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Biennial Monitoring Evaluation Report

White River National Forest



Forest Service

White River National Forest

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Summary of Findings and Results

Table 1 consists of the 2018 Monitoring Report summary of the findings and results. This table briefly describes for each monitoring item if the monitoring results demonstrate intended progress toward plan targets, whether changes are warranted, and where changes may be needed in the forest plan, management activities and/or monitoring program.

Table 1. Summary of findings.

Monitoring Item	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
1.1: Watershed Condition Framework Is the unit improving condition in priority watersheds?	2018	Yes	No	N/A
1.2: Watershed Condition Class Is the unit maintaining or improving watershed condition class in non-priority watersheds?	2018	Uncertain (C)	Yes	Monitoring Plan
1.3: National Best Management Practices Program Are Best Management Practices (BMPs) implemented, and are they effective at protecting water quality?	2018	Yes	No	N/A
2.1: Air Quality What are the conditions and trends for visibility in Class I and selected Class II areas on the unit?	2017	Yes	No	N/A

Monitoring Item	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
<p>2.2: Forest and Grassland Health</p> <p>What are the status and trends of insects and disease in and around the plan area?</p>	2017	Yes	No	N/A
<p>2.3: Ecosystem Health</p> <p>How are major vegetation types on the planning unit changing over time?</p>	2017	Yes	No	N/A
<p>3.1: Macro-invertebrates</p> <p>Is Forest management contributing to conditions that maintain or improve biological stream health trends for biotic macroinvertebrate communities?</p>	2017	Uncertain (B)	More evaluation of site specific declines needs to be conducted.	Unknown at this time.
<p>3.2: Red Squirrel</p> <p>What do red squirrel populations tell us about the extent and condition of mid to late successional forested ecosystems on the planning unit?</p>	2017	Yes	No	N/A
<p>3.3: Pika</p> <p>What is the status of American pika populations as an indicator for alpine ecosystem integrity?</p>	2017	Uncertain (B).	No	N/A

Monitoring Item	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
<p>3.4 Avian Species</p> <p>What are the status and trends of select avian species on the White River National Forest?</p>	2017	Yes	No	N/A
<p>4.1: Cutthroat Trout</p> <p>What is the status and trend of cutthroat trout across the planning area?</p>	2018	Uncertain (B)	N/A	N/A
<p>4.2 Amphibians</p> <p>What is the status and trend of boreal toads and northern leopard frogs being across the planning area?</p>	This question will be evaluated in the 2020 Monitoring Report	N/A	N/A	N/A
<p>4.3 Lynx Habitat</p> <p>What is the status and trend of early successional conifer and late seral spruce-fir forests to promote recovery of Canada lynx?</p>	2017	Yes	No	N/A
<p>5.1: Visitor Satisfaction and use.</p> <p>What are the status and trends of visitor satisfaction for recreational visits on the planning unit?</p>	2007, 2012	Yes	No	N/A
<p>5.2: Special Uses Administration</p> <p>What are the number and type of Special Use Permits administered to standard?</p>	2017	Yes	No	N/A

Monitoring Item	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
<p>5.3: Sustaining Recreation Infrastructure</p> <p>How is the forest trending towards implementing a sustainable program for recreation related infrastructure?</p>	2016	Yes	No	N/A
<p>6.1: Snowpack and Precipitation</p> <p>What is the status and trends of snowpack and precipitation in the planning area?</p>	2017	Uncertain (B)	No	N/A
<p>7.1: Economic Contributions from Specific Programs</p> <p>What are the contributions from the range, timber, recreation, and minerals program from the National Forest or Grassland?</p>	2018	Yes	Yes	Monitoring plan
<p>7.2. Heritage Program Stewardship</p> <p>To what extent have management activities on the Forest complied with Section 110 of the National Historic Preservation Act and provided quality heritage recreational experiences?</p>	This question will be evaluated in the 2020 Monitoring Report			
<p>7.3 – Travel Management Implementation</p> <p>What are the status and trends of roads and trails in the White River NF?</p>	2017	Yes	No	N/A

Monitoring Item	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
<p>7.4 - Wilderness</p> <p>What are the status and trends of the Wilderness Stewardship Performance elements?</p>	2016, 2017	Yes	No	N/A
<p>7.5 - Management Activity Bare Ground Recovery</p> <p>Are project level design criteria and mitigation measures addressing ground disturbing management activities meeting the direction to "...maintain or improve levels of soil organic matter on all lands" through bare ground rehabilitation projects?</p>	2018	Yes	No	N/A
<p>8.1 - Soil Productivity Monitoring</p> <p>What are the status and trends of soil productivity?</p>	2018	Yes	No	N/A

¹Interval of data collection is beyond this reporting cycle (A); or more time/data are needed to understand status or progress of the plan component (B); or methods/results are inadequate to answer monitoring question (C).

² see body of the report for more details regarding any specific recommendations/opportunities for change.

Introduction

Purpose

The purpose of the biennial monitoring evaluation report is to help the responsible official determine whether a change is needed in forest plan direction, such as plan components or other plan content that guide management of resources in the plan area. The biennial monitoring evaluation report represents one part of the Forest Service’s overall monitoring program for this national forest unit. The biennial monitoring evaluation report is not a decision document—it evaluates monitoring questions and indicators presented in the Plan Monitoring Program chapter of the forest plan, in relation to management actions carried out in the plan area. The White River National Forest Land and Resource Management Plan – 2002 Revision (Forest Plan) was updated in 2016 following the 2012 Planning Rule in order to replace “Chapter 4 Monitoring and Evaluation” with “White River Forest Plan: Updated Monitoring Plan (Monitoring Plan).”

Monitoring and evaluation are continuous learning tools that form the backbone of adaptive management. For this reason, our goal is to produce an evaluation report every two years. This is our first written report of this evaluation since the Monitoring Plan was adopted on May 6, 2016. This report indicates whether a change to the forest plan, management activities, monitoring program or forest assessment may be needed based on the new information. This 2018 biennial monitoring evaluation report for the White River National Forest (WRNF) is available at https://www.fs.usda.gov/detail/whiteriver/landmanagement/?cid=fsbdev3_001228.

Objectives

There are several objectives for this report, including:

- Assess the current condition (i.e., status) and trend of selected forest resources.
- Document implementation of the Monitoring Plan including changed conditions or status of key characteristics used to assess accomplishments and progress toward achievement of the selected Forest Plan components.
- Evaluate relevant assumptions, changed conditions, management effectiveness, and progress towards achieving the selected desired conditions, objectives, and goals described in the Forest Plan.
- Assess the status of previous recommended options for change based on previous monitoring and evaluation reports.
- Document any scheduled monitoring actions that have not been completed and the reasons and rationale why it has not.
- Present any new information not outlined in the current plan monitoring program that is relevant to the evaluation of the selected monitoring questions.

How to Use this Report

This report is a tool and a resource for the Forest Service to assess the condition of forest resources in relation to Forest Plan direction and management actions. It is also a tool and a resource for the public to learn more about how the Forest Service is managing forest resources.

The biennial monitoring evaluation report is designed to help the public, tribal entities, other stakeholders, and federal, state, local governments anticipate key steps in the overall monitoring program. The biennial monitoring evaluation report is also intended to help people better understand reported results in relation to past monitoring reports, future monitoring reports, and the broader-scale monitoring strategy that is issued at the Forest Service regional level.

The White River National Forest will make this report available for public review and feedback. The forest is also interested in how members of the public feel that the forest supervisor should incorporate this information into decision making. We will reactivate the public comment portal from the monitoring transition project page and individuals and organizations are strongly encouraged to submit feedback here: <https://cara.ecosystem-management.org/Public/CommentInput?Project=49221>

The goal is to receive constructive feedback on how the forest can utilize limited forest plan monitoring resources and take advantage of existing datasets and monitoring information. The monitoring program welcomes public participation per the Forest Service Handbook (FSH 1909.12_42.14) “to obtain public feedback on what the monitoring information suggests about the effectiveness of the land management plan.”

About the Forest Plan Monitoring Program

Roles and Responsibilities

The Forest Plan Monitoring Program requires a coordinated effort of many people. It includes people who collect the data, people who analyze the data and report results, people outside the Forest Service who provide feedback and assistance, and agency decision makers who apply the results. A list of contributors to this report is found in Appendix B: List of contributors.

How the Forest Plan Monitoring Program Works

Monitoring and evaluation requirements are established through the National Forest Management Act (NFMA) at 36 CFR 219. Additional direction is provided by the Forest Service in Chapter 30 – Monitoring – of the Land Management Handbook (FSH 1909.12).

Monitoring of the Forest Plan has occurred since it was adopted in 2002. For a copy of previous monitoring reports and for information about the monitoring program go to https://www.fs.usda.gov/detail/whiteriver/landmanagement/?cid=fsbdev3_001228.

This 2018 biennial monitoring evaluation report uses a new framework that is in line with the 2012 Planning Rule and follows the amendment to the Forest Plan made in 2016. Monitoring questions and indicators were selected to inform the management of resources on the plan area and not every plan component was determined necessary to track [36 CFR 219.12(a)(2)]. See the Plan Monitoring Program at https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500459.pdf for discussion on how the monitoring questions were selected to be consistent with the 2012 planning regulations 36 CFR 219.12. Providing timely, accurate monitoring information to the responsible official and the public is a key requirement of the plan monitoring program. This 2018 biennial monitoring evaluation report is the vehicle for disseminating this information.

In the context of forest planning there are three main monitoring goals:

- Implementation monitoring - Are we implementing the Forest Plan implemented properly? Are we meeting our management targets and project guidelines?

- Effectiveness monitoring - Are we achieving our Forest Plan management goals and desired outcomes? If not, how, and why?
- Validation monitoring - Do our hypotheses testing indicate we may need to change the Forest Plan? To what extent? In what direction?

Implementation monitoring is important for tracking progress and accomplishments. However, it is effectiveness and validation monitoring that drive and support the adaptive management process. Effectiveness monitoring evaluates condition and trend relative to desired conditions. Validation monitoring tests hypotheses and provides information that might necessitate changes to desired conditions in the plan (e.g. is what we think the desired state should be accurate?).

Monitoring Evaluation

Monitoring Activities

The following sections present the most current information (data and evaluations) for all monitoring questions contained within the WRNF Monitoring Plan. The monitoring plan contains 23 questions. Twenty-one of those questions were updated during the current evaluation period 2016 - 2018 with the most recent available data and have had their associated discussions updated in the next section of this report. Two additional questions were removed from consideration during this reporting cycle and are identified in Appendix A – Monitoring Items Not Evaluated in Detail (Amphibians and Heritage Resources).

This section and all its subsections describe the details of how monitoring data were collected, reported, and evaluated for the Monitoring Plan to support the recommendation options. This section displays the summary of data results compiled for each monitoring item. The organization of this section follows the organization of the monitoring program contained within the Forest Plan.

Questions in the 2016 Monitoring Plan Strategy have reporting intervals ranging from one to five years. This report includes questions scheduled for reporting after the adoption of the updated monitoring plan through mid-2018. Results for questions that have reporting intervals longer than two years are not included in this report, except for those that depend on periodic reports. For example, the White River National Visitor Use Management Survey was conducted in 2017, but the data are not yet available, so this report relies on 2012 data. This information will be updated in the next biennial report. As described in the 2016 Monitoring Plan Strategy, 23 questions are spread over the 8 required monitoring categories:

- i. Watershed conditions
- ii. Ecological conditions
- iii. Focal species
- iv. Ecological conditions for at-risk species
- v. Visitor use, visitor satisfaction, and recreation plan objectives
- vi. Climate change measures and other stressors
- vii. Forest Plan desired conditions and objectives
- viii. Management and productivity of land (soils)

Each monitoring item includes 1) a summary of the monitoring question and its indicators; 2) an evaluation of the monitoring results, discussion, and findings; and 3) an adaptive management finding on whether recommendation options could be considered for future changes or not.

I. The status of select watershed conditions

Monitoring Item 1.1: Watershed Condition Framework

Monitoring Question and Background

- Is the unit improving condition in priority watersheds?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Frequency of data a) collection b) reporting	Targets or thresholds
Goal 1, Objective 1a: “Improve and protect watershed conditions to provide the water quality and quantity necessary to support ecological functions and intended beneficial uses.”	Completion of the number and percentage of essential projects identified in Watershed Restoration Action Plan(s).	<u>USFS Watershed Condition Framework (WCF)</u> . Watershed Condition Assessment Tracking (WCATT) database	a) Every 6 years for WCF and annually for WCATT; b) Every 6 years for WCF and annually for WCATT;	Condition class of select watersheds is maintained or improved over the life of the Forest Plan

Monitoring Results

The US Forest Service’s “Watershed Condition Framework” (WCF) is used to assess the overall watershed condition of all sub-watersheds on the forest, prioritize restoration efforts, and track progress toward improving watershed condition on National Forest System (NFS) lands (USDA Forest Service, 2011a). Within the WCF framework, several priority watersheds are designated that require the preparation of a Watershed Restoration Action Plans (WRAPs). These are programmatic documents that identify essential projects needed to improve conditions in priority watersheds. Completion of WRAPs and essential projects are used to evaluate progress toward meeting Forest Plan goals and objectives related to maintaining and improving watershed conditions. Figure 1 shows the location of priority watersheds on the WRNF, and Table 2 summarizes WRAPs and essential projects. In the figure, green represents watersheds in best condition (Condition Class 1) and yellow represent watersheds in moderate condition (Condition Class 2). The WRNF has no watersheds in the lowest condition class (shown in red). Blue stars indicate WRNF priority watersheds.

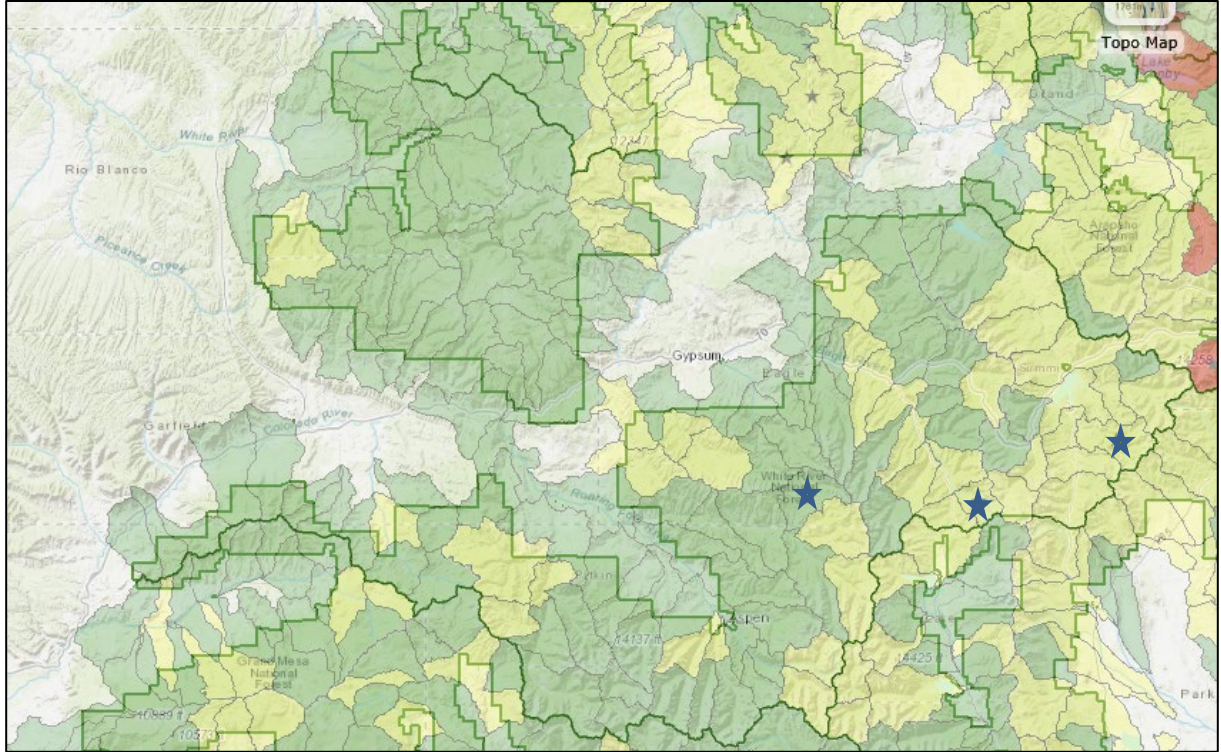


Figure 1. WRNF watershed condition classification and priority watersheds.

Green represents watersheds in best condition (Condition Class 1) and yellow represent watersheds in moderate condition (Condition Class 2). The WRNF has no watersheds in the lowest condition class (shown in red). Blue stars indicate WRNF priority watersheds.

Table 2. Summary of Watershed Restoration Action Plan implementation.

Sub-basin (HUC-8)	Sub-watershed (HUC-12)	WRAP Approval Date	Number of Essential Projects	Number of Essential Projects Completed	Estimated Completion Date of All Essential Projects
Roaring Fork	Lime Creek	24 Oct 2011	5	4	30 Sept 2019
Eagle	East Fork Eagle	01 Sept 2012	4	2	31 Oct 2028
Blue	Swan River	31 Aug 2012	3	2	31 Oct 2022
Eagle	Turkey Creek	Still in Draft	7	2	---

Monitoring Discussion and Findings

WRAPs have been approved for three of these priority watersheds and restoration efforts are underway. Table 2 shows that significant progress has been made on the approved WRAPs; most of the remaining projects are either very large, expensive and time consuming or are the responsibility of partner agencies, such as cutthroat trout reintroduction by Colorado Parks and Wildlife.

The WRAP for Lime Creek will be completed in 2019. Progress continues in the Swan River; the remaining project will begin implementation in 2021. Efforts in the Eagle River at Camp Hale have paused while discussions continue with the State Historic Preservation Office about how to

restore aquatic conditions at Camp Hale while honoring the historical significance of the World War II military base.

The Forest intentionally prioritized large-scale and expensive restoration in watersheds that include Camp Hale and the historic dredge boat mining in the Swan River. This was done to bring attention to these large projects, knowing that completion would take a decade or more. While progress is slow in these watersheds, the conditions are being improved with each essential project completed, consistent with the goal of improving watershed conditions.

Adaptive Management Considerations

The monitoring shows that progress is being made to improve conditions in priority watersheds consistent with Forest Plan goals and objectives. Since the WCF is only updated every six years, it is not a particularly sensitive baseline of comparison. However, priority watersheds with associated essential projects can be designated at any time and tracked under this monitoring question. As such, no adaptive changes to the Forest Plan, WCF program or this monitoring question are anticipated at this time.

Monitoring Item 1.2: Watershed Condition Class

Monitoring Question and Background

- Is the unit maintaining or improving watershed condition class in non-priority watersheds?

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Frequency of data a) collection b) reporting	Targets, thresholds
Goal 1, Objective 1a. Strategy 1a.3 Over the life of the plan, monitor watershed condition in all watersheds. Evaluate degraded watersheds for improvement potential. Where restoration work has been applied, assess trends towards positive watershed condition.”	Percentage of sub-watersheds maintained or improved.	Watershed condition framework	a) As conditions change, e.g. wildfire, floods, insect and disease outbreaks, large-scale restoration, etc. b) 6 years	Condition class of all watersheds is maintained or improved over the life of the Forest Plan

The WCF uses a suite of twelve indicators that reflect the condition of the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition. These indicators include the physical aquatic metrics of water quality, water quantity and aquatic habitat; aquatic biological metrics of aquatic biota and riparian/wetland vegetation; terrestrial physical metrics related to the condition of roads, trails and soils; and terrestrial biological metrics for fire regime, forest and rangeland vegetation, invasive species and forest health. Each indicator has sub indicators which are assigned a numeric rating, all of which are summed and averaged to give a condition class rating for each watershed.

Monitoring Results

Class 1 watersheds have an ecological structure, function, and composition that are comparable to natural wildland conditions. Class 2 watersheds are “functioning at risk”, and Class 3 watersheds have highly impaired functions. Figure 2, which summarizes the condition of all sub-watersheds on the

forest, shows the proportion of watersheds in Class 1 and Class 2 condition classes. There are no watersheds on the WRNF in the lowest condition class.

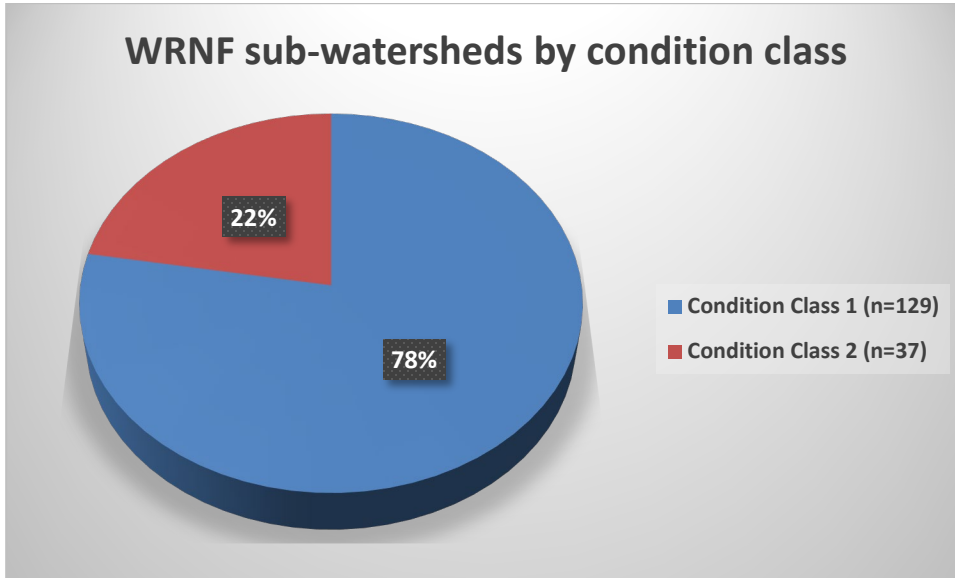


Figure 2. Proportion of WRNF sub-watersheds by condition class.

Monitoring Discussion and Findings

Watersheds in Condition Class 1 account for 78% of the land on the WRNF. Of the 22% of watersheds in Condition Class 2, most are impacted by roads, urbanization and/or invasive species. These current figures serve as a baseline for future biennial reporting.

Adaptive Management Considerations

The monitoring shows a snapshot of conditions from when the Watershed Condition Framework assessment was completed in 2010. Therefore, progress toward Forest Plan goals and objectives cannot be demonstrated in this biennial report.

Since the WCF is only updated every six years, it is not a particularly sensitive baseline of comparison to show progress toward watershed improvement goals. Ground disturbing activities and restoration work are simultaneously occurring in many watersheds across the forest in any given year, yet the net effects of these activities are not large enough to cause a change in condition class. It can be argued that too much resolution is being requested from this national dataset. As such, to be an effective monitoring question, analysis in subsequent years may require that project level data be evaluated in affected watersheds with a determination of whether overall condition was decreased, maintained, or improved. WCF metrics may need to be updated annually to keep track of numeric or categorical changes in each watershed. As such, no adaptive changes to the Forest Plan are anticipated at this time, but elements of the WCF program and this monitoring question may need to be modified to provide meaningful results for subsequent biennial reports.

Monitoring Item 1.3: National Watershed Best Management Practices Program

Monitoring Question and Background

- Are Best Management Practices (BMPs) implemented, and are they effective at protecting water quality?

The purpose of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water, and riparian resources that may result from land management activities in or adjacent to aquatic ecosystems.

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Frequency of data a) collection b) reporting	Targets, thresholds
Goal 1, Objective 1a: “Improve and protect watershed conditions to provide the water quality and quantity necessary to support ecological functions and intended beneficial uses.”	Monitoring protocol rating system categories	National Best Management Practices for Water Quality Management on National Forest System Lands (2012)	a) Annually b) 2 years	All prescribed BMPs in the National Core Technical Guide are fully implemented and effective for each evaluation

Monitoring Results

Since 2015, the WRNF has monitored the implementation and effectiveness of BMPs with nationally consistent protocols. The National BMP Program consists of four main components: 1) a set of National Core BMPs, 2) a set of standardized monitoring protocols to evaluate implementation and effectiveness of those BMPs, 3) a data management and reporting structure, and 4) corresponding national direction.

Monitoring protocols are available for forest management activities related to aquatic restoration, chemical uses, facilities management, fire, minerals and mining, rangeland management, developed and dispersed recreation, roads management, vegetation management, and water uses. Each year the forest completes at least ten formal monitoring evaluations, five of which are assigned by the Regional Office, the other five are selected by the forest. Both implementation monitoring (if BMPs were implemented) and effectiveness monitoring (if BMPs were effective at protecting aquatic resources) can be evaluated for each activity. Table 3 summarizes the monitoring activities evaluated over the reporting period.

Table 3. Forest management activities monitored on WRNF in fiscal years 2017 and 2018.

Activity by BMP monitoring code	Description	Number of Evaluations
AqEco_A	Active Construction of Aquatic Ecosystem Improvements	2
AqEco_B	Completed Aquatic Ecosystem Improvements	1
Chem_C	Chemical Use for Dust Abatement	1
Fac_B	Operation and Maintenance of non-Corridor Facilities	1
Fire_B	Wildfire Management Actions	1

Activity by BMP monitoring code	Description	Number of Evaluations
Min_D	Reclamation of Mineral Operations	1
Rec_C	Completed Construction or Reconstruction of Trails	1
Rec_H	Completed Ski Area Construction or Reconstruction	2
Road_A	Active Road or Waterbody Crossing Reconstruction	4
Road_B	Completed Road or Waterbody Crossing Reconstruction	1
Road_C	Road Operation and Maintenance	2
Road_E	Active Road Decommissioning	1
Road_F	Completed Road Decommissioning	1
Veg_C	Mechanical Site Treatments	1
WatUses_D	Active Construction of Diversion and Conveyances	1
	TOTAL	21

The results from applying the monitoring protocols are summarized below in Figure 3 for implementation monitoring and in Figure 4 for effectiveness monitoring. Figure 3 shows the extent to which required BMPs were implemented across the range of projects. Figure 4 shows how effective required BMPs were at protecting aquatic resources from a variety of land management activities.

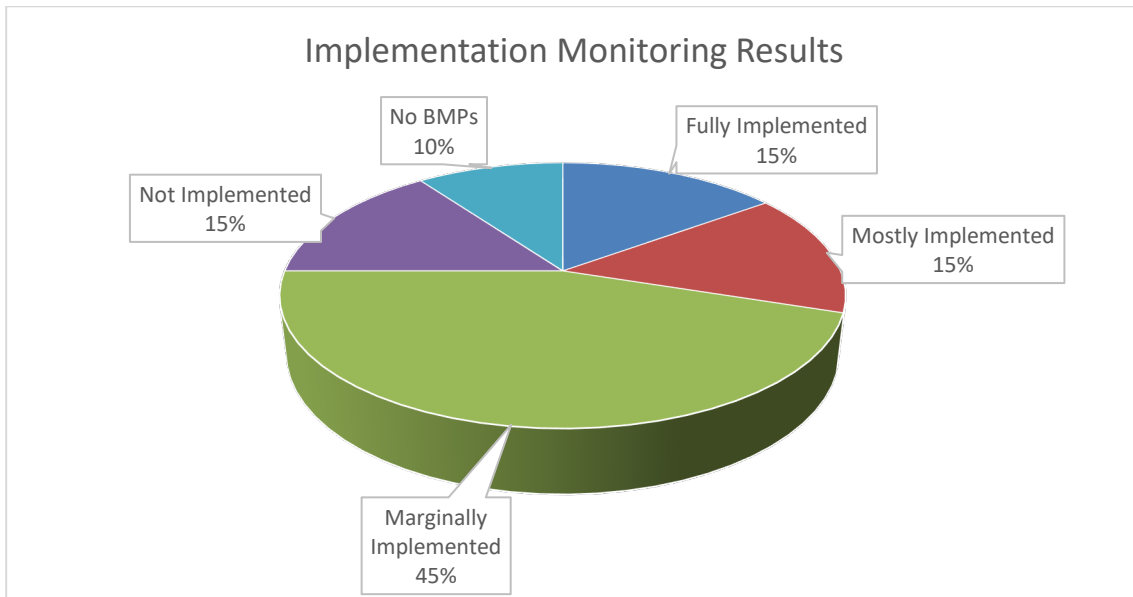


Figure 3. Results from BMP implementation monitoring sites for fiscal years 2017 and 2018.

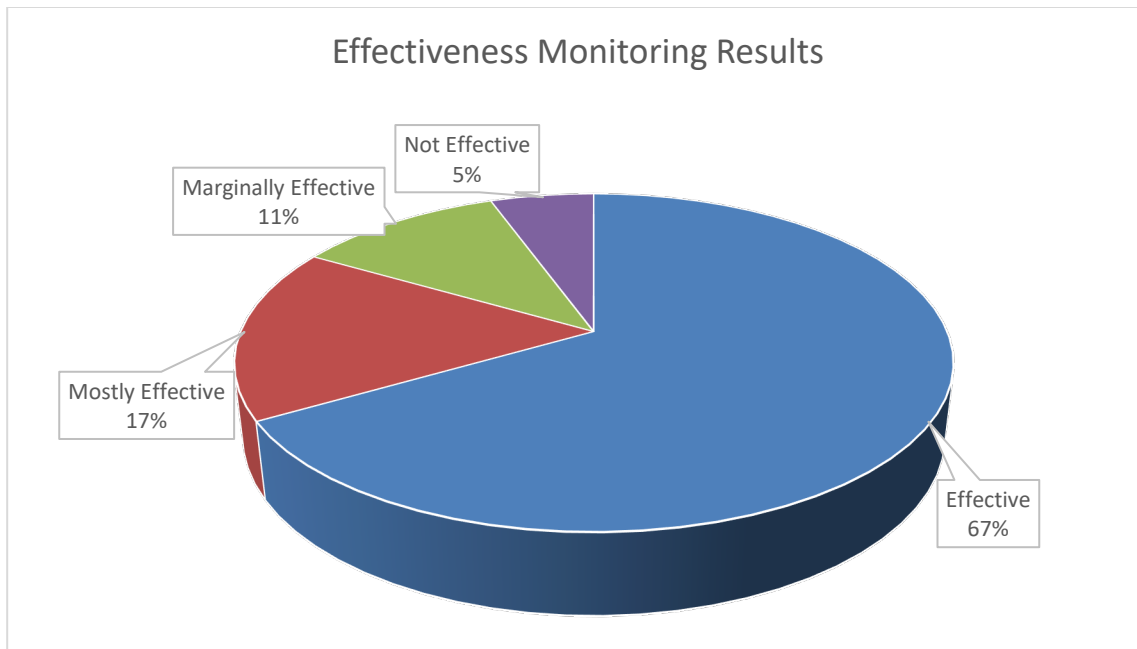


Figure 4. Results from BMP effectiveness monitoring sites for fiscal years 2017 and 2018.

Monitoring Discussion and Findings

The results in Figure 3 and Figure 4 suggest that the implementation and effectiveness of accepted BMPs have protected aquatic resources to a degree but are falling short of complete compliance. Implementation monitoring shows the most room for improvement with only 30 percent of the sites rated as either fully or mostly implemented. One explanation for this shortfall is that 8 of the twenty ratings for implementation monitoring were for projects that were *actively being constructed*. Since projects were ongoing, certain BMPs had yet to be implemented because the sequence of construction had yet to require them. As an example, the final seeding would not be implemented until the project is totally complete. This would show as Not Implemented at the time of the assessment, even though seeding would eventually be completed.

Effectiveness of the prescribed BMPs show that 84% of those applied were fully or mostly effective. While this is encouraging, the intent is for the practices to be 100% effective at protecting aquatic resources. More analysis is required to determine if the shortcoming is due to the efficacy of the BMP itself, or if the BMP was not precisely implemented. A cursory review of the forms suggests that the quality of the implementation could be improved.

Adaptive Management Considerations

The monitoring shows that progress is being made to improve and protect watershed conditions consistent with Forest Plan goals and objectives, although there is room for improvement. The data collection methodology and monitoring question appear to be sufficiently scaled to reach meaningful conclusions about if, and how well, management actions are mitigated to protect aquatic resources. As such, no adaptive changes to the Forest Plan, BMP program or this monitoring question are anticipated at this time.

II. The status of select ecological conditions

Monitoring Item 2.1: Air Quality

Monitoring Question and Background

- What are the conditions and trends for visibility in Class I and selected Class II areas on the unit?

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Frequency of data a) collection b) reporting	Targets, thresholds
Physical, Air Resources, Standard 1. "Meet state and federal air quality standards and comply with local, state, and federal air quality regulations and requirements either through original project design or through mitigation for such activities...."	Haze and visibility at Ajax IMPROVE monitoring site	IMPROVE / Federal Land Manager Environmental Database	a) Weekly b) 2 years	Maintain or improve visibility in Class I areas

Monitoring Results

Visibility monitoring has been conducted on the WRNF at Ajax Ski Area in Aspen, CO since 2001 as part of the Interagency Monitoring of Protected Visual Environments program (IMPROVE). IMPROVE stations monitor concentrations of atmospheric aerosols, such as sulfates and nitrates. Visibility is calculated using the “deciview” index, which measures the degree to which light is absorbed or scattered by air pollution. A deciview value of 1 reflects a measure of change in visibility that is perceptible to the human eye. A low deciview reflects high visibility, while a high deciview number reflects low visibility. Results are shown below in Figure 5, Figure 6, and Figure 7. Annual data representing the clearest days are the average of the clearest 20 percent of samples collected in a year. Similarly, data for the haziest days are the average of the haziest 20 percent of samples over the year.

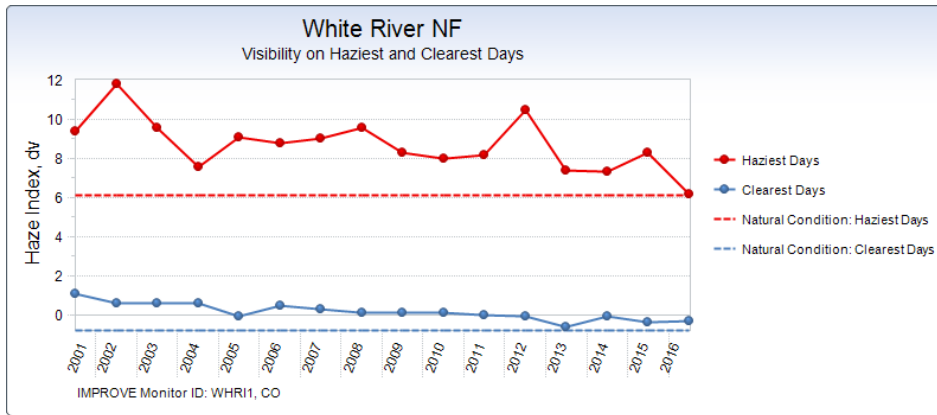


Figure 5. Trends in visibility for the haziest and clearest days on WRNF from 2001 to 2016.

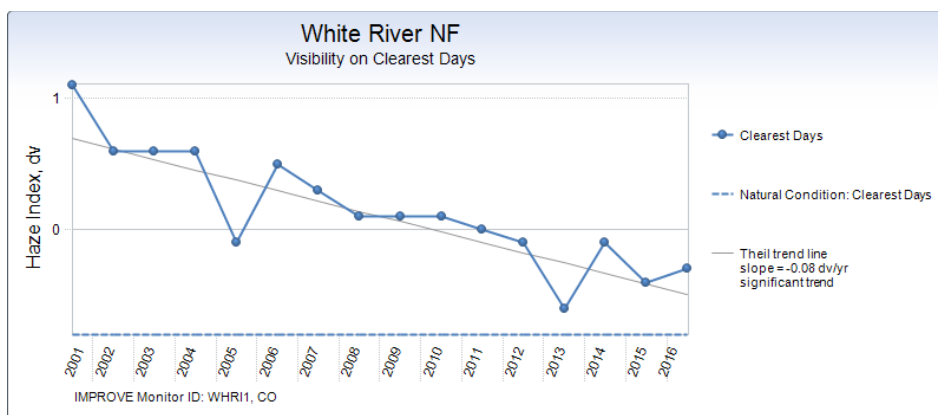


Figure 6. Visibility measurements on clearest days from 2001-2016 show a statistically significant trend of improvement.

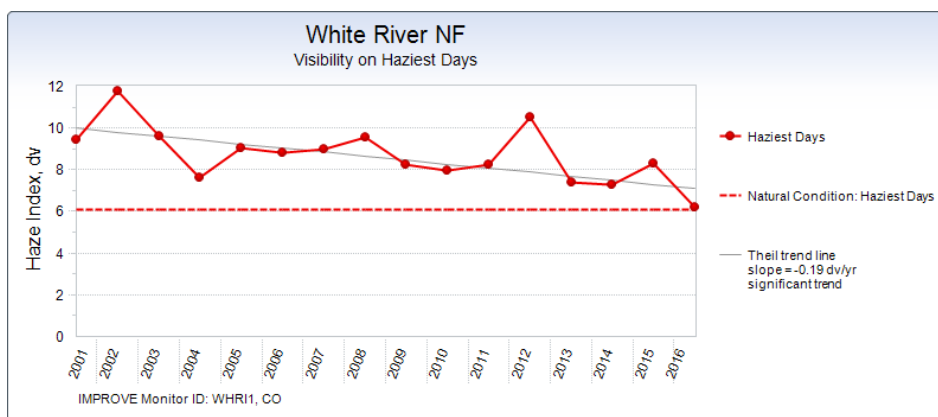


Figure 7. Visibility measurements on haziest days from 2001-2016 show a statistically significant trend of improvement.

Monitoring Discussion and Findings

IMPROVE monitoring results for both the haziest and clearest days indicate a decreasing trend in haze over time, particularly for the haziest days. The regression line for the haziest days shows a general decrease in haze of 0.19 deciviews/year, while the same data for the clearest days shows an improvement in visibility over time of 0.08 deciviews/year. Note that years with the most significant haze are periods of extreme drought and associated fire activity (i.e. 2002 and 2012). This long-term data set serves as the monitoring baseline going forward. It should be noted that while some forest management activities can affect visibility, these measured values are influenced by activities well beyond and outside the control of the WRNF.

Adaptive Management Considerations

The monitoring shows that visibility in Class 1 areas is being maintained or improved, consistent with Forest Plan goals and objectives. The data collection methodology and monitoring question provide the means to reach meaningful conclusions about trends in air quality, even though there may be no direct link between forest management activities occurring at a local scale and air quality values that assess conditions for an airshed much, much larger than the WRNF. No adaptive changes to the Forest Plan, IMPROVE program or this monitoring question are anticipated at this time.

Monitoring Item 2.2: Forest and Rangelands Health

Monitoring Question and Background

- What are the status and trends of insects and disease in and around the plan area?

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Freq. of a) data collection b) reporting	Targets, thresholds
<p>Goal 1, Objective 1d</p> <p>“Increase the amount of forest and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects, disease, and invasive species.”</p>	Type of Outbreak, acres and location in Canada lynx habitat (lynx analysis unit = LAU)	<p>Maps and GIS shapefiles at http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/</p> <p>R2 Insect/Disease Aerial Detection Flight Data</p> <p>Colorado State Forest Service</p>	<p>a) annually</p> <p>b) every four years</p>	The SLRA's Veg standard S1, LAU has no more than 30 percent of its lynx habitat in a currently unsuitable condition

Monitoring Results

Insect and disease outbreaks are monitored annually by the Region 2 Forest Health Monitoring program through aerial surveys. Surveys from 2017 show that while Subalpine fir mortality has decreased from 2016, it is still the most important form of damage on the WRNF (Figure 8, Table 4). Western balsam bark beetle and Armillaria root disease are the two primary agents responsible for this mortality. Western Spruce budworm activity has also decreased, but there remains significant activity in the Flat Tops east of Meeker and areas west of Aspen. Western tent caterpillar and large aspen tortrix are likely responsible for aspen defoliation observed on and near the Aspen-Sopris Ranger District (though they may not lead to mortality) and Marssonina leaf blight was responsible for discoloration and defoliation in the Flat Tops. The number of new acres affected by Douglas Fir beetle has also decreased from 2016 and remains clustered around the Roaring Fork valley. While the WRNF has not yet seen Spruce Beetle outbreaks such as those raging across the GMUG, Rio Grande, and San Juan National Forests, the Elk and Sawatch Mountains south and east of the Town of Aspen are at high risk if spruce beetle populations continue to move north,

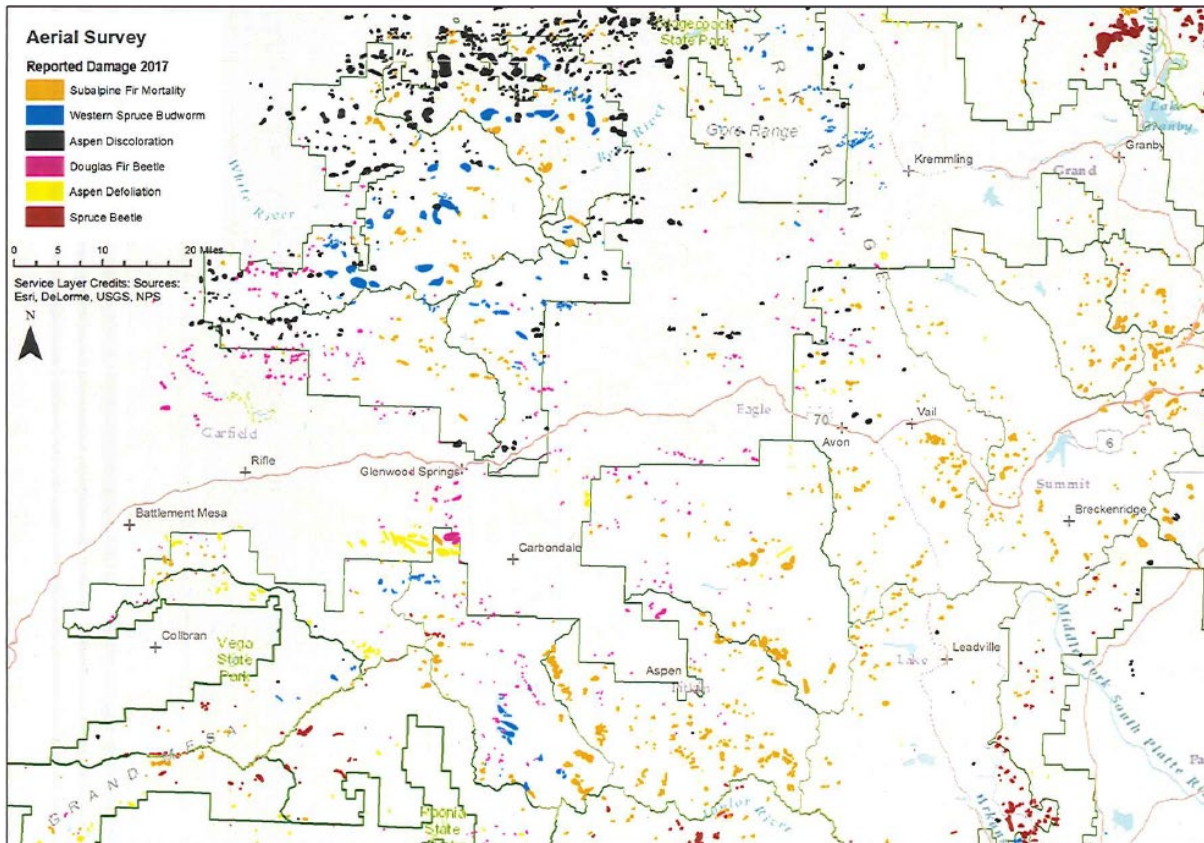


Figure 8. Insect and Disease activity mapped by aerial survey on WRNF in 2017.

Table 4. Major damage agents detected in aerial surveys on WRNF.

Agent	2016 acres Affected		2017 Acres Affected	1996-2017 Cumulative Acres Affected
Subalpine fir mortality	37,000		20,000	-
Western spruce budworm	22,000		13,000	-
Aspen discoloration	3,600		7,200	-
Aspen defoliation	3,800		3,000	1,000
Douglas-fir beetle	3,800		2,300	31,000
Spruce beetle	230		160	31,000
Mountain pie beetle	0		10	386,000
Western pine beetle	100		0	-

Subalpine fir mortality continues to be the major contributor to tree mortality on WRNF. Acres impacted by Douglas-fir beetle declined slightly from 2016-2017. Damage to aspen stands increased and are trending upwards. All other detectable insect agents are on the decline, most notable spruce beetle.

Monitoring Discussion and Findings

Insect and disease trends across the forest are stable. Subalpine fir and aspen have the highest amount of damage across the landscape but are at endemic levels. Insects and disease are a normal function of forest ecology and shape the structural composition of the forest. There are not currently any damaging agents increasing to outbreak levels in any one forest vegetation component. Current rates of insect and disease impact are less than 30 percent on lynx analysis units (LAU) across the forest. It has been determined that no changes to the Forest Plan or monitoring program are warranted at this time based on the current monitoring data.

Adaptive Management Considerations

Damaging agents fluctuate in their scope and intensity over time and will always be present on the forested landscape. Some agents have concentrated effects on tree mortality while other agents have a broader effect across the landscape. Forest managers consult with Gunnison Service Center forest health biologists when considering forest management actions and their probability of success to suppress damaging agents. The overall goal is to have a diverse forest structure with a variety of tree species and age classes distributed across the forest to minimize the effects of any one damaging agent reaching outbreak levels. Silvicultural treatments using prescribed fire, timber harvest, mastication and other treatment methods can be implemented to meet desired future conditions for an identified landscape and within standards/guidelines of the 2002 Forest Plan. If any LAU has no more than 30 percent of its lynx habitat in a currently unsuitable condition, then vegetation management projects should not move additional acres into a stand initiation stage.

Monitoring Item 2.3: Ecosystem Health

Monitoring Question and Background

- How are major vegetation types on the planning unit changing over time?

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Freq. of a) data collection b) reporting	Targets, thresholds
<p>Goal 1, Objective 1d</p> <p>"Increase the amount of forest and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects, disease, and invasive species."</p>	<p>Cover type, ecological site conditions, age class, size class, and structural stages of forest, shrubland, and grassland vegetation.</p>	<p>USFS FSVeg Corporate Database</p> <p>USFS FACTS activities database</p> <p>Forest Inventory and Analysis program</p> <p>Forest Health monitoring</p>	<p>a) annually</p> <p>b) every four years</p>	<p>The SLRA's Veg standard S1, LAU has no more than 30 percent of its lynx habitat in a currently unsuitable condition.</p>

Monitoring Results

Forest structure, function, and composition

Monitoring data on vegetation structure, function, and composition is provided by the USFS Forest Inventory and Analysis (FIA) program. FIA collects data on permanent fixed area plots distributed across a random and spatially balanced sample frame that covers the forested area of the contiguous

United States. Plots are revisited once every 10 years, and in the interior west, data is collected annually on 1/10th of all the plots in each state.

Figure 9 show FIA estimates for acres by cover type, acres affected by disturbance, volume of net growth, and seedling density. All dates in each figure show the end period of an “evaluation group” which contain 10 years of data for the entire WRNF. Estimates shown are a snapshot of forest conditions across the 10-year evaluation period. For example, the 2016 evaluation period shows an estimate based on data collected from 2007 – 2016.

Forested acres are mostly stable, but there has been a decline in lodgepole pine acres, likely because these are now classified as another forest type (such as spruce/fir) due to loss of lodgepole basal area.

Disturbance events trended upward from 2011-2016 before stabilizing in 2016. Insect and disease agents were the main contributor to the disturbance increase during this time period.

Insect and disease disturbance agents have been steadily increasing over the last 5 years. As forests age across the landscape, they become more susceptible to insect and disease agents. Consecutive years of drought weaken natural defense mechanisms of trees and allow insect and disease agents to become more prevalent, and in some cases thrive. As seen in Figure 10, forested areas affected by insects and disease have increased over the last 5 years. This majority of these acres can be attributed to mountain pine beetle, western balsam bark beetle, armillaria root disease and western spruce budworm. Other disturbance agents in Figure 11 are stable and not increasing to any detectable degree.

Lodgepole pine growth has been negative for several years, but the decrease in net growth (Figure 12) has leveled to a stable condition, likely due to the end of epidemic mountain pine beetle conditions. Subalpine fir growth has also been negative but is moving towards positive. Aspen growth has been positive but is trending towards zero, and if current trends continue will be in negative territory soon.

Though there is negative net growth of Engelmann spruce and lodgepole pine, in these forest types there is high regeneration density. Douglas fir seedling density is also increasing. Aspen regeneration densities are beginning to trend upwards slightly, perhaps due to loss mortality in older age classes and resultant regeneration via suckering. See Figure 13 for seedlings per acre.

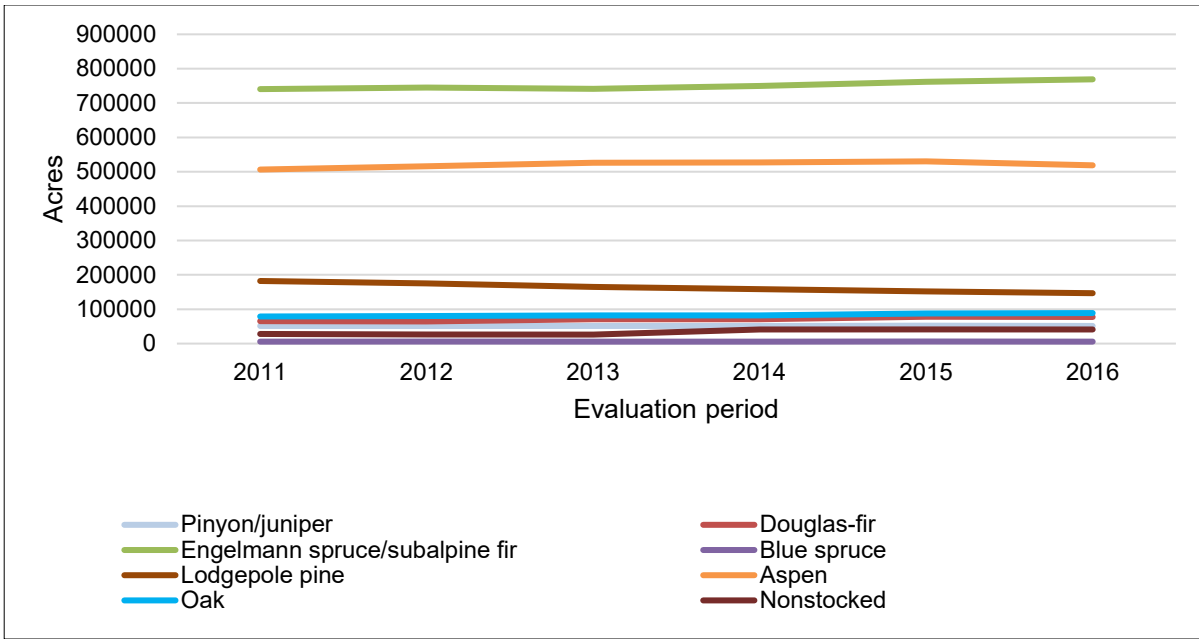


Figure 9. Area of forested acres by forest type.

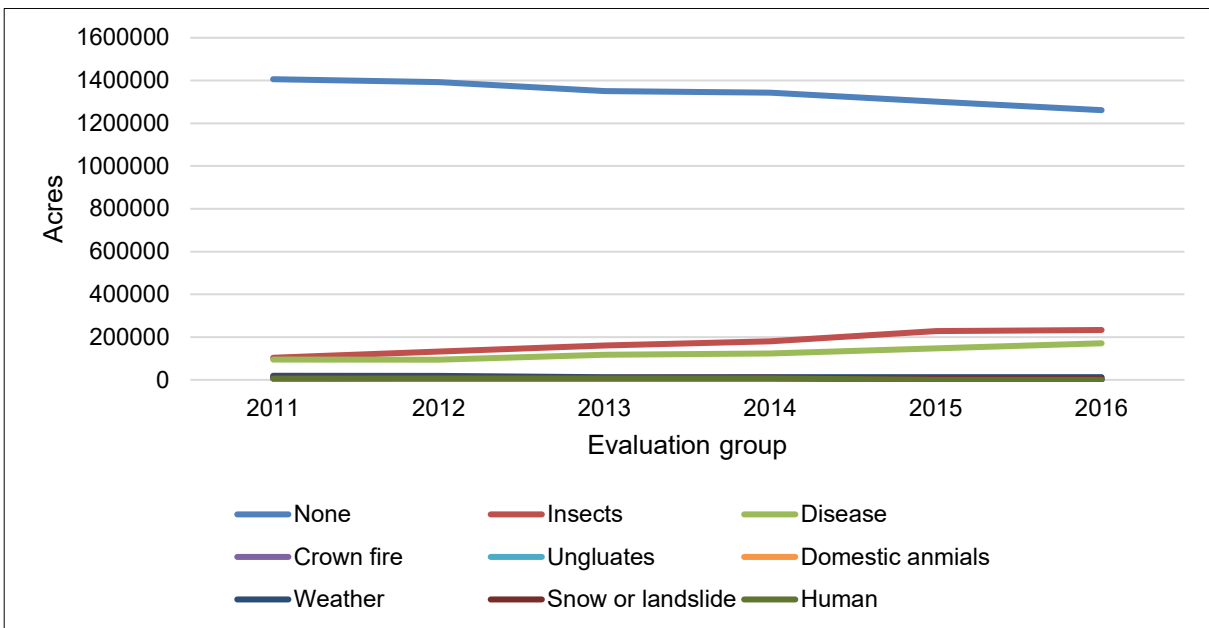


Figure 10. Acres with and without disturbance.

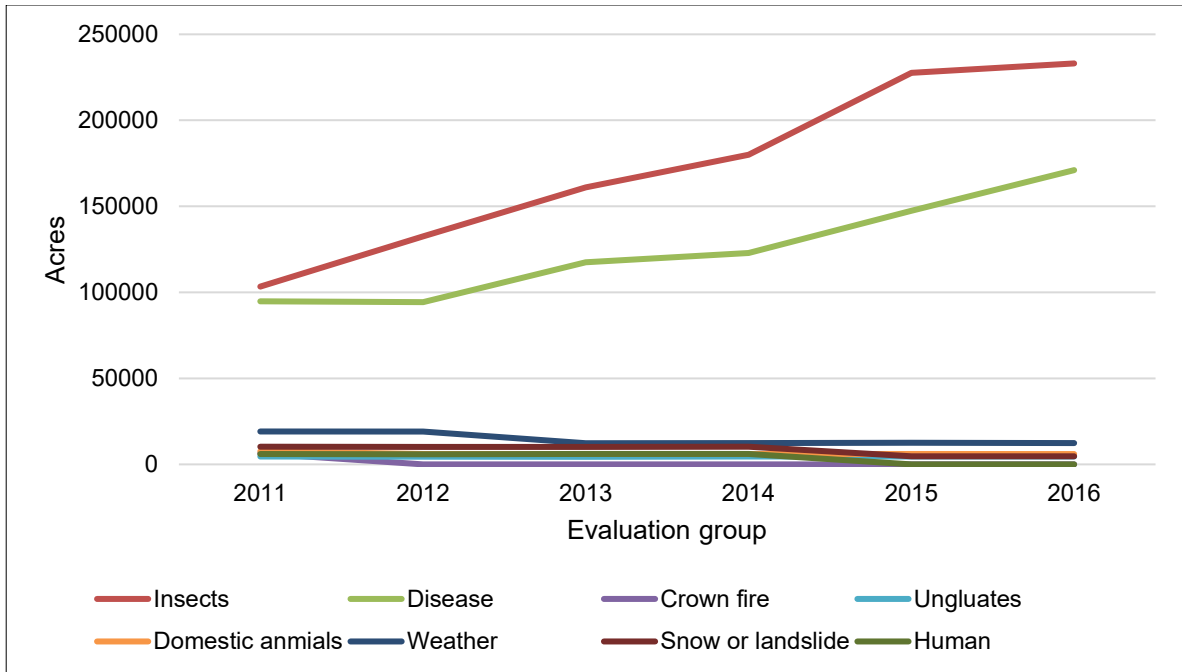


Figure 11. Acres of disturbance by type.

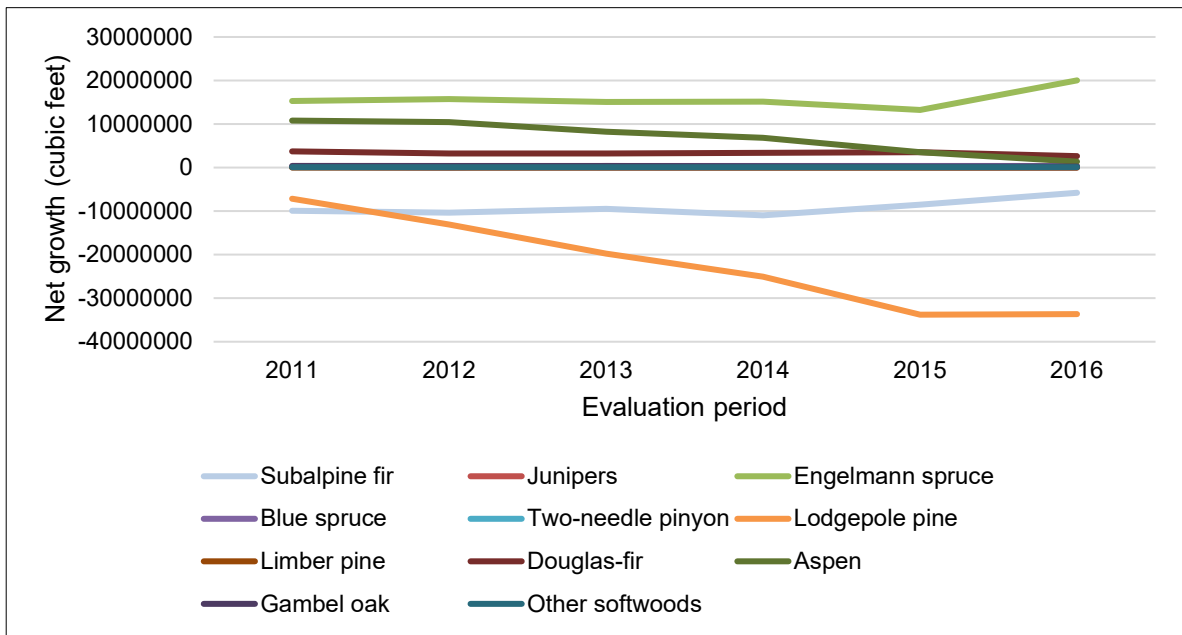


Figure 12. Net growth by tree species.

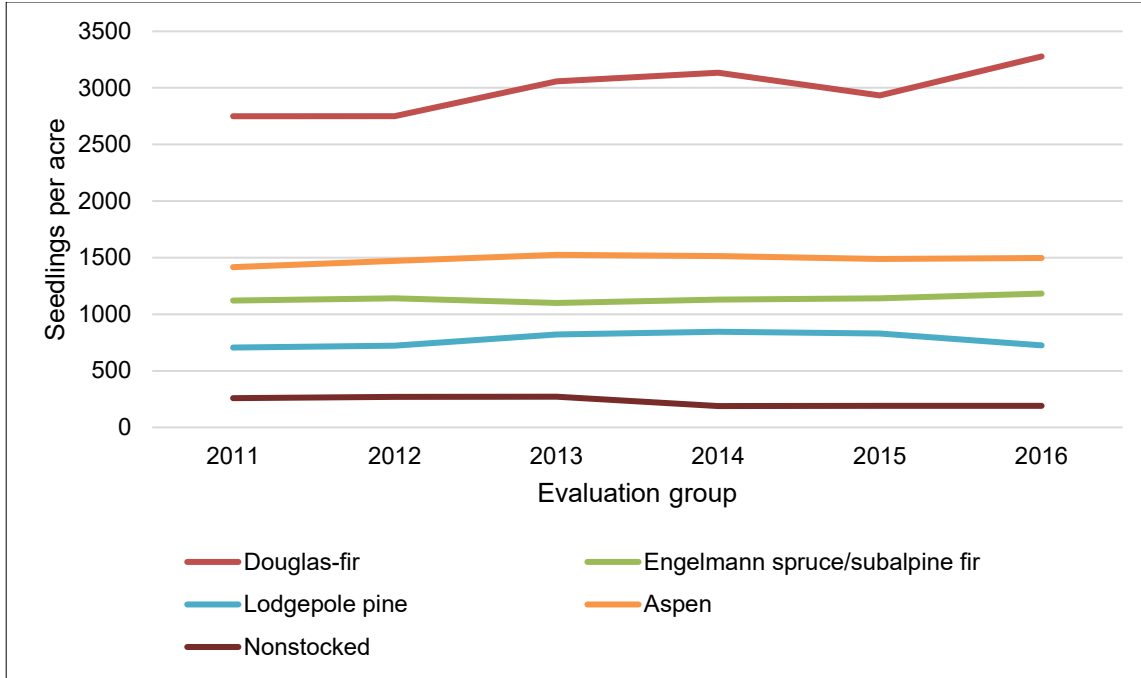


Figure 13. Seedlings per acre in major forest types.

Monitoring Discussion and Findings

Spruce-fir forests are the largest vegetation component and are generally stable. Aspen and lodgepole pine vegetation has declined slightly but are starting to stabilize. Overall, all vegetation across the forest has seen a slight increase in disturbance events and are regenerating at acceptable levels. This is a normal progression of forest successional ecology. It has been determined that no changes to the Forest Plan or monitoring program is warranted at this time based on the current monitoring data.

Adaptive Management Considerations

Forest ecosystems on WRNF are dynamic. Changes to forest structure generally occur slowly over time (10-50 years), except when disturbance events affect large portions of the landscape in short timeframes (1-10 years). The overall goal is to have a diverse forest structure with a variety of tree species and age classes distributed across the forest. Having a diverse forest structure across the landscape benefits all resources across the forest. Silvicultural treatments using prescribed fire, timber harvest, mastication and other treatment methods can be implemented to achieve forest structure desired future conditions for an identified landscape and within standards/guidelines of the 2002 Forest Plan. If any LAU has no more than 30 percent of its lynx habitat in a currently unsuitable condition, then vegetation management projects should not move additional acres into a stand initiation stage.

III. The status of focal species

Monitoring Item 3.1: Macro-invertebrates

Monitoring Question and Background

- Is forest management contributing to conditions that maintain or improve biological stream health trends for freshwater riparian macroinvertebrate communities?

Based on several long-term data sets that have indicated static or changing levels of stream health over time, this quantitative monitoring approach gives the forest a rigorous multi variate dataset and successfully evaluates biological stream health over time.

Forest Plan Ref./ Driver	Indicators	Data Sources / Protocols / Partners	Freq. of a) data collection b) reporting	Targets, thresholds
Goal 1, Objective 1b “Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for Management Indicator Species (MIS) and focal species.	Aquatic macroinvertebrate richness	USFS Macro-invertebrate surveys	a) Annually b) Biannually	Presence/Absence of indicator species; CDPHE aquatic life standards

Monitoring Results

The WRNF has been sampling benthic macroinvertebrates (aquatic insects) to assess and monitor aquatic ecosystem integrity since 2003. A view of a trend at the scale of the Forest was obtained by aggregating site-level trends from sites scattered across the Forest. Metrics speak to taxa diversity, and a community’s degree of tolerance for stressors including dissolved oxygen levels and heavy metals, nutrients, and fine sediment. The measure of aquatic macroinvertebrate richness equates to sustainable ecological health and can be measured by the presence or absence of indicator species.

Because of the number of metrics, the number of factors that can affect aquatic communities, and the natural variability in data collected from the field over the years, determinations were based on a plurality of evidence. If a site had one or two metrics that declined, for example, while the other metrics showed no slope or improved, that site was considered stable i.e. no trend one way or the other in habitat quality. If a site had three or more metrics that increased or decreased (about 1/3 of the metrics examined), that would be evidence to suggest that that site had either improved or deteriorated in terms of habitat quality. The fundamental assumption of this monitoring approach is that sites that “improved” or “deteriorated” are reflecting degrees of disturbance in the watershed upstream of the sampled location. A site that appears to have deteriorated in instream habitat quality thus gets a closer examination to try to determine the validity of the statistical assessment or the nature of the disturbance.

Between 2003 and 2017, samples were collected from 348 different sites in 167 streams, including 93 reference sites in undisturbed reaches. Reference sites are expected to reflect a relatively natural condition, absent a known, substantial degree of anthropogenic disturbance. A subset of sites was

sampled repeatedly to establish trends in instream conditions over time. Three to fourteen samples were collected from 153 sites (n = 763). This forest-scale analysis thus examined site-level trends in aggregate to look for a Forest-wide glimpse at trends. Statistical analyses were conducted on sites grouped by drainage size (km²) to compare similar stream types and reduce the number of variables affecting macroinvertebrate communities. Drainage size is correlated with some metrics but not all. Table 5 summarize results by watershed area.

Table 5. Summary of trend results by watershed area.

Drainage Size	Number of Sites	Number of Samples	Improved Sites ≥ 3 Metrics	Declined Sites ≥ 3 Metrics	% Improved	% Declined	No Change Detected
<11 km ²	56	246	1	0	1.8%	0.0%	98.2%
11 - 23 km ²	32	145	1	1	3.1%	3.1%	93.8%
24 - 47 km ²	32	182	0	3	0.0%	9.4%	90.6%
>48 km ²	33	190	4	2	12.1%	6.1%	81.8%
	153	763	6	6	3.9%	3.9%	92.2%

Monitoring Discussion and Findings

No reference sites improved, and three of the sites where conditions appeared to decline were reference sites. Sites that showed the greatest improvement were sites that were known to be significantly impacted and degraded sites (adjacent to I-70, for example) where improving trends emerged from very low baseline conditions. Likewise, three of the six sites where conditions appeared to have deteriorated are also known to be highly disturbed sites. Declines at the other three sites warrant further field investigation.

Headwater sites in the smallest drainages appeared to be maintaining their generally good instream conditions, with no sites exhibiting multiple, negative trends and conditions at one site appearing to have improved. Identified declines in all watersheds, now highlighted, can be investigated further. Sites in the largest drainages tended to have the lowest baseline conditions, as they are relatively large, mainstem, valley floor streams, that generally have a greater level of use and infrastructure. These types of watersheds showed the most frequent improvements.

The majority of sites repeatedly sampled, 92.2% overall, appeared to be stable in terms of instream habitat quality. This shows that the majority of streams are in an ecologically intact condition and in a relatively stable trend. Given the relatively high level of recreational activity and multiple uses across the Forest, this aquatic monitoring continues to be very important to assess aquatic conditions on a Forest-wide scale and is also useful in project level analysis.

Adaptive Management Considerations

There are no changes recommended to this monitoring program or forest plan direction at this time. At site specific locations where a plurality of macroinvertebrate metrics are declining, management activities in the watershed may be evaluated to determine if there are any measures that can be taken to improve riparian conditions or water quality impacts.

Monitoring Item 3.2: Red Squirrel

Monitoring Question and Background

- What do red squirrel populations tell us about the extent and condition of mid to late successional forested ecosystems on the planning unit?

The 2012 planning rule requires forests to monitor focal species that can indicate changes in key characteristics of ecological integrity (36 CFR 219.12). Red squirrels were selected as one of the focal species for forest structure and composition because they require mature conifer forests for pinecones and seeds, and in Colorado they are often found in stands with closed canopies (Scott et al. 1982).

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection b) reporting	Targets, thresholds
Goal 1, Objective 1b	Extent, density and occupancy of red squirrels	Bird Conservancy of the Rockies (BCR)	Annually; reporting every 2 years	Declining trend in extent, density, or occupancy

Monitoring Results

The Bird Conservancy of the Rockies (BCR) has monitored red squirrels on WRNF since 2010. The year 2018 is the first year this data has been utilized to fulfill the focal species monitoring requirement in the new rule. BCR utilizes highly trained crews and a sophisticated spatially balanced sample frame to generate estimates of occupancy and density for numerous bird species and small mammals at multiple scales. Evaluating both density and occupancy is important for understanding population trends and distribution across the landscape, and potential changes in ecological conditions (BCR, 2018). Figure 14 shows trends in occupancy and density for red squirrels on WRNF.

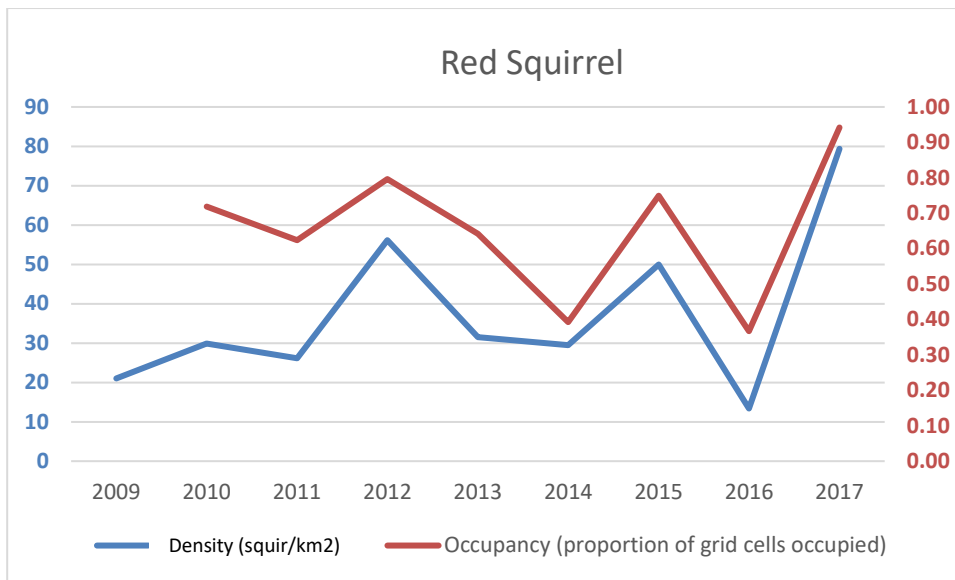


Figure 14. Density and occupancy of red squirrel on the WRNF, 2010-2017.

Monitoring Discussion and Findings

The occupancy rates and densities of red squirrel were variable over time; however, they did generally track together. This may indicate that local populations were responding to habitat changes or

environmental conditions. Both metrics show an increase from the time sampling began in 2009/2010 to 2018, with a great increase shown in density of animals. This data could be interpreted to infer that late seral conditions in conifer forested stands across the Forest could be increasing in quality and extent, but there is likely more vegetation data analysis that would need to be completed to determine if this correlation was valid.

Adaptive Management Considerations

Red squirrel density and occupancy rates will continue to be evaluated from BCR data collection efforts. Vegetation data analysis and large disturbance patterns will be evaluated in subsequent monitoring reports to compare with density and occupancy rates over time. There are no changes recommended to this monitoring program or forest plan direction at this time.

Monitoring Item 3.3: Pika

Monitoring Question and Background

- What is the status of American pika populations as an indicator for alpine ecosystem integrity?

Pikas are excellent focal species for assessing alpine ecosystem integrity and climate change because they can be abundant, are active during the day and easily detectable, and are sensitive to climate change (Beever et al, 2016).

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection b) reporting	Targets, thresholds
Goal 1, Objective 1b	Extent, density and occupancy of American pika	Bird Conservancy of the Rockies (BCR) and WRNF-Rocky Mountain Wildlife Citizen Science Monitoring Project.	Annually; reporting every 2 years	Declining trend in extent, density, or occupancy

Monitoring Results

American Pika

Pika monitoring has been conducted by the Bird Conservancy of the Rockies since 2015. Table 6 shows number of detections, transects conducted, and estimated density and occupancy (<http://rmbo.org/v3/avian/ExploretheData.aspx>).

Table 6. BCR pika observations.

Year	Number of detections	Density (# per km2)	Number of transects	Occupancy
2015	29	3.74	4	0.182
2016	4	0.48	1	0.036
2017	48	5.32	6	0.124

Monitoring Discussion and Findings

Given that there have only been three years of data, and significant variation in detections, there is currently insufficient data to identify a trend.

In addition to BCR Pika monitoring, however, the WRNF recently began cooperating with Rocky Mountain Wild on a collaborative project that will leverage citizen science for long term pika monitoring. This effort started on a small scale in 2018, and survey sites will increase starting in 2019. Results from this effort will be used to supplement BCR monitoring in the next biennial reporting cycle.

Adaptive Management Considerations

Since the data does not show significant variation yet, no trends to the extent, density, or occupancy are known. There are no changes recommended to the monitoring program or to forest plan direction at this time.

Monitoring Item 3.4: Avian Species

Monitoring Question and Background

- What are the status and trends of select avian species on the WRNF?

Birds are excellent focal species for evaluating ecological trends and conditions because they are generally conspicuous during the breeding season, and responsive to their environment at multiple scales (Hutto, 1998).

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection b) reporting	Targets, Thresholds
Goal 1, Objective 1b	Species richness, density and occupancy of, and trends of bird communities	Bird Conservancy of the Rockies (BCR)	Annually; reporting every 2 years	Declining trend in extent, density, or occupancy




Monitoring Results

Bird Conservancy of the Rockies has monitored breeding birds on WRNF since 2008. The year 2018 is the first year this data has been utilized to fulfill the focal species monitoring requirement in the new rule. BCR monitoring data is used to estimate the density of breeding birds and their occupancy across the landscape. Evaluating both density and occupancy is important for understanding population trends and distribution across the landscape, and potential changes in ecological conditions.

The WRNF initially identified American pipit (alpine), hairy woodpecker (all forest types), golden-crowned kinglet (late seral conifer), mountain bluebird (open forests), Brewer’s sparrow (sagebrush), and common flicker (cavity excavator) as potential focal species. However, there is insufficient data from BCR surveys to establish a trend with any reliability for American pipit, hairy woodpecker, mountain bluebird, or Brewer’s sparrow given the relative scarcity of these species, and the limited number of transects and detections. As a result, the WRNF changed the species for this monitoring to question to the dusky flycatcher (shrub habitats), green-tailed towhee (shrub habitats and disturbed habitats), red-breasted nuthatch (conifer habitats), ruby crowned kinglet (conifer habitats), warbling vireo (aspen habitats), and western wood peewee as focal species.

The following graphs show the estimated occupancy and estimated density for each focal species with a robust dataset (Confidence Interval <50%). Each graph shows results for WRNF, as well as the two adjacent National Forests that have similar habitats and elevations, the Medicine Bow Routt National Forest (MBRNF) and the Grand Mesa, Uncompaghre and Gunnison National Forest (GMUGNF). Comparing multiple forests data may help to identify any changes in avian density or occupation that may be occurring more broadly across the immediate portion of Region 2 within similar habitat structure. If declines or increases are only occurring on one National Forest, then a further look into overall habitat conditions may be warranted.

Legend for all Graphs:

-  White River National Forest (WRNF) in **Green**
-  Grand Mesa, Uncompaghre and Gunnison National Forests (GMUGNF) in **Red**
-  Medicine Bow and Routt National Forests (MBRNF) in **Brown**

Dusky Flycatcher

Occupancy – Figure 15: For the WRNF, very little variation or change in occupancy of birds per grid, after an initial higher number during the first year of monitoring in 2008.

Density – Figure 16: For the WRNF there was no strong change in density over the monitoring period.

Comparison of Forests: The WRNF has less birds, in both occupancy and density than the other Forests, but both metrics remain more stable. The adjacent Forests have much more variability, especially density on the GMUGNF.

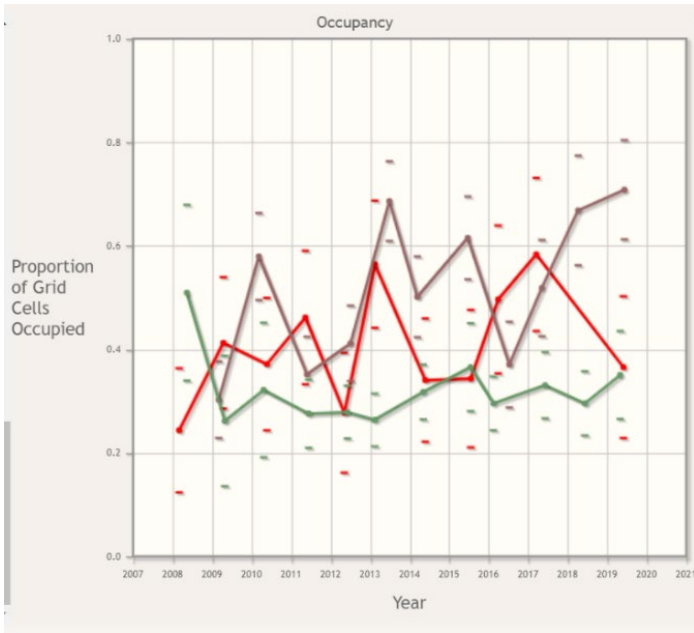


Figure 15. Dusky flycatcher occupancy rate.

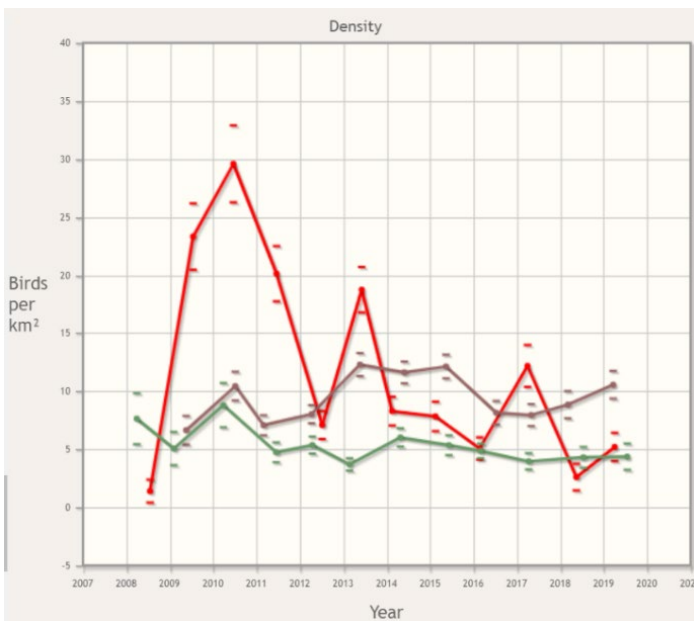


Figure 16. Dusky flycatcher density.

Green-tailed Towhee

Occupancy – Figure 17: For the WRNF there was a slight decline in occupancy rates.

Density – Figure 18: There was a very slight downward change in density over this period for the WRNF.

Comparison of Forests: The WRNF occupancy rate dropped slightly more than the adjacent Forests, while the density metric was very similar to both the GMUGNF and the MBRNF.

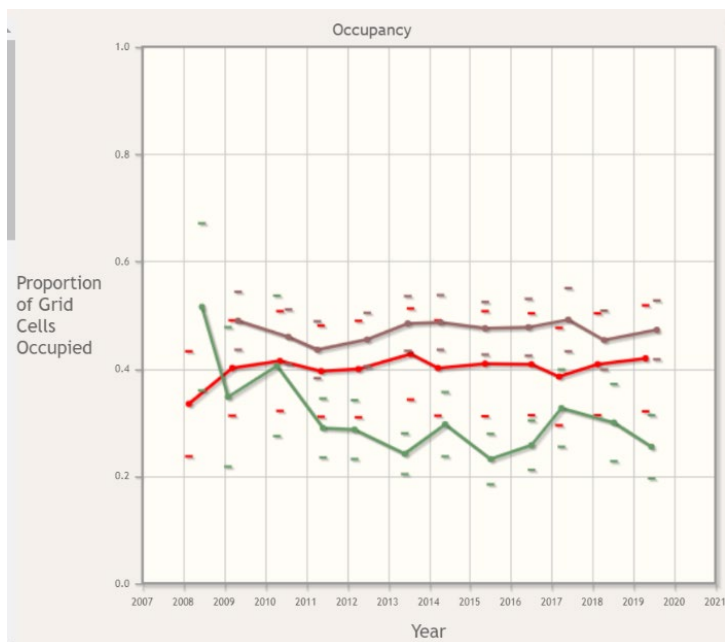


Figure 17. Green-tailed towhee occupancy rate.

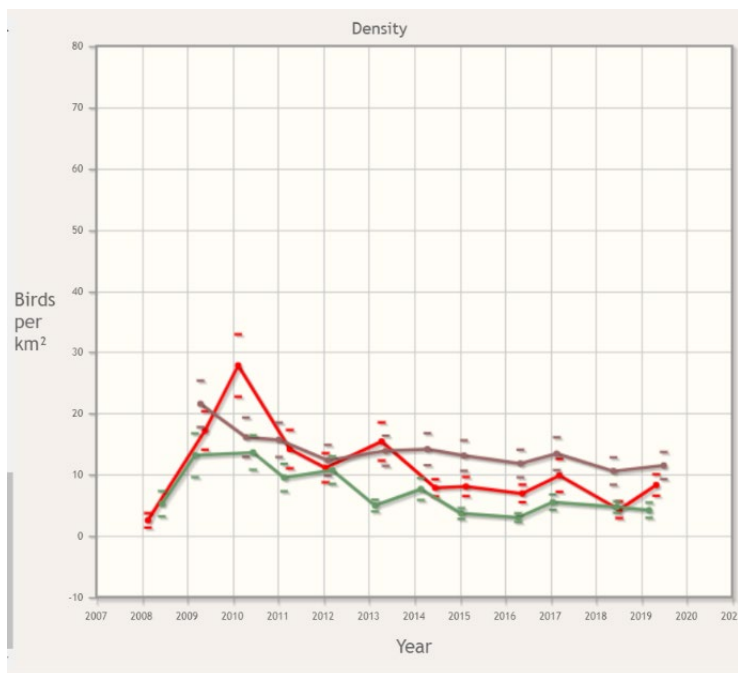


Figure 18. Green-tailed towhee density.

Northern Flicker

Occupancy – Figure 19: The WRNF showed an increase in occupancy of birds per grid sampled.

Density – Figure 20: There was no strong change in density over this period for the WRNF.

Comparison of Forests: The WRNF showed a stronger increase in occupancy rates across the grids that were sampled, which generally indicates that northern flickers were distributed across more of the Forest. The WRNF varied from the adjacent Forests in this metric, which both did not show a notable increase.

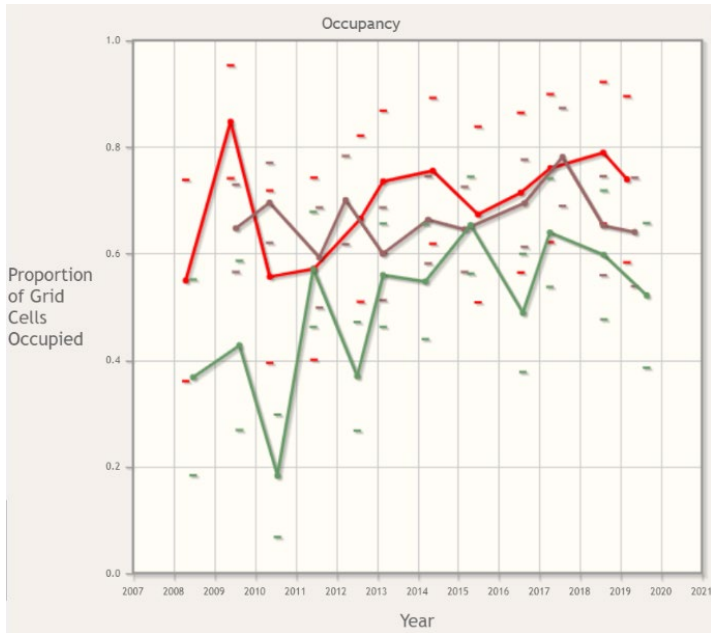


Figure 19. Northern flicker occupancy rate.

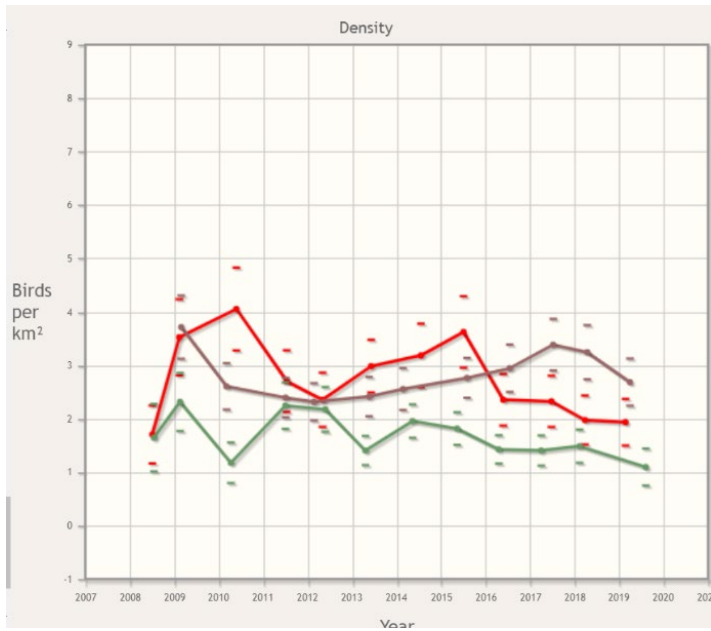


Figure 20. Northern flicker density.

Red Breasted Nuthatch

Occupancy – Figure 21: There was no strong change in occupancy rates over time, and results were variable by year on the WRNF.

Density – Figure 22: The WRNF showed an increase in density over the monitoring period, especially over the last four years.

Comparison of Forests: The three Forests tracked similar in both occupancy and density.

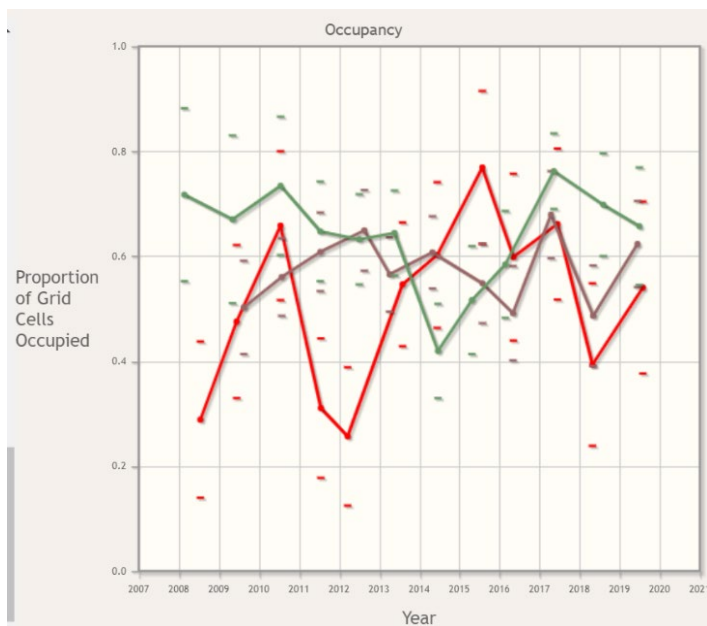


Figure 21. Red-breasted nuthatch occupancy rates.

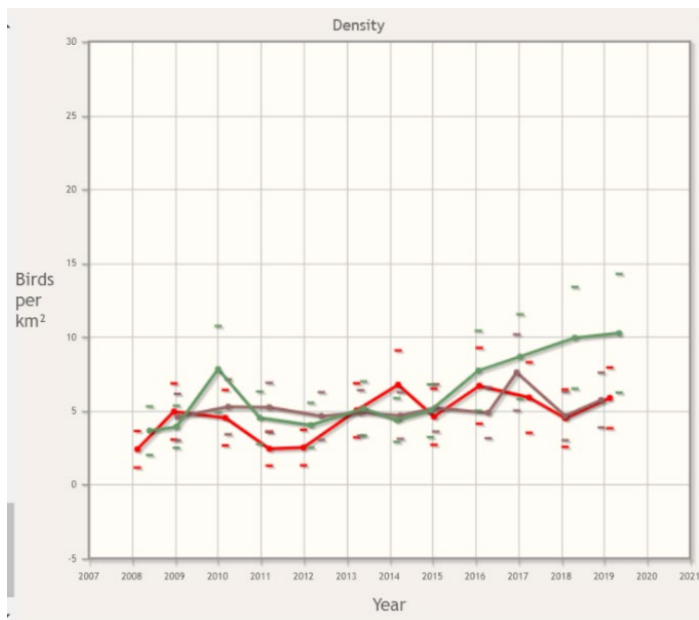


Figure 22. Red-breasted density.

Ruby Crowned Kinglet

Occupancy – Figure 23: On the WRNF there was very little variation or change in occupancy of birds per grid.

Density – Figure 24: Although there was an anomaly in 2010 on the WRNF, there is still showing a general increase in density over this period.

Comparison of Forests: Both the WRNF and GMUGNF show a similar increase in density. The MBRNF shows a notable deviation in density as compared to the other two Forests.

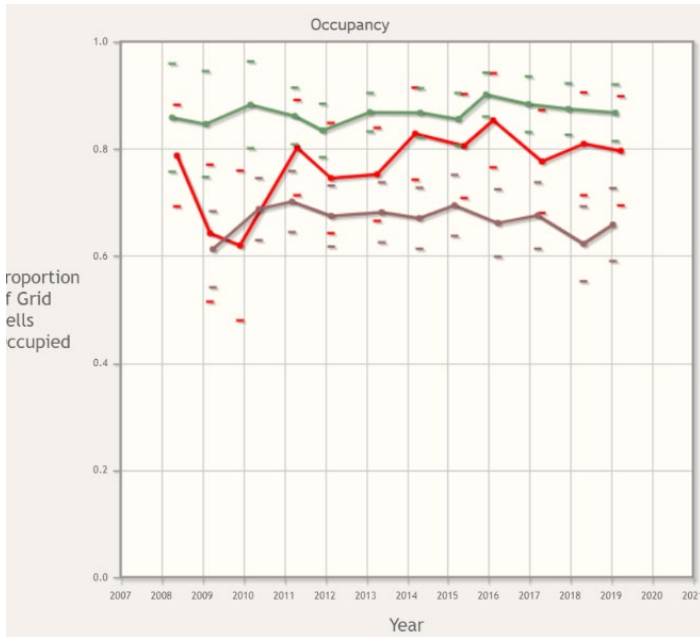


Figure 23. Ruby crowned kinglet occupancy rate.

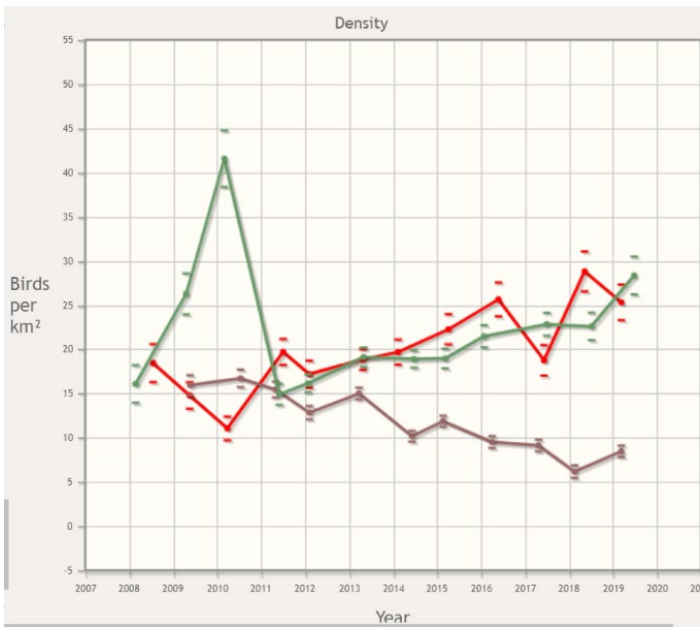


Figure 24. Ruby crowned kinglet density.

Warbling Vireo

Occupancy – Figure 25: There was very little variation or change in occupancy of birds per grid on the WRNF.

Density – Figure 26: There was very little change in density over this period on the WRNF.

Comparison of Forests: The WRNF and MBRNF showed similar trend lines for both metrics. The GMUGNF generally has a higher density of warbling vireos, as well as higher variation in density rates.

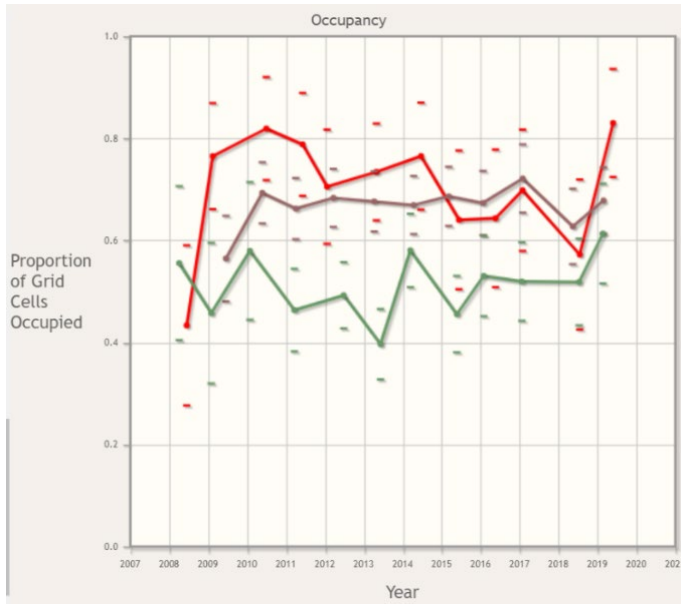


Figure 25. Warbling Vireo occupancy rate.

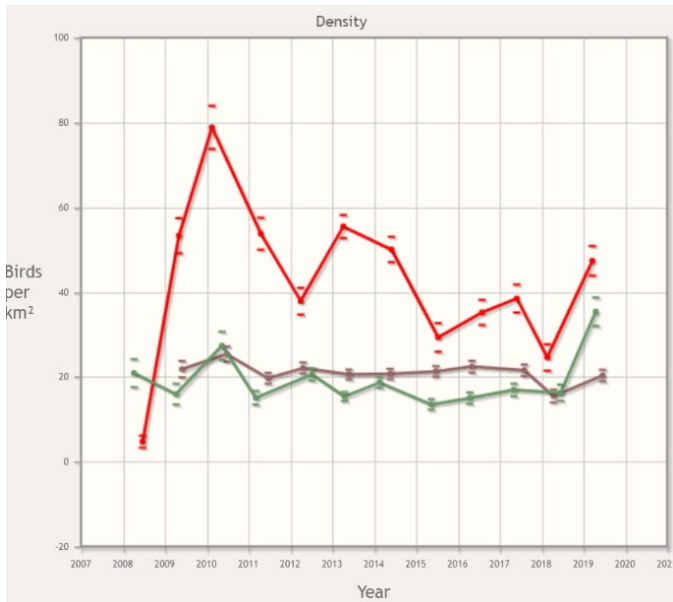


Figure 26. Warbling Vireo density.

Western Wood-Pewee

Occupancy – Figure 27: There was very little variation or change in distribution of birds per grid on the WRNF .

Density – Figure 28: There was very little change in density over this period for the WRNF.

Comparison of Forests: Similar to the warbling vireo, the WRNF and MBRNF showed similar trend lines for both metrics for the western wood pewee. The GMUGNF generally has a higher density of western wood peewees, as well as higher variation in density rates.

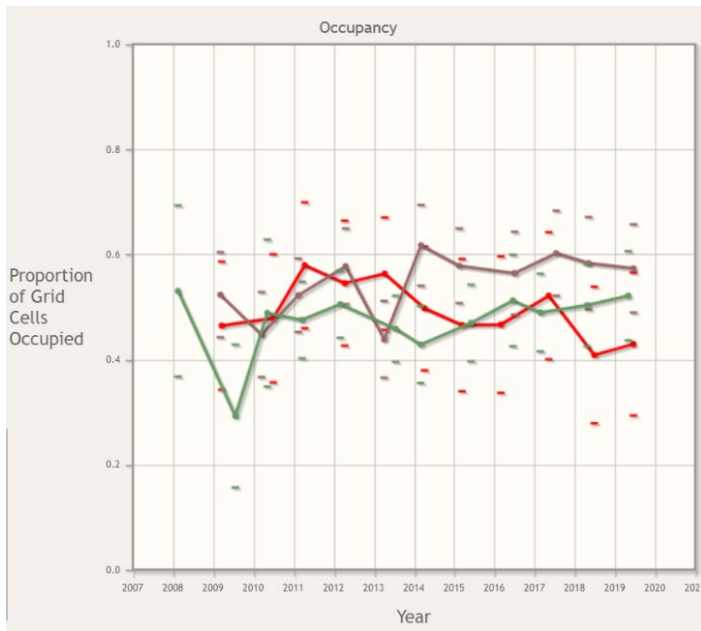


Figure 27. Western wood peewee occupancy rates.

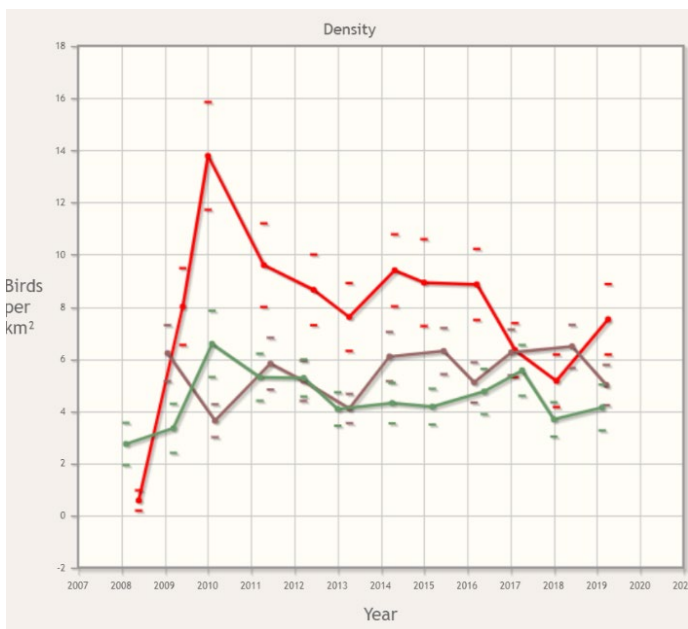


Figure 28. Western wood peewee density.

Monitoring Discussion and Findings

The largest variations in density and occupancy numbers for all species and forests are more apparent in the very first year of the monitoring program. Between 2011 and 2018 results become more consistent. Northern Flicker showed strong variations from year to year in monitoring numbers, but woodpeckers are a more erratic species following insect eruptions and infestations while showing less fidelity to a habitat area.

None of the selected species showed strong downward declines between 2008 and 2018, and the WRNF did not have declines that differed measurably from the neighboring two Forests. In order to have a sufficient number of detections to analyze, the WRNF had to select species that are relatively common species that occur in widespread, abundant habitats. Although this data is useful, it is not a measure of declines in more rare species, or species that are not as widespread. It also may not be the best way to monitor specific habitat types and species that may become imperiled. The WRNF will continue to work with its partners at BCR to find the best species to analyze from the vast amount of bird survey data that the organization continues to collect. In addition, the WRNF will explore ways to analyze this data with respect to changes in vegetation structure, disturbances and management actions.

Adaptive Management Considerations

Avian density and occupancy rates will continue to be evaluated from BCR data collection efforts. The longer that this same monitoring technique is utilized, the more accurate trend data will be. If additional funding becomes available, the WRNF has the ability to have BCR increase the number of monitoring transects on the forest. Since none of the selected species showed strong downward declines between 2008 and 2018, and the WRNF did not have declines that differed measurably from the neighboring two Forests, there are no changes to the monitoring program, forest plan direction, or management activities proposed at this time.

IV. The status of select ecological conditions for at-risk species

Monitoring Item 4.1: Colorado River Native Cutthroat Trout

Monitoring Question and Background

- What is the status and trend of cutthroat trout across the planning area?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection b) reporting	Targets, Thresholds
Goal 1, Objective 1c "Help ensure viability of species of concern for the White River National Forest"	Number of conservation populations in the planning area; Miles of occupied habitat; Presence/absence of aquatic nuisance species and/or non-native trout; Elevation, snow depth inches, and snow-water-equivalent (SWE)	USFS sensitive species monitoring data; Colorado Parks and Wildlife (CPW) cutthroat monitoring data; FWS Recovery Plan; CRCT Conservation Agreement	Annually; reporting every 2 years	Decline in any of the indicators

Monitoring Results

A Colorado River Native cutthroat trout (CRN) status assessment conducted by Hirsch et al. (2006) suggests that Western Slope cutthroat trout occupy only 14% of their historic range, while only 8% of their former range is currently occupied with “Conservation Populations.” These Conservation Populations listed in the CRN Conservation Assessment and Strategy (CRCT Task Force 2001) are those that are naturally reproducing and recruiting populations with genetic integrity greater than or equal to ninety percent ($\geq 90\%$). Also considered Conservation Populations, Core Conservation Populations are assigned to CRN populations believed to be equal or greater than ninety-seven percent pure ($\geq 97\%$).

In collaboration with Colorado Parks and Wildlife (CPW), the WRNF has used genetic testing to identify Conservation Populations (including Core Conservation Populations) of Colorado River cutthroat trout since 2003. As a result of genetic testing, the WRNF has identified 46 Conservation Populations of native trout, inhabiting an approximated 216 miles of waters (Figure 29). The current number of Conservation Populations and the occupied stream miles within the planning area will be used as a baseline for future reporting.

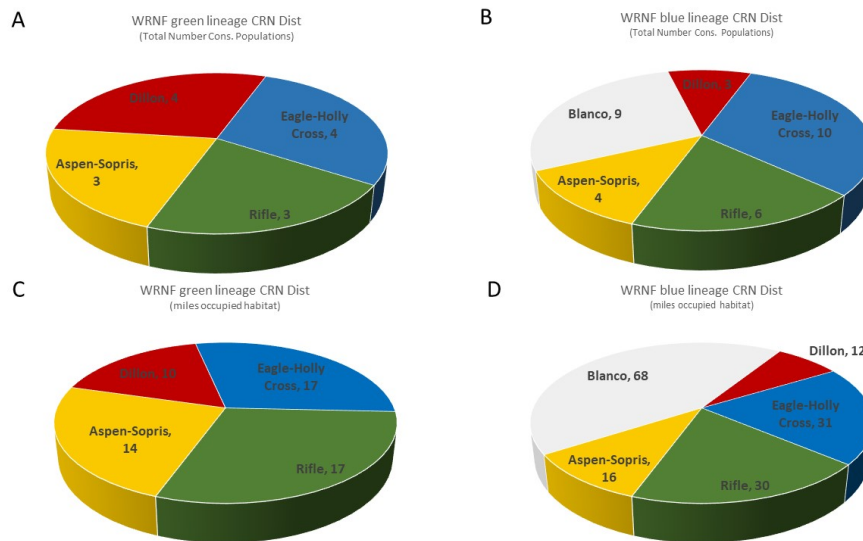


Figure 29. Total number (A, B) and total miles (C, D) of Colorado River native conservation populations across WRNF.

Using the National Hydrologic Dataset (NHD flowlines) it is approximated that the WRNF has about 5,014 miles of 3rd order streams (larger headwater streams). Assuming 1/3 of those stream miles are either not adequate habitat or inaccessible to fishes, that leaves 3,342 miles of stream for possible occupation. The 216 miles of estimated occupied habitat by CRN (Table 7) is **6.5%** of the total 3rd order stream miles on the WRNF. This obviously is a reduction from the estimated 8% of historic streams occupied by Conservation Populations (Hirsch et al. 2006).

Table 7. Summary of conservation population of Colorado River cutthroat trout on WRNF.

	Number of populations	Stream miles (≥3 rd order)	Percent of Total CRN occupied habitat
Green lineage Conservation Population (6)			
<u>without</u> non-natives	2.5	8.34	3.9
<u>with</u> non-natives	3.5	30.74	14.3
Green lineage Core Conservation Population (8)			
<u>without</u> non-natives	5.5	13.02	6.0
<u>with</u> non-natives	2.5	6.56	3.0
total	14	58.67	27.2
Blue lineage Conservation Population (17)			
<u>without</u> non-natives	11	42.36	19.6
<u>with</u> non-natives	6	20.38	9.4
Blue lineage Core Conservation Population (15)			
<u>without</u> non-natives	9.5	36.73	17.0
<u>with</u> non-natives	5.5	57.54	26.7
total	32	157.01	72.8
* half numbers signify that a migration barrier exists in stream occupied habitat preventing invasion/introgression			

During this baseline assessment it was determined that some recent Conservation Populations have been lost due to non-native invasion or hybridization. A total of approximately 11 miles of cutthroat trout habit has been overtaken. This includes invasion by brook trout in the previously blue lineage streams of Lower Ute Creek and Main Fawn Creek in the White River drainage (Blanco Ranger District), and Elliot Creek in the Blue River drainage (Dillon Ranger District). Similarly, only brook trout can be found in the now eliminated Conservation Population of North Fork Cattle Creek (Aspen-Sopris Ranger District).

With an observed blue lineage integrity of 92% Missouri Creek (1.62mi) was counted as a Conservation Population in this assessment, however it has recently been documented as being invaded and overrun with non-natives, creating a hybrid swarm. For future assessments, Missouri Creek will no longer be considered a Conservation Population. Of the other blue lineage CRN streams, only slightly more than one-third (37.3%) of the blue lineage occupied habit is estimated to not be undergoing an ecological invasion or genetic introgression from non-native fishes (Table 8).

Table 8. Summary of conservation population status for Colorado River cutthroat trout on WRNF.

Population Status	Miles stream	Percent
green ConPop at risk invasion & introgression	26.26	45.4%
green ConPop likely not at risk from invasion & introgression	12.45	21.3%
green CorePop at risk invasion & introgression	6.56	11.5%
green CorePop likely not at risk from invasion & introgression	8.47	14.5%
undetermined	4.55	7.8%
blue ConPop at risk invasion & introgression	13.38	8.5%
blue ConPop likely not at risk from invasion & introgression	34.62	22.0%
blue CorePop at risk invasion & introgression	56.00	35.7%
blue CorePop likely not at risk from invasion & introgression	23.96	15.3%
undetermined	29.05	18.5%

Green lineage Conservation Populations such as Beaver Creek, Cache Creek, West Divide/Little Rock Creek (Rifle Ranger District), and Park/North Thompson Creek (Aspen-Sopris Ranger District) have less than 95% genetic integrity when they were last tested. They also have no known barriers to prevent further invasion and introgression; therefore, these populations are expected to deteriorate further. Should these populations fall below 90% CRN, 25.21 miles of green lineage Conservation Populations will be lost. That would be 43.0% of all green lineage Conservation Populations on WRNF.

Compounding the issue for native cutthroat trout, in her 2000 dissertation, Harig evidenced that for a cutthroat population to persist there must be approximately 3.54 miles of available stream habitat. Of the 32 populations of blue lineage CRN on the WNF, 21 meet that criteria. Of those eleven at risk, six alone are on the Eagle-Holy Cross Ranger District and total 28.2 miles of blue lineage occupied waters.

Unfortunately, of the 14 green lineage Conservation Populations of CRN on the WRNF, four populations thought to be secure by natural barriers are less than 3.54 miles long. These additional stream miles (8.5 miles total) may not persist into the long term due to small size. Along with ecological invasion and genetic introgression, these small stream segments would account for **57%** of the green lineage CRN on WRNF to be at high risk of extirpation.

Table 9 includes just a few examples of current streams that are undergoing invasion or introgression, yet if a migration barrier were constructed and a restoration undertaken, they would go a long way to ensuring the long-term persistence of native cutthroat on WRNF.

Table 9. Streams undergoing invasion or introgression.

Stream Name	CRN Lineage	miles of habitat to be secured	Ranger District
North Elk Creek	blue	12.0	Blanco
Hunter Creek	green	12.0	Aspen
Snell Creek	blue	10.23	Blanco
Meadow Creek	green	7.62	Holy Cross
North Thompson & Park Cks	green	10.38	Sopris
Red Dirt Creek	green	8.78	Eagle

Monitoring Discussion and Findings

This report serves as a baseline for inventory and monitoring of Colorado River cutthroat trout throughout the life of the Forest Plan. Although the findings here do indicate a decline since the 2006. CRN status assessment conducted by Hirsch et al., because their assessment was for all CRN, it is not an equivalent comparison.

Adaptive Management Considerations

No adaptive changes to the Forest Plan or this monitoring question are anticipated at this time.

Monitoring Item 4.2: Lynx Habitat

Monitoring Question and Background

- What is the status and trend of early successional conifer and late seral spruce-fir forests to promote recovery of Canada lynx?

This monitoring item address regulatory requirements associated with the Southern Rockies Lynx Amendment (SLRA) (USDA Forest Service 2008). The SLRA contains several management standards intended to conserve habitat for lynx, a threatened species under the Endangered Species Act.

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols	Freq. of data collection/	Last evaluation/ next evaluation	Desired conditions/ Thresholds/ Triggers
Goal 1, Objective 1c. Southern Rockies Lynx Amendment	Extent and condition of early successional and late seral spruce-fir forests; Habitat connectivity; and Dense horizontal cover	FS Veg Spatial Project impacts or mitigation Habitat improvements USFWS Future FWS Recovery plan WRNF lynx habitat map layer.	Annually	The lynx habitat on WRNF was re-mapped in 2017. In 2018 there were 3 large fires on WRNF– the change in habitat will be evaluated and mapped in 2019.	3% lynx habitat treated (VegS1, S2, S5, S6) WUI exemption 1% precommercial thinning exception (VegS5) .5% pre-commercial thinning or multi-story management (VegS5, S6 Exception)

Monitoring Results

The SLRA’s Veg standard S1 states that if a lynx analysis unit (LAU) (an area approximating the size of the home range of a female lynx) has more than 30 percent of its lynx habitat in a currently unsuitable condition, then vegetation management projects should not move additional acres into a stand initiation stage. However, the SRLA provides exceptions for different types of management in LAUs with >30% unsuitable condition as long as acres treated remains below a threshold or cap: 3% of lynx habitat on each administrative forest for fuel management treatments (WUI exemption); 1% of lynx habitat for pre-commercial timber harvesting; and .5% for pre-commercial and multi-story management. Monitoring of habitat conditions and activities is needed to ensure these caps are maintained.

The WRNF recently re-mapped Canada lynx (hereafter lynx) habitat in FS Veg the USFS corporate geodatabase, to capture changes to forest structure resulting from fire, bark beetle, and other disturbances. The previous lynx mapping version (2011) over predicted the amount of dead lodgepole pine. The 2017 mapping update shows no LAUs exceeding Veg S1 standard, although there are a few LAUs that are approaching the 30% unsuitable condition on the east side of the Forest where mountain pine beetle activity was the highest. Activity tracking in LAUs is collected and reported annually to the U.S. Fish and Wildlife Service. The following calculations (Table 10) include all project acres accounted for under the 3%, 1%, and 0.5% and the respective standards for exemptions and exceptions under the SRLA (USDA Forest Service 2008):

Table 10. SRLA thresholds and acres treated.

SRLA standards with exemptions and exceptions	cap (%) under exemption	2011 mapping (allowable acres under cap)	2017 mapping (allowable acres under cap)	SRLA acres treated since 2008
VegS1, S2, S5, S6 WUI Exemption	3%	34,284	41,431	560
VegS5 Exception 5	1%	11,427	13,810	254
VegS5, S6 Exception	0.50%	5,714	6,905	1135

Monitoring Discussion and Findings

Mapping and activity tracking indicate that the WRNF is in full compliance with the SRLA. For each exemption and exception, the WRNF has stayed well below the management thresholds set out in the SLRA. The WRNF is meeting the vegetation standards and the respective caps for treatments under the wildland urban interface (WUI) cap of 3%, pre-commercial thinning cap of 1%, and the remaining 0.5% for projects that may occur under pre-commercial thinning or multi-story management. The total acres for these caps did increase somewhat from 2011 to the new mapping for 2017.

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

V. Visitor use, visitor satisfaction, and progress toward meeting recreation objectives

Monitoring item 5.1: Visitor satisfaction and use

Monitoring Question and Background

- What are the status and trends of visitor satisfaction for recreational visits on the planning unit?

This monitoring question address WRNF plan goals and objectives associated with recreation and visitor use.

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 2 “Multiple Benefits to People”, Objective 2a “Improve the capability of the national forests and grasslands to provide diverse, high quality recreation opportunities.”	Visitor satisfaction; Number of visitors; Demand within the Forests niche	National Visitor Use Monitoring Program	a) 5 Years; b) 5 years	N/A

Monitoring Results

Data on visitation, visitor satisfaction and changes in recreation demand is collected through survey methods by the USFS National Visitor Use Monitoring (NVUM) Program every five years. NVUM visitation surveys estimate both National Forest visits and Site visits (Figure 30). A Site Visit is the entry of one person onto a national forest site or area to participate in recreation activities for an unspecified period. A National Forest Visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period. A National Forest Visit can be composed of multiple Site Visits.

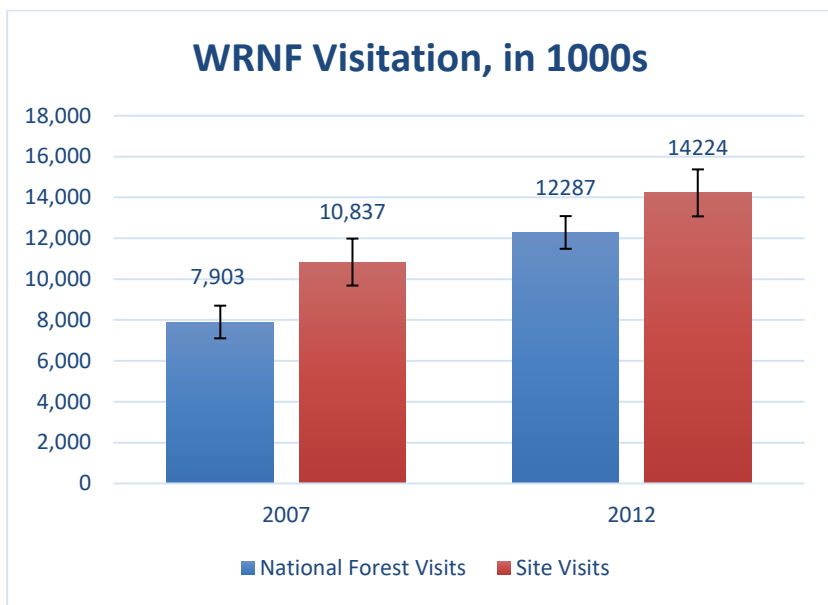


Figure 30. Number of visitors to the WRNF.
Error bars represent the range of estimates at the 90% confidence interval

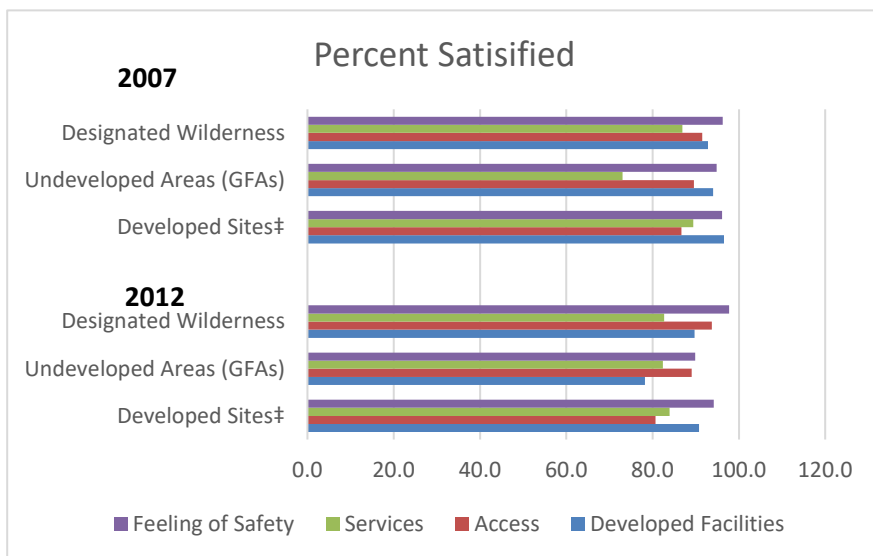


Figure 31. Trends in visitor satisfaction measures by recreation areas, 2007-2012.

Table 11. Changes in visitor activity and demand

2007 top 10 activities by participation	2007 % Participation	2007 % Main Activity	2012 top 10 activities by participation	2012 % Participation	2012 % Main Activity
Downhill Skiing	76.4	74.4	Downhill Skiing	53.5	53.5
Viewing Natural Features	31.7	3.3	Hiking / Walking	36.8	23.5
Viewing Wildlife	23.3	0.4	Viewing Natural Features	36.7	5.6
Hiking / Walking	13.7	6.6	Relaxing	22.2	2.3
Relaxing	11.0	1.0	Viewing Wildlife	20.9	0.3
Cross-country Skiing	9.0	4.6	Bicycling	9.2	6.7
Driving for Pleasure	6.8	1.4	Driving for Pleasure	6.3	0.2
Some Other Activity	5.1	1.5	Cross-country Skiing	6.0	4.6
Snowmobiling	4.7	1.8	Picnicking	5.2	0.8
Visiting Historic Sites	2.8	0.2	Nature Study	5.1	0.2

Monitoring Discussion and Findings

National Visitor Use Monitoring is the standardized protocol across all forest units within the National Forest System. While survey methods do not capture 100% of visitation, they provide a statistically valid representation of visitation. General consistencies from 2007 to 2012 are indicated, leading to the conclusion that survey methods are accurate.

White River National Forest is among the top 3 most visited in the National Forest System, as well as being an international destination. Opportunities for outdoor recreation within the White River National Forest are seemingly endless, as visitation trends continue to rise, and visitor satisfaction are generally high and stable (Figure 31).

As shown in Table 11, Downhill skiing accounts for the vast majority of White River National Forest Visits to the forests 11 privately operated ski resorts. Aside from ski resort visitation, other main purposes of visits include: hiking/walking, viewing natural features, viewing wildlife, and relaxing are consistently the next highest uses, followed by driving for pleasure and cross country skiing. This indicates continuing to manage for the high demand for year round recreation opportunities, including from the platforms that facilitate these visits (ie. Trails, roads, developed recreation sites).

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

Monitoring item 5.2: Recreation Special Uses Administration

Monitoring Question and Background

- What are the number and type of Recreation Special Use Permits administered to standard?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 2, Objective 2c "Improve the capability of national forests and rangelands to sustain desired uses, values, products, and services."	Permits administered to standard, number of service days permitted, type of permit.	INFRA, Administering Recreation Special Use Permits to Standard Best Practices; SUDS	Annually	All permits administered to standard set by Region for permit type

Special use permits provide the public high-quality recreational opportunities on WRNF and support the local economy. Administering these permits to standard is key to maintaining these experiences.

The national target established to ensure delivery of a quality special uses program on behalf of the Forest Service is the number of permits administered to standard. At the end of each fiscal year, all active special use authorizations are evaluated within the Special Uses Data System (SUDS). Depending on the type of authorization, various measurement elements are considered when determining whether the permit has been administered to standard for that fiscal year. In order to be rated as "administered to standard" for the current fiscal year, the special use authorization being evaluated must receive a "Yes" determination for all applicable measurement elements. Any "No" determinations, will result in a determination of "Not Administered to Standard". Measurement elements have been identified at a national level as critical for maintaining a quality special uses program, delivering quality experiences and opportunities to the public, providing adequate natural resource protections, and for ensuring Forest Service compliance with applicable law, regulation and policy.

ATS Measurement Element Relation to the WRNF Forest Plan Goal and Objective for Special Uses Administration:

Authorization Document Current- All special use permits must be current and up to date.

Rental Fees Documented- Land use fees are determined in accordance with applicable law, regulation, policy, and permit terms and conditions. 36 CFR 251.57 requires all special use permits to have an advance fee paid unless otherwise stated in law, regulation or policy.

Bill Issued or Rent Fully Waived- 36 CFR 251.57 states: "(a) Except as otherwise provided in this part or when specifically authorized by the Secretary of Agriculture, special use authorizations shall require the payment in advance of an annual rental fee as determined by the authorized officer." Most fees are returned to the U.S. Treasury; however, in unique cases like outfitting and guiding, recreation events, and filming, the majority of the land use fees are returned to the Forest on which they were collected. Those fees are intended for continuation and enhancement of those

specific programs and opportunities. The WRNF, its permit holders, and the public benefit greatly from the Forest’s ability to reinvest those fees into those specific programs and by extension allow us to meet the Forest Plan objective of “Improv[ing] the capability of national forests and rangelands to sustain desired uses, values, products, and services.”

Document Current and Adequate Insurance- FSM 2713 states that the Forest Service must require insurance for concessionaire uses and should require other holders to carry liability insurance depending on the likelihood and potential severity of injury.

Document Inspections and Take Actions for Non-Compliance- Inspection of special uses permits is an integral process for ensuring the holders’ compliance with the terms and conditions of their special use permit and help the Forest maintain high quality public services on NFS lands.

Document Performance Evaluations and Take Action for Non-Compliance- Similar to inspections, it is necessary for the Forest Service to be familiar with the holders’ operations and ensure compliance with the permit terms and conditions and operation and maintenance plan. Performance reviews also allow for verification of public satisfaction with the permit holders’ operation.

Monitoring Discussion and Findings

In past years, Administered to Standard has been identified as an accomplishment target for Regions and Forests as part of the annual National Budget Direction. Below is a table (Table 12) identifying the specific program administered by WRNF from FY2015-FY2017 including the number of permits, diversity of uses authorized, regional target accomplishment, as well as number of permits administered to standard.

Table 12. WRNF administered to standard data for recreation special uses from fiscal year 2015- 2017.

Recreation	FY2015	FY2016	FY2017
Total Permits	415	375	418
Total Use Types Authorized	12	14	15
Total ATS for FY	306	333	324
R2 Assigned Target for FY	126	162	207
# Over Target	180	171	117

White River National Forest- Meeting Forest Plan Goal and Objective for Recreation Special Uses Administration:

With the exception of number of service days authorized, the table above provides information on the indicators identified in the Forest Plan Monitoring Plan for Special Uses Administration- Permits Administered to Standard, Service Days Authorized, and Types of Permits. Findings with respect to each of these indicators are listed below.

Number of Permits Administered to Standard- The number of permits administered to standard alone does not supply much information for use to assess the Forest’s program delivery or its success in meeting the Forest Plan goal and objective; however, when we allow for the regional target to act as a proxy for that assessment, we can better assess the Forest’s program. From 2015-2017 the WRNF has not only met, but exceeded the annual target provided by the Regional Office for both recreation and lands special uses. This is a good indicator that the WRNF has prioritized this accomplishment and is aware of how this accomplishment contributes to the Forest’s ability to meet the Forest Plan goal and objective for special uses administration.

Service Days Authorized- At this time, WRNF does not maintain a database for gathering or tracking the total amount of service days authorized. However, data shows that WRNF is the most highly visited forest in the country. Most of these visits occur at the Forest’s ski areas that are authorized under a special use permit. SUDS data shows that WRNF administers one of the largest outfitter and guide programs and recreation event programs in the Rocky Mountain Region. With the exception of recreation event authorizations in 2015, WRNF led the Rocky Mountain Region in the total outfitting and guiding and recreation event authorization in fiscal year’s 2015-2017. This is good indicator that the WRNF has not only a great number of service days authorized for outfitting and guiding use, but also supports a great number of visitor opportunities through its recreation event and ski area programs.

Types of Permits- With respect to recreation and lands uses, the WRNF demonstrates a wide variety of special use authorizations. Furthermore, the forest has maintained that variety of uses for multiple years running, indicating a willingness to continue providing those opportunities into the future.

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

Monitoring item 5.3: Sustaining Recreation Infrastructure

Monitoring Question and Background

- How is the forest trending towards implementing a sustainable program for recreation related infrastructure?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 2 Objective 2a	Site Condition	INFRA corporate database; Site Condition Surveys	Once every 5 years	Site conditions improving Deferred maintenance backlog reduced

Monitoring Results

Site Condition Surveys are completed a minimum of once every five years for all developed recreation sites, including trailheads. Table 13 shows the number and type of sites permanently taken out of service/decommissioned since 2003, the number currently closed, and the number of sites currently open as of 2003. Current data will serve as a baseline to evaluate changes in the future.

Table 13. Recreation sites closed or opened since 2003.

Recreation Site Type	Permanently closed	Currently closed	Currently Open
BOATING SITE			5
CAMPGROUND	7		55
CAMPING AREA			1
CLIMBING AREA			1
DAY USE AREA	2		4
DOCUMENTARY SITE			4
FISHING SITE	2		3
GROUP CAMPGROUND		1	5
GROUP PICNIC SITE			2
HORSE CAMP			2
HOTEL, LODGE, RESORT			23
INFO SITE/FEE STATION			2
INTERPRETIVE SITE			4
INTERPRETIVE VISITOR CENTER (MINOR)			2
LOOKOUT/CABIN			1
OBSERVATION SITE			3
PICNIC SITE	3		13
RECREATION RESIDENCE	1		15
SKI AREA ALPINE			11
SKI AREA NORDIC			2
TARGET RANGE			1
TRAILHEAD	2	3	159
Grand Total	17	4	318

Monitoring Discussion and Findings

The White River National Forest manages developed recreation sites through a combination of concessionaires (private companies) and force-account (Forest Service employees), and through both fee and non-fee sites. Site condition surveys document and track a recreation site being “managed to standard,” annual operations and maintenance, and help with future planning of replacements of developed recreation sites features and amenities. These are also useful to understanding the amount of deferred maintenance, where recreation fees may or may not provide enough funding to address deferred maintenance.

The findings disclosed in Table 13 provide a baseline for future evaluations. As such, it reflects that there a 5% permanent closure (17 of 339) of recreation sites between 2003-2018. The permanent recreation site closures reduce the amount of overall developed recreation infrastructure and focus concessionaire and force-account capacity on supporting a sustainable recreation program.

Another tool to implementing a sustainable program for recreation related infrastructure is through Recreation Site Analysis (RSA). RSA looks at the totality of operating and maintaining sites and deferred maintenance, but also broadens the goals to consider how recreation sites contribute to social stability, environmental integrity, and economic viability for the forest and its communities. This is a tool that could provide future prioritization, including a range of options including expansion and/or reductions in services of recreation sites, closing sites, shifting operational responsibility to other stakeholders, etc.

Adaptive Management Considerations

Completing the Recreation Site Analysis is an attractive tool, this process would result in a 5-year program of work for which may or may not be reasonably implemented. Therefore, no changes to the monitoring program, forest plan direction or management activities proposed at this time.

VI: Status of climate change measures and other stressors

Monitoring Item 6.1: Snowpack and Precipitation

Monitoring Question and Background

- What are the status and trends of snowpack and precipitation in the planning area?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Frequency of data a) collection b) reporting	Targets, Thresholds
Goal 1, Objective 1e "Work cooperatively with individuals, organizations, local, state, tribal, and other federal agencies to promote ecosystem health and sustainability across landscapes."	Snow water equivalent (SWE), annual precipitation and average temperature	Natural Resource Conservation Service SNOTEL DRI/University of Idaho Google Earth Engine	a) Daily b) 2 years.	Declining snow-water equivalent trends Declining trends in climatic measures of precipitation and temperature over time

Monitoring Results

Snowpack

Snowpack monitoring on WRNF is conducted by the Natural Resources Conservation Service at automated [SNOTEL](#) monitoring sites. Data from multiple SNOTEL sites are used to assess trends in the snow-water equivalent (SWE) (i.e. the amount of water in snow snowpack) across the upper Colorado River Basin, a watershed that encompasses most WRNF (Figure 32).

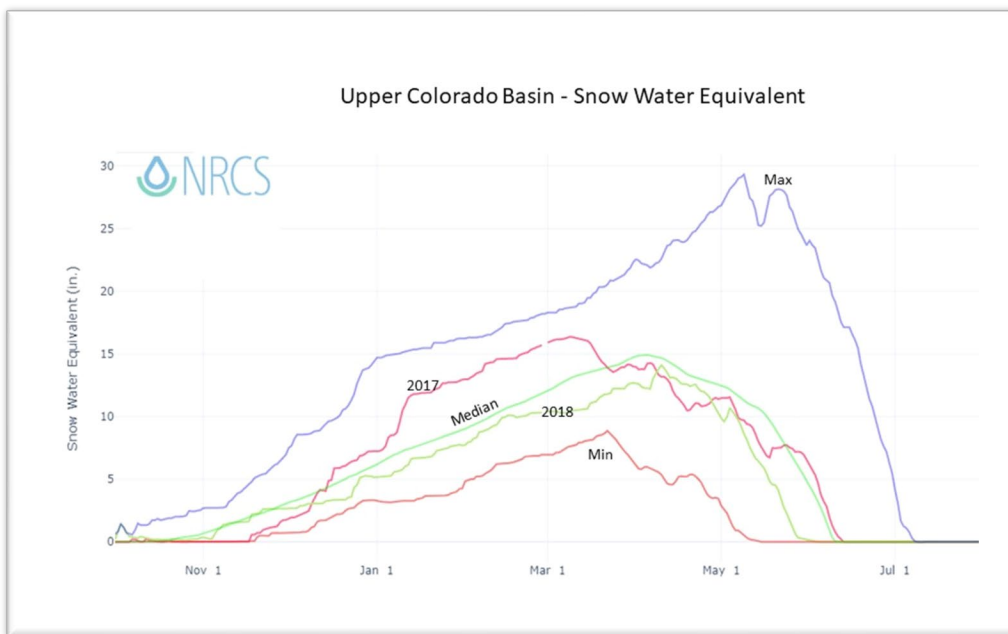


Figure 32. Snow Water Equivalent trends for the Upper Colorado River Basin. Maximum, minimum and median are 30-year averages for the 31 SNOTEL sites in the basin.

Recent annual trends for the WRNF plan area are also evident in area averaged estimates of snow water equivalent derived from NOAA’s SNODAS product, summarized here using the Desert Research Institute and University of Idaho’s [Climate Engine](#). See Figure 33.

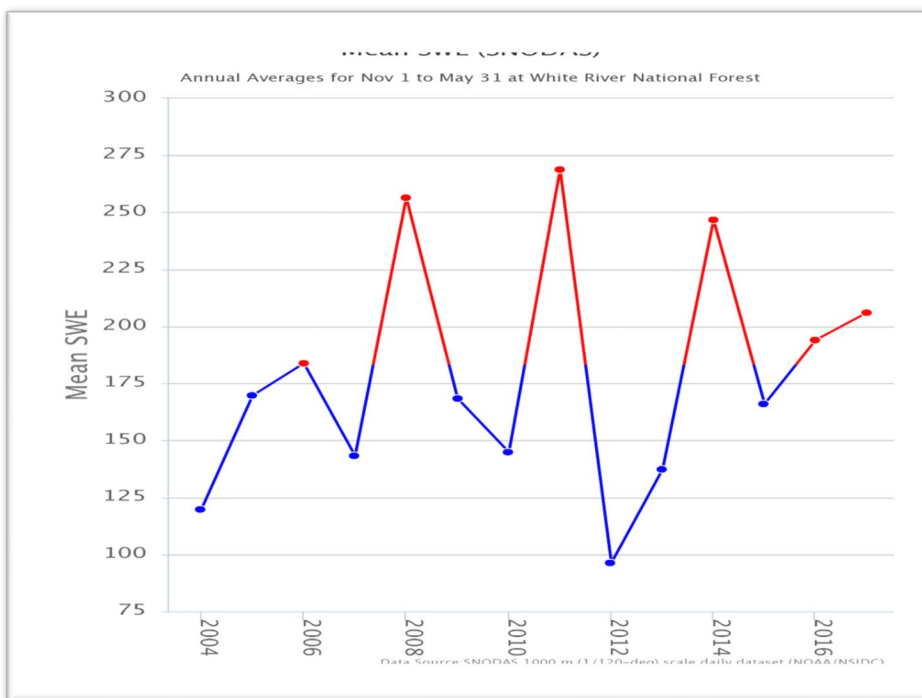


Figure 33. Area averaged mean SWE (millimeters) for the WRNF planning unit, 2004-2017.

Precipitation and temperature

Annual precipitation and temperature trends for the WRNF planning area were also calculated from gridded datasets (i.e. GRIDMET) in the Climate Engine. Results are shown below in Figure 34 and Figure 35.

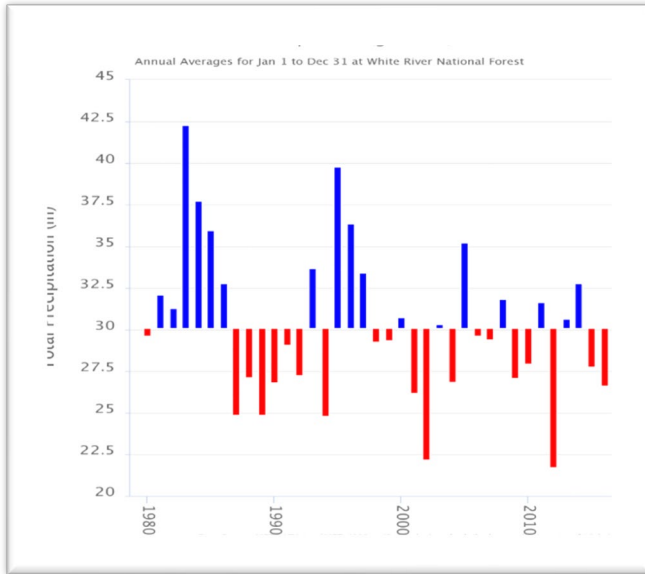


Figure 34. Annual area averaged precipitation deviations from the mean for the WRNF, 1980-2017.

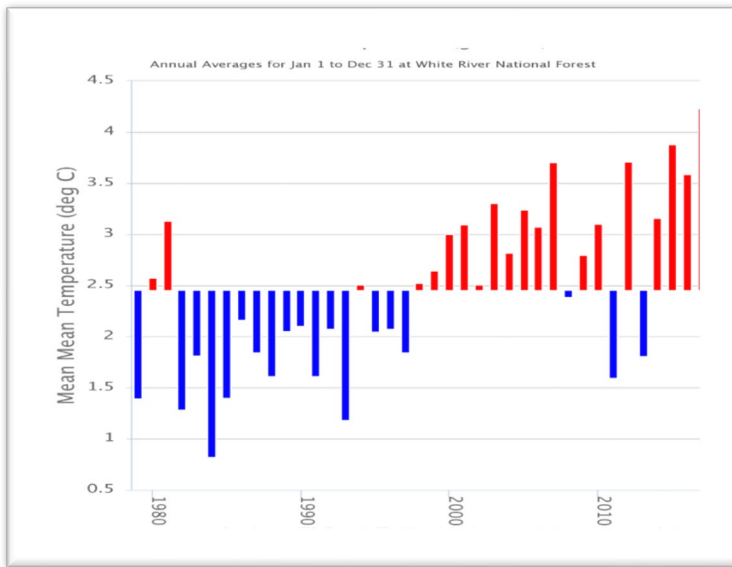


Figure 35. Annual area averaged temperature deviations from the mean for the WRNF, 1980-2017.

Monitoring Discussion and Findings

Snow water equivalent values for 2017-2018 closely bracket the median values for the long-term data set in Figure 32. The annual values in Figure 33 show a lot of annual variation but no significant trend between 2004 and 2017. These data for snow water equivalent will serve as a baseline for subsequent monitoring periods going forward.

The data in Figure 34 and Figure 35 show that while there has been little discernible trend in precipitation in annual precipitation, there has been a clear warming trend from 1980 to 2017. Again, these longer-term datasets will serve baseline for subsequent monitoring periods.

Adaptive Management Considerations

These climate datasets are collected continuously and reported over various time increments useful for these analyses. Although forest management activities will typically not have a direct and measurable influence on these climate parameters, the trends described can provide a context for evaluating other fine-scale monitoring results and trends on the forest. As such, no adaptive changes to the Forest Plan or this monitoring question are anticipated at this time.

VII. Progress toward meeting Forest Plan desired conditions and objectives

Monitoring Item 7.1: Economic Contributions from Specific Programs

Monitoring Question and Background

- What are the contributions from the range, timber, recreation, and minerals programs to the National Forest?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 5, Objective 5a "Work cooperatively with individuals and organizations, local, state, tribal, and federal governments to promote ecological, economic, and social health and sustainability across landscapes."	Indicator 1: Range, timber, recreation, and minerals contributions to local employment and income	IMPLAN	a) Annually; b) 2 years.	Maintain economic contributions

The structure of the local economy and how the different pieces of the economy interact (an "Input-Output" model) are calculated using a software and data package called IMPLAN (www.implan.com). Forest Service data for program outputs from the WRNF is added to the model: recreation (including fish and wildlife related), livestock grazing, forest products, energy, minerals, payments to states, and the Forest Service budget. The IMPLAN model then estimates the economic links between natural resource management on the WRNF and local jobs and income, also known as economic contributions. Economic contributions for 2016 used National Visitor Use Monitoring (NVUM)

information from 2011 to 2014. For 2018 economic contributions, NVUM information from 2015-2019 was used. The most recent available visitor use survey data was from 2012.

National Forests and Grasslands provide multiple benefits to the American people and to local communities. They provide clean air and water, preserve cultural resources, and conserve lands for the enjoyment of present and future generations. They also support local economies through recreation, timber, energy, minerals, and livestock grazing. WRNF has a far reach geographically for economic contributions. This includes approximately 29 total counties, of which two are in Utah. In addition, counties with national forests or grasslands receive funds to support schools, road maintenance, and stewardship projects. The Forest Service also invests in such things as the construction and maintenance of infrastructure, environmental restoration, and forest health. All these items are reflected in job contributions and labor income contributions attributed by WRNF.

Monitoring Results

Job Contributions by Program

Jobs supported by the National Forests and Grasslands are often in small, rural communities and are therefore an important contribution to economic and social sustainability. Employment is the estimate of average annual full-time, part-time, temporary, and seasonal jobs. Job contributions come from economic activity associated with a Forest Service Program. Secondary job contributions are the ripples of economic activity stimulated by the direct economic activity. Total job contributions are the sum of direct and secondary contributions. Table 14 shows the total annual jobs attributed to various program areas on WRNF.

Table 14. Total jobs by program supported by WRNF.

Program	2016 Total Jobs (avg annual)	2018 Total Jobs (avg annual)	Net Change, 2016 to 2018
Recreation by local and non-local visitors	16,000	17,360	1,360
Wildlife recreation by local and non-local visitors	130	100	-30
Minerals and energy	20	10	-10
Forest products	220	180	-40
Livestock grazing	320	320	0
USFS resource mgt investments	400	550	150
Payments to states/counties	160	110	-50
Total	17,250	18,630	1,380

Economic monitoring data shows a total net job increase from 2016-2018. Recreation by local and non-local visitors experienced the largest increase within this time period. Slight declines in wildlife recreation by local and non-local visitors, minerals and energy, forest products and payments to states/counties occurred. Livestock grazing was neutral, and the resource management investment program experienced a slight increase.

Table 15 shows the direct jobs attributed to various program areas on WRNF.

Table 15. direct jobs by program supported by WRNF.

Program	2016 Direct Jobs (avg annual)	2018 Direct Jobs (avg annual)	Net Change, 2016 to 2018
Recreation by Local and Non-local Visitors	11,080	11,480	400
Wildlife Recreation by Local and Non-local visitors	90	60	-30
Minerals and Energy	10	4	-6
Forest Products	100	110	10
Livestock Grazing	200	200	0
Resource Mgt Investments	280	380	100
Payments to States/Counties	110	70	-40
Total	11,870	12,304	434

Jobs directly related to programs also experienced an overall increase from 2016-2018. Recreation by local and non-local visitors experienced the largest increase within this time period. There were declines in direct jobs within wildlife recreation by local and non-local visitors, minerals and energy and payments to states/counties program areas. Resource management investments and forest product programs increased in direct total jobs, and the livestock grazing program showed no increase or decrease.

Labor Income Contributions by Major Program

Labor income is the value of wages, salaries and benefits for wage earners plus income to local business owners. Table 16 shows the total labor income attributed to various program areas on WRNF.

Table 16. Total labor income by program supported by WRNF.

Program	2016 Total Labor Income (annual, \$1000's)	2018 Total Labor Income (annual, \$1000's)	Net Change, 2016 to 2018 (annual, \$1000's)
Recreation by Local and Non-local Visitors	\$387,252	\$717,296	\$330,044
Wildlife Recreation by Local and Non-local visitors	\$2,368	\$4,570	\$2,202
Minerals and Energy	\$691	\$1,354	\$663
Forest Products	\$4,448	\$8,994	\$4,546
Livestock Grazing	\$2,565	\$7,140	\$4,575
Resource Mgt Investments	\$20,925	\$29,926	\$9,001
Payments to States/Counties	\$4,379	\$6,348	\$1,969
Total	\$422,628	\$775,630	\$353,002

Overall, total labor income increased within all program areas on the forest for the period 2016-2018. Recreation by local and non-local visitors experienced the largest increase within this time period, followed by resource management investments, livestock grazing, forest products, wildlife recreation by local and non-local visitors, payments to states/counties and minerals and energy programs.

Table 17 shows the direct labor income attributed to various program areas on WRNF.

Table 17. Direct labor income by program supported by WRNF.

Program	2016 Direct Labor Income (annual, \$1000's)	2018 Direct Labor Income (annual, \$1000's)	Net Change, 2016 to 2018 (annual, \$1000's)
Recreation by Local and Non-local Visitors	\$319,347	\$717,296	\$397,949
Wildlife Recreation by Local and Non-local visitors	\$2,874	\$4,570	\$1,696
Minerals and Energy	\$1,391	\$1,354	(\$37)
Forest Products	\$3,907	\$8,994	\$5,087
Livestock Grazing	\$2,452	\$7,140	\$4,688
Resource Mgt Investments	\$16,120	\$29,926	\$13,806
Payments to States/Counties	\$6,333	\$6,348	\$15
Total	\$352,424.00	\$775,628	\$423,204

Overall, total direct labor income increased within most of the program areas on the forest for the period 2016-2018. Recreation by local and non-local visitors experienced the largest increase within this time period, followed by resource management investments, forest products, livestock grazing, wildlife recreation by local and non-local visitors and payments to states/counties. The minerals and energy program experienced a slight decrease in direct labor income during this period.

Monitoring Discussion and Findings

Figure 36 and Figure 37 show economic contributions both directly and as a whole increased from 2016-2018.

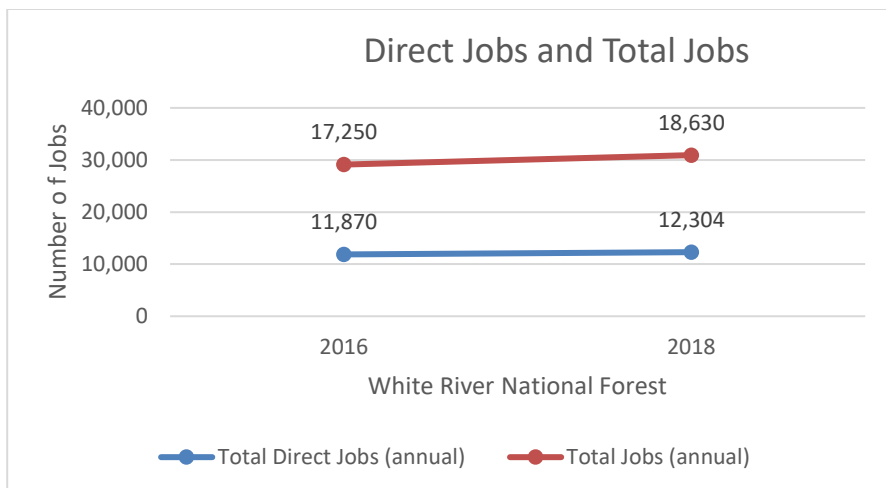


Figure 36. Direct and total job contribution.

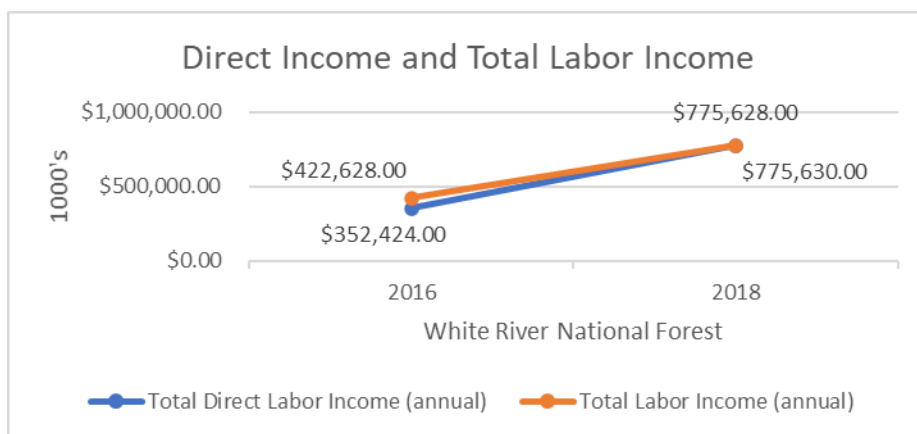


Figure 37. Direct and total labor income contributions.

Increase in economic contributions to WRNF are a result of updated economic data used for the 2018 analysis. For 2016, analysis used NVUM information from 2011 to 2014, and for 2018, the analysis used NVUM information from 2015 to 2019. Recreational use expenditures increased from 2011-14 to 2015-19 which caused the increase to economic contributions. It should be noted that recreational visitation use data for the forest did not change between 2016 and 2018. Visitation use data is collected on 5-year intervals and updated data was not available for this monitoring period. The WRNF is one of the most highly visited forests in the nation with high recreational use. Even though managers are experiencing increased visitation use of the forest annually, it is not totally reflective in the economic data at this time. Even without updated visitor use information, the data indicates that economic contribution activity by the forest has increased in this period due to the increased recreational expenditures. Monitoring results for this period and future two-year periods may not capture economic contributions in their entirety due to recreation visitation being reported on a 5 year cycle. Consideration should be given to align the economic activity report on the same 5-year timeframe as recreational visitors use data within the forest monitoring program.

Adaptive Management Considerations

At this time, there are no adaptive management considerations to consider for economic contributions to WRNF.

Monitoring Item 7.2 - Travel Management Implementation

Monitoring Question and Background

- What are the status and trends of roads and trails on WRNF?

Forest Plan Ref./ Driver	Indicators	Data Sources, Protocols, Partners	Freq. of a) data collection and b) reporting	Desired Conditions, Targets, Thresholds
Goal 4, Objective 4a 2011 Travel Management Plan	Miles of Roads Managed to Standard, Miles of Trails managed to Standard, Miles of Routes (Roads/Trails) Decommissioned, Number of Kiosks and Information Panels installed	USFS Infrastructure (INFRA) database	a) Annually; b) 2 years.	14 miles of road decommissioned per year Number of miles of trails maintained to USFS standard

Monitoring Results

Since the signed record of decision of the 2011 Travel Management Plan (TMP), WRNF recreation staff has been implementing management actions in accordance with decisions related to motorized and non-motorized trails and recreation visitors for both summer and winter seasons. The 2011 TMP Record of Decision requires a substantial amount of planning and coordination every year between WRNF staff, public and private organizations, volunteer and partner organizations, as well as state and local government agencies. Every year the forest completes updates, produces and makes available to the public Motor Vehicle Use Maps (MVUM's) for both summer and winter seasons.

Roads

Forest Service classifies maintenance of National Forest System roads by five levels: 1, 2, 3, 4, and 5. Maintenance level 1 roads are closed to motor vehicle use. Maintenance level 2 roads are maintained for high-clearance vehicles. Maintenance level 3, 4, and 5 roads are maintained for passage by standard passenger cars during the normal season of use. The status and trend of roads within the WRNF is summarized in Table 18. This data was prepared from the natural resource manager (NRM) corporate database's road accomplishment reporting (RAR) module. The quantity of system road miles in the WRNF NRM report differs greatly from the quantity of system road miles shown in 2011 TMP (Table 19). This large difference in mileage is because the total mileage of system roads identified the 2011 TMP as "decommissioned", or "not needed" is not included in the TMP road mileage. WRNF engineering is working with the USFS enterprise team through an agreement to make the proper corrections to our databases. Current figures will serve as a baseline for future biennial reporting.

The TMP identified 1,551 miles of system and non-system roads for decommissioning, and a target of 14 miles of road decommissioned each year. Figure 38 shows miles of road decommissioned each year versus the target. Figure 38 was populated with a variety of reports, ranging from force account, to recreation staff cooperative agreement accomplishments, and contract reports. Since the March 2011 Record of Decision for the TMP, and through 2017, approximately 120 miles of road have been physically closed and decommissioned with heavy equipment. Another approximate 23 miles are anticipated to be completed in 2018. This totals approximately nine percent of the decommissioning identified in the TMP. A substantial portion, perhaps one-third or more, of the remaining identified road decommissioning mileage has become effectively closed to traffic and become stabilized through natural processes. This will remain a rough estimate until project level planning efforts are able to identify decommissioning treatments needed for specific roads.

Table 18. WRNF roads by maintenance level operated at or above plan objectives.

Objective Maintenance Level	Mileage Operated Above Objective	Mileage Operated Equal To Objective	Mileage Operated Below Objective	Total System Miles	% of Mileage Operated At Or Above Objective
5	0.0000	19.1790	1.5840	20.7630	92.4
4	0.0000	45.0730	39.0700	84.1430	53.6
3	0.3490	309.4242	75.9720	385.7452	80.3
2	28.9600	1,264.2303	27.7140	1,320.9043	97.9
1	57.2200	282.5900	0.0000	339.8100	100.0
C	12.7070	0.0000	0.0000	12.7070	100.0
D	1.4000	0.0000	0.0000	1.4000	100.0
Total:	100.6360	1,920.4965	144.3400	2,165.4725	93.3

Table 19. 2011 TMP data and 2015 Subpart A report.

Roads	Miles
Maintenance Level 5	14
Maintenance Level 4	48
Maintenance Level 3	325
Maintenance Level 2	1,029
Maintenance Level 1	4
Total System Roads	1,420

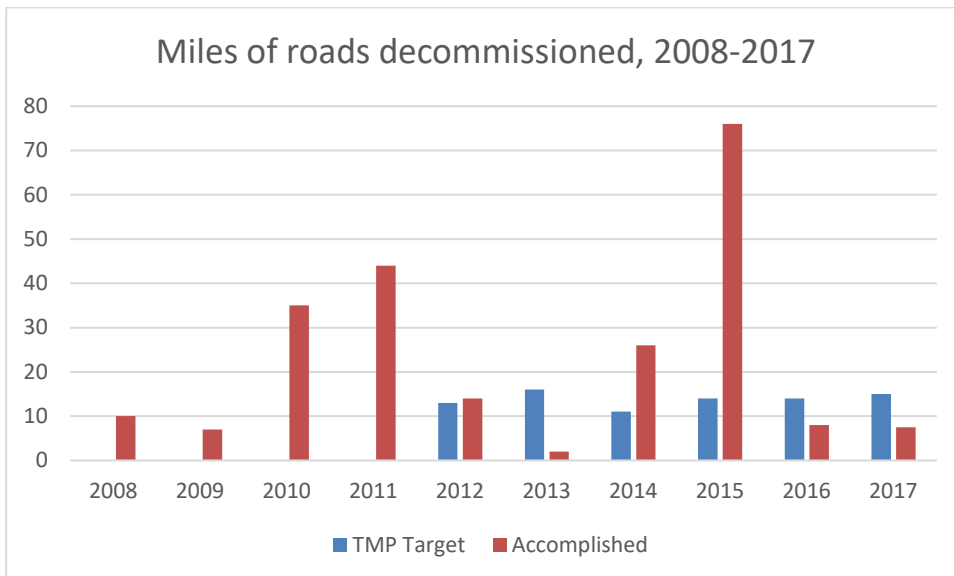


Figure 38. Miles of road decommissioned 2008-2017.

In summary, while there is significant variation in miles decommissioned each year based on available funding and priorities, the WRNF has been averaging above target for the lifetime of the TMP.

Trails

The TMP Implementation Plan identified management actions related to Recreation and Trails under four separate emphasis areas: Education, Enforcement, Engineering, and Evaluation (addressed within Monitoring Discussion and Findings). All trails designated through the TMP are to be maintained to standard, routes not designated will be decommissioned. The made Travel Management Implementation a priority for 5 years and continues to earmark monies for education, informational and regulatory signing across the forest.

Education: As part of the education and information component of the TMP, the WRNF sign program has been an integral part of getting travel and access information out to forest visitors. The sign program started since 2005 in an effort to provide consistent and high-quality signage across the forest. As part of TMP implementation the sign plan identified kiosk locations across the forest that would house TMP information for roads and trails. As part of that effort, the forest entered into an agreement in 2012 with Colorado Corrections Industry (CCI), in Buena Vista to construct kiosks. The forest has budgeted approximately \$22k for materials for kiosk materials annually since 2012. Over the last 7 years CCI has constructed on average 36 +/- kiosks per year. As of 2017 the forest has installed kiosks at approximately 166 locations across the forest. Currently, the forest is approximately 50% complete given the originally planned 313 kiosk locations. Planned kiosk and sign locations includes TMP “Portals”, Ranger Districts, trailheads and campgrounds. WRNF recreation continues to work with the USFS Enterprise Team for the design and production of trailhead sign panels in accordance with our sign and kiosk plan.

Enforcement: Enforcement has been underway from the beginning, however information and education was the focus for the first 3 years. A key part of enforcement was the production and distribution of the MVUM’s. MVUM’s have been available and free to the public since 2012. On average the WRNF spends \$16,000 + a year to print MVUM’s.

Engineering: The TMP identified 2,608 miles of system trails on WRNF. As of 2017, all system routes have been signed and continue to be maintained in accordance with USFS signing standards. Sign procurement on the WRNF has been supplemented \$7,500 each year from “Stay the Trail Colorado” which is funded from Colorado Parks and Wildlife. The Forest currently has 3 “Good Management” OHV Crews that are also funded by CPW through the States OHV sticker fund. These OHV crews play a key role in providing public information, planning, management, and maintenance for motorized routes on WRNF.

Monitoring Discussion and Findings

On average, the WRNF is assigned and has met the following trails accomplishments/targets each year. “Trails maintained to standard” =478 miles; and “Trails Improved to Standard” = 12 miles. Non-system trails continue to be decommissioned or closed as recreation staff comes upon unauthorized trails.

WRNF continues to focus maintenance on existing system trails that are important for access and key to our community’s sense of place. Trails have been a priority on the forest for decades as the forest is home to some of Colorado’s key tourism destination resorts. Trails serve as a key component that offer’s visitors high quality recreation opportunities in a world class setting. Visitation continues to increase as well as increased stewardship and volunteerism. Trail maintenance on WRNF is and has been predominately done with youth corps, partner, non-profit and volunteer organizations. WRNF recreation continues to work on validating and ground truthing trail data so we can provide the public with the most accurate and current data so visitors can interface this information with their phones or handheld devices.

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

Monitoring Item 7.4 - Wilderness

Monitoring Question and Background

- What are the status and trends of the Wilderness Stewardship Performance elements?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 2, Objective 2b	Wilderness Stewardship Performance (WSP) Elements	NRM- "WSP Accomplishment Report Summary" (9/27/2018)	A) Annual B) Annual	Target: 5-point increase per selected element each year in every wilderness until all meet or are above "Standard Performance level = 60-69 points".

Wilderness Stewardship Performance (WSP) is a framework to track how well the USFS is meeting our primary responsibility under the Wilderness Act—which is to preserve wilderness character. This new performance allows the flexibility in the selection of individual elements for each wilderness area to reflect local wilderness stewardship priorities, while also correcting other long-acknowledged short-coming. It seeks to foster improved integration and communication between program areas, to accurately reflect the collaboration required to steward our wilderness resources. Wilderness Stewardship Performance will track the number of wildernesses meeting baseline performance for preserving wilderness character. For complete information on WSP:

https://www.wilderness.net/NWPS/documents/FS/WSP-Guidebook_v2017.2.pdf

Ten elements are selected for each wilderness and will be reported upon annually. The WRNF convened several full interdisciplinary team (IDT) meetings to select six elements that matched local stewardship priorities for each wilderness. There are four mandatory elements; Agency Management Actions, Workforce Capacity, Education, and Wilderness Character Baseline. A wilderness scoring 60 points or higher equates to "Wilderness meeting baseline performance for preserving wilderness character". Scoring and deliverables is unique to each element.

Wilderness Character Monitoring (WCM): The framework for WCM is woven into the overall format of the new performance measure and is also included as a stand-alone required element.

Monitoring Results, Discussion and Findings

Performance measure upward reporting began in FY 2016, with targets based on the initial WSP scores submitted in FY 2015 that began the new WSP process. Annual performance assumes slow-but-steady incremental improvement in scores, estimated at a 5-point increase per year. This progression of scores also assumes the continued support of national funding.

2015 WRNF selected and approved elements for all six wilderness areas with a full IDT and submitted to RO for approval.

2016 WRNF was successful in WSP project submissions in the initial rollout of WO internal funding for projects for the following: \$47k for "*Indigenous Cutthroat Trout Conservation Monitoring and Invasive Species Removal*" as well as \$39.5k for "*Flat Tops Wilderness Recreation Site and*

Solitude Monitoring Project". Both projects elevated WSP scores in the Flat Tops and Holy Cross Wilderness Areas respectively.

Overall, scoring improved in 2016 from the initial 2015 scores for all wilderness areas with exception for the Maroon Bells-Snowmass Wilderness (MBSW) which dropped 2 points due to limited workforce capacity and issues related to high use challenges in this wilderness area. Ptarmigan Peak and Eagles Nest continue to be "Well Below Standard Performance= < 30 points".

2017 WRNF was once again successful in WSP project submissions for 37.7k for "*Holy Cross Wilderness Solitude and Recreation Site Inventory*". It is expected that this project will further elevate Holy Cross Wilderness area scoring in both the solitude and recreation site elements.

The overall scoring improved for all wilderness areas except for the MBSW and the Hunter Frying Pan which both remained the same as in 2016. Holy Cross scores increased from a 42 to a "60" in 2017 which brought this wilderness area up to meeting baseline performance or "at or above standard performance = 60-69 points". The only WRNF wilderness area that remains at "Well Below Standard Performance= < 30 points" in 2017 is Ptarmigan Peak.

2018 WRNF was successful in a WSP project submission for \$38.9 k for "*Eagles Nest Wilderness Solitude Monitoring & Trail Assessment*". At the time of this report, 2018 WSP upward reporting had not been finalized. It is expected that overall scores will continue to increase and that the WSP project work will continue to elevate the Eagles Nest Above the current "Below Standard Performance = 30- 49 points".

Adaptive Management Considerations

Wilderness performance measures are on target. There are no changes recommended to the monitoring program or to forest plan direction at this time.

Monitoring Item 7.5 - Status of Bare Ground Recovery

Monitoring Question and Background

- Are management projects designed to address ground disturbing management activities meeting the direction to "...maintain or improve levels of soil organic matter on all lands" through bare ground rehabilitation projects?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Targets, Thresholds
Goal 2; "Multiple Benefits to People", Objective 2c "Improve the capability of national forests and rangelands to sustain desired uses, values, products, and services."	Field/ground-truthed soil organic matter transects coupled with a comparison of time-stamped, remotely-sensed data of bare ground rehabilitation areas prior to and following mitigation.	Soil Organic Matter transects Remote sensing products, i.e. Climate Engine	a) Annually; b) 2 years.	14 miles of road decommissioned per year

Monitoring Results, Discussion and Findings

Bare ground data has been collected by contractors that supplies the base imagery for a visual comparison of vegetation ground cover at several ski areas. This bare ground data has been utilized to compare before and after implementation to determine if projects are maintaining or improving levels of soil organic matter. Soil organic transects data on ski area projects have been collected by Forest Service personnel and contractors to document depth of soil O and/or A horizons prior to ground disturbance activities. After ground disturbance, soil organic transects were collected and it was determined that soil organic matter was less than prior implementation levels so mitigation measures and design criteria will be utilized to go back to long-term soil organic matter levels. Bare ground on timber projects have been observed to be on landings, multiple pass skid trails and temporary roads that have not been closed – these bare ground areas do not exceed 15% of the project areas, but efforts to rehabilitate the bare ground still remain active. There was no quantitative analysis to determine total bare ground on WRNF but it is known to exist in more actively managed project areas in particular ski resorts and timber sales. Adherence to design criteria and best management practices should keep soil erosion and bare ground to minimal levels that fall well within tolerances for acceptable loss.

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

VIII. Status of land productivity (soils)

Monitoring Item 8.1 - Soil Productivity Monitoring

Monitoring Question and Background

- What are the status and trends of soil productivity?

Forest Plan Ref./ Driver	Indicators	Data Sources/ Protocols/ Partners	Freq. of a) data collection and b) reporting	Target or Threshold
Goal 2; Objective 2c	Type, degree, and extent of soil disturbances to determine effects on soil productivity and hydrologic function.	National Forest Soil Disturbance Monitoring Protocol; Results from best management practices reviews in timber, recreation, roads, range, etc.	a) Annually; b) 2 years.	Extent of detrimental soil disturbance must be less than 15% of activity area

Monitoring Results, Discussion and Findings

Soil disturbance monitoring guidelines provide reliable monitoring methods that are repeatable and used to evaluate soil conditions across the forest. These methods should be regularly reviewed to ensure adaptive management considerations are met. These evaluations are used to identify detrimental compaction, displacement, puddling, erosion, effective ground cover, and overall soil quality as well as identifying and predicting soils that are susceptible to disturbances. Continued

monitoring also identifies project sites with significant disturbance needing restoration to reestablish soil productivity. Finally, continued monitoring of sites where soil restoration has occurred, will improve continued decision making for future monitoring and restoration.

Timber

A variety of timber projects were implemented throughout the forest between the years 2015-2018 on WRNF. They include salvage, sales, ski area settlement, fuelwood, and fuel reduction. Some of these timber projects had little to no impact on the soil resource due to helicopter logging on ski resort special use permit areas. However, most of the ski area settle projects used conventional logging treatments that have a local impact on soils via skid trails and landings.

Conventional timber treatments can leave some compaction, displacement, and removal of ground cover, and increased potential for erosion. However, the area of the designated landings and ski-trails for each of the timber sales do not reach greater than 15% of the activity area. These effects to soils are short-term because they are mitigated through restoration activities such as de-compaction, lopping and scattering, as well as slash and seeding. Other timber projects include salvage treatments from mountain beetle-killed trees and hand treatments which do not cause much ground disturbance nor effect to soil productivity. Overall, the timber harvest activities during the monitoring period did not substantially and permanently impair the productivity of the lands on WRNF.

Ski Resorts

WRNF has eleven ski areas that are developed and operated by the private sector to provide opportunities for intensively managed outdoor recreation activities during all seasons of the year. Construction activities to build facilities, summer use recreation, and winter recreation infrastructure has occurred on the majority of ski resorts on WRNF between the years of 2015-2018. Ground disturbance occurs in a greater scale with ski area development through activities such as vegetation clearing and grading which results in temporary and permanent impairment of the productivity of soils. Implementation of soil management requirements and project design criteria minimalizes erosion and loss of soil organic material from ski area projects. The footprint from past management activities on the ski areas does exist, as there is an array of unintentional bare ground still remaining. As new intentional bare ground is being created, mitigation of existing bare ground would occur through revegetation and rehabilitation. Soil productivity in the Management Area 8.25 (Ski areas) is maintained through following project design criteria and Forest Service Handbook direction.

Other Management Activities

Range developments and livestock grazing has continued to occur through the years of 2015-2018, however, no additional projects are currently proposed. Impacts from livestock grazing to soils has been minimal due to the spread out impacts that livestock have on the landscape, however, when there are impacts local to streams and waterbodies, there have been documented instances where soil erosion has occurred rapidly.

Oil and gas developments and its impacts on soil has not been monitored during the monitoring period.

Adaptive Management Considerations

There are no changes recommended to the monitoring program or to forest plan direction at this time.

Conclusion

Progressing trends

The following monitoring items and associated resources have been determined to be progressing and/or trending toward Forest Plan targets.

- 1.1: Watershed Condition Framework
- 1.3: National Best Management Practices Program
- 2.1: Air Quality
- 2.2: Forest and Grassland Health
- 2.3: Ecosystem Health
- 3.2: Red Squirrel
- 3.4: Avian Species
- 4.3: Lynx Habitat
- 5.1: Visitor Satisfaction and use
- 5.2: Special uses Administration
- 5.3: Sustaining Recreation Infrastructure
- 7.1 Economic Contributions from Specific Programs
- 7.3: Travel Management Implementation
- 7.4: Wilderness
- 7.5: Management Activity Bare Ground Recovery
- 8.1: Soil Productivity Monitoring

Uncertain trends

The following monitoring items and associated resources have uncertainties in progressing and/or trending toward Forest Plan targets.

1.2: Watershed Condition Class

WCF data is updated every 6 years, is a snapshot of the watershed condition at that time and is not a particularly sensitive baseline comparison. WCF metrics may need to be updated annually to better track numeric or categorical changes in each watershed to better determine that non-priority watersheds are in a maintained or improving watershed condition class.

3.1: Macro-invertebrates

There were 3.9% of the monitoring sites that showed a decline in biological stream health trends for lotic macroinvertebrate communities. Management activities in these areas should be only be taken if it can be shown to maintain or improve the biological stream health.

3.3: Pika

Only three years of data has been collected to monitor Pika. The data shows significant variation in detections, therefore, there is insufficient data to identify baselines and trends. As more data is collected, the agency should be better able to analyze baseline and trends associated with Pika populations and the relationship to alpine ecosystem integrity.

4.1: Cutthroat Trout

There are currently uncertainties in comparing monitoring data for CRN prior to 2016 and data collected during this monitoring period. Forest biologists will use the current monitoring data collected for inventory and monitoring of Colorado River cutthroat trout throughout the life of the Forest Plan. As additional data is collected in future monitoring periods, the status and trend of CRN can be determined across the planning area.

6.1: Snowpack and Precipitation

It is important to set baseline data for this monitoring plan going forward. It has been determined to use the snow water equivalent values for 2017-2018 and the annual values in Figure 33 between 2004 and 2017 to serve as a baseline for subsequent monitoring periods going forward. With this baseline data, the status and trends of snowpack and precipitation can be better evaluated in the planning area.

Not yet evaluated

The following monitoring items and associated resources were not evaluated during this monitoring period, and therefore a determination whether these resources are progressing and/or trending toward Forest Plan targets and/or thresholds have not been made.

4.2: Amphibians

7.2: Heritage Program Stewardship

Not determined

The following monitoring items and associated resources findings were not determined in this monitoring report.

Appendix A: Monitoring Items Not Evaluated in Detail

This appendix highlights the monitoring questions that were not evaluated this reporting period. Both questions were tabled for this reporting period due to staffing turnover in those programs over the last two years and a above average fire season in 2018. At an interdisciplinary team meeting this winter,

the Forest will revisit whether it would like to continue including these questions in the biennial monitoring report.

4.2: Amphibians

Related Plan Components: Goal 1, Objective 1c.

Monitoring Question: What is the status and trend of boreal toads and northern leopard frogs being across the planning area?

Indicators: Number of active breeding populations in the planning area; Presence/absence of chytrid fungus

Data Sources/Protocol: CNHP survey data; CPW survey data; USFS survey data; Future eDNA testing based on new research

Background and rationale: The forest conducts boreal toad surveys annually and provides this data to CPW. It also participates in the Boreal Toad Conservation Plan working group and provide valuable information regarding management decisions and population status.

7.2: Heritage Program Stewardship

Related Plan Components: Heritage Program, Standard 1: “Conduct all land management activities in such a manner as to comply with all applicable federal, state and local regulations. Many heritage resources values can be protected effectively through application of the provisions of these regulations.”

Monitoring Question: To what extent have management activities on the Forest complied with Section 110 of the National Historic Preservation Act and provided quality heritage recreational experiences?

Indicator: Number of heritage stewardship actions taken, including preservation, stabilization, research, interpretation, partnerships, volunteer opportunities, and other forms of public outreach.

Data Sources/Protocol: National Resource Manager Database, Heritage Program reports – frequency 10 years.

Background and rationale: Heritage Program Managed to Standard Measure

Appendix B: List of contributors

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Appendix C: References

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