

Chapter 5. Monitoring Program

Introduction

Monitoring provides feedback for the Forest's planning cycle by testing assumptions, tracking relevant conditions over time, measuring management effectiveness, and evaluating effects of management practices. Monitoring information should enable the Forest to determine whether a change in plan components or other plan management guidance may be needed, forming a basis for continual improvement and adaptive management. Direction for the monitoring and evaluation of forest plans is found under the 2012 planning rule at 36 CFR § 219.12 and in the directives at 1909.12 chapter 30.

The 2012 planning rule states that a plan monitoring program must contain one or more monitoring questions and associated indicators addressing each of the following:

1. The status of select **watershed conditions**.
2. The status of select **ecological conditions**, including **key characteristics** of terrestrial and aquatic ecosystems.
3. The status of **focal species** to assess the **ecological conditions** required under § 219.9.
4. The status of a select set of the **ecological conditions** required under § 219.9 to contribute to the recovery of **federally listed threatened and endangered species**, conserve proposed and **candidate species**, and maintain a viable population of each **species of conservation concern**.
5. The status of **visitor use, visitor satisfaction, and progress towards meeting recreation objectives**.
6. Measurable changes in the plan area related to **climate change** and other **stressors** that may be affecting the plan area.
7. Progress towards **meeting the desired conditions and objectives** in the plan, including providing **multiple-use opportunities**.
8. The effects of each management system to determine that they do not substantially and permanently **impair the productivity of the land**.

Additionally, monitoring may be conducted for other purposes, such as to

- comply with USFWS biological opinion terms and conditions or court orders;
- track social, cultural, and economic indicators;
- discern the magnitude of departures from desired conditions and the reasons for the departures, if applicable;
- reduce uncertainty or verify assumptions;
- assess whether there are changes in drivers or stressors that are affecting sustainability; and
- respond to key public issues.

The plan monitoring program addresses the most critical components related to informed management of the Forest's resources within the financial and technical capability of the agency. Every monitoring

question links to one or more desired conditions, objectives, standards, or guidelines. However, not every plan component has a corresponding monitoring question.

This monitoring program is not intended to depict all monitoring, inventorying, and data-gathering activities undertaken on the Forest, nor is it intended to limit monitoring to just the questions and indicators listed in Table 49 through table 68. Consideration and coordination with broader-scale monitoring strategies adopted by the regional forester, multi-party monitoring collaboration, and cooperation with State and private forestry as well as research and development, as required by § 219.12(a), will increase efficiencies and help track changing conditions beyond the Forest boundaries to improve the effectiveness of the plan monitoring program. In addition, project and activity monitoring may be used to gather information for the plan monitoring program if it will provide relevant information to inform adaptive management.

The monitoring program sets out the plan monitoring questions, plan components, and associated indicators. The monitoring program will be guided by a monitoring guide that will provide more detailed information on the monitoring questions, indicators, frequency and reliability, data sources and storage, and cost. For example, the Forest anticipates that Forest Inventory and Analysis data will be used to monitor vegetation conditions and that data will be updated about every 10 years. However, data sources and frequency of updates may change, so the specifics will be included in a monitoring guide. It is important to note that not all monitoring questions are expected to be evaluated biennially.

The Forest used the best available scientific information in the development of the monitoring plan, giving consideration to expected budgets and agency protocols. For example, Forest Inventory and Analysis data is the most accurate, reliable, and relevant data source for monitoring terrestrial vegetation conditions because it follows nationwide, statistically based protocols. Similarly, Pacific Fish Strategy/Inland Native Fish Strategy biological opinion (PIBO) data is the most accurate, reliable, and relevant data for monitoring aquatic ecosystem conditions because it uses a probabilistic sampling design. The program was initiated to evaluate the effect of land management activities on aquatic and riparian communities at multiple scales and to determine whether management practices are effective in maintaining or improving the structure and function of riparian and aquatic conditions.

An interdisciplinary team will develop a biennial monitoring evaluation report that summarizes the results of completed monitoring, including the evaluation of the collected data and relevant information from broader-scale or other monitoring efforts. The report will also include recommendations for the responsible official as to whether a change to forest plan management activities, the monitoring program, or a new assessment may be warranted based on the assessed information. The monitoring evaluation report is used to inform adaptive management of the plan area and will be made available to the public (26 CFR § 219.12(d)(2)).

Some types of monitoring indicators require longer time frames for thorough evaluation of results, but a biennial review of the certain information that has been collected ensures timely evaluation to inform planning. The biennial monitoring evaluation does not need to evaluate all questions or indicators on a biennial basis but must focus on new data and results that provide new information regarding management effectiveness, progress towards meeting desired conditions or objectives, changing conditions, or validation (or invalidation) of assumptions.

Table 49 through table 68 are organized to display the monitoring question(s), the indicator(s) for answering the monitoring question(s), and the plan components associated with them. Monitoring questions are used to evaluate whether management is maintaining or moving towards or away from desired conditions. Indicators are the specific resource measures used in answering the monitoring

questions. In general, the forest plan components listed are the primary direction being addressed by the monitoring question.

Adaptive management

The revised plan follows adaptive management principles outlined in the planning rule directives (Forest Service Handbook 1909.12, zero code 06.1 and 06.2). Assumptions and uncertainty are characterized throughout the plan and the plan's environmental impact statement. For example, the Forest modeled acres burned by wildfire over the last 1,000 years and interpreted results to assess the natural range of variability for the Forest's ecosystems. Actual acres burned by wildfire in the last 100 years were graphed to help validate assumptions, modeled acres that may be burned by wildfire in the future based upon projections of downscaled climate models, and disclosed the uncertainty of the models. The environmental impact statement used this information to inform the establishment of desired conditions and to assess effects of alternatives on ecological sustainability, considering likely future environments. Once the plan is implemented, monitoring item MON-TE&V-02 would be used to assess wildfire acres by burn severity class and monitoring item MON-T&E-LYNX-01 would be used to relate this information to the percentage of lynx habitat burned by wildfire in each lynx analysis unit. This monitoring information would be shared internally and with the public through the monitoring report so that the Forest can adapt its strategies and adjust decisions based upon what has been learned.

Items included in this monitoring plan also use data collection protocols for terrestrial and aquatic ecosystems at appropriate temporal and spatial scales. For example, monitoring item MON-TE&V-01 would be used to assess the change in key ecosystem characteristics of forest and non-forest vegetation at the scale of the potential vegetation type as well as forestwide. Using adaptive management principals, recently remeasured Forest Inventory and Analysis data informed the development of management direction in the revised plan and will assist the Forest in determining if adjustments to management direction are needed in the future. For example, Forest Inventory and Analysis data was used to assess the trend in the amount of old-growth forest by determining the amount burned by wildfire since the last Forest Inventory and Analysis measurements were completed. In light of this monitoring information, the revised plan has added plan components that place more emphasis on management for key ecosystem characteristics of old-growth forest, such as live trees and snags in the 20-inch-d.b.h. class. Monitoring item MON-WL-10 would be used to assess the status of habitat for wildlife species associated with snags and live trees in the 20-inch-or-greater d.b.h. class. Monitoring item MON-WL-15 would be used to assess the status of the breeding season bird community on the Forest using Integrated Monitoring in Bird Conservation Regions data and reports on species associated with those characteristics.

Past monitoring has helped to inform development of plan components and will help make the plan adaptive in the future. For example, birds, including neo-tropical migratory birds, have been extensively monitored on the Forest. The Forest participates in the Region 1 Landbird Monitoring Program that includes (1) standard point-count surveys; (2) monitoring of avian productivity and survivorship (MAPS); and (3) single species habitat use and distribution surveys. In addition to point count surveys, the Avian Science Center at the University of Montana conducted habitat and distribution surveys for individual bird species on the Forest from 1994 to 2004, including flammulated owls, goshawks, and black-backed woodpeckers. The USDA Forest Service Northern Region Songbird Monitoring Program³³ has provided

³³ R. L. Hutto & J. S. Young, J. S. (1999), *Habitat relationships of landbirds in the Northern Region*, USDA Forest Service (Ogden, UT: USDA Forest Service, Rocky Mountain Research Station), retrieved from <https://www.treesearch.fs.fed.us/pubs/37402>, https://www.fs.fed.us/rm/pubs/rmrs_gtr032.pdf, planning record exhibit # 00582.

data on occupancy, habitat relationships, and effects from past management activities for breeding birds in western Montana.

For aquatic ecosystems, monitoring item MON-WTR-01 would be used to assess water quality and riparian and aquatic habitats. Pacific Fish Strategy/Inland Native Fish Strategy biological opinion monitoring data was used to develop plan components and will be used in the future to test assumptions and assess the trend in key ecosystem characteristics of aquatic ecosystems. For example, metrics such as percent fines, residual pool depth, percent pools, and median substrate size will be collected, along with native fish population monitoring using bull trout redd counts, electrofishing, and genetic status monitoring (in cooperation with MFWP). This information will enable the Forest to adapt its management strategies and adjust decisions in the future, as needed, based upon what has been learned.

Monitoring scale and responsibility

Monitoring occurs at the scale of the Forest, the Northern Region, and even larger areas. Monitoring may be the responsibility of the Forest Service or another agency or may involve multiple agencies and organizations. For example, key ecosystem characteristics related to a changing climate may be monitored at very large scales. One key ecosystem characteristic associated with high elevations is “persistent spring snow,” which is useful in monitoring habitat for species such as the wolverine. Persistent spring snow maps and data layers were produced by researchers at the scale of the broad range of the wolverine. These maps and data layers are updated by researchers, not by the individual national forests, and changes are made only if and when researchers update the existing data. Similarly, a research effort would be required for monitoring of deep, fluffy snow in critical habitat for Canada lynx, or for a retrospective study of the density of snowshoe hares and habitat use by lynx in response to various past vegetation management practices.

Similarly, the presence and distribution of threatened or endangered species, species of conservation concern (see glossary), and species that are of interest to the public for hunting, trapping, fishing or observing, may be assessed as part of a research effort or monitored across large scales in cooperation with others (e.g., IND-WLD-28, 45, 69-72, and 75 in table 53). The Montana Natural Heritage Program, MFWP, USFWS, the tribes, universities, research stations, nongovernmental organizations, and Federal agencies other than the Forest Service are all instrumental in monitoring species across multiple land management jurisdictions (e.g., Integrated Bird Monitoring in Bird Conservation Regions).

Monitoring related to the grizzly bear occurs at the large scale of the NCDE and is the responsibility of multiple agencies. For example, the USFWS and MFWP are responsible for monitoring grizzly bear-human conflicts, grizzly bear-livestock conflicts, and grizzly bear mortality. As directed by the draft NCDE Grizzly Bear Conservation Strategy,³⁴ monitoring results are to be reported to the NCDE coordinating committee. The coordinating committee is not a decisionmaking body, although it may provide recommendations to member agencies from time to time. Additionally, the coordinating committee does not supersede the authority of the management agencies beyond the specific actions agreed to by the signatories to the Grizzly Bear Conservation Strategy.

³⁴ USFWS (2013), *Draft Northern Continental Divide Ecosystem grizzly bear conservation strategy*, U.S. Fish and Wildlife Service, retrieved from <http://www.fws.gov/mountain-prairie/species/mammals/grizzly/continentalindex.html>, http://www.fws.gov/mountain-prairie/species/mammals/grizzly/NCDE_Draft_CS_Apr2013_Final_Version_corrected_headers.pdf.

As detailed in the monitoring sections of the draft Grizzly Bear Conservation Strategy, the following monitoring information will be compiled by the USFS to support the habitat-related tasks of the NCDE monitoring team:

- Coordinate updates and maintenance of the motorized access, developed sites, and livestock allotments databases.
- Document and report any changes in motorized access route density, levels of secure core habitat, developed sites and their capacity, livestock allotments, and permitted sheep numbers biennially, according to the monitoring schedules described in chapter 3 of the draft Grizzly Bear Conservation Strategy.
- Ensure that cooperators have the tools and training to evaluate motorized access route density and secure core habitat for projects.
- Evaluate the need to update or change the methods used to evaluate habitat parameters and make recommendations to the NCDE coordinating committee on such changes, as necessary.
- Set and maintain standards, definitions, values, formats, and processes for collecting and updating habitat data and assessment models consistently across jurisdictions.

In order to accomplish this, a coordinated approach to the funding, use, and intensive maintenance of GIS databases is required. The Grizzly Bear Conservation Strategy monitoring team will include biologists and GIS specialists from the signatory agencies (including the USFS) and the tribes.

Because the draft Grizzly Bear Conservation Strategy describes the need for monitoring to adequately assess habitat conditions, for adherence to the habitat standards, and to report on the habitat monitoring items identified in the draft Grizzly Bear Conservation Strategy, some of the monitoring items listed in the table below are part of the Northern Region's broad-scale monitoring strategy, but these will also be evaluated at the Forest scale. The grizzly bear monitoring questions with an "NCDE" prefix, as identified in the tables, will apply to the NCDE national forests (Flathead, Helena-Lewis and Clark, Kootenai, and Lolo). The other monitoring items listed in this chapter are intended to be used for forest plan monitoring at smaller scales but may also be compiled at a regional scale.

Monitoring of ecosystem characteristics may also be applied at the mid-scale or project level. For example, spatial mapping of forest size classes or canopy cover classes may be done using the Northern Region's existing vegetation classification system (Region 1 VMap) or other vegetation databases to assess habitat conditions and their distribution for projects. Species-specific habitat models may also be used at the project scale to assess potential effects of forest plan implementation. For example, project-level monitoring can be used to assess the availability of multistoried hare habitat within a lynx analysis unit or to assess spatial distribution of old-growth forest patch size and connectivity within a subwatershed.

Physical and Biological Elements

The plan monitoring program contains monitoring questions and indicators addressing the physical and biological elements of the ecosystem, including questions and indicators associated with vegetation, soils, fish, water, and wildlife (shown in table 49 through table 57).

Aquatic ecosystems

Table 49. Plan monitoring questions and indicators for aquatic ecosystems

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-WTR-01: What are the changed conditions of instream physical habitat parameters in managed vs. unmanaged sites?	FW-DC-WTR-04	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) 02. Results of McNeil core samples of percent fines 03. Number of redds (bull trout) 04. Fish density—number/100 square meters
MON-WTR-02: To what extent are forest management activities moving towards habitat objectives for native fish?	FW-OBJ-CWN-01 FW-OBJ-WTR-01 through 04 FW-DC-CWN-01	IND-WTR- 05. Number of fish passage barriers removed or created and the miles/acres of resource improvement. 06. Miles of roads decommissioned within the riparian management zone 07. Number of culverts removed or upgraded and the miles/acres of resource improvement 08. Number of activities with stream miles of habitat improvements and the miles/acres of resource improvement
MON-WTR-03: What vegetation treatment activities have occurred in the riparian management zone?	FW-STD-RMZ-05, 06 FW-DC-RMZ-01, 03, 04, 05 FW-RMZ-OBJ-01	IND-WTR- 09. Treatment type and acres within riparian management zones 10. Miles of new road construction and perennial stream crossings inside riparian management zones
MON-WTR-04: What is the condition of water quality in waterbodies?	FW-DC-WTR-06	IND-WTR- 11. Number of waterbodies listed on the Montana Department of Environmental Quality integrated report (305b/303d)
MON-WTR-05: What is the status of streambanks within grazing allotments?	FW-GDL-GR-04	IND-WTR- 12. Percentage of stable streambanks for Squaw Meadows and Griffin Creeks, within the 2 active grazing allotments that have accessible streams.

Terrestrial ecosystems and vegetation and focal species

Table 50. Plan monitoring questions and indicators for terrestrial ecosystems and vegetation and focal species

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-TE&V-01: What is the change in key ecosystem characteristics for forest and non-forest vegetation?	FW-DC-TE&V-03 FW-DC-TE&V-07, 08, 10 through 15	IND-TE&V- Proportion (percentage of total acres) forestwide and/or by PVT for each of these indicators: 01. Dominance type (i.e., cover type)—forestwide 02. Species presence—forestwide and by PVT 03. Forest size class—forestwide and by PVT 04. Tree canopy cover—forestwide and by PVT 05. Old-growth forest—proportion of area forestwide and by potential vegetation type. 06. Proportion of area (FW and by PVT) where large and very large tree structural components occur at densities that contribute to ecosystem functions. 07. Density (tpa) of very large live trees, by PVT (Snag Analysis Group), Inside and Outside Wilderness/Roadless areas. 08. Snag density: Snags per acre \geq 10 inches d.b.h.; \geq 15 inches d.b.h.; \geq 20 inches d.b.h. by PVT (Snag Analysis Group)
MON-TE&V-02: What is the change in amount and severity of wildfire and the status of fire regimes?	FW-DC-TE&V-25 FW-DC-FIRE-04	IND-TE&V- 09. Forestwide acres burned by wildfire by severity class (low, medium, high) and acres not burned
MON-TE&V-03: What is the change in insect hazard and root disease severity?	FW-DC-TE&V-20	IND-TE&V- 10. Acres or percent of Douglas-fir beetle hazard, mountain pine beetle hazard, and root disease severity
MON-TE&V-04: How many acres of vegetation treatments are occurring that contribute to maintaining or moving towards achieving desired conditions in the plan?	FW-OBJ-TE&V-01, 02, 03, 04	IND-TE&V- 11. Acres treated by vegetation management actions (e.g. harvest, prescribed fire, precommercial thinning, tree/shrub planting, fuel treatments, control of invasive plants) 12. Acres treated by vegetation management that specifically address the Northern Region indicators associated with restoration and resilience of forests

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-TE&V-05: To what extent have management actions maintained required levels of snags or snag replacement trees within harvest units?	FW-STD-TE&V-03 GA-STD-HH, SF, SV, NF-01 GA-STD-MF, SM-02	IND-TE&V- 13. Snag and snag replacement tree densities retained within a sample of timber harvest areas
MON-TE&V Focal-01: What is the change in ecological conditions within the warm-moist and cool-moist PVTs, as indicated by conditions suitable for western white pine?	FW-DC-TE&V-04, 07	IND-TE&V Focal- 01. Proportion (percentage of total acres) forestwide and by the warm-moist and cool-moist PVTs for western white pine species presence
MON-TE&V Focal-02: What management actions are contributing to the restoration of western white pine?	FW-OBJ-TE&V-02	IND-TE&V Focal- 02. Acres treated for the purpose of sustaining or restoring western white pine 03. Survival of planted western white pine seedlings

Plant species at risk

Table 51. Plan monitoring questions and indicators for plant species at risk (threatened, endangered, proposed, and candidate plant species and species of conservation concern)

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-PLANT-01: What is the status of water howellia in areas where disturbances (natural or human-caused) have occurred?	FW-DC-PLANT-01 FW-GDL-PLANT-01	IND-PLANT- 01. Presence/absence of water howellia in habitat that has been disturbed
MON-PLANT-02: How are ecological conditions in the cold PVT affecting whitebark pine populations and habitats?	FW-DC-PLANT-03	IND-PLANT- 02. Proportion (percentage of total acres) forestwide and by cold PVT for whitebark pine dominance type (i.e., cover type) 03. Proportion (percentage of total acres) forestwide, and by cold PVT for whitebark pine species presence
MON-PLANT-03: What management actions are contributing to the restoration of whitebark pine?	FW-OBJ-PLANT-01	IND-PLANT- 04. Acres treated for the purpose of sustaining or restoring whitebark pine. 05. Survival of planted whitebark pine seedlings
MON-PLANT DIV-01: What is the status of the known occurrences of plant species of conservation concern?	FW-DC-PLANT DIV-01	IND-PLANT DIV- 01. Occurrences of plant species of conservation concern and associated habitats that are being monitored

Non-native invasive species

Table 52. Plan monitoring questions and indicators for non-native invasive species

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-NNIP-01: What is the status of acres infested on the Forest by non-native invasive plants, and the treatments of invasive plant infestations?	FW-DC-NNIP-01, 02, 04 FW-OBJ-NNIP-01	IND-NNIP-01. Acres infested by invasive plant species. 01a: Acres treated for invasive plants.
MON-NNIP-02: What management actions are contributing to coordination and cooperation with adjacent landowners and partners in managing non-native invasive weeds?	FW-DC-P&C-17	IND-NNIP-02. Number and type of weed management actions conducted involving coordination and cooperation with partners and adjacent landowners

Wildlife

Note that Northern Rockies Lynx Management Direction plan components can be found in appendix A, along with monitoring items required for this lynx direction. Monitoring items required in the biological opinion for the revised forest plan (USFWS 2017³⁵) are also included in this monitoring plan. If a monitoring item applies to the NCDE, the alphanumeric identifier references NCDE.

Table 53. Plan monitoring questions and indicators for grizzly bear

Monitoring Question	Plan Component(s)	Indicator(s)
MON-NCDE-01: Within the NCDE primary conservation area, what is the level of secure core, open motorized route density (> 1 square mile) and total motorized route density (> 2 square miles) within each bear management subunit during the non-denning season?	FW-STD-IFS-02	IND-NCDE- For each grizzly bear subunit in the PCA: 01. Open motorized route density percentage 02. Total motorized route density percentage 03. Secure core percentage
MON-NCDE-02: a) Within the NCDE PCA, what is the number and overnight capacity of developed recreation sites designed and managed for overnight use on NFS lands within each bear management unit, and how does this compare to the baseline? b) Within the NCDE primary conservation area, what is the status of administrative sites, day-use developed recreation sites, and trailheads in each bear management unit?	FW-STD-REC-01 FW-GDL-REC-01	IND-NCDE- 04. Number of developed recreation sites (NCDE definition) managed for overnight use in each grizzly bear management unit. 05. Capacity of sites managed for overnight developed recreation use in each grizzly bear management unit. 06. If increases in number or capacity occur, measures used to reduce the risk of grizzly-bear human conflicts. 07. Number of new administrative sites, day-use developed recreation sites or trailheads (NCDE definition) in each grizzly bear management unit.

³⁵ USFWS (2017). Biological opinion for the revised forest plan—Flathead National Forest. Helena, MT: U.S. Fish & Wildlife Service, Ecological Services, pp. IV-93-94. Retrieved from www.fs.usda.gov/goto/flathead/fpr.

Monitoring Question	Plan Component(s)	Indicator(s)
<p>MON-NCDE-03: Within the NCDE primary conservation area, is there a change in the number of allotments? Have conflicts occurred between grizzly bears and livestock on NFS lands?</p>	<p>FW-STD-GR-05</p>	<p>IND-NCDE-</p> <p>08. Number of livestock allotments in the PCA (by livestock type).</p> <p>09. Permitted animal unit months for sheep allotments.</p> <p>10. Number of grizzly bear-livestock conflicts on NFS lands by grizzly bear management zone (e.g., PCA, DCA) and livestock type.</p>
<p>MON-NCDE-04: If new leasable and locatable mineral activities occur in the PCA, do the record of decision and permit/plan of operation include a monitoring plan for changes in habitat and/or measures to avoid, minimize, or mitigate environmental impacts to grizzly bears or their habitat?</p>	<p>FW-STD-E&M-01, 03 through 06</p>	<p>IND-NCDE-</p> <p>11. Number of permits authorized in the PCA and mitigation measures included in the permit/plan of operations where it is determined there is potential for adverse effects to the grizzly bear population or its habitat resulting from leasable or locatable mineral activities.</p>
<p>MON-NCDE-05: Within the NCDE primary conservation area, what is the status of grizzly bear subunits that have temporary increases in motorized access due to projects (see glossary)?</p>	<p>FW-STD-IFS-03</p>	<p>IND-NCDE-</p> <p>12. Percent change in the 10-year running average of open motorized route density, total motorized route density, and secure core for each subunit that has had temporary increases in projects (see appendix C for examples of methods).</p>
<p>MON-NCDE-06: Within the NCDE primary conservation area, are projects (see glossary) completed within the five-year time period specified by guideline FW-GDL-IFS-01?</p>	<p>FW-GDL-IFS-01</p>	<p>IND-NCDE-</p> <p>13. For each grizzly bear subunit in the PCA with a project (see glossary): Number of years to complete a project (the definition of "project (in grizzly bear habitat in the NCDE)" in the glossary).</p>
<p>MON-NCDE-07: In the Salish DCA, what is the density of roads and motorized trails on NFS lands that are open to public use during the non-denning season? In zone 1 outside the Salish DCA, what is the density of roads on NFS lands that are open to public use during the non-denning season?</p>	<p>GA-SM-STD-01</p>	<p>IND-NCDE-</p> <p>14. Density of roads and motorized trails on NFS lands in the DCA that are open to public motor vehicle use during the non-denning season.</p> <p>15. Density of roads on NFS lands in zone 1 outside the DCA that are open to public motor vehicle use during the non-denning season.</p>
<p>MON-NCDE-08: What is the risk of human disturbance in areas modeled as grizzly bear denning habitat during the den emergence time period (see glossary)?</p>	<p>FW-STD-REC-05</p>	<p>IND-NCDE-</p> <p>16. Percentage of modeled grizzly bear denning habitat where public motorized over-snow vehicle use is allowed during the den emergence time period (MFWP model for the NCDE or subsequent updates)</p>

Table 54. Plan monitoring questions and indicators for Canada lynx

Monitoring Question	Plan Component(s)	Indicator(s)
MON- LYNX-01: How much of lynx habitat does not yet provide stand initiation snowshoe hare habitat (PCE1a) but is progressing towards providing PCE1a?	Critical Habitat, FW-DC-WL-05	IND-LYNX- 01. Percentage of lynx habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to wildfire 02. Percentage of lynx habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to vegetation management projects
MON- LYNX-02: If modified precommercial thinning techniques are used in lynx habitat, do they increase snowshoe hare habitat (PCE1a) and/or its persistence?	Critical Habitat, FW-DC-WL-05	IND-LYNX- 03. Number of acres of lynx habitat that were treated with modified thinning techniques under VEG S5 exception #2 or #3 04. The percentage of dense horizontal cover developing over time in areas treated with modified thinning techniques compared to areas treated with conventional thinning techniques.
MON- LYNX-03: Are fuel treatment and vegetation management projects compliant with the Canada lynx vegetation standards in the Northern Rockies Lynx Management Direction?	Appendix A VEGS1, VEGS2, VEGS5, VEGS6	IND-LYNX- 05. Cumulative total acres of fuel treatment projects in lynx habitat conducted under exemptions to standards VEGS1, S2, S5, and S6 within the WUI (as defined by HFRA), by LAU and forestwide, since the end of 2018. 06. Number of projects/acres treated in lynx habitat conducted under exemptions to standards VEGS1, S2, S5, and S6 that result in more than three adjacent lynx analysis units that do not meet the standard VEG S1 (more than 30 percent of a lynx analysis unit that is not yet snowshoe hare habitat.) 07. Number of projects/acres treated in lynx habitat that create stand initiation hare habitat (e.g., regeneration harvest) that occur in LAUs that exceed VEGS1 (have >30% of area currently in stand initiation stage that does not yet provide hare habitat). 08. Number of timber management projects conducted under exceptions to VEG S5 and VEGS6 that regenerate more than 15 percent of lynx habitat on Forest lands within a lynx analysis unit in a 10-year period. 09. Cumulative total acres of vegetation treatments conducted under exceptions to VEG S5 and VEGS6 since the end of 2018.

Table 55. Plan monitoring questions and indicators for other wildlife species

Monitoring Question	Plan Component(s)	Indicator(s)
MON-WL-01: What is the status of habitat conditions that support harlequin ducks during the nesting season?	FW-DC-WL DIV-01, FW-GDL-WL DIV-05	<p>IND-WL-</p> <p>01. Stream habitat data on known harlequin duck nesting stream reaches (see aquatics section)</p> <p>02. Number of projects authorized within the riparian management zone along known harlequin duck nesting stream reaches</p> <p>03. Number of project authorizations that include timing requirements for harlequin duck nesting</p> <p>04. Number of nesting stream reaches surveyed, number of harlequin duck broods detected, and size of broods, in cooperation with other partners</p>
MON-WL-02: What is the status of habitat conditions that support flammulated owls during the nesting season?	FW-DC-WL DIV-01	<p>IND-WL-</p> <p>05. The conditions of five attributes associated with flammulated owl habitat.</p> <ol style="list-style-type: none"> 1. In the warm-dry PVT, acres with presence of live ponderosa pine 15"+ DBH 2. In the warm-dry PVT acres with presence of dead ponderosa pine 15"+ DBH 3. In the warm-dry PVT acres with presence of both live and dead ponderosa pine 15"+ DBH 4. In the Ponderosa pine Dominance type, Acres with canopy cover <=40% 5. In the Ponderosa pine Dominance type, Proportion (%) with canopy cover <=40% <p>06. Acres and percentage of the Forest that meets modeled habitat criteria for flammulated owl habitat (as classified in R1 Summary database, using FIA data).</p> <p>07. Number of acres of forest treated in the warm-dry and warm-moist PVT focused on promoting desired habitat conditions for flammulated owls</p>
MON-WL-03: What is the status of habitat conditions that support fisher?	FW-DC-WL DIV-01	<p>IND-WL-</p> <p>08a. Percent of NFS lands in the Warm Moist PVT with at least one snag/acre greater than or equal to 20 inches d.b.h. Inside and Outside Wilderness/Roadless areas.</p> <p>08b. Density (tpa) of very large live trees in the warm moist PVT, Inside and Outside Wilderness/Roadless areas.</p> <p>08c. Proportion of warm moist PVT where large and very large tree structural components occur at densities that contribute to ecosystem functions.</p> <p>09. Acres that meets modeled habitat criteria for fisher winter and summer habitat (as classified in the R1 Summary database, using FIA data).</p>

Monitoring Question	Plan Component(s)	Indicator(s)
MON-WL-04: What is the status of forest conditions that support wildlife habitat connectivity for fisher and other species?	FW-DC-TE&V-19, FW-DC-RMZ-06, FW-DC-WL DIV-01	IND-WL- 10. In the areas of the Forest modeled as potential fisher habitat, what is the landscape pattern of forests where tree size class is 5 inches or greater DBH (small, medium, large and very large forest size classes), and tree canopy cover is greater than 40%. 11. In riparian management zones: acres where tree size class is 5 inches or greater DBH (small, medium, large and very large forest size classes), and tree canopy cover is greater than 40%. 12. In riparian management zones: distribution of areas where tree size class is 5 inches or greater DBH and tree canopy cover is greater than 40% 13. In key connectivity areas identified for the geographic areas: mapped distribution of forest cover with an average tree d.b.h. of 5 inches or greater and canopy cover greater than 40%
MON-WL-05: What is the status of habitat conditions that support Clark's nutcrackers during the nesting season?	FW-DC-WL DIV-01, FW-OBJ-PLANT-01	IND-WL- 14. Trees per acre of live whitebark pine greater than or equal to 10 inches d.b.h., 15. Acres of whitebark pine habitat (i.e., acres in the cold PVT) affected by recent wildfire 16. Acres of vegetation management treatments that contribute to restoration of whitebark pine
MON-WL-06: What is the status of habitat conditions that support Townsend's big-eared bats and other bat species?	FW-DC-WL DIV-01, FW-GDL-CAVES-03	IND-WL- 17. Number of grid cell acoustic surveys and number of detections of each bat species 18. Number of evaluations for closure or removal of structures used by bats and measures specified to mitigate or provide for bat use
MON-WL-07: What is the status of habitat conditions that support common loons on code A territorial nesting lakes?	FW-DC-WL DIV-01, FW-OBJ-WL DIV-01, FW-GDL-WL DIV-05	IND-WL- 19. Number of code A ³⁶ territorial nesting lakes surveyed for loon presence (Hammond 2009 or subsequent updates), in cooperation with other partners 20. Number of loon breeding pairs/chicks detected on code A territorial nesting lakes during July 21. Structures installed to support common loon nesting (if needed) 22. Number of projects authorized on NFS lands within 150 yards of active loon nesting sites and number that included activity timing

³⁶ C.A.M. Hammond, (2009), Conservation plan for the common loon in Montana (Kalispell, MT: Montana Department of Fish, Wildlife and Parks, Montana Common Loon Working Group), retrieved from <http://fwp.mt.gov/fish/AndWildlife/management/commonLoon/>.

Monitoring Question	Plan Component(s)	Indicator(s)
MON-WL-08: What is the status of habitat for wildlife species associated with hardwood tree habitats on NFS lands?	FW-DC-TE&V-09, FW-OBJ-TE&V-03	IND-WL- 23. Percentage of NFS lands with presence of hardwood tree species (birch, aspen, or cottonwood). 24. Number of acres with vegetation management treatments focused on promoting hardwood tree species (birch, aspen and/or cottonwood)
MON-WL-09: What is the status of habitat for wildlife species associated with grass/forb/shrub habitats on NFS lands?	FW-DC-TE&V-09, FW-OBJ-TE&V-04,	IND-WL- 25. Percentage/acres of NFS lands that are grass, forb or shrub non-forest lifeform and percentage/acres of NFS lands that are seedling forest size class 26. Number of acres treated to maintain or restore key ungulate winter grass/forb/shrub habitats. 27. Number of key ungulate winter habitat acres treated to control non-native invasive plants
MON-WL-10: What is the status of habitat for wildlife species associated with snags and potential live snag replacement trees in the 20-inch or greater d.b.h. class?	FW-DC-TE&V-15, 16	IND-WL- 28. Percent of NFS lands with presence of at least 1 snag per acre greater than or equal to 20 inches d.b.h. in each PVT, Inside and Outside Wilderness/Roadless areas. 29. Average number of snags per acre on NFS lands greater than or equal to 20 inches d.b.h. in each PVT 30. Density (tpa) of Live trees greater than or equal to 20 inches d.b.h.(tpa) in each PVT, Inside and Outside Wilderness/Roadless areas
MON-WL-11: What is the status of habitat for wildlife species associated with snags and potential live snag replacement trees in the 10-inch or greater d.b.h class?	FW-DC-TE&V-15	IND-WL- 31. Percent of NFS lands with presence of at least 1 snag per acre greater than or equal to 10 inches d.b.h. in each PVT, Inside and Outside Wilderness/Roadless areas. 32. Average number of snags per acre on NFS lands greater than or equal to 10 inches d.b.h. in each PVT 33. Density (tpa) of Live trees greater than or equal to 15 inches d.b.h. (tpa) in each PVT, Inside and Outside Wilderness/Roadless areas
MON-WL-12: What is the status of habitat for wildlife species associated with downed woody material?	FW-DC-TE&V-17	IND-WL- 34. Average tons per acre on NFS lands of coarse woody material greater than 3 inches d.b.h. in each PVT

<p>MON-WL-13: What is the status of habitat for wildlife species associated with forests burned with moderate- to high-severity wildfire?</p>	<p>FW-DC-TE&V-25, FW-GDL-TIMB-01 through 03</p>	<p>IND-WL-</p> <p>35. Forestwide acres burned by wildfire in the previous decade</p> <p>36. Percentage of acreage burned with moderate- to high-severity wildfire followed by salvage harvest in previous decade</p> <p>37. For wildfires with salvage harvest, acres of unburned forest or forest burned with low-severity retained within fire perimeter</p> <p>38. For wildfires with salvage harvest, size range of burned forest patches retained within burn perimeter</p> <p>39. For wildfires with salvage harvest, number of standing and downed trees per acre greater than 20 inch d.b.h. retained within salvage harvest units that were verified old-growth forest prior to the fire</p>
<p>MON-WL-14: What is the risk of human disturbance in areas modeled as wolverine maternal denning habitat during the time period of February 15 to May 15?</p>	<p>FW-GDL-REC-04. FW-GDL-WL-04</p>	<p>IND-WL-</p> <p>40. Projects or activity authorizations in modeled maternal denning habitat and design features to reduce the risk of disturbance</p> <p>41. Percentage of modeled maternal denning habitat where public motorized over-snow vehicle use is allowed (Modeling based upon Copeland and Yates³⁷ or subsequent updates for the northern Rocky Mountains by the USFWS or USFS Rocky Mountain Research Station)</p>
<p>MON-WL-15: What is the status of the breeding season bird community on the Forest (including neo-tropical migratory birds)?</p>	<p>FW-DC-WL DIV-01</p>	<p>IND-WL-</p> <p>42. Bird species observations and occupancy on the Forest based upon data collected for Integrated Monitoring in Bird Conservation Regions.</p> <p>43. Bird species density on the Forest based upon data collected for Integrated Monitoring in Bird Conservation Regions.</p> <p>44. Bird species for which there are statistically significant (95% credible interval) population changes (trends- compare FNF with MT-Bird Conservation Region 10)</p>
<p>MON-WL-16: What is the status of the aquatic amphibian community on the Forest?</p>	<p>FW-DC-WL DIV-01 FW-DC-WTR-12</p>	<p>IND-WL-</p> <p>45. Aquatic sites surveyed for amphibian presence, in cooperation with other partners.</p> <p>46. Amphibian species detections; whether there is evidence of reproduction</p> <p>47. Percentage of sites surveyed where aquatic invasive species (plants or animals) are detected</p>
<p>MON-WL-17: What is the status of forest mesocarnivores (e.g., lynx, wolverine, fisher) on the Forest?</p>	<p>FW-DC-WL DIV-01</p>	<p>IND-WL-</p> <p>48. Grid cells surveyed and number of detections of each mesocarnivore species on the Forest, in cooperation with other partners</p>

³⁷ J.P. Copeland & R.E. Yates(2006), *Wolverine population assessment in Glacier National Park*, Missoula, MT: USDA Forest Service, Rocky Mountain Research Station, planning record exhibit # 00355

Soils and geology

Table 56. Plan monitoring questions and indicators for soils and geology

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-SOIL-01: To what extent are vegetation management activities not causing irreversible damage to soil conditions?	FW-DC-SOIL-01 FW-STD-SOIL-01	IND-SOIL- 01. Number of harvest units surveyed and percent that meet the soil quality standard post-harvest
MON-SOIL-02: How many miles of temporary road are constructed and rehabilitated and was soil function successfully restored as a result?	FW-DC-SOIL-01 FW-STD-SOIL-03	IND-SOIL- 02. Miles of temporary roads constructed 03. Miles of temporary roads rehabilitated

Fire and fuels management

Table 57. Plan monitoring questions and indicators for fire and fuels management

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-FIRE-01: What management actions are contributing towards reducing wildland fuels?	FW-OBJ-FIRE-01 FW-DC-FIRE-02	IND-FIRE- 01. Acres of fuel reduction treatments in and out of the wildland-urban interface 02. Acres of treatment effectiveness by treatment type.
MON-FIRE-02: To what extent is natural fire used to achieve desired ecological, social, or economic conditions?	FW-DC-FIRE-03	IND-FIRE- 03. Number and acres of natural fire ignitions managed for ecological, social, or economic reasons and the number of natural ignitions managed with the primary goal of suppression
MON-FIRE-03: To what extent is prescribed fire used to achieve desired ecological, social, or economic conditions?	FW-DC-FIRE-03	IND-FIRE- 04. Number and acres of prescribed fire ignitions managed for ecological, social, or economic reasons

Human Uses and Designations of the Forest

The plan monitoring program contains monitoring questions and indicators addressing human uses of the Forest associated with the transportation system, recreation, scenery, timber production, and other socioeconomic factors. Monitoring items associated with designated areas such as recommended wilderness and wild and scenic rivers are also identified. Monitoring questions and indicators are shown in Table 58 through Table 68.

Sustainable recreation

Table 58. Plan monitoring questions and indicators for sustainable recreation

Monitoring Question(s)	Plan Component(s)	Indicator(s)
<p>MON-REC-01: What is the status of visitor use?</p> <p>MON-REC-02: Are facilities maintained to users' satisfaction?</p>	<p>FW-DC-REC-04, 14, 15</p>	<p>IND-REC-</p> <p>Using the National Visitor Use Monitoring data, show trends in</p> <p>01. Visitation estimates</p> <p>02. Visitor activities</p> <p>03. Percent overall satisfaction</p>
<p>MON-REC-03: Are the recreation objectives in the plan being achieved??</p>	<p>FW-OBJ-REC-01; FW-OBJ-REC-03; FW-OBJ-REC-04; GA-NF-OBJ-02; GA-SV-MA7-Crane-OBJ-01; GA-SM-OBJ-01; GA-SM-OBJ-02; GA-SM-MA7-Blacktailski-OBJ-01</p>	<p>IND-REC-</p> <p>04. Number of dispersed recreation sites on the Forest that have been rehabilitated to correct erosion or sanitation issues</p> <p>05. Number of campgrounds that have been improved</p> <p>06. Number of recreation cabin rentals added to the national reservation system since the record of decision</p> <p>07. Number of bicycle trails constructed in the Whitefish Range vicinity</p> <p>08. Construction of a bicycle trail in the Crane Mountain area</p> <p>09. Construction of a nonmotorized trail that connects NFS lands in the Blacktail vicinity to the Foy's to Blacktail Trails system</p> <p>10. Construction and designation of motorized trail connectors that provide high-elevation loop opportunities</p> <p>11. Construction of a nonmotorized trail that connects the Whitefish Trail (Whitefishlegacy.org) to NFS lands</p>
<p>MON-REC-04: Are current recreation settings and opportunities meeting or moving toward desired recreation settings and opportunities?</p>	<p>FW-DC-SREC-01 FW-DC-WREC-01 FW-DC-REC-03</p>	<p>IND-REC-</p> <p>12. Management actions or activities that move towards desired recreation opportunity spectrum class characteristics</p>

Scenery

Table 59. Plan monitoring questions and indicators for scenery

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-SCN-01: Is the existing condition and trend of the scenic character meeting or moving toward desired conditions??	FW-DC-SCN-02 FW-GDL-SCN-03	IND-SCN- 01. Management actions or activities that move towards the desired scenic integrity objectives

Infrastructure

Table 60. Plan monitoring questions and indicators for Infrastructure (roads and trails)

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-IFS-01: Are road closure devices effective at restricting public motorized use?	FW-DC-IFS-12	IND-IFS- 01. Number and percentage of road closure devices checked and percentage determined to be effective at restricting public motorized use
MON-IFS-02: What is the status of the road system on the Forest?	FW-DC-IFS-06 FW-OBJ-IFS-01 through 03	IND-IFS- 02. Miles of roads open year-long by operational maintenance level 03. Miles of roads open seasonally by operational maintenance level 04. Miles of roads maintained by operational maintenance level 05. Miles of roads decommissioned 06. Miles of roads put into intermittent storage 07. Miles of reconstruction or improvement projects 08. Miles of new road construction
MON-IFS-03: What is the status of the trail system on the Forest?	FW-DC-IFS-07 through 09 FW-OBJ-IFS-04 through 06	IND-IFS- 09. Miles of motorized and nonmotorized summer trails 10. Miles of motorized and nonmotorized winter trails 11. Miles and percent of system trails meeting standards 12. Miles of system trails improved 13. Miles of trails maintained 14. Miles of new motorized trails constructed 15. Miles of new nonmotorized trails constructed 16. Miles of trails reported reconstructed

Wild and scenic rivers, designated and eligible

Table 61. Plan monitoring questions and indicators for designated wild and scenic rivers

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-MA2a-01: Are the statutory requirements (outstandingly remarkable values, water quality, and free-flowing conditions) of the three forks of the Flathead Wild and Scenic River being protected?	MA2a-DC-01, 02, 06	IND-MA2a-01. Number, kind, extent, and evaluated outcomes of identified management activities that occur within designated wild and scenic river corridors

Table 62. Plan monitoring questions and indicators for eligible wild and scenic rivers

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-MA2b-01: Are the outstandingly remarkable values for which the river was deemed eligible and the free-flowing conditions protected?	MA2b-DC-01, 02	IND-MA2b-01. Number, kind, extent, and evaluated outcomes of identified management activities that occur within eligible wild and scenic river corridors

Wilderness, designated and recommended

Table 63. Plan monitoring questions and indicators for designated wilderness areas

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-WILD-01: Do management activities in designated wilderness areas preserve and protect wilderness character?	FW-MA1a-DC-01, 02 MA1a-GDL-03	IND-WILD- 01. Score on National Wilderness Stewardship Performance elements 02. Limits of acceptable change monitoring measures for the Bob Marshall Wilderness Complex and Mission Mountains Wilderness 03. The number and type of authorized motorized use and mechanized transport entry as reported through the USFS INFRA database 04. The number and type of unauthorized motorized use and mechanized transport 05. Number, kind, and extent of identified actions (e.g., natural and human-caused fire) that have occurred in designated wilderness areas on the Forest

Table 64. Plan monitoring questions and indicators for recommended wilderness areas

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-RWILD-01: Do outcomes from management activities protect the wilderness characteristics of the recommended wilderness area?	MA1b-DC-01, 02 MA1b-SUIT-06	IND-RWILD- 01. Number, kind, extent, and evaluated outcomes of identified management activities (including prescribed fire) that have occurred in recommended wilderness areas 02. Number and type of unauthorized motorized travel, uses, and mechanized transport

Inventoried roadless areas

Table 65. Plan monitoring questions and indicators for inventoried roadless areas

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-IRAs-01: Do outcomes from management actions maintain roadless area characteristics within inventoried roadless areas?	Roadless Area Conservation Rule ³⁸	IND-IRA- 01. Number, kind, and extent of identified actions that have occurred in inventoried roadless areas on the Forest

Production of Natural Resources

Timber products

Table 66. Plan monitoring questions and indicators for timber products

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-TIMB-01: How are management actions contributing to a sustainable mix of forest products in response to market demands?	FW-DC-TIMB-02, FW-OBJ-01 and 02	IND-TIMB- 01. Million board feet/million cubic feet offered and sold annually
MON-TIMB-02: How are management actions contributing to the recovery of economic value of dead or dying trees on suitable lands?	FW-DC-TIMB-02 and 05	IND-TIMB- 02. Million board feet/million cubic feet offered and sold annually as salvage harvest

Economic and Social Environment

Table 67. Plan monitoring questions and indicators for the social and economic environment

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-S&E-01: To what extent is the Forest providing goods and services for local communities? MON-S&E-02: To what extent is the Forest contributing to desired conditions for a stable and functioning local economy?	FW-DC-S&E-02	IND-S&E- 01. Levels of production of tangible multiple uses, including timber products, grazing, recreational visits, and downhill skiing 02. Number of jobs and thousands of dollars in labor income resulting from Flathead National Forest management 03. Land payment revenues (e.g., Secure Rural Schools Act, payment in lieu of taxes, etc.) to state and counties from NFS lands

³⁸ USDA (2001), 36 CFR Part 294—Special areas, roadless area conservation rule (Washington, DC: USDA Forest Service), retrieved from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5050459.pdf

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-S&E-03: To what extent are there opportunities for all people, including youth, to connect with the Forest through conservation education, interpretive and visitor information programs across the Forest?	FW-DC-S&E-03 FW-DC-R&E-01 through 04	IND-S&E- 04. Number and type of education, interpretive, visitor info programs 05. Number of people including youth participating in Forest education interpretive and visitor info programs
MON-S&E-04: Is the cost of implementing the forest plan consistent with projections?	FW and GA objectives	IND-S&E- 06. Forest annual budget, supplemented by partnerships and other outside funding.

Cultural resources

Table 68. Plan monitoring questions and indicators for cultural resources

Monitoring Question(s)	Plan Component(s)	Indicator(s)
MON-CR-01: To what extent are cultural resource objectives being met, and are they trending towards desired conditions to identify, evaluate, and nominate cultural resources for listing in the National Register of Historic Places?	FW-OBJ-CR-01 through 03	IND-CR- 01. Number of submitted cultural resource nominations to the State Historic Preservation Officer, and number of completed historic contexts, overviews, thematic studies, or cultural resources property preservation plans for significant cultural resources identified through inventory 02. Number of completed public outreaches or interpretive projects
MON-CR-02: To what extent are plan components ensuring treaty rights are preserved and trending towards desired conditions for consultation with each tribe?	FW-DC-CR-02 FW-OBJ-TRIB-01, 02	IND-CR- 03. Completion of a cooperatively established tribal consultation protocol 04. Number of completed consultations under the tribal consultation protocol

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