Flathead National Forest Plan

Aquatic Ecosystem Monitoring Guide and Evaluation of Results (MON-WTR)

Point of Contact

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Introduction

This document provides the instructions and information needed to address the forest plan monitoring items associated with aquatic ecosystems on the FNF. The monitoring questions and indicators in this document target the status of watershed conditions and whether FNF management activities are maintaining or creating more resilient watersheds. These monitoring items are important in the determination of whether a suite of biological and physical attributes, processes, and functions of riparian and aquatic systems are being degraded, maintained, or restored across the Forest. The monitoring items included in this document are listed below:

Monitoring Item and Question (Chapter 5 of Flathead Forest Plan)
MON-WTR-01: What are the changed conditions of instream physical habitat parameters in managed vs. unmanaged sites?
MON-WTR-02: To what extent are forest management activities moving towards habitat objectives for native fish?
MON-WTR-03: What vegetation treatment activities have occurred in the riparian management zone?
MON-WTR-04: What is the condition of water quality in waterbodies?
MON-WTR-05: What is the status of native fish populations?
MON-WTR-06: Do management activities contribute nutrients to Flathead Lake?
MON-WTR-07: What is the status of streambanks within grazing allotments?

Purpose and Outline of this Document

Each individual monitoring item in the Forest Plan monitoring program (Chapter 5 of the Plan) has been addressed in a document such as this one, which is intended to serve as the primary location for information needed to conduct the monitoring and to record the results. It is designed to aid in the tracking and preservation of monitoring methods, data and results over the life of the plan. It is anticipated that these documents would be revisited and used as a guide to conduct the monitoring for each biennial reporting; to see past results and record new results; and updated where needed based on recommendations for change in the previous biennial report.

This document is **NOT** the final Biennial Monitoring Evaluation Report (MER), but it should contain most if not all the information needed to prepare that report, and functions as project record material for the biennial MER.

Each monitoring item in this document is organized into five main sections:

- **Introduction:** Key information from the monitoring plan (i.e. indicators, plan component being monitored, data source/collection)
- **Methods**: Detailed information on how the monitoring will be accomplished, the intent of the selected indicators, data sources and confidence levels, etc.
- **Results:** Summary of the monitoring data used and the results for the current biennial monitoring report.
- **Discussion of Results**: A fact-based discussion of results. A list of general questions (see below) and in some cases more specific resource-based questions are provided to help guide this discussion.
- **Evaluation of Results for Adaptive Management Finding:** evaluation of what the results mean in terms of management decisions. This information is incorporated into the Biennial Monitoring Evaluation Report.

AQUATIC ECOSYSTEM MONITORING (MON-WTR)

MON-WTR-01. What are the changed conditions of instream physical habitat parameters in managed versus unmanaged sites?

Introduction

The Forest Plan Desired Condition FW-DC-WTR-04 states: Instream habitat conditions for managed watersheds move in concert with or towards those in reference watersheds. Aquatic habitats are diverse, with channel characteristics and water quality reflective of the climate, geology, and natural vegetation of the area. Stream habitat features across the Forest, such as large woody material, percent pools, residual pool depth, median particle size, and percent fines, are within reference ranges as defined by agency monitoring.

The PACFISH/INFISH Biological Opinion (PIBO) monitoring program reports on status and trend of managed stream reaches compared to reference stream reaches and the natural range of variability. PIBO monitoring is part of the Region 1 BSMS and includes a total of 1,556 sites across the west. The Region is evaluating watersheds across the broader landscape of the ecoregions and Columbia River Basin. Each site is monitored every 5 years. Results in this report include sites on the Flathead National Forest. The FNF has 44 managed sites and 27 reference sites.

Objectives of PIBO monitoring

Source: (https://www.fs.usda.gov/detail/r4/landmanagement/resourcemanagement/?cid=stelprd3845865):

1. Determine whether a suite of biological and physical attributes, and functions of upland, riparian, and aquatic systems are being degraded, maintained, or restored across the PIBO landscape - the Columbia River and Upper Missouri River basins.
2. Determine the direction and rate of change in riparian and aquatic habitats over time as a function of management practices.
3. Determine if specific designated management area practices related to livestock grazing are maintaining or restoring riparian vegetation structure and function (see Aquatic Ecosystems Monitoring MON-WTR-07).

Table 1. MON-WTR-01, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-DC-WTR-04. Instream habitat conditions for managed watersheds move in concert with or towards those in reference watersheds. Aquatic habitats are diverse, with channel characteristics and water quality	**IND-WTR-01** PIBO monitoring: positive trend in PIBO metrics such as bank angle, wood frequency, percent fines, residual pool depth, percent pools, and median substrate size (D50)	See PIBO – R1 Instructions to acquire data summary https://www.fs.usda.gov/detail/r4/landmanagement/resourcemanagement/?cid=stelprd3845865	5 Year Rotating Panel	Aquatics program manager

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
reflective of the climate, geology, and natural vegetation of the area. Stream habitat features across the Forest, such as large woody material, percent pools, residual pool depth, median particle size, and percent fines, are within the range of conditions of the reference watersheds as defined by agency monitoring. Refer to FW-DC-WTR-07 and FW-DC-RMZ-01.				
	IND-WTR-02 Percent fines measured from McNeil core samples	McNeil core samples	Annually	Aquatics program manager

Methods

IND-WTR-01: Data is collected by the National PACFISH/INFISH Biological Opinion (PIBO) crews. The sampling methodology is available at: *https://www.fs.usda.gov/detail/r4/landmanagement/resourcemanagement/?cid=stelprd3845865*

Table 2 lists habitat attributes that are collected at each site. These attributes are assessed individually and together as a physical habitat index in reference and managed streams (Al-Chokhachy et al. 2010). The physical habitat index is good for determining status but may be less sensitive when detecting trend in habitat condition over time because it averages conditions of several attributes that may be more individually responsive. Therefore, trends are determined for each of the attributes in Table 2 over the duration of the sampling period, which may range between 10 and 20 years.

Table 2. Components of PIBO physical habitat index and desired trends

Components of PIBO habitat index	Desired Trend
1) Residual pool depth;	An increase in residual pool depth
2) Pool frequency;	An increase in residual pool frequency
3) Large woody debris frequency;	An increase in large woody debris frequency
4) Bank angle;	An increase in bank angle
5) D50- mean particle size;	A decrease in mean particle size
6) Pool tail fines < 6 mm.	A decrease in percent pool tail fines

Standard statistical analyses have been developed that use linear regression and ANCOVA techniques to determine how management may be affecting streams. Reference and managed sites were analyzed by PIBO statisticians in 2018 and 2019, and the results are provided below.

IND-WTR-02: McNeil cores are collected in streams to sample the size composition of bed material. The percent of material (by weight) less than 0.25 inches is used to gage the degree of fine sediment deposition that can impact bull trout embryo survival and fry emergence. Core samples are typically collected before spring runoff and prior to the fry emergence period which usually begins in late April. This approach allows measurement of sediment conditions that best represent the incubation period, which is about 225 days.

Results

Table 3. Monitoring Evaluation Report – summary of data sources for MON-WTR-01. Conditions of instream physical habitat parameters in managed versus unmanaged sites

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	IND-WTR-01	2018 and 2019 assessments based on data gathered from PIBO sites since 2005.	High level of confidence in data.
2021	IND-WTR-02	McNeil Core Samples gathered since the early 1980s.	High level of confidence in data

IND-WTR-01 – PIBO Monitoring and change in conditions of instream physical habitat parameters

In 2018, a forest-wide analysis was completed that compared the 44 managed sites on the FNF with reference data at various scales (Archer et al. 2018). Review of these results indicate many of the managed sites with low index scores for sediment (median substrate, percent fines, and residual pool depth) are located on the west side of the forest in the Salish Mountains. A subsequent analysis (Saunders et al. 2019) focused exclusively on drainages that contain bull trout Critical Habitat, which excludes the Salish Mountains. These drainages include the three forks of the Flathead River system, and the Swan River system. The forest-wide assessment (Archer et al. 2018) revealed the following conditions.

- Managed streams have lower index scores for median substrate size compared to local reference values ($p<0.05$).
- Managed streams have higher index scores for bank angle compared to reference data at all scales ($p<0.05$).
- Managed streams are improving ($p<0.05$) in terms of overall habitat, macroinvertebrate scores, large woody material, percent fines, and median substrate size.

The 2019 assessment (Saunders et al. 2019) excluded the Salish Mountains and focused exclusively on the three forks of the Flathead and the Swan system. This portion of the forest has fewer differences between reference and managed streams. Median substrate score was lower than reference ranges ($P<0.05$) and bank angle scores were higher than reference values. Managed streams have positive trends in median substrate and large woody material ($P<0.05$).

IND-WTR-02 –McNeil Core Samples

The table below displays the results of core samples. Each year in the data set represents the year in which spawning occurred. For example, the 2017 data was collected in the early months of 2018. Hungry Horse, Tiger, Margaret, and Emery Creek are not bull trout streams. Table 4 also provides summary statistics for percent fine material less than 0.25 inches. Core sample data has been collected by MFWP since the early 1980s.

Table 4. McNeil Core sample summary statistics for creeks on the Flathead National Forest.

Stream	Percent Fine Material <0.25 Inches			
	N	Average	Standard Deviation	Trend
Whale Creek	36	32.4	3.4	0.17
Trail Creek	36	30.0	2.6	0.03
Big Creek	38	32.6	5.8	-0.03
Coal Creek	38	36.8	3.2	-0.08
North Coal Creek	34	31.7	2.4	-0.06
South Coal Creek	34	31.7	2.0	0.00
Granite Creek	33	36.6	4.2	-0.23
Challenge Creek	31	35.9	2.6	-0.14
Hungry Horse Creek	32	31.8	3.5	0.13
Tiger Creek	32	32.0	2.4	0.10
Margaret Creek	32	33.3	1.6	0.02
Emery Creek	30	34.1	1.6	-0.03
Wounded Buck Creek	24	31.9	2.2	0.14
Elk Creek	31	32.3	3.3	-0.26
Lion Creek	31	38.8	2.7	-0.03
Jim Creek	30	38.7	3.6	-0.24
Averages	**32.6**	**33.8**	**2.9**	**-0.03**

Discussion of Results

PIBO data indicates that streams in managed watersheds are similar to those in reference watersheds, and that management activities have little impact. INFISH components, as carried forward in the new Forest Plan, continues to protect aquatic habitats and move conditions in managed stream segments towards conditions in reference watersheds. It also suggests that INFISH has been an effective management strategy to improve and maintain stream habitat. The PIBO habitat data is reflective of several years of past management. INFISH was established in 1995, so it has had almost 25 years of implementation.

The McNeil core sample data can only be used to assess trends. Without stream morphology data, streams that have core samples cannot be compared to each other or to reference streams. Preliminary analysis suggests that core sample data may not be responsive to management activities.

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 5. Summary of Findings for Monitoring Item MON-WTR-01

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
YES
Recommendations – IND-WTR-02 McNeil Core Samples. Preliminary analysis suggests that core sample data may not be responsive to upstream management activities. More information will be provided in the 2023 monitoring report.
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
YES
Recommendation – Continue reporting PIBO results
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
Uncertain (McNeil core samples only)

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain -** Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s).(**D**) **NO -** Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for where change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

MON-WTR-02. To what extent are forest management activities related to roads moving towards habitat objectives for native fish?

Introduction

Sustaining healthy and resilient habitat conditions for native fish is a desired condition on the FNF. Aquatic habitat is reconnected by removing barriers, enhancing existing barriers to prevent invasion of non-native species, or replacing existing structures with improved structures for restored connectivity. Miles of reconnected habitat and habitat improvements will provide inferences on moving towards desired conditions and objectives for providing access for all life histories of aquatic species. Increased access to available habitat reduces the likelihood of extirpation of local populations by extreme stochastic events or genetic drift resulting in reduced viability. Forest objectives for aquatic habitat are provided in the plan and will be monitored under this item. They include:

FW-OBJ-WTR-01. Complete all essential work identified within the Class 2 priority watersheds as identified under the watershed condition framework (see [Revised Forest Plan] appendix E).

FW-OBJ-WTR-02. Enhance or restore 25 to 50 miles of stream habitat to maintain or restore structure, composition, and function of habitat for fisheries and aquatic species other than fish. Activities include, but are not limited to, barrier removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, and channel reconstruction.

FW-OBJ-WTR-03. Reconnect 10 to 20 miles of habitat in streams disconnected by roads or culverts where aquatic and riparian-associated species' migratory needs are limiting distribution of those species.

FW-OBJ-WTR-04. Improve watershed conditions on 4,000 to 8,000 acres, with an emphasis on priority watersheds under the watershed condition framework and the conservation watershed network.

High-quality habitat and functionally intact ecosystems are desired within the conservation watershed network on the Forest. These watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change. Objectives that support this desired condition are as follows:

FW-OBJ-CWN-01. The conservation watershed network is the highest priority for restoration actions for native fish and other aquatic species. The stormproofing of 15 to 30 percent of the roads in the conservation watershed network is prioritized, as funding allows, to benefit aquatic species (e.g., bull trout). See appendix C for specific strategies for treatment options and for prioritization, such as of roads paralleling streams vs. ridgetop roads.

FW-OBJ-CWN-02: Over the life of the plan, stormproofing the transportation system (e.g., upsizing culverts, reducing sediment on roads, realigning stream-constraining road segments, etc.) will be accomplished as opportunities are identified on the following prioritized subwatersheds: Sullivan Creek, Wounded Buck Creek, Trail Creek in the North Fork, Whale Creek (includes Upper Whale, Lower Whale, and Shorty Creeks), Granite Creek, Bear Creek, Goat Creek, and Lion Creek.

Table 6. MON-WTR-02, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-DC-CWN-01. The conservation watershed network has high-quality habitat and functionally intact ecosystems that are contributing to and enhancing the conservation and recovery of specific threatened or endangered fish species or aquatic species of conservation concern9 and providing high water quality and quantity. The watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change. **FW-OBJ-CNW-01** (see above) **FW-OBJ-WTR-01 through 04** (see above)	**IND-WTR-03** Number of fish passage barriers removed or created **IND-WTR-04** Miles of roads decommissioned within the riparian management zone **IND-WTR-05** Number of culverts removed or upgraded **IND-WTR-06** Number of activities with stream miles of habitat improvements	FNF Annual accomplishment reporting in FACTS or WIT by FY GIS analysis of miles of roads where decommissioning has been completed within RMZ R1 Watershed Condition Framework -- Instructions to acquire data summary	Annually	Primary-Aquatics program manager Secondary- Forest Engineer

Methods

The source of data for this monitoring item would be annual accomplishment reporting documentation. Because this item is monitoring for consistency with the revised forest plan direction, only NEPA decisions after November 2018 (adoption of the Plan) and subsequent activities accomplished on the ground would be reviewed. The monitoring would consider activities accomplished in the period since the previous monitoring report (the previous 2 years).

IND-WTR-03, 05 and 06: Recommend to also record *acres* or *miles* of activities conducted to improve native fish habitat, along with the *number* of activities, to be consistent with the way the objectives are worded. Activities recorded include culverts or fish passage barriers removed, stream miles where aquatic habitat has been improved, culvert upgrading, large woody debris placement, road decommissioning or storm-proofing, riparian planting, channel reconstruction, and any other improvement activities that improve habitat.

IND-WTR-04: Determining the miles of road decommissioned within riparian management zones requires extensive analysis using spatial GIS layers and data tables.

Results

Table 7. Monitoring Evaluation Report – summary of data sources for MON-WTR-02, Activities related to roads that move towards desired habitat conditions for native fish

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	**MON-WTR-03, 04, 05, 06**	NEPA decision documents signed since plan was adopted (Nov 2018) and associated Activities accomplished on the ground in 2018 and 2019	High level of confidence in data. Using standardized procedures for accomplishment reporting and GIS analysis and mapping.

Table 8. FY18 Aquatic and Stream improvement projects completed

Activity Name	Activity Category	Activity Type	Miles of Stream Claimed for Improvement (miles)	Soil and Water Resource Improvement (acres)
Raghorn Road Storage	Road	Storage-Level 2		17.4
Glacier Creek Bridge Replacement	Aquatic	Restore Hydrologic Function	1.9	1.4
FSR 903 Culvert Removal	Aquatic	Crossing Removal	0.1	
FSR 903 Culvert Removal	Aquatic	Crossing Removal	0.2	
FSR 903 Culvert Removal	Aquatic	Crossing Removal	0.2	
FSR 90503 Culvert Upgrade	Aquatic	Crossing Improvement	0.1	
FSR10503 Culvert Removal	Aquatic	Crossing Removal	0.8	4.0
FSR10503 Road Storage	Road	Storage-Level 2		11.14
Potter Creek Dam Removal	Aquatic	Structure Removal	0.4	1.0
FSR 903 Culvert Replacement	Aquatic	Crossing Improvement	0.3	

Table 9. FY19 Aquatic and Stream improvement projects completed

Activity Name	Activity Category	Activity Type	Miles of Stream Claimed for Improvement (miles)	Soil/Water Resource Improvement (acres)
Heinrude Creek AOP	Aquatic	AOP Improvement-Road	1.2	1.0
Oliver Creek AOP	Aquatic	AOP Improvement-Road	0.3	1.0
Sunset Creek AOP	Aquatic	AOP Improvement-Road	3.7	1.0
Sunset Creek Fish Barrier	Aquatic	AOP Barrier Construction	1.4	
Unnamed Emery Creek Tributary AOP	Aquatic	AOP Improvement-Road	0.5	1.0
Potter Creek Channel Reconstruct	Aquatic	Channel Reconstruction	0.016	0.1
FSR1662 Road Storage	Road	Storage-Level 2	0.8	8.2
South Hornet Ridge Road Storage	Road	Storage-Level 2	1,0	29.5

Activity Name	Activity Category	Activity Type	Miles of Stream Claimed for Improvement (miles)	Soil/Water Resource Improvement (acres)
Meadow Creek Culvert Replacement	Aquatic	Crossing Improvement	0.2	1
Raghorn Road Culvert Removal	Aquatic	Crossing Removal	0.2	1

Discussion of Results

The Flathead Forest is doing watershed and aquatic improvement work that is consistent with forest plan direction. In many cases, this work is associated with timber and fuels projects. All of the work shown in Tables 8 and 9 are within the Conservation Watershed Network, except for the Potter Creek dam removal, Potter Creek channel reconstruction, Sunset Creek AOP and barrier, and Meadow Creek culvert replacement projects.

Recommended changes in monitoring indicators and data sources

Based on the discussion under the Methods section above, the following changes in the Forest Plan monitoring program are recommended for indicators under this monitoring item.

Table 10. Recommended changes in indicators under MON-WTR-02.

Original Indicator in the Plan	New indicator	Data source for new indicator
IND-WTR-03 Number of fish passage barriers removed or created IND-WTR-05 Number of culverts removed or upgraded IND-WTR-06 Number of activities with stream miles of habitat improvements	IND-WTR-03. Number of fish passage barriers removed or created, and the miles/acres of resource improvement IND-WTR-05 Number of culverts removed or upgraded, and the miles/acres of resource improvement IND-WTR-06 Number of other habitat improvement activities, and the miles/acres of resource improvement	Annual accomplishment reports

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 11. Summary of Findings for Monitoring Item MON-WTR-02

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
YES with some recommendations for indicator modifications
Recommendations –
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
YES
Recommendation –
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
Forest Plan monitoring program Modify Indicators IND-WTR-03, 05 and 06 to record *miles* or *acres* as well as *number*, to be consistent with the wording in the Forest Plan objectives being monitored. See table above.

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain -** Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s).(**D**) **NO** - Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for where change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

MON-WTR-03. What vegetation treatment activities have occurred in the riparian management zone?

Introduction

Riparian management zones are areas where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. These areas consist of riparian and upland vegetation adjacent to streams, wetlands, and other bodies of water and help maintain the integrity of aquatic ecosystems. Fish and other aquatic life benefit greatly from riparian area protection due to these functions.

This monitoring item is designed to monitor activities that occur within RMZs and whether treatment prescriptions and results are consistent with standards and guidelines in the plan (see Riparian Management Zone section in the plan for the standards and guidelines associated with vegetation treatment activities). Treatments are also desired in riparian management zones to sustain or improve riparian habitat conditions, with an objective of 300 to 1000 acres over the life of the plan (FW-OBJ-RMZ-01).

Forest plan components that this monitoring question is addressing includes:

> FW-DC-RMZ-01: Riparian management zones reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes and processes affecting the area. In addition to natural processes, vegetation management activities contribute to vegetation conditions that are resilient. The species composition and structural diversity of native plant communities in riparian management zones, including wetlands, provide summer and winter thermal regulation, nutrient filtering and appropriate rates of surface erosion, bank erosion, and channel migration. Refer to FW-DC-WTR-04 and 07.
>
> FW-DC-RMZ-03: Riparian management zones in forested settings have more diverse vegetation structure relative to areas outside the riparian management zone. This includes a higher density of large, downed wood, snags, and decadent live trees and higher amounts of litter and duff to support terrestrial riparian-associated plants and animals that feed, nest, den, or roost near water. Downed wood greater than 9 inches in diameter is available, consisting of intact pieces of a variety of species, sizes, and stages of decay, including cull tree tops and cull logs.
>
> FW-DC-RMZ-04: Riparian management zones have more diverse vegetation composition relative to areas outside the riparian management zone. This includes riparian-associated grasses, forbs, shrubs (e.g., willows); deciduous trees (e.g., cottonwoods, birch, aspen), and conifer trees to support terrestrial animals that feed, nest, den, or roost near water.
>
> FW-DC-RMZ-05: A mosaic vegetation pattern, including forest patches of different shapes, successional stages, and tree densities, occurs within riparian management zones. Early successional forest openings are typically irregularly shaped, with variable tree densities or patches of larger trees along their boundaries that reduce the risk of windthrow and reduce edge effects for wildlife.
>
> FW-OBJ-RMZ-01: Improve 300 to 1,000 acres of riparian habitat.

FW-STD-RMZ-05: Ground-disturbing vegetation treatments in the riparian management zones for peatlands, fens, and bogs shall only occur in order to restore or enhance aquatic and riparian-associated resources.

FW-STD-RMZ-06: Vegetation management shall only occur in the inner riparian management zone in order to restore or enhance aquatic and riparian-associated resources. Exceptions may occur as long as aquatic and riparian-associated resources are maintained. Exceptions shall be limited to (1) non-mechanical treatments such as prescribed fire, sapling thinning, or hand fuel reduction treatments; (2) mechanical fuel reduction treatments in the wildland-urban interface within 300 feet of private property boundaries; or (3) treatments that address human safety hazards (e.g., hazard trees) adjacent to infrastructure or within administrative or developed recreation sites.

FW-GDL-CWN-01: To reduce sedimentation, for subwatersheds included in the conservation watershed network, net increases in stream crossings and road lengths should be avoided in riparian management zones unless the net increase improves ecological function in aquatic ecosystems. The net increase is measured from the beginning to the end of each project.

Table 12. MON-WTR-03, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-OBJ-RMZ-01 FW-STD-RMZ-05, 06; FW-DC-RMZ-01, 03, 04, 05 FW-GDL-CWN-01	**IND-WTR-07** Vegetation treatment type and acres within riparian management zones **IND-WTR-08** Number of entries and road crossings inside riparian management zones	FACTS database Timber harvest contracts, project-level NEPA documents and treatment prescriptions	Annually	Primary: Forest aquatics program manager; Secondaries: Forest Wildlife biologist; Forest Silviculturist; Forest Timber Management Officer

Methods

IND-WTR-07 and 08: Identify the vegetative treatment activities and any road entries/crossings that have occurred in RMZs during the monitoring period (the 2 years since the previous monitoring report. The source for this information is project level NEPA decision documents and activities accomplished from those decisions. Any activities within RMZs would be clearly identified in the decision document. Because this item is monitoring for consistency with the revised forest plan direction, only NEPA decisions after November 2018 (adoption of the Plan) and subsequent vegetation treatments accomplished on the ground would be reviewed for this monitoring item.

Post treatment surveys are routinely conducted for most vegetation treatments. Determine if post-treatment surveys have been completed for the treatments within RMZs. If so, review a sample of the post treatment surveys to assess the results of the treatments, relative to the prescription elements (i.e., design criteria from the NEPA decision, consistency with plan components, etc.). The prescription should provide the project-level, site-specific documentation on purpose for treatment in the RMZ, the type of treatment, how the treatment is moving towards the desired conditions for the RMZ, and how the treatments (including any road construction) addressed and met the standards and guidelines for RMZs.

Results

Table 13. Monitoring Evaluation Report – summary of data sources for MON-WTR-03, Vegetation treatment and road crossing activities in the riparian management zone

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	MON-WTR-03	NEPA decision documents signed since plan was adopted (Nov 2018) and associated Activities accomplished on the ground in 2019 and 2020.	High level of confidence in data. Using standardized procedures for accomplishment reporting, and for GIS analysis and mapping.

The vegetation mgmt. projects that have had decisions since adoption of the plan (decisions in 2019 or 2020) are the following: GNA Taylor Hellroaring, Crystal Cedar, Salish Good, March Madness, and Hellroaring Basin Improvements Project (Whitefish Mountain ski area improvements). The proposed treatments within RMZs in the Decisions for each of these projects is listed below:

Crystal Cedar

- OuterRMZ: 288 acres intermediate treatments, 35 acres regeneration harvest in outer RMZ= 323 acres
- InnerRMZ: 8 acres sapling thin

Taylor Hellroaring

- 0 acres

Salish Good

- OuterRMZ: 2 acres regen, 16 aces understory removal, 45 ac PCT, 25 42 ac hardwood release, 19 ac possible RX burning = 124 acres
- InnerRMZ: 16 ac understory removal, 45 acres PCT, 8 ac possible RX burning, 25 ac hardwood release = 94 acres

March Madness

- Inner and OuterRMZ – 20 acres of salvage

Hellroaring Basin Improvement Project

- 0 acres

The three vegetation management projects with planned treatments in RMZs (Crystal Cedar, March Madness, and Salish Good) are in the very early stages of implementation. Treatments within RMZs have not yet been completed, so there is no information at this time for the monitoring report.

Table 14. Monitoring results for MON-WTR-03, Vegetation treatment and road crossing activities in the riparian management zone

Indicator	Monitoring date and data results 2021 (Activities in years 2018 and 2019)		
IND-WTR-07 Treatment type and acres within riparian management zones	No data yet		
IND-WTR-08 Number of road entries and road crossings inside riparian management zones	No data yet.		

Discussion of Results

Recent NEPA decisions contain proposals to improve the condition of RMZs and avoid impacts to aquatic resources. Because these projects are in the early stages, much of this work has not been implemented.

Table 15. Recommended changes in indicators under MON-WTR-03.

Original Indicator in the Plan	New indicator
IND-WTR-08 Number of road entries and road crossings inside riparian management zones	**IND-WTR-08** Miles of new road construction and perennial stream crossings inside riparian management zones.

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 16. Summary of Findings for Monitoring Item MON-WTR-03

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
YES, with some modification to monitoring question and an indicator. See Table 15 above.
Recommendations – add language to the monitoring question to clarify intent: **Clarify IND-WTR-08 to read: Miles of new road construction and perennial stream crossings inside** riparian management zones
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
UNCERTAIN – A. No management actions relevant to this monitoring item have occurred during this monitoring cycle. No data
Recommendation –
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
NA

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain –** Availability of data **or** Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s) (**D**) **NO** - Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for <u>where</u> change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

MON-WTR-04. What is the condition of water quality in waterbodies?

Introduction

The forest plan promotes watershed restoration with an emphasis in restoration of 303(d) watersheds where feasible. The forest plan has a strong emphasis in watershed restoration and tracking the relative amount of change across the landscape will be an indicator of the movement towards desired conditions.

FW-DC-WTR-06 states: "Water quality, including groundwater, meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, and meets the ecological needs of native aquatic and riparian-associated plant and animal species. The Forest has no documented lands or areas that are delivering water, sediment, nutrients, and/or chemical pollutants that would result in conditions that violate the State of Montana's water quality standards (e.g., TMDLs) or are permanently above natural or background levels."

Table 17. MON-WTR-04, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-DC-WTR-06	**IND-WTR-09:** Number of waterbodies listed on the Montana Department of Environmental Quality (DEQ) integrated report (305b/303d).	R1 State Listed Waters- Instructions to acquire data summary Data on waterbody status is maintained by DEQ http://deq.mt.gov/Water/WQPB/cwaic/reports	Bi-annually	Aquatics program manager

Methods

Disclose listed water bodies reported in the latest integrated report (305b/303d) prepared by Montana DEQ.

Results

Table 18. Monitoring Evaluation Report – summary of data sources for MON-WTR-04 Condition of water quality in waterbodies

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	MON-WTR-04	Montana 305b/303(d) report (2020)	High level of confidence in data.

The table below summarizes listed water bodies within, adjacent to, or immediately downstream of NFS lands.

Table 19. Impaired waterbodies adjacent to, within, or immediately downstream of NFS land. Source: 2020 Integrated Water Quality Report and 303(d) List

Impaired Waterbody	Cause
Coal Creek, from headwaters to South Fork	Alteration in stream-side or littoral vegetative covers
Coal Creek, from South Fork to mouth North Fork Flathead River	Sedimentation/Siltation
Ashley Creek, from Ashley Lake to Smith Lake	Alternation in streamside or litoral vegetative covers, Chlorophyl-a, dissolved oxygen, total nitrogen, sedimentation/siltation, temperature
Flathead Lake	Mercury, total nitrogen, total phosphorus, poly Chlorinated biphenyls (PCBs)
Lake Mary Ronan	Chlorophyll-a
South Fork Flathead River, from HH Dam to mouth	Flow regime modification
Logan Creek, from headwaters to Tally Lake	Flow regime modification, physical substrate habitat alterations, sedimentation/siltation
Sinclair Creek, from headwaters to Sheppard Creek	Flow regime modification
Sheppard Creek, from headwaters to Griffin Creek	Alternation in streamside or litoral vegetative covers, sedimentation/siltation
Haskill Creek, from headwaters to Whitefish River	Sedimentation/siltation
Swan Lake	Total nitrogen, total phosphorus, sediment oxygen demand, total suspended solids
Goat Creek	Total suspended solids

Table 20: Monitoring results for MON-WTR-04, Condition of water quality in waterbodies

Indicator	Monitoring date and data results 2021		
IND-WTR-09: Number of waterbodies listed on the Montana Department of Environmental Quality (DEQ) integrated report (305b/303d).	12 watersheds/portions of watersheds (see table above)		

Discussion of Results

Detailed information about each listed water body is provided by the Montana Department of Environmental Quality at https://deq.mt.gov/water. Information and extensive data are available in numerous assessments, non-point source management plans, TMDLs, and model results.

The causes of 303(d) listings are highly complex and often involve multiple land ownerships. Listing status has a major influence on designating priority watersheds through the Watershed Condition Framework (WCF).

Listing status plays an important role in identifying aquatic priorities across the forest. It is an integral component of the Watershed Condition Framework. The Forest Service often does restoration work that benefits both water quality (particularly listed water bodies) and native fish. Jim Creek is the most recent example, and this stream was de-listed in 2018. This was the result of sediment reduction efforts on the road system, which improved water quality and habitat for native fish. This work also demonstrates a downward trend in the number of listed water bodies on the forest. The de-listing of Jim Creek demonstrates a downward trend in listed water bodies and progress toward FW-DC-WTR-06.

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 21. Summary of Findings for Monitoring Item MON-WTR-04

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
YES.
Recommendations –
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
YES – The delisting of Jim Creek demonstrates progress toward meeting State water quality standards.
Recommendation –
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
NA

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain -** Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s) (**D**) **NO** - Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for where change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

MON-WTR-05. What is the status of native fish populations?

Introduction

Management of fish populations (native and non-native) are under the jurisdiction of Montana Fish, Wildlife, and Parks. The Forest Service is responsible for management of fish habitat on NFS lands. The FNF Forest Plan has a desired condition to maintain high-quality habitat and functionally intact ecosystems in the conservation watershed network (FW-DC-CWN-01). These conditions are contributing to and enhancing the conservation and recovery of specific threatened or endangered fish species or aquatic species of conservation concern and providing high water quality and quantity. The watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change

Table 22. MON-WTR-05 plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-DC-CWN-01	**IND-WTR-10** Number of bull trout redds **IND-WTR-11** Fish density—number/100 meters **IND-WTR-12** Degree of spread of hybridization	Montana Department of Fish, Wildlife and Parks (MFWP).	Annually	Aquatics program manager

Methods

Data is collected and maintained by Montana Fish, Wildlife and Parks (MFWP), and their reports are the source of the data for these indicators.

IND-WTR-10: Bull trout population trends are based on redd counts in known spawning reaches.

IND-WTR-11: Density estimates of westslope cutthroat trout provided MFWP at several stream locations across the Flathead National Forest.

IND-WTR-12: Hybridization information is provided by numerous reports available from MFWP.

Results and Discussion

Table 23. Monitoring Evaluation Report – summary of data sources for MON-WTR-05, Status of key native fish populations

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	IND-WTR-10 IND-WTR-11 IND-WTR-12	MT Fish, Wildlife and Parks data, collected and reported annually.	High level of confidence

IND-WTR-10. Number of redds (bull trout)

Several factors have contributed to the decline of bull trout across its range. Habitat degradation, interaction with exotic species, over-harvest, and fragmentation of habitat by dams and diversions, are all factors contributing to the decline (Rieman and McIntyre 1995). In the Flathead River Basin, lake trout are considered the primary threat facing bull trout. Between 1968 and 1976, Opossum shrimp were introduced into 3 lakes within the basin and drifted downstream to Flathead Lake where they were detected in 1981. Numbers peaked in 1986. As a result, lake trout and lake whitefish expanded as juvenile fish benefited from the addition of shrimp to the prey base. It is believed that the expansion of lake trout and lake whitefish contributed to the decline of bull trout in Flathead Lake (McIntyre 1998). This conclusion is substantiated by the fact that local bull trout populations fluctuate similarly across the core area (Table 24). In the late 1990s, lake trout were detected in Swan Lake which likely explains sharp declines in this core area.

Bull trout populations are monitored through fall redd counts. Index streams are monitored annually, and results are displayed in Figure 1. Lake trout are considered a major driver of bull trout populations in the Flathead Lake Core Area (McIntire 1998, USDA 2018a) and other core areas across the basin.

In 2015, the USFWS published the Columbia Headwaters Recovery Unit Implementation Plan for bull trout (USDI 2015). This plan identifies habitat and non-native species threats to bull trout in complex and simple core areas (Table 24). The FNF provides extensive spawning and rearing habitat (SR), as well as foraging, migration, and overwintering (FMO) habitat. Habitat is not considered a primary threat in 6 of the 8 core areas. The Whitefish Lake and Upper Whitefish Lake core areas have primary habitat threats, but these drainages are primarily in State and private ownership. Demographic and non-native species threats are under the jurisdiction of the Montana FWP. However, the Forest Service works closely with Montana FWP to address demographic and non-native species threats as a partner agency.

As stated in the MON-WTR-01 section of this report, streams in managed watersheds are generally close to reference condition, which indicates current management direction is providing quality bull trout habitat (Archer, E and J. V. Ojala. 2018, Saunders et al. 2019). These data support the conclusion that habitat is not a primary threat to bull trout on national forest lands.

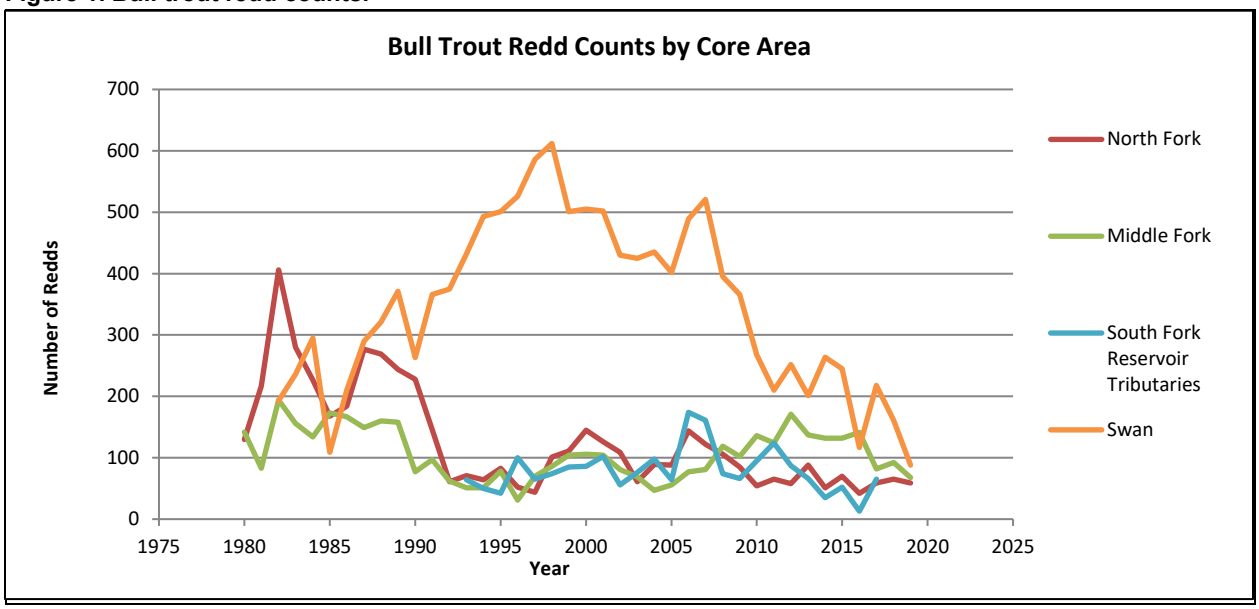
Table 24. Primary threats facing bull trout in the Flathead Lake and Frozen Lake Core Areas (USFWS 2015).

Core Area	Number of Local Populations	Primary Threats Habitat	Primary Threats Demographic	Primary Threats Non-Natives
Flathead Lake (complex core area)	17	None	Fisheries Management (2.2) Loss of bull trout from angling bycatch mortality (combined Flathead Lake and River system) and occasional poaching contributes to the low populations in this system. Low population size (single digit redd counts) are a concern in some SR tributaries, especially in recent years in the	Nonnative fishes (3.1) In the 1980's, the nonnative lake trout expanded in the Flathead Lake and mainstem Flathead River FMO habitat, triggered by the Mysis introduction (now estimated 1+ million lake trout population). Concurrently, the complete collapse of the formerly abundant kokanee forage base for lake trout likely lead to substantial increase in predation of bull trout and competition for other foods. This combination of effects likely caused the subsequent rapid decline in bull trout, demonstrated by a 75 percent decline in redd counts from the 1980s levels. Partial recovery of bull trout

Core Area	Number of Local Populations	Primary Threats Habitat	Primary Threats Demographic	Primary Threats Non-Natives
			North Fork Flathead SR streams. Sampling mortality of bull trout due to aggressive monitoring in SR habitat (e.g., North Fork Flathead) and gillnetting for lake trout suppression in Flathead Lake may directly impact potential recruitment and reduce local populations.	occurred in the 2000's (to approx. one-half 1980's levels) but gains have stagnated and are fluctuating below conservation objectives. Nonnative lake trout predation and competition remains a substantial threat to bull trout in this system. Predation from nonnative northern pike populations in the mainstem Flathead River is a documented threat.
Frozen Lake (simple core area)	1	None	None	None
Upper Stillwater Lake	1	None	None	Nonnative fishes (3.1). Abundant brook trout population in most of SR habitat. Competing/predating lake trout and northern pike dominate FMO habitat.
Upper Whitefish Lake	1	Upland/Riparian Land Management (1.1) Developed State campground on the lakeshore and outlet; associated multiple user activities affect habitat quality through riparian degradation and sedimentation.	Fisheries Management (2.2) Low numbers aggravated by almost certain (though undocumented) bycatch mortality due to high angler use (supported by cutthroat stocking). Small Population Size (2.3) Low population (mid-single digit red count over recent decade) is partially natural due to size of core area but lower than what may be sustainable or viable.	None
Whitefish Lake	1	Upland/Riparian Land Management (1.1) Residential development (including municipality of Whitefish), roads, and	None	Nonnative fishes (3.1) Abundant brook trout populations in SR likely leading to hybridization and competition, but poorly documented. Competing/predating lake trout and northern pike dominate FMO habitat.

Core Area	Number of Local Populations	Primary Threats Habitat	Primary Threats Demographic	Primary Threats Non-Natives
		railroad continue to affect habitat quality through riparian degradation, sedimentation, and nutrient enrichment on the lakeshore. The upstream watershed was impacted by roads and logging.		
Hungry Horse Reservoir (complex core area)	10	None	None	None
Lindbergh Lake	1	None	None	Nonnative fishes (3.1) Lake trout were recently (past 10 years) established in FMO habitat, ostensibly through upstream migration from Swan Lake, with rising predation and competition anticipated. Brook trout population is well established in most of SR habitat.
Holland Lake	1	None	Small Population Size (2.3) Population size is naturally limited due to size of core area and extremely limited and unstable SR habitat. Redd counts averaged in the teens to low 20's prior to 2000, typically in single digits since. May not remain sustainable or viable in face of nonnative lake trout pressure.	Nonnative fishes (3.1) Lake trout were recently (past 10 years) established in FMO habitat, ostensibly through upstream migration from Swan Lake, with rising predation and competition anticipated. Brook trout population is well established in most of SR habitat.

Figure 1. Bull trout redd counts.



IND-WTR-11. Fish density—number/100 square meters.

Juvenile fish densities are monitored by Montana Fish, Wildlife, and Parks (FWP). They monitor several bull trout streams across the forest, most of which are index streams where redds are counted every fall. Westlope cutthroat trout densities are monitored in Tiger, Margaret, Emery, and Challenge Creeks. Data was requested from Montana FWP, but it has not yet been processed. They expect to make this data available in the next 2-3 years.

IND-WTR-12. Degree of spread of hybridization.

Management of hybridization is under the jurisdiction of Montana FWP. The Forest Service plays a minor role as a partner agency. Hybridizationn is a common problem throughout the Flathead River Basin and include westslope cutthroat trout/rainbow trout and bull trout/eastern brook trout. Yellowstone cutthroat have hybridized with westslope cutthroat in a few mountain lakes across the basin.

Westslope Cutthroat Trout (WCT): Hybridization with Rainbow Trout (RT) and Yellowstone Cutthroat Trout (YCT).

Sources of hybridization are large rivers and high mountain lakes. Rainbows are generally present in the lower reaches of the Swan, Stillwater, and three forks of the Flathead. Hungry Horse Dam blocks hybridization from entering the upper South Fork Flathead system. Hybridization for westslope cutthroat trout and rainbow trout tends to move upstream as the climate warms. High mountain lakes are also a source of hybridization. With exception to the upper South Fork Flathead, little is known about the status and trend of hybridization in high mountain lakes.

Warmer waters favor rainbow trout, so hybridization is expected to continue as the climate warms. Cutthroat trout have also hybridized with Yellowstone cutthroat trout, but this is less common. Montana FWP completed the South Fork Cutthroat Restoration Project in 2018, which focused on removing hybridized cutthroat populations. This project was very successful in restoring the native cutthroat populations and is now considered a regional stronghold for the species.

As an agency partner, the Forest Service has been supporting Montana FWP in conserving isolated cutthroat populations in the Swan Valley and Salish Mountains.

Bull Trout (BT): Hybridization with Eastern Brook Trout (EBT)

Hybridization is occurring the Swan Valley, namely in Lion, Goat, Squeezer, Elk creeks. Trends are unknown at this time.

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 25. Summary of Findings for Monitoring Item MON-WTR-05

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
Yes **-** Native fish population indicators IND-WTR-10, IND-WTR-11 and IND-WTR-12 address FW-DC-CWN-01, which is a desired condition for aquatic habitat. In general, there is weak relationship between the three indicators (IND-WTR-10, IND-WTR-11 and IND-WTR-12) and their associated plan component (MON-WTR-05). Native fish population status can be an indicator of habitat condition in some circumstances, but this information should be complimented by actual habitat data. IND-WTR-12 addresses the degree and spread of hybridization. Broad trends can be described, but the degree of hybridization can vary from stream to stream. At the forest scale, it is not practical to use this indicator due to the wide range of conditions and trends. Montana Fish, Wildlife, and Parks has the authority to manage fish populations and associated hybridization. It is the agency that tracks hybridization on the forest. The Forest Service is responsible for managing habitat only.
Recommendations – Drop the monitoring question, but move IND-WTR-10 and IND-WTR-11 to MON-WTR-01. This would allow these two indicators to be presented in the context of actual habitat data. Drop IND-WTR-12.
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
Yes - Native fish population indicators IND-WTR-10, IND-WTR-11 and IND-WTR-12 address FW-DC-CWN-01, which is a desired condition for aquatic habitat. In general, there is weak relationship between the three indicators (IND-WTR-10, IND-WTR-11 and IND-WTR-12) and their associated plan component (MON-WTR-05). In some site-specific cases, native fish populations can reflect habitat condition. One example could be a stream recently burned over by forest fire.
Recommendation – IND-WTR-10 and IND-WTR-11 should be moved to MON-WTR-01. This would allow the indicators to be presented in the context of actual habitat data. IND-WTR-12 should be dropped. Broad trends in hybridization can be described, but the degree of hybridization can vary from stream to stream. Montana Fish, Wildlife, and Parks has the authority to manage fish populations and associated hybridization. It is the agency that tracks hybridization on the forest. The Forest Service is responsible for managing habitat only. In addition, the FS is not responsible for managing invasive species and hybridization.
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
Monitoring Program

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain -** Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s) (**D**) **NO** - Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for <u>where</u> change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

MON-WTR-06. Do management activities contribute nutrients to Flathead Lake?

Introduction

The Flathead Lake Biological Station (FLBS) is a year-round University of Montana Center of Excellence that conducts ecological research with an emphasis on fresh water, particularly Flathead Lake and the Flathead watershed. Flathead Lake is listed as 'impaired' by Federal and State management agencies due to human-caused increases in nutrients and sediments. Additionally, introduced species have dramatically changed the community found in the lake. The FLBS Monitoring Program has documented all of these changes. Flathead Lake Biological Station (FLBS) has been monitoring Flathead Lake for over 100 year and, instituted a scientifically rigorous monitoring program in 1977. FLBS provides this information to citizens, state and federal resource managers and politicians so they can make science-based decisions that protect the Flathead Lake-River system.

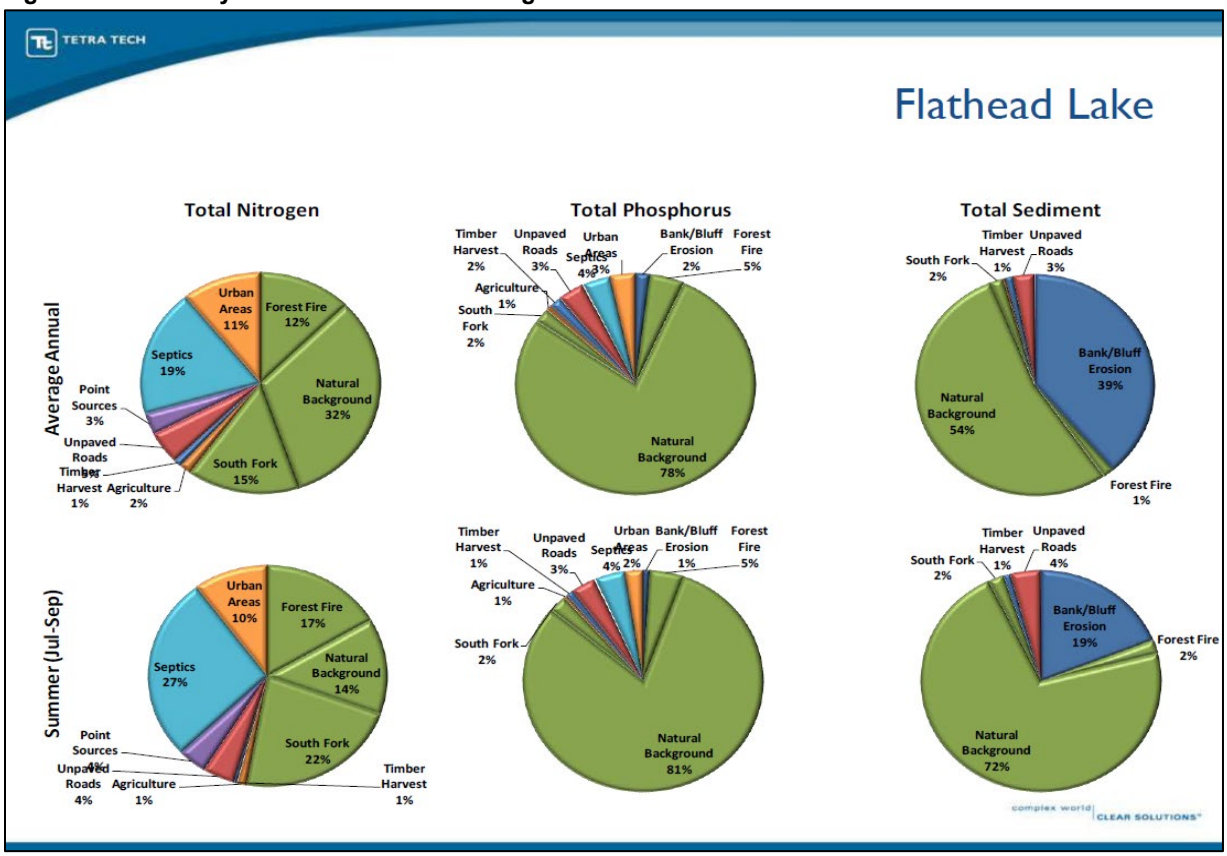
Table 26. MON-WTR-06, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-DC-WTR-17. The Forest cooperates with Federal, tribal, State, and local governments to identify and secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.	IND-WTR-13. Amount of phosphorus, nitrites, and nitrates that originate from NFS lands	Flathead Lake Biological Station research results if available	when available	quatics program manager

Results and Discussion

This monitoring item was suggested by the Flathead Basin Commission (FBC) during the development of the Flathead Forest Plan. However, FBC's representative and the forest plan revision team were not aware of the Phase II TMDL modeling efforts that occurred between 2011 and 2014. The results of the modeling work lead to the recommendation that monitoring item MON-WTR-06 be dropped. Results show a very low estimated proportion of nutrients produced from management activities on NFS lands and the unlikelihood of a direct cause and effect relationship between management on FNF lands and conditions in Flathead Lake. A summary of these results that address this monitoring item is presented below.

Figure 2 Preliminary results of nutrient loading to Flathead Lake from various sources



Nutrient loading in Flathead Lake has been studied extensively through TMDL planning efforts. TMDL modeling and planning work has been conducted in phases. Phase I was completed in 2001 and Phase II work was put on hold in 2014, pending approval of nutrient standards in the lake. During Phase II, a model was developed and calibrated to characterize hydrology, sediment, and nutrient flux using the Loading Simulation Program in C++ (LSPC). In 2014, MDEQ published a report that summarized LSPC output for nitrogen and phosphorus loading. Unit nutrient production from forest harvest was estimated at 1.20 and 0.07 lbs/acre/year for nitrogen and phosphorus, respectively (MDEQ 2014[1]). Unit production of total nitrogen and total phosphorus from unpaved roads was estimated to be 3.79 and 0.486 lbs/acre/year.

Unit production rates of nitrogen and phosphorus from forest harvest and unpaved roads are necessary for load calculations. In practical terms, it is critical to understand the relative contribution of these land uses compared to natural background levels and other land uses. On January 29, 2014, EPA held a webinar to review the completed Flathead Lake watershed model with the technical advisory group. Representatives from Tetra Tech gave a presentation on the setup of the LSPC model and calibration results. Figure 1

[1] US Environmental Protection Agency. 2014. Modeling Hydrology, Sediment, and Nutrients in the Flathead Lake Watershed. US Environmental Protection Agency. Helena, MT. Prepared by TetraTech, Inc. Jackson Hole, WY.

displays slide 52 of this presentation[2]. It displays the nitrogen, phosphorus, and sediment contributions from land uses across the basin.

The Flathead National Forest makes up 53% of the basin area defined by this modeling effort. Timber harvest (on all ownerships) is estimated to contribute roughly 1% and 2% of the total nitrogen and phosphorus loads, respectively. Unpaved roads (on all ownerships) contribute roughly 5% of total nitrogen and 3% of total phosphorus. Because these load estimates come from all ownerships upstream of Flathead Lake, it is safe to assume the nutrient contributions from NFS lands are less than the above percentages. When these nutrients are delivered to the forest's stream network, it is difficult to determine how they are absorbed as they move downstream to Flathead Lake. It is highly unlikely that a direct cause and effect relationship between management-induced nutrient production on NFS lands and conditions in Flathead Lake.

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 27. Summary of Findings for Monitoring Item MON-WTR-06

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
NO –
Recommendations – Drop this monitoring item; See discussion above.
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
NA
Recommendation – Drop this monitoring item; See discussion above.
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
Plan monitoring program

[1] PLAN IMPLEMENTATION STATUS: (A) Uncertain - Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s) (**D**) **NO -** Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] CHOICES for where change may be needed include: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

[2] http://montanatmdlflathead.pbworks.com/w/file/73788815/Jan2014FlatheadTAGMeetingPres.pdf

MON-WTR-07. What is the status of streambanks within grazing allotments?

Introduction

The forest's range program has been declining gradually as permittees have sold their base properties or have become too old to manage livestock. The forest has 9 active allotments, and 4 of them are vacant. The Lemonade Springs and Island Meadows Allotments are the only ones where livestock have direct access to streams in meadow environments. All other active allotments are forested, and livestock have difficulty reaching streams.

Stubble height, a measure of the herbaceous vegetation remaining after grazing, has been widely used in recent years to gage the impacts of grazing use in riparian areas. Maintaining a minimum stubble height helps preserve forage plant vigor, retain sufficient forage to reduce cattle browsing of willows (Salix spp.), stabilize sediments, indirectly limit streambank trampling, maintain cattle gains, and provide an easily communicated management criterion. In addition to changing herbaceous vegetation, cattle grazing can result in trampling of streambanks, collapse of overhanging banks providing cover for fish, and/or streambank erosion/stream sedimentation.

This monitoring item is designed to ensure consistency with FW-GDL-GR-04, which provides the following criteria to reduce bank trampling of perennial vegetation on or near the water's edge (i.e., the greenline):

- Do not exceed 20 percent streambank alteration;
- Do not exceed 40 percent utilization of mean annual vegetative production on woody vegetation; and
- Maintain at least 4-6 inches or do not exceed 40 percent utilization of mean annual vegetative production on herbaceous vegetation.

Table 28. MON-WTR-07, plan components, indicators, data source, data collection interval and point of contact

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
FW-GDL-GR-05 (there is no 05 – meant 04). To reduce bank trampling of perennial vegetation on or near the water's edge (i.e., the greenline): • do not exceed 20 percent streambank alteration; • do not exceed 40 percent utilization of mean annual vegetative production on	IND-WTR 14. Percent streambank alteration 15. Percent stubble height	Results from the monitoring plan for Lemonade Springs and Island Meadows Allotments	Annual	Forest aquatics program manager

Plan Component(s)	Indicators	Data Source / Partner	Data collection interval	Point of Contact
woody vegetation; and • maintain at least 4-6 inches or do not exceed 40 percent utilization of mean annual vegetative production on herbaceous vegetation.				

Methods

The NEPA decision that authorizes livestock grazing on the Lemonade Springs and Island Meadows Allotments has a monitoring plan for streams. Bank stability is monitored annually at 7 locations along Squaw Meadows Creek and Griffin Creek. The NEPA decision requires a bank stability average of 85% or more among all 7 sites. Bank stability is a direct surrogate to bank alteration and stubble height. Because it is readily available from the annual monitoring within these grazing allotments, it is recommended that IND-WTR-15 be dropped and IND-WTR-14 be modified to use bank stability as the attribute measured. Data for the indicator would come directly from the annual monitoring of the streams within the allotments. IND-WTR-15 is redundant with IND-WTR-14. IND-WTR-14 was revised to use current methods in Squaw Meadows and Griffin Creeks. Both of these streams are within the Lemonade Springs/Island Meadows allotments where livestock have direct access to streams. The method identified in the revised IND-WTR-14 indicator matches the method used along Squaw Meadows and Griffin Creeks that has been used for several years. Maintaining this method in the new monitoring plan will provide a consistent, long term data set. This method can also be applied to vacant allotments in the event they become stocked again. The indicator would read:

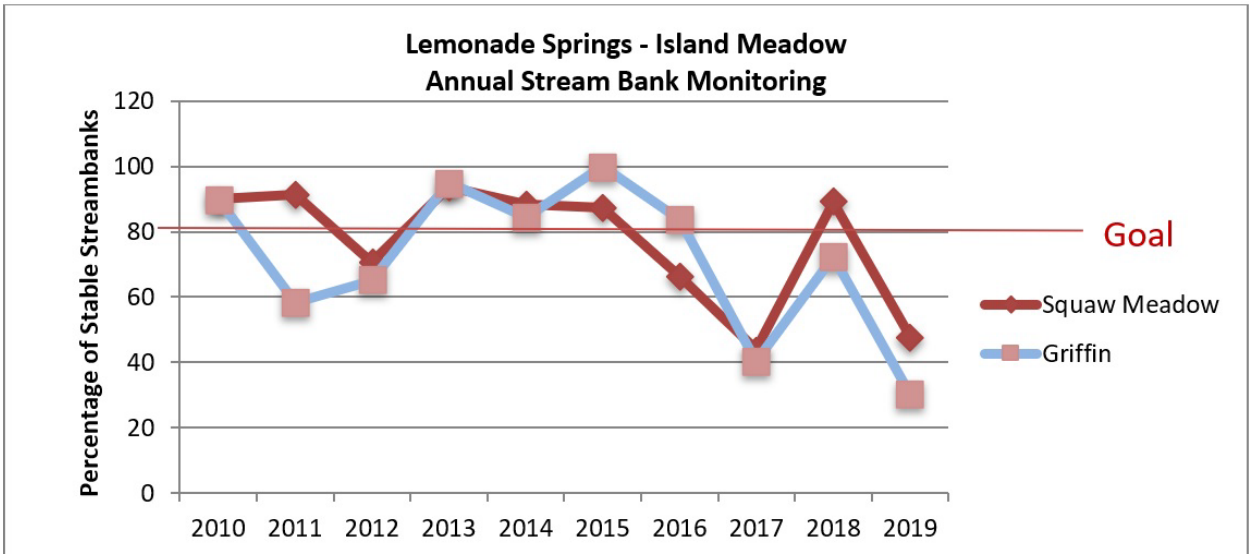
IND-WTR-14. Percentage of stable streambanks for Squaw Meadows and Griffin Creeks within the Lemonade Springs and Island Meadows Allotments.

Results

Table 29. Monitoring Evaluation Report – summary of data sources for MON-WTR-07, Status of streambanks within grazing allotments

Year	Indicator	Date of Data Collection/Compilation	Data confidence
2021	**MON-WTR-07**	Field review data collected in 2019	High level of confidence

Figure 3. Bank stability monitoring results in Squaw Meadow Creek and Griffin Creek. In 2010, only 1 location was monitored.



Trends in bank stability indicate a decline between 2018 and 2019. Data gathered in 2020 has not been processed. Trends in bank stability monitoring over time can vary due to trampling, but is also influenced by natural environmental factors, such as precipitation levels. Future monitoring will confirm whether this trend is consistent over time.

Recommended changes in Forest Plan monitoring program

Based on the discussion under the Methods section above, the following changes in the Forest Plan monitoring program are recommended for indicators related to streambanks within grazing allotments.

Table 30. Recommended changes in indicators under MON-WTR-07.

Original Indicator in the Plan	New indicator	Data source for new indicator
IND-WTR-14. Percent streambank alteration	IND-WTR-14. Percentage of stable streambanks for Squaw Meadows and Griffin Creeks, within the 2 active grazing allotments that have accessible streams.	Annual reports from monitoring of Squaw Meadows Creek and Griffin Creek within the Lemonade Springs and Island Meadow grazing allotments
IND-WTR-15. Percent stubble height	Drop	

Evaluation of Results for Adaptive Management Finding

The following findings and recommendations resulted from the evaluation of monitoring results as documented above.

Table 31. Summary of Findings for Monitoring Item MON-WTR-07

1. Plan Monitoring Results: Does the monitoring question and indicator(s) provide the information necessary to understand the status of the associated plan component listed above?
YES – with the modification of the indicators
Recommendations – One indicator will be dropped and the other modified to be consistent with the ongoing monitoring of the streambank conditions that are occurring in the allotments. See discussion in Methods section. Additionally note in the forest plan monitoring report that plan component FW-GDL-05 is incorrectly noted – it should be replaced by FW-GDL-GR-04.
2. Plan Implementation Status [1]: Do monitoring results demonstrate progress of the associated plan components for this monitoring item?
UNCERTAIN. (B) - More time/data are needed to understand status or progress of the Plan Component(s)**;**
Recommendation –
3. Type of change under consideration [2]: If corrective action/change was indicated under either #1 or #2, where might that change might be needed?
NA

[1] **PLAN IMPLEMENTATION STATUS: (A) Uncertain –** Availability of data or Interval of data collection beyond this reporting cycle (*indicate date of next time this monitoring item will be evaluated*); **(B) Uncertain -** More time/data are needed to understand status or progress of the plan component(s)**; (C) Uncertain -** Methods inadequate to assess the status or progress toward achieving plan component(s) (**D**) **NO** - Implementation of plan component(s) ARE NOT trending, progressing, and/or conducted as desired**; (E) YES -** Implementation of plan component(s) ARE trending, progressing, and/or conducted as desired

[2] **CHOICES for where change may be needed include**: Monitoring program, plan component, management activity, plan assessment, program strategy or approaches documents, public engagement strategy

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