inventory data collected beginning in 2001 has been summarized to characterize current invasive plant infestations (in acres) on the HLC NF.
- Treatment data collected from 2010 to 2019 has been summarized to characterize invasive plant treatments (in acres) across the HLC NF. This allows for the use of the most recent and relevant data in regards to invasive plant treatments.

The following methods and associated data were used to analyze the current condition of invasive species:

- Summarization of existing Geospatial Information Systems data as entered through the Threatened, Endangered, and Sensitive Plants, and Invasive Species database and reported through the Geospatial Interface;
- Summarization of existing Forest Service Activity Tracking System data.
- Literature review of the best available science.

Terrestrial Wildlife Diversity

In developing plan components and in analyzing their potential effects on the diversity of native wildlife communities, we sought information on local wildlife populations and habitat factors from sources described in the section in the FEIS on best available scientific information. We identified key ecosystem characteristics, including those that support native wildlife species, assessed system drivers and stressors, and estimated the NRV for key ecosystem components. All of these are documented in the Terrestrial Vegetation section of the FEIS, and appendices H and I of the FEIS. During the planning process, evaluations were made regarding whether wildlife species' needs would be met by plan components that were being developed to maintain or restore ecosystem diversity and integrity.

This section of the FEIS relies on vegetation models (SIMPPLLE and PRISM) to estimate and predict the current status, NRV, and predicted future condition of key ecosystem characteristics that comprise

wildlife habitats. The Terrestrial Vegetation and Timber sections as well as appendices H and I provide information regarding the methods, accuracy, and limits of those models and their products. Estimates and predictions made for key ecosystem characteristics were evaluated using the best available scientific information regarding the habitat needs of native wildlife species, in order to assess the effectiveness of plan components in maintaining wildlife diversity.

For most habitats and species considered in this section of the FEIS, the analysis area is NFS lands within the administrative boundary of the HLC NF. The cumulative effects analysis area considers management of adjoining lands. The anticipated life of the forest plan is about 15 years. Management actions that occur under direction of the plan have the potential to impact wildlife species and their habitats for many decades, however, the analysis of potential vegetation and therefore habitat change spanned the next 50 years (refer to Terrestrial Vegetation section of the FEIS).

At-Risk Terrestrial Wildlife Species

The 2012 Planning Rule states that plan components that provide for ecological conditions for ecosystem integrity and ecosystem diversity are the primary context for the evaluation of at-risk species. For most species, the only practical quantitative evaluation of their required ecological conditions is an assessment of habitat conditions (ecological conditions). Therefore, this section of the FEIS relies on the analysis completed in the Terrestrial Vegetation section, and other sections as appropriate, regarding the ecological conditions required by at-risk species. As such, the methodologies and science used in the analysis of terrestrial vegetation (see appendix H) is inherent in the discussion and conclusions provided in this section.

This section also relies primarily on information in the scientific literature, and in published and unpublished reports regarding the presence, distribution, and requirements of at-risk wildlife species and potential impacts on them of existing and proposed management actions. Research reports and literature are frequently not available specifically for the HLC NF or nearby areas, or for the specific management proposed in the 2020 Forest Plan. Therefore, in this section, we have made inferences in applying information and conclusions from reports and literature to species, habitats, and management actions on the HLC NF.

The methods used for selecting species of conservation concern (SCC) for the HLC NF are documented on the Region 1 Species of Conservation Concern web page (www.fs.usda.gov/goto/R1/SCC). That process included extensive coordination with the HLC NF, and review of available data, observations, scientific literature, published and unpublished reports, and other information as documented there.

Habitat models used to estimate current and future habitat for some at-risk species discussed in this section of the FEIS are the same as those used to estimate current and future amount and distribution of terrestrial vegetation. Methods for modelling vegetation, as well as information about accuracy of those models, are described in the Terrestrial Vegetation section, and in appendix H of the FEIS. Estimates of wildlife habitat were made using specific queries from those vegetation models, and therefore assume the accuracy of the model that was queried. Information regarding the queries used to estimate wildlife habitats is available in appendix H and the project file. Models are based on accumulations of assumptions and therefore vary in their ability to predict actual habitat, and they cannot predict whether animals will actually use habitat as depicted. Please see appendix H for SIMPPLLE model results for some at-risk wildlife species.

Elk

This section summarizes the information sources and methodology used in the elk analysis. Additional detail can be found in the Elk Background Report in the project file. Information presented in this analysis and in the Elk Background Report comes from field examination of the planning area, inferences from

scientific literature, wildlife survey work in in the planning area, geospatial data, and discussions with other state and federal biologists.

The 1986 Forest Plans are described to provide context for the Environmental Consequence section. Note that both the Helena and Lewis and Clark 1986 Forest Plans include management area requirements specific to elk. For the purposes of this analysis, however, only forestwide requirements are included.

The USFS and MTDFWP Collaborative Recommendations for Big Game Habitat Management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests (U.S. Department of Agriculture, 2013) is also used because this paper reflects the efforts of wildlife biologists from the FS and MTDFWP to use the best contemporary information and their collective experiences in managing elk and elk habitat to address current issues and conditions on the referenced NFs.

Habitat-related data are presented according to metrics identified in (1) the 1986 Helena NF Plan; (2) the 1986 Lewis and Clark NF Plan; and (3) the U.S. FS and MTDFWP Collaborative Recommendations for Big Game Habitat Management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests. All vegetation data are based on R1-VMap. R1-VMap data are remotely sensed and represent a broad-scale, coarse filter depiction that is classified into vegetation components such as canopy cover, tree dominance type, and size class. Refer to the Elk Background Report in the project file for additional details regarding habitat mapping and estimation.

Please refer to appendix H for the modeling results for elk habitat.

1986 Helena National Forest Plan

The following methods and information have been used to describe the existing condition for elk habitat under the 1986 Helena NF Plan.

- Elk herd units serve as the basis for the analysis; these have been developed in conjunction with MTDFWP.
- Summer range comprises the entire elk herd unit. Winter range is based on updated MTDFWP range maps (2008).
- Hiding cover is based on the MTDFWP definition; both hiding cover and thermal cover are summarized in the Elk Background Report in the project file.
- Road density information is derived from transportation database. Assumptions made regarding which roads are included in calculations of density are detailed in the Elk Background Report in the project file.

1986 Lewis and Clark Forest Plan

The following methods and information have been used to describe the existing condition for elk habitat under the current Lewis and Clark NF Plan. See also the *Process for Analyzing Big Game Cover*, 2016.

- Sixth and 7th code subwatersheds (ranging from 3,000 acres to 40,000 acres) serve as the basis for the cover analysis under the Lewis and Clark plan.
- Vegetation data are used to develop the photo interpretive (PI) types as defined in the Montana Cooperative Elk/Logging Study (Lyon et al., 1985). Vegetation data from R1-VMap (refer to information in the Elk Background Report in the project file) has been used to assign PI type.
- Effective hiding cover is based on the “Montana Rule” that assigns a hiding cover percent to specific stand characteristics.

USDA FS and MTDFWP 2013

The following methods and information have been used to describe the existing condition for elk habitat according to the U.S. Forest Service and Montana Department of Fish, Wildlife, and Parks Collaborative Recommendations for Big Game Habitat Management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests (U.S. Department of Agriculture, 2013).

- The geographic area serves as the basis for the analysis.
- Elk security analysis is based on motorized routes (roads and trails). Definitions of elk security areas are in the collaborative recommendation paper cited above and are described in the Elk Background Report in the project file.
- Elk spring/summer/fall cover is determined primarily by tree canopy cover in certain tree dominance types, and elk winter cover is based on tree canopy cover. Refer to the collaborative recommendation paper cited above, and the Elk Background Report in the project file.

Elk Population Data

Elk survey data are provided by MTDFWP area biologists for the respective hunting districts (MTDFWP 2002 – 2016, where available). Elk analyses are also based on the Montana Statewide Elk Management Plan (Montana Fish and Wildlife and Parks, 2004). Elk harvest reports from 2004 to 2016 are located at <http://fwp.mt.gov/hunting/planahunt/harvestReports.html>

Recreation Settings, Opportunities, Special Uses, and Access

The analysis for sustainable recreation settings used existing travel plan information and the geographic information system to map each of the recreation opportunity spectrum classes. These classes were verified with forest personnel familiar with these areas.

Data for the recreation opportunities, recreation special uses, and recreation access portion of this analysis were derived from the Forest Service corporate database, Infrastructure. This database houses the specific information about the numbers, quantities, and types of recreation opportunities and special uses as well as the miles and status of roads and trails. This data was verified by forest personnel prior to inclusion in this analysis.

Scenery

The FS uses the scenery management system to inventory, analyze, and monitor national forest scenic resources. This system recognizes natural disturbance processes such as fire, insects, and disease to be part of the natural landscape that is dynamic and also important in maintaining healthy, sustainable, and scenic landscapes. The scenery management system is also used in the context of ecosystem management to determine the relative value, stability, resiliency, and importance of scenery; assist in establishing overall resource objectives; and ensure high-quality scenery for future generations. The primary components of the scenery management system are:

- scenic character
- scenic attractiveness
- landscape visibility
- existing scenic integrity
- scenic classes
- scenic integrity objectives

The Forest completed an inventory of landscape visibility and scenic attractiveness and compiled scenic classes. In 2011, the FS's Northern Region completed existing scenic integrity mapping at a regional

scale. Using this data, scenery was analyzed on a forestwide scale and included the encompassing viewsheds of the HLC NFS lands and the surrounding nonforest system lands. Landscape character descriptions for each of the GAs have been developed and are located in appendix G of the 2020 Forest Plan.

Data used to conduct the analysis came from the latest spatial information contained in the geographic information system data. Acreages and percentages of scenic integrity objectives were analyzed to determine how well they support the inherent scenic character and move the landscape toward desired scenic integrity objectives.

Administratively Designated Areas

The analysis for the existing administratively designated areas used maps stored in the Forest's GIS. Existing GIS maps were available for the following areas and were used in this analysis:

- inventoried roadless areas
- national recreation trails
- research natural areas
- Tenderfoot Creek Experimental Forest
- Elkhorns Wildlife Management Unit
- Kings Hill Scenic Byway

In addition to these existing administratively designated areas, the HLC NF identified the 6 new areas on the forest that may be administratively designated in the 2020 Forest Plan. The boundaries for these areas were identified and mapped for this analysis.

- recommended wilderness areas
- eligible wild and scenic rivers
- South Hills Recreation Area
- Missouri River Corridor
- Smith River Corridor
- Badger Two Medicine Area
- Green Timber Basin-Beaver Creek Emphasis Area
- Grandview Recreation Area

Wilderness Evaluation

The HLC NF was required to conduct a wilderness evaluation as a part of the forest planning process. The analysis for identifying potential recommended wilderness areas used official maps stored in the geographic information system. Specific data used to assess potential wilderness characteristics and overall descriptions were derived from the FS corporate Infrastructure database. This database houses the specific information about the acres, miles of trail, and facilities available within each wilderness area. Data was verified by forest personnel prior to inclusion in this analysis.

The geographic scope of the analysis included all lands administered by the Forest within the planning area. All lands within the HLC NF boundary form the geographic scope for cumulative effects, and the temporal scope was the life of the plan (approximately 15 years).

The process by which lands are recommended for inclusion in the National Wilderness Preservation System was intended to be transparent and consistent across the NFS. To accomplish this, the process occurred in four primary steps (2012 Forest Service Planning Rule and Chapter 70 of the FS Land Management Planning Handbook 1909.12.) Each step of the process required public participation and

collaboration, intergovernmental coordination with state and local governments, and tribal consultation (as required by the broader planning process). Steps 1-3 have been accomplished. Step 4 will be completed with the signing of the Record of Decision when the FEIS process has been completed.

1. **Inventory**: The Responsible Official (the Forest Supervisor) identifies and creates an inventory of all lands that may be suitable for inclusion in the National Wilderness Preservation System.
2. **Evaluation**: The Responsible Official evaluates the wilderness characteristics of lands identified in the inventory using a set of criteria based on the Wilderness Act of 1964.
3. **Analysis**: The Responsible Official considers the areas evaluated and determined which areas to further analyze for recommendation as part of one or more alternatives identified in a NEPA document.
4. **Recommendation**: The Responsible Official decides, based upon the analysis and input from Tribal, State, and local governments and the public, which areas, if any, to recommend for inclusion in the National Wilderness Preservation System.

All forest plan revisions are required to complete this process before the responsible official determines, within the plan decision document, whether to recommend lands within the plan area to Congress for wilderness designation. Wilderness recommendations are only preliminary administrative recommendations; Congress has reserved the authority to make final decisions on wilderness designation.

Wilderness characteristics are based on natural quality, undeveloped area, unconfined or primitive recreation or solitude, and unique or other features. Oftentimes, the ecological characteristics are discussed in terms of natural quality and undeveloped and can be represented by landscapes where the ecosystems of the area are intact and/or evidence of human disturbance is not readily apparent. Social characteristics can be discussed in terms of solitude or unconfined or primitive recreation and are often represented by remote, quiet landscapes where recreation activities such as hiking, climbing, fishing and hunting are predominant.

The HLC NF conducted a wilderness evaluation process outlined in the 2012 FS Planning Rule, Chapter 70 (Forest Service Land Management Planning Handbook 1909.12). Additional lands with potential for inclusion in the National Wilderness Preservation System were identified and evaluated in this process.

The inventory and evaluation steps were completed and displayed as an appendix in the proposed action. This draft environmental impact statement described the analysis step. The recommendation step will result from the final environmental impact statement and will be recorded in the record of decision. Recommendations of potential wilderness areas are only preliminary administrative recommendations. Congress reserves the authority make final decisions on wilderness designation. The ecological and social characteristics of recommended wilderness areas that provide the basis for suitability for inclusion into the National Wilderness Preservation System are identified for each recommended wilderness area by alternative and can be found in appendix E of the FEIS.

Eligible Wild and Scenic Rivers Study

The HLC NF was required to conduct an eligible wild and scenic river study as a part of the forest planning process. The 2012 Planning Rule's Final Directives (FSH 1909.12 Chapter 80) provided guidance for conducting a wild and scenic rivers eligibility study during forest plan revision. The HLC NFs used this guidance to conduct the wild and scenic rivers eligibility study for the planning area using the following steps.

- Step 1: Identified free-flowing named streams/rivers.
- Step 2: Identified regions of comparison for each resource.
- Step 3: Developed evaluation criteria for identifying outstanding remarkable values.

Step 4: Evaluated named streams/rivers and determine if they possess outstanding remarkable values.

Step 5: Reviewed level of development/determined classification of wild, scenic, or recreational.

Step 6: Developed forest plan management direction (included in the proposed action).

The eligibility study was conducted through a series of meetings and workshops aimed at each of the steps identified in the process paper. Much of the base information was developed from GIS, such as the base maps, determining the number and location of all “named streams”, and identifying the location of developments along or nearby these rivers and streams. Specific resource information about each river/stream was gathered from maps and professional knowledge provided by forest resource specialists.

The geographic scope of the wild and scenic rivers eligibility study was the free-flowing rivers and streams located within lands administered by the Forest. Rivers and segments of rivers that pass through private lands were not considered in the eligibility study. All lands within the HLC NF boundary form the geographic scope for cumulative effects, and the temporal scope is the life of the plan (15 years).

The document that summarizes the wild and scenic rivers eligibility study, as well as descriptions of each eligible river and maps are located in appendix F of the FEIS.

Congressionally Designated Areas

The analysis for designated areas used the official maps from the enabling legislation for these lands which are stored in the geographic information system. The HLC NF used the enabling legislation and official designated areas maps to analyze the following areas:

- Designated wilderness areas
- Wilderness study areas
- Continental Divide National Scenic Trail
- Lewis and Clark National Historic Trail
- Lewis and Clark National Historic Trail Interpretive Center
- Rocky Mountain Front Conservation Management Areas

Cultural, Historical, and Tribal Resources

The Regional Programmatic Agreement and the forest-specific Site Identification Strategy address details of National Historic Preservation Act/Section 106 compliance. They prescribe certain percentages of survey coverage for various types of undertakings, in order to adequately complete Section 106 effects analysis. The amount of survey and research anticipated depends on the undertakings involved. Information from project-level analyses assigns the ‘potential for the occurrence of cultural resources’ used in both NEPA and National Historic Preservation Act reviews.

The primary goal of a cultural resource inventory is to locate and describe archaeological, historic, and cultural sites and to make a recommendation of significance when such sites are found. Significance evaluations of known cultural resources and new sites discovered during inventories of a project area would follow general guidelines as set forth below:

1. Cultural materials were observed in depositional or surficial settings where cultural remains may have been buried or disturbed in essentially their original positions, thus preserving spatial context.
2. Artifacts diagnostic of historic or prehistoric cultural periods were found. Presence of such artifacts allows dating of cultural components and establishment of temporal and cultural context.

3. Presence of diagnostic artifacts in potentially preserved context makes it possible for a site to contribute significantly to understanding of local and regional history and prehistory.
4. Historic sites were found to associate with the lives of person(s) significant to local or regional history. Such associations can be apparent through archival research.
5. Historic or prehistoric sites were found to contain well-preserved features such as buildings, roads, trails, tipi rings, cairns, effigies, pictographs, or petroglyphs. Such features may be representative of or associated with an important period, architectural style, artistic style, or a unique or specialized activity.
6. Physical evidence of past or present cultural use of a locality for prayer, fasting, vision questing, piercing, burial, and other ceremonial activities were found. That evidence could include prayer cloth, rock structures, marked trees, sweat lodge remnants or hearths, or other lodge remnants. Presence of these things allow for identification of Traditional Cultural Properties.

Information from historic maps, the heritage resource database, and from numerous surveys completed in previous project areas identifies specific locations of prehistoric and historic sites. This information provides historic context and helps identify both specific sites present and the kind of sites which may exist across the Forest.

Evaluation of all potential historic properties, including traditional cultural properties, follows a set of criteria established by the Montana State Historic Preservation Office and the National Park Service. Historic properties are determined to be significant if they meet one or more of the following criteria (USDI-NPS Bulletin 15):

- a. They are associated with events that have made a significant contribution to the broad patterns in our history; and/or
- b. They are associated with the lives of persons significant in our past;
- c. They embody distinctive characteristics of a type, period, or method of construction that represents the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
- d. They have yielded, or may likely yield, information important in prehistory or history.

If sites do not meet the criteria for eligibility for the National Register of Historic Places after consultation with the appropriate parties, Section 106 of the National Historic Preservation Act stipulates no further consideration of cultural resources is necessary and the undertaking may proceed.

If a site meets any of these criteria, Section 106 requires an agency to determine the effect of the proposed action on the site. One of the following three determinations is possible:

1. No historic properties affected – a Heritage Specialist has determined that either there are no historic properties present or there are historic properties present, but the undertaking will have no effect upon them. The agency will notify all consulting parties and make the documentation available for public inspection before approving the undertaking.
2. Historic properties affected – a Heritage Specialist finds that there are historic properties the undertaking may affect or the State Historic Preservation Office/Tribal Historic Preservation Office or the Advisory Council objects to the agency's findings. The agency then will notify all consulting parties, invite their views on the effects, and assess adverse effects, if any.
3. Adverse effect – the Heritage Specialist determines that the effect on eligible cultural resources will be adverse. When an undertaking has been determined to have an adverse effect on a property eligible for listing, the agency is directed to consult with the State Historic Preservation Office/Tribal Historic Preservation Office and other consulting parties to develop and evaluate alternatives or modifications to the undertaking that could avoid,

minimize or mitigate adverse effects on historic properties. Mitigation of effects to a significant cultural resource entails a range of options including project redesign, avoidance, documentation (photography and archival research), or restoration and data recovery (through archaeological excavation). Mitigation options are selected on a case-by-case review and are tailored to the distinct values of the property and the planning options available within the project design. Once the agency and the State Historic Preservation Office agree on the mitigation measures for eligible properties and the conditions or stipulations have been met, the project may proceed.

The FS relies on its relationship and consultation with tribes to identify areas of tribal importance that may be impacted by FS actions. The consultation process affords both Tribes and the FS opportunities to identify sites, interests, and values of tribal importance as well as to design protective measures that avoid or mitigate effects to cultural or historical resources that are important to tribes.

Land use management plans, heritage reports, survey and research information, information from FS heritage resource specialists, and consultation with Tribe members are the primary sources of information used for this analysis.

Lands

The total acres of NFS lands are derived using a GIS measuring process. The total is comprised of lands under FS jurisdiction both within and outside of the proclaimed NFS boundary. The total acres of non-NFS lands are provided by the Washington Office Lands group and are only those lands within the proclaimed NFS boundary. The data source for the number of special use authorizations is the national special uses data system.

The FS uses the Land Status Record System (LSRS) as the repository for realty records and land title documents. The LSRS includes accurate information on ownership acreages, condition of title, administrative jurisdiction, rights held by the United States, administrative and legal use restrictions, encumbrances, and access rights on land or interests in land in the NFS.

The FS uses the Special Uses Data System (SUDS) to create and administer special use authorizations. The data in SUDS is supported by hard copy files at Ranger District and Forest Supervisor's offices.

The FS uses the Title Claims and Encroachments Program to store data related to encroachments. This program provides a consistent, standard, operating method to inventory, process, and resolve title claims and encroachment cases, and sort the data needed to prepare summary reports for management. The primary focus of Title Claims and Encroachments Program is the defense and protection of the lands and title of the public's estate managed by the FS.

Infrastructure

Information used to conduct the analysis generally comes from the national Infrastructure database. This database is a collection of web-based data entry forms, reporting tools, and mapping tools (GIS) that enable forest staff to manage and report accurate information about their inventory of constructed features and land units.

Social and Economics

Scale

The spatial scale for the Social and Economic analysis was determined as part of the Assessment process. Several factors were taken into account including FS staff expertise, commuting patterns, recreational

visitation, trade, travel corridors, social and cultural identity and timber processing areas. The temporal scope is the life of the plan (approximately 15 years). For a complete discussion of the process for determining the analysis area, please see the Helena-Lewis and Clark Assessment (Ch 5, p2), as well as the USDA Forest Service Protocols for Delineation of Economic Impact Analysis Areas (METI Corp/Economic Insights of Colorado, 2010).

Analysis

Economic and social benefits of the Forest are measured by identifying how ecosystem services (including multiple uses), infrastructure and operations, either directly or indirectly, contribute to economic and social sustainability. Specifically, ecosystem services are those societal benefits the Forest provides, including both goods and services, that are of value to people. Infrastructure and operations benefits include both physical elements, such as roads and facilities, as well as all the services the Forest staff provide such as fire suppression and educational programs.

The FS manages NFS lands according to the principle of multiple use. This principle allows the agency to manage land for a variety of uses, including amenity, commodity, non-commodity, and recreation. The Multiple-Use Sustained-Yield Act (P.L. 104–333) formalized this management philosophy, stating that the FS is to manage resources to best meet the needs of the American public, with flexibility to provide for “periodic adjustments in use to conform to changing needs and conditions” (Section 4(a) of the Act [16 U.S.C. 531]). For instance, areas suitable for timber production may contribute to the local economy by sustaining timber sector jobs and income; thereby maintaining social fabric and lifestyles of the community. Wilderness areas generate significant social well-being by providing world-class recreational settings and inspiration. Visitors from near and far may benefit from experiencing solitude in these pristine locations while contributing to the regional economy (i.e. travel and tourism related sectors) in terms of jobs, income and other economic activities.

Numerous approaches exist for measuring society’s condition or progress towards achieving social and economic sustainability. In the forest planning context, a broad ecosystem services framework, which catalogues societal benefits of forests, is an ideal framework for identifying how the plan area contributes to social and economic sustainability.

Societal benefits of the Forest are used and/or valued differently by different groups and communities. The Assessment provided a brief overview of social and economic conditions and highlighted the benefits the Forest provides to the affected communities. In the Affected Environment section, the social and economic conditions of affected communities are summarized alongside a discussion of the key societal benefits the Forest provides to beneficiaries.

Livestock Grazing

The analysis area includes NFS rangelands within grazing allotments across the entire HLC NF plan area. While the HLC NF has been combined into one administrative unit, the 1986 Forest Plan guidance and much of the available data is split by the old forest boundaries. Therefore, the units may be described separately where appropriate in the analysis. A portion of the Beaverhead-Deerlodge National Forest lies within the Elkhorns GA, and revision of management direction for this area will take place within the Helena-Lewis and Clark National Forest Plan (2020).

The proposed action and alternatives to the proposed action include components that describe actions that may, or may not, impact the management of grazing livestock. For this analysis, each alternative is evaluated using one or more key indicators to determine the overall impacts to livestock grazing on NFS land. When the degree of impact cannot be quantified, a qualitative assessment is used based on professional judgment and, when possible, in conjunction with available data.

Geology, Energy, and Minerals

There are approximately 2,883,227 acres of NFS lands that are the administrative responsibility of the Forest. This is the result of the original Congressionally-designated lands and the conveyances (acquisitions, disposals, and exchanges) that have occurred to date.

The acres that are available for locatable mineral development are determined by subtracting the number of acres that are withdrawn from locatable mineral entry from the total number of acres for the HLC NF. The number of acres that are withdrawn from mineral entry is a matter of record. By law, the Bureau of Land Management is the keeper of these official records in the General Land Office.

The number of acres that are available for leasing proposals is determined by subtracting the number of acres that are legally unavailable from the total number of acres on the HLC NF. There are no active leases on the forest aside from one lease (Solonex) which has been subject to litigation. A leasing decision is not a part of the 2020 Forest Plan.

The number of acres that are available for disposal of mineral materials is determined by subtracting the number of acres where the FS has exercised its discretion to refrain from authorizing the disposal of mineral materials from the total number of acres on the HLC NF.

Climate and Carbon Sequestration

See appendix J.

Literature

- Chew, J. D., Moeller, K., & Stalling, C. (2012). *SIMPPLLE Version 2.5 user's guide*. Retrieved from Fort Collins, CO.
- Lyon, L. J., Lonner, T. N., Weigand, J. P., Marcum, C. L., Edge, W. D., Jones, J. D., . . . Hicks, L. L. (1985). *Coordinating elk and timber management: Final report of the Montana cooperative elk-logging study 1970-1985*. Retrieved from Bozeman, MT.
- METI Corp/Economic Insights of Colorado, LLC. (2010). *U.S.D.A. Forest Service protocols for delineation of economic impact analysis areas*.
- Montana Fish and Wildlife and Parks. (2004). *Montana statewide elk management plan*. Retrieved from Helena, MT.
- U.S. Department of Agriculture, Forest Service and Montana Department of Fish, Wildlife & Parks. (2013). *Collaborative overview and recommendations for elk habitat management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests*.