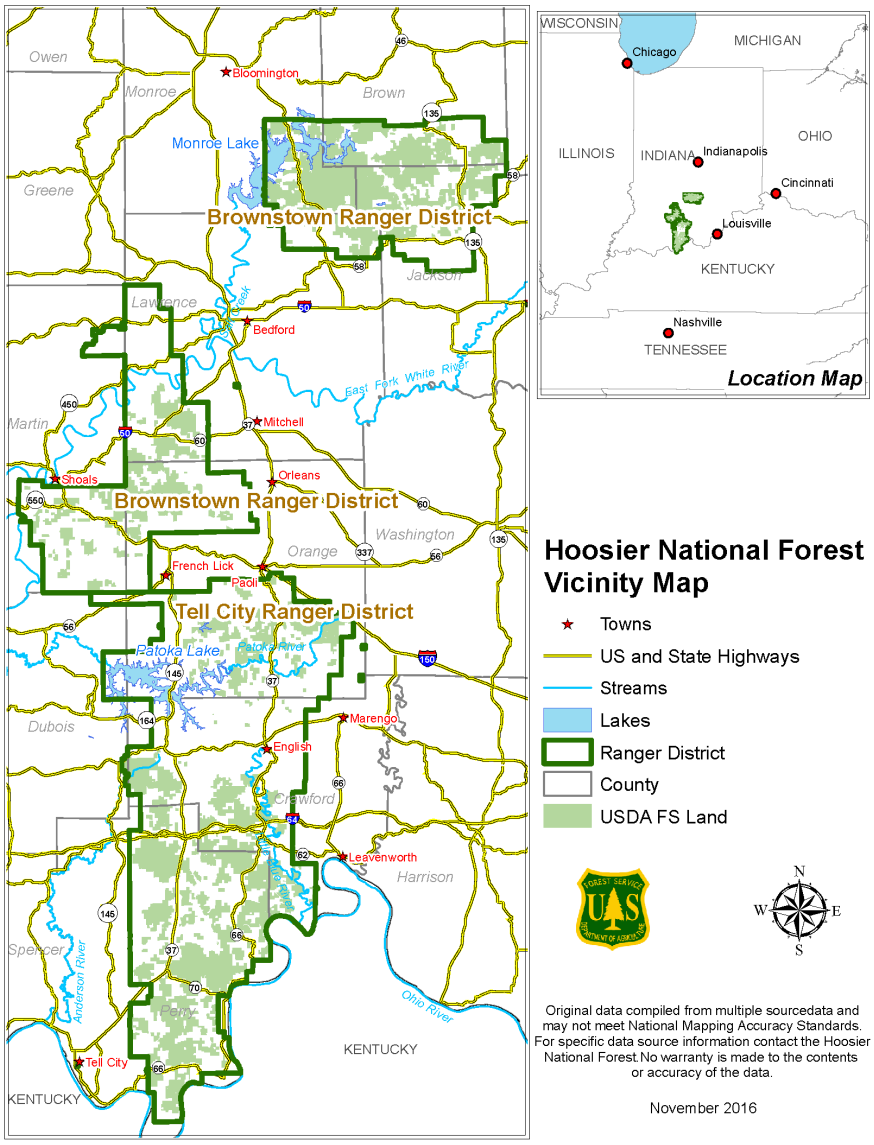
USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Hoosier National Forest 2020 and 2021 Biennial Monitoring Report



July 2023

For more information contact:
Hoosier National Forest
811 Constitution Avenue
Bedford, Indiana 7421
Office: 812-275-5987
TDD 800-877-8339

This Fiscal Year 2020-2021 Monitoring and Evaluation Report for the Hoosier National Forest summarizes the results of management actions conducted under the 2006 Land and Resource Management Plan. This report meets the intent of both the Forest Plan and the 2012 Planning Rule regulations contained in 36 CFR 219 and the National Forest Management Act.

Contents

1.0 Introduction

Management of a National Forest, with a broad, multiple-use mission and mandate, requires careful consideration of trade-offs and expected effectiveness of projects to be implemented. Many land and resource management projects in service of the public require short term disturbance to achieve mid and long-term benefits. To the extent possible, these impacts are avoided or mitigated prior to, during or after project implementation. This monitoring report summarizes findings of Forest-wide monitoring efforts and informs managers of the progress being made towards implementation of the Forest Land and Resource Management Plan and assists in making future decisions based on anticipated effectiveness of those actions and mitigation measures meant to minimize undesirable impacts.

Effective Land and Resource Management Plan (LRMP) monitoring and evaluation fosters improved management and more informed planning decisions. It helps identify the need to adjust management direction, such as desired conditions, goals, objectives, standards, and guidelines, as conditions change. Monitoring and evaluation help the Agency and the public determine how an LRMP is being implemented, whether plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid.

The Biennial Monitoring and Evaluation Report (Biennial M&E Report) is of value to Forest Service leadership, managers, and employees, as well as to the public. The information gained from monitoring is used to determine how well the desired conditions, goals, objectives, and outcomes of the LRMP are being met. The Biennial M&E Report provides a readily available reference document for Forest Service managers as they plan, evaluate the effects of actions on resources, and implement future projects. This information can illuminate changes needed in project planning and implementation, or changes needed in LRMP direction. This report also describes to the public how their public lands are being managed and how effectively the commitments made to them within the LRMP are being met.

2.0 Monitoring & Evaluation Requirements

Minimum monitoring and evaluation requirements have been established through the National Forest Management Act (NFMA) at 36 CFR 219.12. Some requirements provide guidance for the development of a monitoring program, while others include specific compliance requirements.

Monitoring and evaluation are separate, sequential activities required by NFMA regulations. Monitoring involves the repeated collecting of data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. The information gained from monitoring and evaluation is used to determine how well the desired conditions, goals, objectives, and outcomes of the LRMP are being met. Monitoring and evaluation are critical steps in the process of keeping the LRMP responsive to changing conditions, thereby providing the feedback mechanism for an adaptive management framework. The results are used to identify when changes are needed to the LRMP or the way it is implemented.

LRMP Monitoring on the Hoosier National Forest has three major components: the Monitoring Program (contained within the LRMP), the Monitoring and Evaluation Guide, and the Biennial Monitoring and Evaluation Report. Each are described below.

2.1 Monitoring Program

The monitoring program contained within the LRMP is strategic in nature and provides programmatic direction for monitoring and evaluating LRMP implementation. Monitoring consists of collecting information from selected sources, usually on a sample basis. There are four categories of monitoring:

Category 1: Required monitoring items (NFMA and 36 CFR 219 regulations)

Category 2: Monitoring Implementation (Was it done right?)

Category 3: Monitoring Effectiveness (Did it work?)

Category 4: Validation Monitoring (Is the guidance appropriate?)

Required Category 1 monitoring items are mandatory components of every LRMP, whereas Category (2) through (4) monitoring items are more flexible and tailored to address issues raised through public scoping and interdisciplinary team review. A more complete description of the monitoring items can be found in Chapter 4 of the 2006 LRMP.

Budgetary constraints and lack of personnel may affect the level of monitoring that can be done in a particular fiscal year. If budget levels limit the Forest's ability to perform all monitoring tasks, then those items specifically required by law are given the highest priority.

2.2 Monitoring and Evaluation Guide (Monitoring Guide)

The Monitoring and Evaluation Guide (Monitoring Guide) is part of the overall monitoring framework for the Hoosier National Forest. While Chapter 4 (Monitoring and Evaluation) of the LRMP is strategic in nature and provides programmatic direction for monitoring and evaluating LRMP implementation, the Monitoring Guide provides direction that is more specific to implement the monitoring strategy outlined in the LRMP. The Monitoring Guide outlines the methods to be used to collect and analyze the data, and it describes the purpose, methods, locations, responsible persons, and estimated costs.

The Monitoring Guide is dynamic and may be subject to periodic revision to meet current needs during the life of the LRMP. It allows the principles of adaptive management to be applied so that as monitoring techniques are implemented, they can be evaluated for their effectiveness and efficiency (and revised as appropriate).

2.3 Biennial Monitoring and Evaluation Report (Biennial M&E Report)

Providing timely, accurate monitoring information to the decision makers and the public is a key requirement of the monitoring and evaluation strategy. The biennial monitoring and evaluation report, which provides the analysis and summary of the monitoring results, is the vehicle for disseminating this information. As stated on page 4-2 of the 2006 LRMP the purpose of this report is …"to transform the monitoring data into information that supports adaptive management so the Responsible Official may consider making adjustments to the Forest Plan [LRMP], management activities, or the monitoring program, or to begin a new assessment."

Evaluation is the process of transforming data into information—a value-added process. It is a process of synthesis that brings together value, judgment, and reason with monitoring information to answer the question, "So what?" and perhaps, "Why?" Evaluation requires context. A sense of the history of the

place or the circumstances (temporal and spatial context) are important to the evaluation of management activities. Evaluation describes movement from a known point (base line or reference condition) either toward or away from a desired condition. The desired conditions may or may not ever be fully achieved, but it is important to know if management activities are heading in the right direction. Evaluation produces information that is used to infer outcomes and trends: Conclusions will be drawn from an interpretation of evidence. These conclusions are documented in the Biennial M&E Report.

The Biennial M&E Report is intended to be a comprehensive compilation of all the monitoring and evaluation described in the plan. This report will provide summaries of data collected, and complete evaluations of the data. The evaluation process determines whether the observed changes are consistent with LRMP desired conditions, goals, and objectives and identifies adjustments that may be needed. Continuous updating and evaluation of monitoring data provides a means to track management effectiveness from year to year and to show the changes that have been made or are still needed.

3.0 History of Monitoring Activities on the Hoosier National Forest

The Hoosier National Forest has been performing Land Management Plan monitoring since the original LRMP was signed. The requirements for monitoring have changed from the 1982 rule to the 2012 rule, and the monitoring program for the LRMP has recently been changed due to the monitoring transition in April of 2016.

Monitoring Reports are filed on our website at
https://www.fs.usda.gov/detail/hoosier/landmanagement/planning/?cid=fsbdev3_017442

4.0 Monitoring Activities during Fiscal Years 2020 & 2021

Some of the items may have only one year of data or no data due to the monitoring frequency. Each monitoring question is tiered to a forest-wide goal of the LRMP. Those goals are:

- Conservation of threatened and endangered species habitat
- Maintain and restore sustainable ecosystems
- Maintain and restore watershed health
- Protect our cultural heritage
- Provide for visually pleasing landscape
- Provide for recreation use in harmony with natural communities
- Provide a useable landbase
- Provide for human and community development

All monitoring questions are included within every biennial report. Results from some monitoring questions may not be included in every report due to monitoring frequencies greater than two years. The individual sections below for each question will present all data for that question since the plan was last revised, as well as the most recent evaluations performed for that question (based on monitoring frequency).

The following monitoring questions were addressed during the reporting period (from October 1st, 2020 to September 30th, 2021) and have had their associated evaluations updated in the next section of this report:

Monitoring Question 1 (see section 5.1): Are standards and guidelines for threatened and endangered species conservation implemented and effective?

Monitoring Question 2 (see section 5.1): Are hibernacula conditions changing?

Monitoring Question 3 (see section 5.2): Are Forest Plan goals for vegetation composition and age class being met?

Monitoring Question 4 (see section 5.2): Are populations of species dependent on early successional habitat stable or increasing?

Monitoring Question 5 (see section 5.2): Are populations of species dependent on late seral habitats stable or increasing?

Monitoring Question 6 (see section 5.2): Are objectives being met through the use of prescribed fire?

Monitoring Question 7 (see section 5.2): Are non-native invasive species affecting the sustainability of desired ecosystems?

Monitoring Question 8 (see section 5.2): Is the trend of undesirable occurrence of fire, insects, disease, and other mortality increasing?

Monitoring Question 9 (see section 5.2): Are climate stressors (drought, flooding, and storm frequency, and/or severity) affecting sustainability?

Monitoring Question 10 (see section 5.2): Are Forest management systems substantially and permanently affecting the productivity of land?

Monitoring Question 11 (see section 5.2): Is ecosystem health maintained or improved?

Monitoring Question 12 (see section 5.3): Are select watersheds functioning properly?

Monitoring Question 13 (see section 5.3): Are standards and guidelines implemented and effective regarding maintenance and restoration of watershed health and function?

Monitoring Question 14 (see section 5.3): Are roads degrading watershed health and function?

Monitoring Question 15 (see section 5.4): Are cultural resource sites being identified, evaluated, protected, and interpreted?

Monitoring Question 16 (see section 5.4): Are project design criteria and mitigation measures being followed during implementation regarding protection of our cultural heritage?

Monitoring Question 17 (see section 5.4): Are cultural resource sites being damaged?

Monitoring Question 18 (see section 5.5): Are the existing scenic resources meeting or trending toward desired conditions?

Monitoring Question 19 (see section 5.6): Is trail user satisfaction trending up?

Monitoring Question 20 (see section 5.6): Are Forest trails meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives?

Monitoring Question 21 (see section 5.6): What is the status and trend of visitor use and visitor satisfaction?

Monitoring Question 22 (see section 5.6): Are Forest recreation sites and facilities meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives?

Monitoring Question 23 (see section 5.6): Is the wilderness moving toward desired future condition?

Monitoring Question 24 (see section 5.7): Are acquisition of public easements, exchanges of inaccessible parcels, construction of public parking areas and other efforts improving public access to National Forest Service land?

Monitoring Question 25 (see section 5.7): Are land adjustment activities reducing fragmentation?

Monitoring Question 26 (see section 5.8): Are management activities reducing the wildfire risk to communities?

Monitoring Question 27 (see section 5.8): Are Forest product offerings meeting Forest Plan goals?

Monitoring Question 28 (see section 5.8): Is our conservation and interpretive program reaching a broad audience?

5.0 Monitoring Results

5.1 – Conservation of Threatened and Endangered Species Habitat

5.11 – Are standards and guidelines for threatened and endangered species conservation implemented and effective?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Forest Plan standards and guideline implementation and effectiveness

Population trends

Effectiveness of project implementation

Habitat changes

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

The U.S. Fish and Wildlife Service (FWS) has identified six federally listed species (three mammals and three mussel species) as having ranges that likely include the Hoosier National Forest: the endangered fanshell mussel (*Cyprogenia stegaria*), the endangered gray bat (*Myotis grisescens*), the endangered Indiana bat (*Myotis sodalis*), the endangered rough pigtoe mussel (*Pleurobema plenum*), the endangered sheepnose mussel (*Plethobasus cyphyus*), and the northern long-eared bat (*Myotis septentronalis*), which was threatened during the monitoring period but was up listed to endangered in November 2022. There is no designated critical habitat for these species on the Forest.

This monitoring question comes from Chapter 4 of the Forest Plan (4-1). This monitoring question addresses two elements from 36 CFR 219.12:

> (vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area
>
> (viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

Element (vi) is routinely monitored as part of the pre-NEPA and NEPA process. This monitoring is documented under each Preliminary Project Proposal (PPP) for select Forest Projects. Projects are analyzed to determine if they will impact cave and karst resources, specifically hibernacula of threatened and endangered species.

Element (viii) is also monitored by ensuring Forest projects do not impact cave resources and cave fauna. All projects, from different program areas, are reviewed such as engineering, lands recreation and fire.

These elements are tied to the Standards and Guidelines of the Forest Plan (3-2, 3-3, 3-4, 3-5, 3-9 and 3-10) with the objective of having a net gain of acres enhanced/improved for threatened and endangered species and also to provide protection/benefits to threatened and endangered species for the long term. The Standards and Guidelines that apply to this question include:

- Implement prescribed fire within a five mile zone around hibernacula only when bats are unlikely to be swarming or staging. Burns should be conducted under conditions that will reduce or eliminate smoke dispersing into hibernacula.
- Considering both public and private ownerships, maintain or promote at least 70 percent forest canopy cover within a one mile radius of known hibernacula of Indiana bats. Timber harvest should be conducted within this zone only during hibernation and is restricted to single-tree and group selection.
- Any hazard tree that has characteristics of a potential maternal roost tree will not be removed until consultation with a Forest Service biologist has been completed.
- Perform emergence counts on all trees targeted for removal during the bats' active period (April 15 – September 15) that exhibit maternity roost tree characteristics.
- Prohibit timber harvesting and prescribed burning within 200 feet of cave entrances.
- Cave management will be integrated into general land management practices to protect cave resources from subterranean and surface impacts.

An important factor to note is that the global Covid-19 pandemic affected normal operations during the monitoring period. Although projects were ongoing, the Hoosier National Forest office has had limited times of operation. This affected routine working schedules and project timelines. Several field meetings, face-to-face discussions, prescibed burning and wildlife surveys were also affected or canceled completely. The annual hibernacula surveys were reduced in 2020 and did not take place in 2021.

Monitoring Indicator 1: Forest Plan standards and guideline implementation and effectiveness

Results

For 2020-2021, the Forest had several projects where threatened and endangered (TE) species conservation took place. Examples include the Haskins Improvement Project, hazard tree assessments, Oriole Restoration, and Buffalo Pike. In each project, Standards and Guidelines (S&G) were followed to implement the project. During the preliminary project proposal process, issues were brought up ahead of implementation so that the work would be effective and efficient. Pre-inspection of cave resources and roosting habitat was completed prior to the start of implementation. All of the above S&G were addressed in the Biological Evaluations and incorporated in the NEPA Decisions.

One specific example for the Haskins Improvement Project includes conducting monitoring trips prior to prescribed burn implementation. The Haskins tract has had several prescribed fire treatments and no-till drilling of native wildflowers. It is also home to Regional Forester Sensitive Species (Henslow's sparrow, yellow -breasted chat) and has suitable habitat for other State endangered species. Inspections are done prior to burning to determine if another prescribed fire treatment is needed. In 2021, it was discovered that multiple erosion areas were actively taking place. Therefore, further treatments of prescribed burning were not recommended. This tract will continue to be in monitoring status until the erosion issues are mitigated.

Haskins Early Successional Habitat Area

Another example is the hazard tree assessments that occurred in the Hardin Ridge Recreational Area in 2020 and 2021. Several trees were removed that were considered unsafe. Most of these trees were removed during the inactive times for bats (before April 15 and after September 15). Only one occasion occurred that required removing the hazard tree during the active time for bats. In this case, an emergence count was performed, as per *Forest Plan* standards, and no bats were observed leaving the tree. The hazard tree was immediately cut down the following morning.

An example for the Oriole Restoration Project includes the post burn monitoring for cave and karst resources. This was completed during the spring of 2021. Firelines were approved in advance to avoid cave and karst features during the 2020 prescribed burn season.

Through monitoring, 3-5 new cave resources were discovered. These caves were previously unknown and now can be studied and protected. Although our Standards avoid burning within 200 feet of cave resources, this discovery may not have happened without the prescribed burn treatment due to the dense vegetation on site. These sites will now incorporate the 200-foot buffer for protection.

Lastly, the Buffalo Pike project is in its last stages of implementation. This project includes cave and karst surveys prior to beginning the work. Vernal pools were installed in 2019 to enhance the habitat for local bat species. The final set of five vernal pools were installed in 2021. These 2021 surveys also yielded no new locations for cave resources.

One of five vernal pools installed for bat and amphibian habitat

Discussion

Monitoring of threatened and endangered (TE) hibernacula is consistent with state (Indiana Department of Natural Resources) protocols, specifically for the Indiana bat. Indiana bat caves are monitored every other year instead of on a yearly basis.

Past monitoring events have led to findings of new TE species locations. This in turn has led to new management practices inside adjacent project sites. Undoubtedly, monitoring activities have increased the awareness and enhancement possibilities for current and future projects.

This Implementation Monitoring shows that we are consistent with the Forest Plan, State guidelines and US Fish and Wildlife Service protocols for endangered and threatened species. The data collected may also be used for potential candidate species and Forest Plan revision.

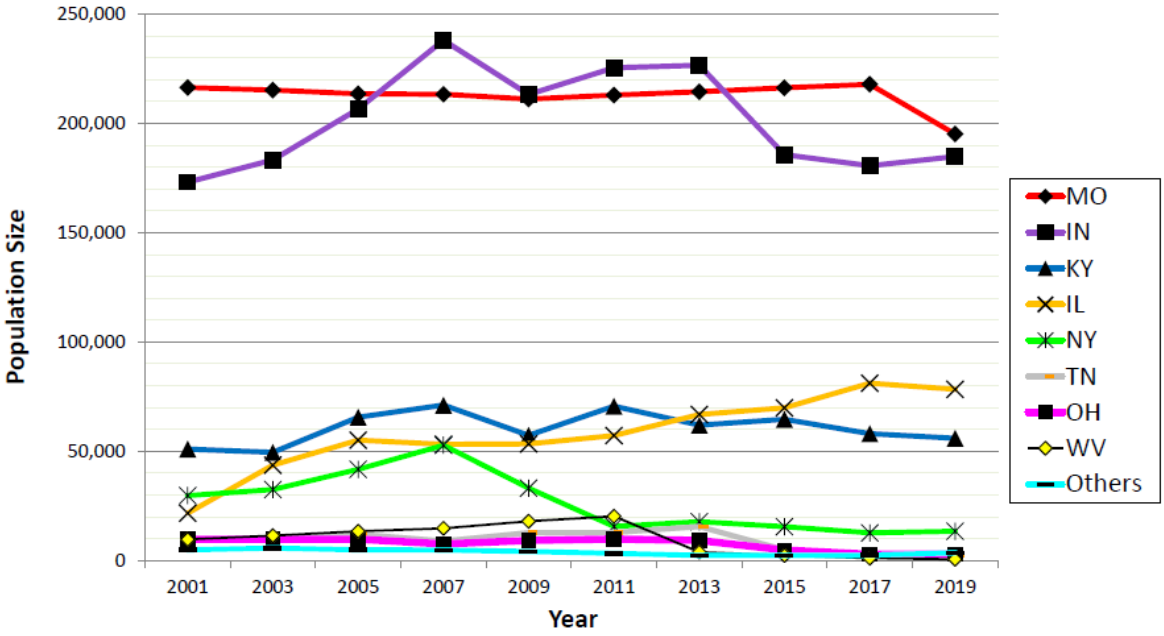
Monitoring Indicator 2: Population trends

Results

Monitoring for threatened and endangered species (TE) on the Forest consists of three different formats: 1) direct monitoring of known hibernacula (bat surveys), acoustic surveys and emergence

counts, 2) surveys of unknown caves during land acquisitions or random sampling, and 3) monitoring to ensure Forest S&G's are being met during project implementation.

White-Nose Syndrome (WNS) is the main factor believed to be affecting the Indiana bat populations on the Forest. It was first found on the Hoosier in 2010 and lab confirmed in this hibernaculum in 2011. The graph below represents the population trend monitoring that has taken place since 2001. The data is taken from the Hoosier's only Indiana bat hibernaculum†. Due to Indiana bat protocols, this cave is only surveyed every other year. Additional cave surveys take place on the Hoosier (between 5-12) each year looking for other bat species and usage.



Indiana bat populations estimated by the Indiana DNR from 2001-2019

USFS and IDNR getting ready to enter an Indiana bat hibernaculum

It appears that Indiana bat populations have somewhat stabilized in the Forest's hibernaculum, although the numbers are very low. The decrease in numbers started prior to the onset of WNS, though it is possible this fungus was present and impacting bat populations prior to the first detection in 2010. The next scheduled survey would take place in early 2022. Indiana bat populations throughout the State have also seen a stabilization with a slight increase in numbers.

†The Hoosier National Forest only has one Indiana bat hibernaculum that has been regularly used by Indiana bats. Other caves have been found being used by Indiana bats, however their use has only been documented as a one-time occurrence and not found again in that cave.

Indiana Bat Hibernaculum Monitoring 2001-2020										
Year	***2001***	***2003***	***2005***	***20T07***	***2009***	***2012***	***2014***	***2016***	***2018***	***2020***
MYSO	134	250	177	134	95	73	20	7	4	3

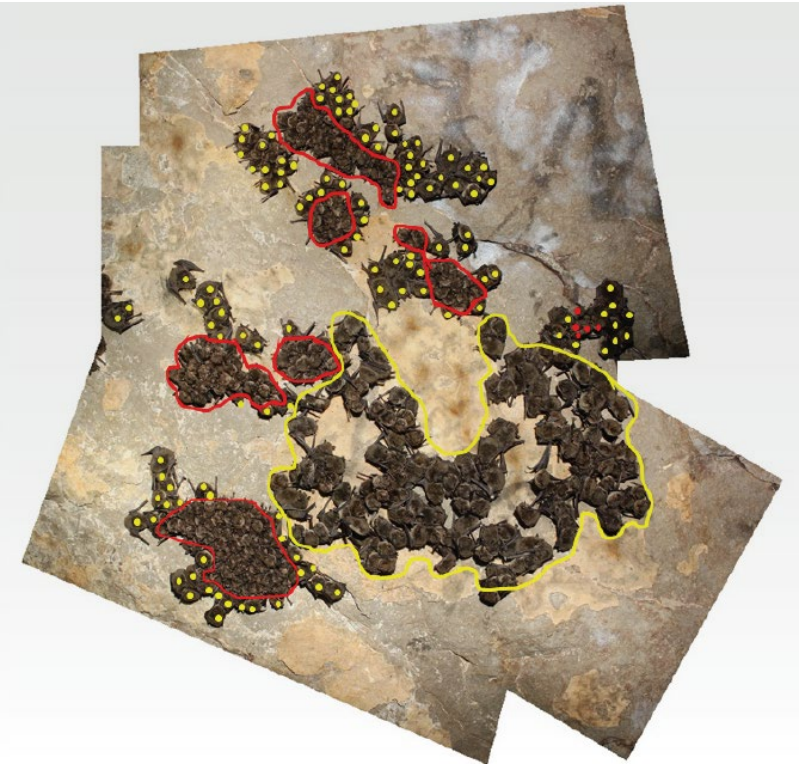
*MYSO = *Myotis sodalis* (Indiana bat)

As part of the surveys that take place on the Forest, photographs are used to reduce bat disturbance and provide documentation of the numbers. In 2019, Indiana DNR biologists inspected images from a state property in southern Indiana and found that gray bats (*Myotis grisescens*), which are Federally endangered, were hibernating alongside Indiana bats and had been misidentified as such.

The DNR discovered that the gray bats have been slowly increasing in one of their hibernacula (IDNR 2019 Wildlife Report). In the picture, Indiana bats are grouped in tight clusters (shown in the red outline and dots).

The larger, more scattered individuals between the clusters are gray bats (yellow outline and dots). Because of this, we are now revisiting several caves during the summer to determine if the gray bats have expanded on the Forest.

2021 was the first year for these new surveys on the Forest. So far, no new gray bats have been located.



Indiana and grey bat pictures

Acoustical monitoring has shown increases in evening bats and gray bat presence on the Forest. 2020 had consistent hits of these two species in the Pleasant Run Unit of the Hoosier. Before 2018, gray bats were not considered present on this part of the Forest.

Discussion

Monitoring generally occurs during the winter to inspect caves for bat usage. Approximately 5 caves have historic bat survey data on the Forest. These are checked every year, minus the single Indiana bat hibernaculum (every other year). Random sampling of other caves also takes place in the winter to look for new TE locations. The additional sampling consists of approximately 5-7 caves, including caves that had never been surveyed for bats or caves that have been sampled in the past to look for changes/new information. Due to Covid-19, 2021 cave surveys were canceled, so a gap in hibernacula surveys exists.

Since 2020, the Indiana DNR has adopted methods of the North American Bat Monitoring Program (NABat), thereby contributing acoustic information to monitor bat populations across species' entire geographic ranges. The Forest also continues to use the same protocols for consistency with other natural resource agencies.

Monitoring of TE hibernacula is consistent with the Indiana DNR protocols, specifically for the Indiana bat. Indiana bat caves are monitored every other year instead of on a yearly basis. Acoustical monitoring takes place in June and July. Five pre-determined routes exist on the Forest and each one is monitored at three separate times during the summer.

Monitoring Indicator 3: Effectiveness of project implementation

Results

Project implementation had no known negative impacts to cave resources (TE species) in 2020-2021. This was due to proper implementation, adhering to Forest S&G and direct monitoring for resource protection. Caves were either monitored for bats prior to implementation or caves did not have TE species and no mitigation was required.

Discussion

One example of monitoring includes cave and karst surveys inside the Shirley Creek Trail Reroute Project. These were accomplished prior to any ground disturbing activities that could have affected cave resources. Several sinkholes are adjacent to the project area and we were prepared to evaluate each one and give setback distances if necessary. However, after gridding the project area, no karst resources were discovered. This occurred during the spring of 2021. This implementation monitoring shows consistency with biological evaluation recommendations and design criteria and that TE species, that potentially could be present, are being considered.

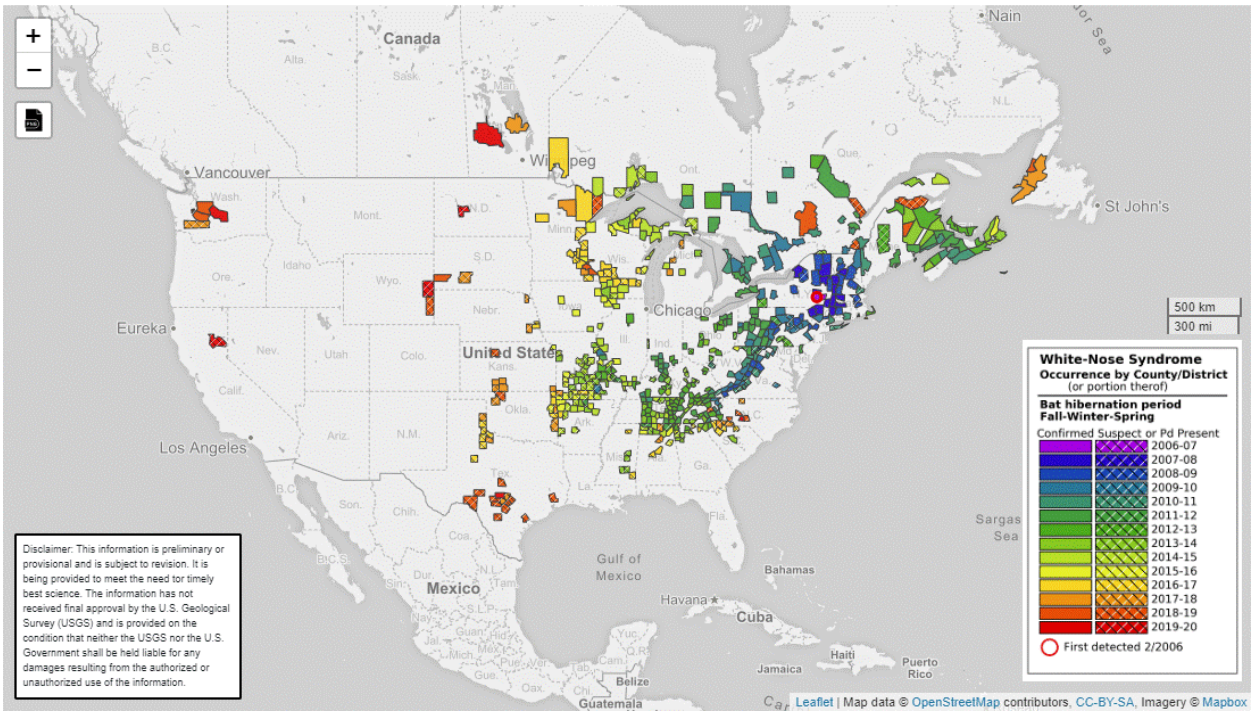
Shirley Creek Reroute Project Area

Monitoring Indicator 4: Habitat changes

Results

Besides the presence of White-Nose Syndrome (WNS), there has been no major change in habitat (TE hibernacula) in the last several years on the Hoosier National Forest. It is unclear at this time if weather changes/increased precipitation are affecting cave habitats or their fauna.

White-Nose Syndrome is a disease that affects hibernating bats and is caused by a fungus, *Pseudogymnoascus destructans,* and has been documented in several counties throughout southern Indiana. It is not a physical change, but the presence of this fungus affects the local fauna. This disease continues to spread across the United States and Canada. On the Hoosier, bat numbers in caves are low but have somewhat stabilized. Below is the latest WNS spread map.



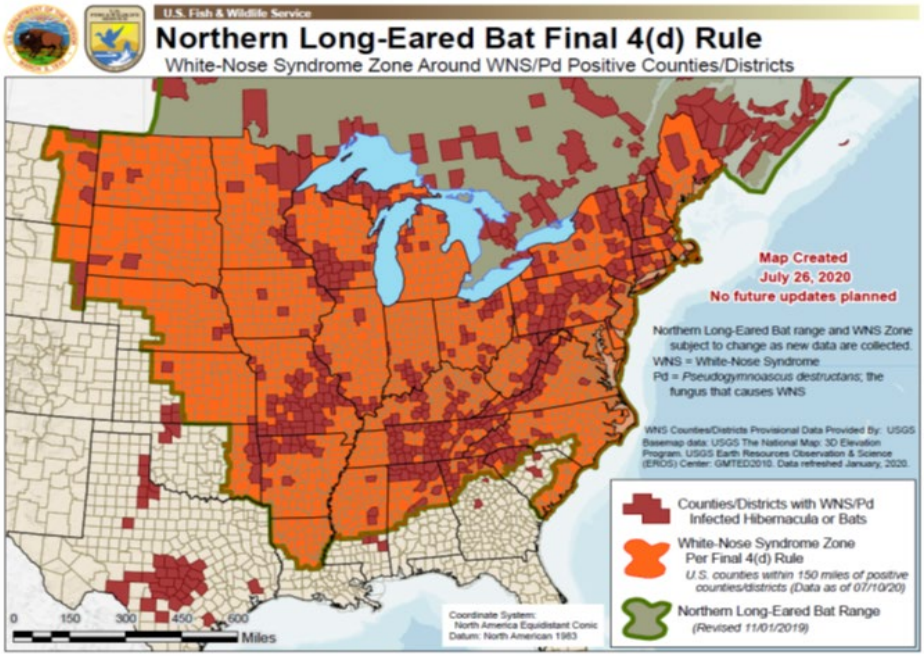
White-Nose Syndrome occurrence by county map

WNS was first detected on the Hoosier in 2010 during routine winter hibernacula surveys conducted by Forest biologists. It was confirmed with lab testing in 2011. By the end of that first winter, the disease had been found in six caves in Crawford, Monroe and Washington counties.

During the following winter, bats exhibiting sign of WNS infection were observed in or reported from 20 additional caves that included six new counties in southern Indiana (Greene, Harrison, Jefferson, Lawrence, Martin and Orange).

Disease surveillance during the 2012-13 winter resulted in WNS detection from nine more caves that included one new county (Jennings). Two caves and one new county (Vermillion) were added from WNS surveillance during the 2013-14 winter.

WNS is now widely distributed throughout much of the karst region in south-central Indiana and locally established within most of the state's major concentrations of important bat hibernacula.



Area of spread for white-nose syndrome in bats overlayed with Northern long-eared bat range

The Forest is also continuing to survey for northern long-eared bats during cave surveys. Again, due to WNS, the numbers have dropped to a historic low. However, the numbers may have stabilized and not had a complete disappearance for this bat.

Discussion

The Forest is continuing to survey for new cave systems across the landscape and learn about adjacent caves to the Forest boundary. This allows for better management decisions to attempt to enhance habitat for our local TE species. This validation Monitoring shows consideration for the effects on private properties near the Forest from on-Forest project activities.

Recommendations

At this time, it is recommended that cave surveys continue throughout the Forest – particularly on potential land acquisitions to gather previously unknown data. Finding a new cave being used by bats would assist the Forest in land management practices in that area and may elevate the rationale for acquiring that land. It would also add to the census knowledge of potential TE species.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Indiana Department of Natural Resources. https://www.in.gov/dnr/fish-and-wildlife/nongame-and-endangered-wildlife/ 2021.

Indiana Department of Natural Resources. 2019. Wildlife Science Report 2019.

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

USDI, Fish and Wildlife Service. 2020. Hibernacula Data

5.12 – Are hibernacula conditions changing?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Hibernacula temperature, humidity and vandalism.

Monitoring Frequency

This is monitored and reported annually or biennially.

Background & Driver(s)

There are three monitoring elements from 36 CFR 219.12 which are addressed with this monitoring question:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (iii) The status of focal species to assess the ecological conditions required under 219.9
>
> (vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area

These items are tied to the Standards and Guidelines of the Forest Plan (3-2, 3-3, 3-4, 3-5, 3-9 and 3-10) with the objective of having a net gain of acres enhanced/improved for TE species and also to provide protection/benefits to TE species for the long term. The Standards and Guidelines that apply to this question include:

- Implement prescribed fire within a five-mile zone around hibernacula only when bats are unlikely to be swarming or staging. Burns should be conducted under conditions that will reduce or eliminate smoke dispersing into hibernacula.
- Considering both public and private ownerships, maintain or promote at least 70 percent forest canopy cover within a one-mile radius of known hibernacula of Indiana bats. Timber harvest should be conducted within this zone only during hibernation and is restricted to single-tree and group selection.
- Prohibit timber harvesting and prescribed burning within 200 feet of cave entrances.
- Cave management will be integrated into general land management practices to protect cave resources from subterranean and surface impacts.

Monitoring Indicator: Hibernacula temperature and humidity

Results

Temperatures and humidity are taken by Indiana Department of Natural Resources (IDNR) and Forest Service personnel during hibernacula monitoring. Weather data is also documented during random cave sampling. No major climatic shifts in cave systems were detected.

Vandalism is not a large issue pertaining to cave resources on the Forest. Breaking of cave formations has not been abundantly documented during annual cave surveys or by other personnel with Forest caving permits. Some sites that are more popular do collect trash and debris. When this is encountered, it is removed when possible by Forest Service staff.

Trash removal

Discussion

Temperature can fluctuate to a small degree in cave systems and may be a minor component in cave monitoring. If a large fluctuation would occur, it would be indicative of a collapse or new opening that could affect the local fauna. To this date, no major temperature fluctuations have been recorded. Cave soil/floor conditions have been noticed (changed) in one cave in the Wesley Chapel Gulf system. More sloughing of floor material down into sinkholes seems to be occurring. This is possibly due to an increase in precipitation or flash flooding events.

Recommendations

The Forest should continue monitoring of new caves when feasible. Also, the Forest should continue re-visiting caves that have not been monitored in several years to determine if changes have occurred. Caves in the Wesley Chapel Gulf area need a more specific soil monitoring plan.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Indiana Department of Natural Resources. 2019. Wildlife Science Report 2019.

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

USDI, Fish and Wildlife Service. 2020. Hibernacula Data.

5.2 – Maintain and Restore Sustainable Ecosystems

5.21 – Are Forest Plan goals for vegetation composition and age class being met?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Acres of various forest types by age

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

A couple of emphasis items in the Land and Resource Management Plan (Forest Plan) for the Hoosier National Forest are age class and species composition. There are two monitoring elements from 36 CFR 219.12 which are addressed with this monitoring question:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

Monitoring Indicator: Acres of various forest types by age

Results

The results shown in the table below were derived from a snapshot of the Forest's Field Sampled Vegetation (FsVeg) Spatial database taken on 1/12/2022. This database is continuously updated as new data is collected and management progresses.

AGE CLASS	FOREST TYPE											
	Aspen-Birch	Lowland Hardwoods	Maple-Beech	Oak-Hickory	Oak-Pine	Mixed Pine	Red Pine	Shortleaf-Virginia Pine	White Pine	Openings	Water	Grand Total
0-9	-	-	571	30	-	-	-	-	-	-	-	601
10-19	-	-	25	100	-	-	-	6	8	-	-	139
20-29	-	122	284	486	38	-	-	35	30	-	-	995
30-39	-	327	3,905	5,188	296	14	36	82	693	-	-	10,541
40-49	26	818	1,725	7,402	1,208	23	11	225	3,639	-	-	15,077
50-59	34	214	1,307	3,017	1,723	269	20	1,838	3,375	-	-	11,797
60-69	41	300	1,328	3,419	2,361	269	76	5,040	1,334	-	-	14,168
70-79	10	242	1,942	4,853	1,343	77	159	3,794	384	-	-	12,804
80-89	-	233	2,237	8,679	840	73	144	1,932	8	-	-	14,146
90-99	-	179	2,886	14,526	309	-	-	86	12	-	-	17,998
100-109	20	41	3,481	20,594	77	40	-	-	2	-	-	24,255
110-119	-	73	2,792	23,734	12	-	-	8	4	-	-	26,623
120-129	-	-	2,011	23,035	118	-	-	-	20	-	-	25,184
130-139	-	10	984	9,451	-	-	-	-	-	-	-	10,445
140-149	-	-	218	3,238	-	-	-	-	-	-	-	3,456
150+	-	-	134	2,019	-	-	-	-	-	-	-	2,153
Unknown	-	25	4,120	174	66	170	-	-	11	-	-	4,566
Openings	-	-	-	-	-	-	-	-	-	6,064	-	6,064
Water	-	-	-	-	-	-	-	-	-	-	1,165	1,165
Grand Total	131	2,584	29,950	129,945	8,391	935	446	13,046	9,520	6,064	1,165	*202,177

*** Roughly 1,800 acres of NFS lands are currently unaccounted for. These areas will be captured in future inventories.**

Forest type by ten-year age classes on the Hoosier National Forest

Discussion

Management for young forest habitat is an area of emphasis in the 2006 Forest Plan. Specifically, desired conditions for management areas 2.8 and 3.3 call for up to 12 and 16 percent of the areas to be maintained as young forest habitat, respectively. This habitat is typically characterized by a young, developing stand of native hardwood species in the 0–9-year age class. At the time of this data pull, there were only 601 acres that were shown in this age class or 0.3 percent of inventoried forest areas. This number is well below the desired amount, but as management continues the percentage of this successional age class will increase.

When Forest Plan implementation began in 2006, timber sales, the primary method used to create 0-9-year-old stands, were coming back online. It can take five years or more to have the required surveys and analysis completed, to prepare and sell a timber sale, and implement the sale. Thus, there is a lag

between planning and implementation. Since planning for timber management continues in new areas of the Forest, we anticipate the next monitoring period will show more progress toward this goal.

The majority of the 0-9-year age class is being created by regenerating non-native pine plantations back to native hardwoods. These pine plantations were established on abandoned agricultural fields during the mid-twentieth century to help stabilize and restore soils. As regeneration harvests continue, we should see a shift from the 23,947 acres of pine shown in Table 1. It is subject to the same lag between planning and implementation.

There are approximately 1,800 acres of NFS lands that are unaccounted for in Table 1. This is due to the ongoing purchase of new parcels that have not been inventoried or have not been added to the database as of this date. Age class is determined by coring a representative tree in each stand and counting annual growth rings. Stand size can range from less than an acre to over 100 acres depending on the site.

Recommendations

The Forest needs to continue implementing the timber program at the Forest Plan prescribed levels. As time progresses, age classes and forest types will begin to change.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question. During the next monitoring cycle, we will be able to compare this table with a new one and better show the changes that have occurred.

References

Field Sampled Vegetation (FsVeg) Spatial Database pull on 1/12/2022.

5.22 – Are populations of species dependent on early successional habitat stable or increasing?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Population of species associated with various habitats

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

This monitoring question addresses two elements from 36 CFR 219.12:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area

Forest Plan guidelines pertinent to early successional habitats include:

- Design projects in a manner that ensures management activities would not adversely affect habitat of sensitive species, unless there is a higher priority concern, such as habitat for threatened and endangered species (FP 3-7)

- Where possible, restore native ecosystems (FP 3-7).

- Generally manage forest openings to provide early successional habitat to benefit wildlife species, provide habitat for native plant communities, add visual variety, and provide for recreation opportunities. Manage the edges of most forest openings as shrubby edge or thickets. Develop and maintain other areas, or portions of shrubby areas, in native forbs and grasses (FP 3-9)

Most birds associated with open habitats have declined in eastern North America since at least the 1950's (Hunter et al. 2001). Populations of mammals that depend on early successional forests or shrub-dominated habitats are declining in portions of eastern United States (Litvaitis 2001) as well.

Regional Forester Sensitive Species for the Hoosier National Forest that are associated with early successional habitats include American woodcock, ruffed grouse, Henslow's sparrow, and barn owl.

Monitoring Indicator: Population of species associated with the various habitats

Results

American Woodcock Survey 2021 - American woodcock singing ground surveys have been conducted during even-numbered years since 2006 on 25 survey routes (22 routes in 2006). Survey efforts nearly doubled in 2010 (44 survey runs vs. 26 and 22 runs in 2006 and 2008, respectively) and have remained relatively stable since then. However, due to COVID workplace restrictions, surveys were not conducted in 2020.

Summary of woodcock surveys 2014-2021					
Year	2014	2016	2018	2021	Total
Birds Observed	21	19	18	4	62
Routes Used	24	summassss25	22	11	-
Survey Runs	44	48	41	27	160
Birds/Run	0.48	0.40	0.44	0.14	0.39

During 2021, only 11 routes (11,260 acres) were surveyed (due to Covid-19), including 8 routes with historically higher rates of detection (≥0.45 birds/run) and 3 routes in the vicinity of proposed forest management projects. However, only 4 woodcock were observed.

An incidental observation of one woodcock was reported in 2021 near Celina Lake, an area with an established survey route.

Ruffed Grouse Survey 2020 & 2021 – Ruffed grouse drumming surveys have been conducted annually on a single route (291 acres) until 2019. Only 1 grouse (not drumming) was observed in 2016 along the

route. Due to very low observation rates of ruffed grouse, Indiana Department of Natural Resources has discontinued annual survey routes.

The last incidental observation of one ruffed grouse was reported in 2018 adjacent to the Mill Creek wildlife opening, one of several nearby areas being actively managed with early successional habitat goals.

Breeding Bird Survey 2020 and 2021 –Eleven survey areas were established in 2016 and contain various habitats in differing stages of early succession. A pattern of surveying roughly half of early successional habitat areas each year and returning every other year was established in 2017. Point-count surveys were not conducted at early successional habitat areas due to lack of funding and an agreement with qualified participants to perform the work.

Occupancy rates of CHJV Conservation Priority Species observed during Breeding Bird Surveys, 2016-2019

	Early Successional Habitat Sites				Forest Sites			
	2016	2017	2018	2019	2016	2017	2018	2019
Forest-Woodland Priority Species								
Cerulean Warbler (a)	<0.01	-	0.01	-	0.03	-	0.02	0.03
Red-headed Woodpecker	0.02	-	0.05	0.01	0.05	0.09	0.09	0.03
Wood Thrush	0.06	0.11	0.11	0.06	0.75	0.88	0.75	0.86
Worm-eating Warbler	0.02	0.01	0.01	-	0.64	0.59	0.58	0.53
Kentucky Warbler	0.04	0.02	0.07	0.04	0.50	0.47	0.60	0.38
Yellow-billed Cuckoo	0.05	0.19	0.24	0.01	0.25	0.62	0.76	0.39
Eastern Wood-peewee	0.06	0.11	0.11	0.07	0.79	0.93	0.80	0.93
Blue-gray Gnatcatcher	0.05	0.11	0.14	0.06	0.14	0.51	0.41	0.40
Grass-Shrubland Priority Species								
Blue-winged Warbler	0.20	0.28	0.15	0.09	0.01	0.03	0.03	0.02
Prairie Warbler	0.49	0.70	0.47	0.48	0.13	0.02	0.15	0.02
Northern Bobwhite (b)	0.15	0.24	0.19	0.16	<0.01	<0.01	0.01	<0.01
Eastern Kingbird (b)	0.04	0.01	0.04	0.01	<0.01	-	-	-
White-eyed Vireo	0.29	0.26	0.37	0.26	0.14	0.04	0.16	0.10
Brown Thrasher	0.13	0.03	0.02	-	0.04	0.05	<0.01	0.01
Yellow-breasted Chat	0.63	0.79	0.75	0.50	0.15	0.08	0.21	0.08
Eastern Towhee	0.43	0.30	0.55	0.45	0.51	0.21	0.48	0.39
Field Sparrow	0.66	0.70	0.54	0.36	0.11	0.03	0.10	0.04
Orchard Oriole	0.02	0.01	0.02	0.01	<0.01	-	0.02	-
Grassland Priority Species								
Henslow's Sparrow (a)	0.29	0.33	0.06	0.35	-	-	-	-
Grasshopper Sparrow	0.03	0.09	0.05	0.04	<0.01	-	<0.01	-
Eastern Meadowlark	0.05	0.01	0.03	0.01	-	-	-	-

(a) Regional Forester Sensitive Species
(b) also listed as a grassland priority species

Discussion

Results show that many species dependent on early successional habitats are supported by current management actions. These include RFSS and species with regional conservation concern. Occupancy rates provided in the table above show the proportion of sites sampled during 4 years of breeding bird survey efforts where species having conservation priority were detected. Areas classified as early successional habits show a higher proportion of bird species associated with grass-shrubland or grassland habitats than birds associated with forest-woodland habitats. Some variation can be expected

from differences in survey conditions and specific sites visited each year. For example, Henslow's sparrow occupied 6% of the sample points in 2018 compared to 29 to 35% in other years. This species is area sensitive and associated with large grassland areas that were not sampled in 2018. The eastern towhee associated with forest edges, forages on the ground or in low vegetation and nests on the ground under a bush or brush pile. It occupied both early successional sites and forested sites about equally since suitable conditions can occur in either. Some species like eastern kingbird, orchard oriole, grasshopper sparrow or eastern meadowlark don't occur in many places or very often on the Hoosier so have low occupancy rates.

Ruffed grouse are problematic due to the spotty distribution of a small population on the Hoosier. Young forests that follow timber harvest operations will provide suitable habitat and should be occupied over time if source grouse populations are nearby.

After peaking in the 1980s, grouse populations in Indiana are declining and its plight reflects a declining early successional habitat base (IDNR, n.d.). The grouse hunting season in Indiana was suspended in 2015 due to low population levels throughout the state. In December 2020, ruffed grouse were added to the "State Endangered" list and are now estimated to exist at extremely low populations levels in about 12 counties.

Purdue University decided to discontinue breeding bird surveys beginning in 2020. Because of this, breeding bird surveys were not completed in May 2020. New qualified participants need to be found and a new agreement for bird surveys needs to be created.

Recommendations

Acquire adequate funding and find qualified participants to re-initiate annual breeding bird surveys on the Hoosier National Forest.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Dunning, J. B., and J. K. Riegel. 2018. Results of the successional habitat bird monitoring survey, Hoosier National Forest, Summer 2016. Final report, Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana. 6 p.

Dunning, J. B., and J. K. Riegel. 2019. Results of the successional habitat bird monitoring survey, Hoosier National Forest, Summer 2017. Final report, Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana. 6 p.

Hunter, W. C., D. A. Buhler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. Wildlife Society Bulletin 29:440-455.

Indiana Department of Natural Resources (IDNR). No date. Ruffed grouse. Available online at https://www.in.gov/dnr/fishwild/3362.htm. Accessed on January 25, 2018.

Litvaitis, J. A. 2001. Importance of early successional habitats to mammals in eastern forests. Wildlife Society Bulletin 29:466-473.

5.23 -- Are populations of species dependent on late seral habitats stable or increasing?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Population of species associated with the various habitats

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

One of the components of the goal to maintain and restore sustainable ecosystems is "use vegetation management to perpetuate and enhance biological diversity. Intersperse vegetative types to provide viable habitat for native species" (FP 2-3). There is an emphasis on "native plants and animal species and communities in management" (FP 2-3).

There are three monitoring elements from 36 CFR 219.12 which are addressed with this monitoring question:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (iii) The status of focal species to assess the ecological conditions required under 219.9

Monitoring Indicator: Population of species associated with the various habitats

Results

Breeding Bird Survey 2020 and 2021 – Nineteen forested survey areas having 472 survey points (3,682 acres) have been surveyed on an alternating year basis since at least 2000. However, point-count surveys were not conducted at forest habitat areas due to lack of funding and an agreement with qualified participants to perform the work.

Discussion

Survey results show that many species dependent on forest habitats are supported by current management actions. These include RFSS and species with regional conservation concern. Occupancy rates provided in the table above show the proportion of sites sampled during 4 years of breeding bird survey efforts where species having conservation priority were detected. Areas classified as forest habitats show a higher proportion of bird species associated with forest-woodland habitats than birds associated with grass-shrubland or grassland habitats. The eastern towhee associated with forest edges, forages on the ground or in low vegetation and nests on the ground under a bush or brush pile. It occupied both early successional sites and forested sites about equally since suitable conditions can occur in either. Other bird species associated with edges, openings, or early-successional forests such as yellow-breasted chat, prairie warbler, and white-eyed vireo were detected in areas of past timber harvest.

Some species like cerulean warbler and red-headed woodpecker don't occur in many places or very often on the Hoosier so have low occupancy rates. The presence of several locally rare, potentially breeding species, such as black-and-white warbler, black-throated green warbler, and blue-winged warbler is encouraging.

Purdue University has decided to discontinue breeding bird surveys beginning in 2020. New qualified participants need to be found and a new agreement for bird surveys needs to be created.

Recommendations

Acquire adequate funding and find qualified participants to re-initiate annual breeding bird surveys on the Hoosier National Forest.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Dunning, J. B., Jr., and J. K. Riegel. 2018. Results of the forest breeding bird monitoring survey, Hoosier National Forest, Summer 2016. Final report, Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana. 9 p.

Dunning, J. B., Jr., and J. K. Riegel. 2019. Results of the forest breeding bird monitoring survey, Hoosier National Forest, Summer 2017. Final report, Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana. 8 p.

5.24 – Are objectives being met through the use of prescribed fire?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Natural community structure (e.g. overstory, midstory, understory ground cover) and fuels

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

This monitoring question addresses three monitoring elements described within 36 CFR 219.12:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

The LRMP mentions prescribed fire in several places regarding ecosystems and including Forest-wide guidance to maintain or restore ecosystems to a pre-fire suppression condition and use prescribed fire to accomplish silvicultural objectives such as oak regeneration. Further site-specific guidance exists in individual management area descriptions but, by and large, ties directly to the two afore mentioned statements. Otherwise, the applicability of prescribed fire is mentioned in all sections of the Forest Plan.

Monitoring Indicator 1: Natural community structure and fuels

Results

Natural community structure is monitored primarily, through the use of before, during, and after growing season photo-plots, collection of basic plot demographics, variable radius plots, and fuels transects. Photos are stored in the 5140 folder of the Forest's Box Drive and are available for analysis without special permission. Qualitative analysis of photo-plots (below) suggest that the objectives of prescribed burns are readily met. Thatch removal, seedbank scarification and stimulation, and understory top-kill is readily achieved. Companion monitoring of a recently burned silvicultural area revealed results of just over 3,000 oak and hickory seedlings per acre post-treatment. However, as canopy position and size of woody individuals increase the effectiveness of prescribed burning is reduced. Quantitative data collection on overstory composition and fuel loading continues in its infancy and not yet available for analysis during this cycle. Areas under the repeated fire treatment appear to enter a state of "desirable", as indicated by LMP, after 3-5 applications of prescribed fire with increasing species diversity and richness.

Example of a before (top), 1-year post burn (middle), 2-year post burn (bottom) 360-degree photo monitoring plot data.

Discussion

Areas monitored can be loosely lumped into three groups: silvicultural, early successional habitat (ESH) maintenance, and natural community restoration. Data collection and analysis on silvicultural burns are in their infancy. Prescribed burning for silvicultural results is well documented in the literature and preliminary qualitative analysis suggest that burning on the Hoosier garners similar successful results.

ESH and natural community restoration burning have been ongoing with a limited amount of pre-treatment data collected, but a substantial amount of post-treatment data collected, albeit in the form of photo-plots. ESH habitats are especially responsive to prescribed fire management when woody encroachment can be limited to diameters of 3" or less and occur in a matrix of grass. The typical rotation for prescribed fire in ESH situations has been 3 years. This works well in the majority of situations however an increased return interval, mechanical treatment, or growing season burn is likely needed is some situations to adequately control woody regeneration or alter structure (grasses vs. forbs).

Prescribed burning to restore barrens communities has been underway for some time on the Forest. Photo-plot analysis has shown a pronounced and desirable response to fire. Herbaceous response is desirable, and understory woody top-kill is effective on smaller (<3" DBH) stems with varying mortality

on larger stems (3-6" DBH). However, the trend of lessening effectiveness as woody diameter increases is believed to hamper several barrens areas from reaching their full potential. Fire intensity great enough to top-kill advanced woody regeneration, especially those individuals that have promoted into the mid-story, is difficult to attain under the predominantly wet weather pattern of the last several years, save 2012. Furthermore, it is surmised that calendar-date restrictions on prescribed burning exclude times of the year when fire can be most effective on larger woody individuals.

Immediate loading of grass, litter, and 1-hour fuels is reduced or eliminated over a majority of areas treated with prescribed fire. In a similar diameter trend produced by woody regeneration, larger fuels (10-1,000-hr + time-lag class fuels) are proportionally less affected as their size increases. The results are not surprising and supported by photos and literature.

Recommendations

Qualitative analysis is currently sufficient to inform management decisions. As monitoring continues in a systematic matter further analysis of quantitative data to convert it into qualitative data for analysis is recommended.

Evaluation of Monitoring Question and Indicator(s)

Current monitoring efforts in the arena of fire effects are currently adequate to address current management decisions overall including adaptive management projects. Current monitoring is designed to consider not only sampling needs but logistical and human resource constraints. Data taken in photographic form is available for further conversion into quantitative formats. Long term trends can best be addressed quantitatively and as the data set grows conversion is possible.

References

None

5.25 -- Are non-native invasive species (NNIS) affecting the sustainability of desired ecosystems?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

There are three areas monitored for NNIS in the Hoosier National Forest. They are listed below with the corresponding monitoring indicator:

- On the ground review of projects associated with aquatic invasive species control efforts (aquatic invasive plants, Eurasian Water Milfoil)
- Regular counts in hibernacula (invasive fungus, *Pseudogymnoascus destructans*, which causes White-Nose Syndrome in bats)
- Mapping and treatment of infestations (invasive species of plants)

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

The following monitoring element from 36 CFR 219.12 is addressed with this monitoring question:

(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems

From HNF Forest Plan F-2: Aquatic weed control keeps boat ramps and beaches from being overrun with submerged or floating aquatic weeds. No equipment has been developed for mechanical control on small scale applications such as exist on the Forest. Herbicides available for use have been selected for environmental safety; will not harm fish, people, or other aquatic organisms; and do not require closure of the lakes to swimming or fishing.

Monitoring Indicator 1: On the ground review of projects associated with aquatic invasive species control efforts

Results

The Forest has been using lake drawdowns to try and control Eurasian Water Milfoil (EWM), an invasive plant species. This control method is weather dependent as a drawdown is used to expose the root crowns of EWM during subfreezing temperatures. In southern Indiana, winter temperatures are highly variable. Keeping lake levels at the desired elevation is also difficult with larger precipitation events becoming the new normal in southern Indiana. Each lake fills and lowers at different rates. The timing of having the lake at the desired level in concurrence with freezing temperatures has proven difficult. Results from the first six years of drawdowns have been mixed due to maintaining lake levels and lack of sustained sub-freezing temperatures.

Discussion

As a low-cost alternative to herbicide application, drawdowns will be used in future years. Six years of drawdowns have been completed on three lakes. Due to lack of sustained sub-freezing temperatures and difficulty in keeping each lake at the desired elevation due to large storm events, the outcome is not what the Forest was hoping for. The initial six-year trial period called for 2 consecutive years of drawdowns on each of three lakes. After three lakes are lowered for 2 years, the drawdown method of EWM control will be reassessed to see if the method is adequately controlling this NNIS.

Monitoring Indicator 2: Regular counts in hibernacula

Results

White Nose Syndrome (WNS) is the main factor believed to be affecting the Indiana bat populations on the Forest. It was first found on the Hoosier in 2010 and lab confirmed in this hibernaculum in 2012. This graph represents the population trend monitoring that has taken place since 2001.

Indiana Bat Hibernaculum Monitoring 2001-2020										
Year	**2001**	**2003**	**2005**	**2007**	**2009**	**2012**	**2014**	**2016**	**2018**	**2020**
MYSO	134	250	177	134	95	73	20	7	4	*

*MYSO = *Myotis sodalis* (Indiana bat)

*No data was recorded in 2020 due to COVID-19 restrictions and region-wide cancelation of bat surveys.

Discussion

White-Nose Syndrome is a disease that affects hibernating bats and is caused by a fungus, *Pseudogymnoascus destructans*, and has been documented in several counties throughout southern Indiana and first found on the Forest in 2010. It is not a physical change, but the presence of this fungus affects the local fauna.

We have no direct measure of its occurrence or influence on bat populations. It arrived in Indiana in 2010 and once it's in a particular cave, it stays there long-term. There is no known, effective management action we can take to influence it at this time (other than avoid spreading it on contaminated clothes or equipment). Annual acoustic bat survey efforts are indirect measures since we can document detection trends, but not actual population counts. The best count data are regular counts in hibernacula.

Monitoring generally occurs during the winter to inspect caves for bat usage. Approximately 5 caves have historic bat survey data on the Forest. Random sampling of other caves also takes place in the winter to look for new TE locations.

Statewide monitoring of sensitive bat species is consistent with Forest findings:

Trends in species populations pre- and post WNS at 13 caves surveyed regularly from 1989-2018			
Species	**Average bats per survey, pre-WNS (1989-2009)**	**2018 count**	**% change from pre-WNS average to 2018**
Myotis sodalias (Indiana bat)	1876.8	1278	-31.9%
Myotis lucifugus (little brown bat)	1672.6	212	-87.3%
Eptesicus fuscus (big brown bat)	54.4	47	-13.5%
Perimyotis subflavus (tri-color bat)	279.8	70	-75.0%
Total	**3883.5**	**1607**	**-58.6%**

Monitoring of TE hibernacula is consistent with state (Indiana Department of Natural Resources) protocols, specifically for the Indiana bat. Indiana bat caves are monitored every other year instead of on a yearly basis.

Monitoring Indicator 3: Mapping and treatment of invasive plant species infestations

Results

Invasive species have many impacts on ecosystems, some that we don't fully understand. The Hoosier has 40 species of invasive plants mapped on the Forest (up 3 since the 2019 Monitoring report). Currently there are 639 mapped invasive infestations in the Forest Service Activity Tracking System (FACTS), totaling 6,244 acres on the Hoosier National Forest. From 2020-2021 there was an additional 297.67 acres of invasive plants mapped and added to the database. The size of infestations range from 0.0008 to 206.3 acres. The mapped infestations in FACTS represent a small percentage of the actual invasive species on the Forest, and in areas with multiple species mapped the acreage is re-counted for each species. Mapping efforts focus on new species or infestations that could be attacked with Early

Detection Rapid Response (EDRR), we do not try to map all infestations we see due to the time and effort this would take to collect and put into the FACTS database. All areas that have been treated, must have an inventory entered for treatment to be reported, so these represent a large number of the inventories currently in the database.

Treated areas are monitored annually and reported in the FACTS database after treatment. Untreated areas are not monitored on a regular basis, but the map of their infestation can be updated in the FACTS database. While COVID-19 initially impacted field work in early 2020, invasive plant work was one of the first activities green-lighted for employees to work on in the field again. Contracts were not impacted either year. Over the 2020-2021 fiscal years, the Hoosier treated 2,940 acres.

Non-native Invasive plant species treatments in 2020 and 2021, by species.

Acres shown include both chemical and mechanical treatments.

Common_Name	***Scientific_Name***	**Acres Treated By Year:**		**Acres Treated Both Years**
		2020	**2021**	
Tree of heaven	*Ailanthus altissima*	30.3	2.9	33.2
Garlic mustard	*Alliaria petiolata*	263.8	168.4	432.2
Small carpetgrass	*Arthraxon hispidus*	20.3	40.5	60.8
Smooth brome	*Bromus inermis*	9.6	-	9.6
Oriental bittersweet	*Celastrus orbiculatus*	83.8	1.6	85.4
Autumn olive	*Elaeagnus umbellata*	158.1	178.4	336.5
Burning bush	*Euonymus alatus*	79.9	18.5	98.4
Ground ivy	*Glechoma hederacea*	1.6	-	1.6
Sericea lespedeza	*Lespedeza cuneata*	153.3	101	254.3
Japanese honeysuckle	*Lonicera japonica*	175.6	307.1	482.7
Chinese silvergrass	*Miscanthus sinensis*	80.9	78.8	159.7
Nepalese browntop	*Microstegium vimineum*	202.9	178.7	381.6
Eurasian watermilfoil	*Myriophyllum spicatum*	7.9	7.9	15.8
Reed canarygrass	*Phalaris arundinacea*	67	68.2	135.2
Common reed	*Phragmites australis*	-	4.5	4.5
Callery pear	*Pyrus calleryana*	-	13	13
Multiflora rose	*Rosa multiflora*	163.7	172.1	335.8
Tall fescue	*Schedonorus phoenix*	-	33	33
Johnsongrass	*Sorghum halepense*	38.2	38.2	76.4
TOTALS		**1536.9**	**1412.8**	**2940.1**

Discussion

Small carpetgrass infestations have been found increasingly during the past two years on the Tell City District. It is suspected that these infestations came up from the Ohio River and/or on equipment used in the area. These infestations are being treated as found, in hopes of halting their spread on Forest Service property, however as we see more along mowed rights-of-way by other groups, the species is likely to continue to spread throughout the area along roadsides and utility corridors. The fast spread of this annual species seems to be as quick and aggressive as Japanese stiltgrass; a neighboring Forest in Ohio (Wayne National Forest) reports that carpetgrass can outcompete stiltgrass. Research on small

carpetgrass is being conducted by USFS Research staff in Morgantown, WV, and the Hoosier plans to send plants/seeds from IN to be included in their future research.

Of note, chemical treatments were used to clear Eurasian milfoil and other vegetation from along the Tipsaw Lake boat ramp at the request of recreational staff for the past two years. The public was complaining that the boat ramp was not accessible, and vegetation was clogging electric boat motors. Since we are only treating the area next to the boat ramp (not the whole lake), this will likely become an annual maintenance project. By reducing vegetation in the primary boat corridor, we hope to reduce the ability of the invasive species to spread via boats to other bodies of water.

Recommendations

In the 2019 Monitoring report, we mentioned the need to find funding and a partner to map invasives in the Charles C. Deam Wilderness area to analyze the potential use of herbicide. A potential partner has been identified, that would help with hiring interns and putting them on a payroll. Now, we just need to find funding, and an agreement could be written to hire and have mapping done in the Wilderness.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Forest Service ACtivity Tracking System (FACTS) database

5.26 -- Is the trend of undesirable occurrence of fire, insects, disease, and other mortality increasing?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Acres of undesirable wildfire relative to total wildfire acres

Acres of infestation by type from forest health flight

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

Forest health is a big concern while monitoring. We need to anticipate problems well before they are prevalent in the area. This gives forest staff the maximum time to react to potential threats.

This monitoring question addresses four elements in 36 CFR 219.12:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (iii) The status of focal species to assess the ecological conditions required
>
> (iv) The status of 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

(vi) Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area

This topic is broad, and it is also important to many of the Goals in the LRMP. These goals are similar to the elements above and include:

- Conservation of Threatened and Endangered Species Habitat
- Maintain and Restore Sustainable Ecosystems
- Maintain and Restore Watershed Health
- Provide for a Visually Pleasing Landscape
- Provide a Usable Landbase
- Provide for Human and Community Development

Monitoring Indicator 1: Acres of undesirable wildfire relative to total wildfire acres

Results

For the calendar years of 2020 and 2021 wildfires reportedly burned approximately 15 acres on Hoosier National Forest lands. None of the acres were found to have sustained stand replacement.

Discussion

Approximately 99% of wildfires on, and around, the Forest are started by human activity with an overwhelming majority starting on private land. In the past eight years no wildfires have been known to start on HNF lands and move onto private land. However, the converse happens with regularity, and many fires are started each year on the HNF and burn in their entirety on the National Forest only. Human behavior regarding wildfire starts is largely regulated by culture or individual county ordinances. In general, fire has been identified as an important disturbance that, when applied appropriately, contributes to forest health. However, under certain circumstances wildfire can impress a negative effect on the ecosystem and threaten both public and private infrastructure. Negative effects are usually considered those resulting in stand replacement from high intensity/severity wildfire. By and large, an effective fuels program that reduces fuel loading while concurrently increasing diversity and overall forest function and health is key to reducing the impact of undesirable wildfire.

During the monitoring period, wildfires on the Hoosier National Forest have not resulted in any undesirable effects. This is based on field evaluation of wildfires on FS lands by the Fuels Specialist and/or Silviculturist. Concurrently, neither drought nor outstanding fire indexes have been present on the Forest during fire season. The lack of either played a significant role in the results.

Monitoring Indicator 2: Acres by damage agent from forest health flight

Results

The results in the table below are derived from the Eastern Region aerial detection surveys flown by the Forest Health Protection Division of the State and Private Forestry Deputy Area, USDA Forest Service. These surveys are conducted on a yearly basis to look for damage caused by pests, pathogens, and other natural disturbance events on the Forest. The acreages displayed in the below table include areas found inside Hoosier National Forest purchase units, including National Forest System lands and adjacent lands falling under other ownership.

Acres of damage-by-damage agent (2017-2021)

DAMAGE AGENT	YEAR					
	2017	2018	2019	2020	2021	Totals
Unknown	399	-	185	24,863	57	**25,504**
Oak Decline	74	1,266	149	-	9,098	**10,587**
Emerald Ash Borer	875	-	759	-	-	**1,634**
Flooding – High Water	-	-	486	-	-	**486**
Wind-Tornado	59	-	298	-	14	**371**
Oak Wilt	6	103	1	-	127	**237**
Locust Leafminer	-	-	135	-	-	**135**
Jumping Oak Gall	-	-	26	-	-	**26**
Agromyzid Fly	-	-	-	4	-	**4**
Unknown Bark Beetle	-	-	1	-	-	**1**
Totals	**1,413**	**1,369**	**2,040**	**24,867**	**9,296**	**38,985**

Discussion

In spring and early summer 2020 heavy defoliation of species in the red oak family occurred across much of the Forest, with the highest intensities occurring on the Pleasant Run Unit. This event comprises most of the 24,863 acres of unknown damage listed in Table 1 for that year. Specific causes could not be identified from aerial surveys, but ground-based investigations by Forest Service and IDNR Specialists more accurately identified the damage agents. The defoliation was caused by a combination of three agents including a late springtime freeze, oak anthracnose, and oak shothole leafminer. Oak anthracnose is a fungal pathogen that thrives during prolonged periods of cool and wet conditions in the spring. Symptoms include browning of leaf tissue along the margins and veins. Oak shothole leafminer is a small fly that feeds on oak leaf buds and young leaves and eventually pierces the leaves to lay eggs inside. This activity creates numerous holes (up to 3/8 inch) in individual leaves. This was the first known widescale outbreak of oak shothole leafminer in southern Indiana. Follow up investigations in 2021 indicated that most of the black and scarlet oaks that were affected have recovered from the defoliation.

Damage to black oak foliage caused by oak shothole leafminer in 2020.

The 9,098 acres of oak decline that were identified during 2021 flights are the most alarming of current damage events. The exact causal agents are still being identified, but *Armillaria* root disease is believed to be the primary cause of the decline. Well-established trees may be infected by this wood rotting disease for long periods without showing symptoms until they are weakened by another stressor such as insect defoliation, drought, increased competition for light and soil nutrients, or attack from other diseases. The largest pockets of decline are currently found in overstocked chestnut oak stands in the Pleasant Run Unit. An exceptional drought hit this area in 2012 and further weakened trees in overstocked stands, making them highly susceptible to the effects of *Armillaria*. Similar pockets of oak mortality are now being identified throughout other parts of the Forest in multiple oak species. Current climate predictions suggest an increase in frequency and intensity of summer drought in southern Indiana, which will likely increase the occurrence of oak decline throughout the Forest.

For nearly a decade (2009-2019) the emerald ash borer (EAB) was responsible for more tree mortality on the Forest than any other disturbance agent. After it's discovery in the late 2000s, it quickly progressed south through all nine counties that encompass the Forest. Attempts were made to slow the spread of EAB in and around the initial infestation area. These attempts utilized pesticides in trees that were stressed to draw in the EAB. While the project could have been successful, it was quickly realized

that EAB was being transported in firewood which allowed it to spread at an alarming rate. This rendered the initial project ineffective. EAB is now found in every county in the State of Indiana and Forest Health Protection now indicates that EAB has caused mortality of nearly all green and white ash trees found on the Forest. Aerial surveys in 2020-2021 did not indicate any new mortality from EAB as most host trees were already documented as dead or dying in previous surveys.

The rest of the damage agents listed in Table 1 are normal for this region, although the effects of climate change are predicted to increase the frequency and intensity of severe flooding and wind events. Populations of pests like jumping oak gall and the occurrence of diseases such as oak wilt will continue to rise and fall and will not have significant effects on the Forest.

Recommendations

As implementation of the Forest Plan continues, the density in the areas of the forest where management is appropriate will decrease. This will increase the resiliency of forest stands and will lessen the chance that a significant pest or pathogen outbreak will occur.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

USDA Forest Service. 2021. Hoosier National Forest Snapshot 2012, Insect and Disease Aerial Survey & Forest Health Protection Activities. Eastern Region, State & Private Forestry, Forest Health Protection, St. Paul Field Office.

USDA Forest Service. 2022. R9 Aerial Detection Survey Dashboard. Available online at: https://usfs.maps.arcgis.com/apps/dashboards/46aa60669da34e919b560f7f1df9ca28 Accessed February 2, 2022.

5.27 -- Are climate stressors (drought, flooding and storm frequency, and/or severity) affecting sustainability?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Acres by forest type

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

As our climate changes it will change the type of vegetation expected on the Hoosier National Forest. This monitoring question addresses four elements in 36 CFR 219.12:

(i) The status of select watershed conditions

(ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems

(vi)Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area

(viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

This question also is addressed in the Hoosier National Forest's plan objectives. The plan emphasizes the maintenance and restoration of sustainable ecosystems and watershed health. Both of these objectives are affected by the changing climate.

Monitoring Indicator: Acres by forest type

Results

The table below shows the results of Field Sampled Vegetation (FSVeg) Spatial data pulls in 2019 and 2021. The data represents acreages of each forest type occurring on the Forest. There are some areas of the Forest that do not have current data and are missing on this table. This is due to the ongoing purchase of new parcels that have not been inventoried or have not been added to the database as of this date. As budgets allow, these areas will be inventoried in the future.

Acres by forest type on Hoosier NF, 2019 and 2021

	FOREST TYPE							
	PINE	**OAK-PINE**	**OAK-HICKORY**	**LOWLAND HARDWOODS**	**MAPLE-BEECH**	**ASPEN-BIRCH**	**WATER & OPENINGS**	**TOTALS**
2019	23,805	8,944	129,741	2,679	28,598	287	8,489	202,543
2021	23,947	8,391	129,945	2,584	29,950	131	7,229	202,177

Stands are also being re-delineated as new areas are inventoried to better match NFS ownership. This explains the drop in total acreage between 2019 and 2021.

Another way to estimate long-term forest trends is by utilizing data from the Forest Inventory and Analysis (FIA) program. FIA measures several plots each year, but these plots need to be analyzed at a state level to be meaningful. There are 3,810 plots across the State, of which 1,021 are currently forested. Approximately 10-20 percent of the plots are visited and measured each year. The most current FIA data indicates a 4.9 percent decrease in annual gross growth in Indiana between 2014 and 2019.

Other climate related indicators of forest sustainability include the frequency of damage from weather events and forest pests and pathogens. Data collected from aerial detection surveys conducted by the Forest Health Protection Division of State and Private Forestry offer a good illustration of recent trends. Since 2019, an estimated 312 acres of wind damage has been documented on the Forest. This includes a tornado event that hit the Charles C. Deam Wilderness area in 2019. A flood event also occurred in 2019 around Patoka Lake, causing 486 acres of mortality in the area. Furthermore, 9,098 acres of oak decline were documented across the Forest in 2021. Climate related stress is likely playing a role in the

oak mortality, but further research is being conducted to pinpoint the exact agents at play. More information on forest health issues can be found in Section 5.26.

Discussion

The table above serves as a baseline for the species groupings in 2019 and 2021. Forest types are an important indicator of an area's resiliency and productivity in a changing climate. The range and abundance of species are expected to fluctuate under future climate change scenarios and as this table changes, it will better indicate the effects of climate stressors on forest sustainability.

Climate change will affect patterns of forest growth and species succession. Climate effects need to be analyzed over a long period and could have a broad range of impacts on the Forest beyond rate of growth, which makes this question difficult to answer. The overall decrease in annual gross growth within the State could be partially attributed to climate change, but it is likely due to a combination of drivers. For example, many forest stands are becoming more overstocked due to lack of disturbance. This alone can create a reduction in available resources, and when combined with more frequent and intense droughts the overall growth will become increasingly stagnated. As the monitoring program progresses throughout time, data discussed here will become more meaningful.

Weather related disturbance and mortality events are expected to increase over the next 100 years in southern Indiana. As more data is collected via aerial surveys, climate related trends of weather and insect and disease damage on Forest should become more apparent. Recently collected data will act as a baseline for identifying future trends.

Recommendations

As climate modeling improves, the Forest needs to consider that some species may no longer be appropriate for this region while others may become important. The Climate Change Atlas for Tree Species should be utilized when assessing the adaptability of species currently found on Forest. For example, non-native eastern white pine is given the lowest adaptability rating on the Climate Change Atlas for Trees. White pine stands should continue to be converted to native hardwoods to create a more resilient landscape. The Atlas can also help identify species that are predicted to shift into our area as the climate changes and their habitat moves north. Shifts in species will be tracked at the Forest-level by the FSVeg Spatial data table through time. In future monitoring reports, the Forest should expect to see a transition from pine to species groups that are or will become native to the area.

Evaluation of Monitoring Question and Indicator(s)

This is a difficult question to answer in the short run and at a narrow spatial scale. It may become more meaningful as time progresses. Consideration will be given to relevant research on a broader scale, at the landscape, statewide and regional levels, to inform future decision making.

References

Field Sampled Vegetation (FsVeg) Spatial Database pull on January 12, 2022.

USDA Forest Service. 2020. Forests of Indiana, 2019. Resource Update FS-238. Madison, WI: U.S. Department of Agriculture, Forest Service. 2p. https://doi.org/10.2737/FS-RU-238 .

USDA Forest Service. 2021. National Forests and Grasslands, Climate Change Atlas Tree Species, Current and Potential Future Habitat, Capability, and Migration, Hoosier National Forest. www.fs.fed.us/atlas .

USDA Forest Service. 2022. R9 Aerial Detection Survey Dashboard. Available online at: https://usfs.maps.arcgis.com/apps/dashboards/46aa60669da34e919b560f7f1df9ca28 Accessed February 2, 2022.

5.28 -- Are forest management systems substantially and permanently affecting the productivity of land?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Forest regeneration

Forest soil properties

Monitoring Frequency

This is monitored annually to every 10 years depending on indicator.

Background & Driver(s)

This monitoring question addresses two elements in 36 CFR 219.12:

> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems
>
> (vi)Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area

Monitoring Indicator 1: Forest regeneration

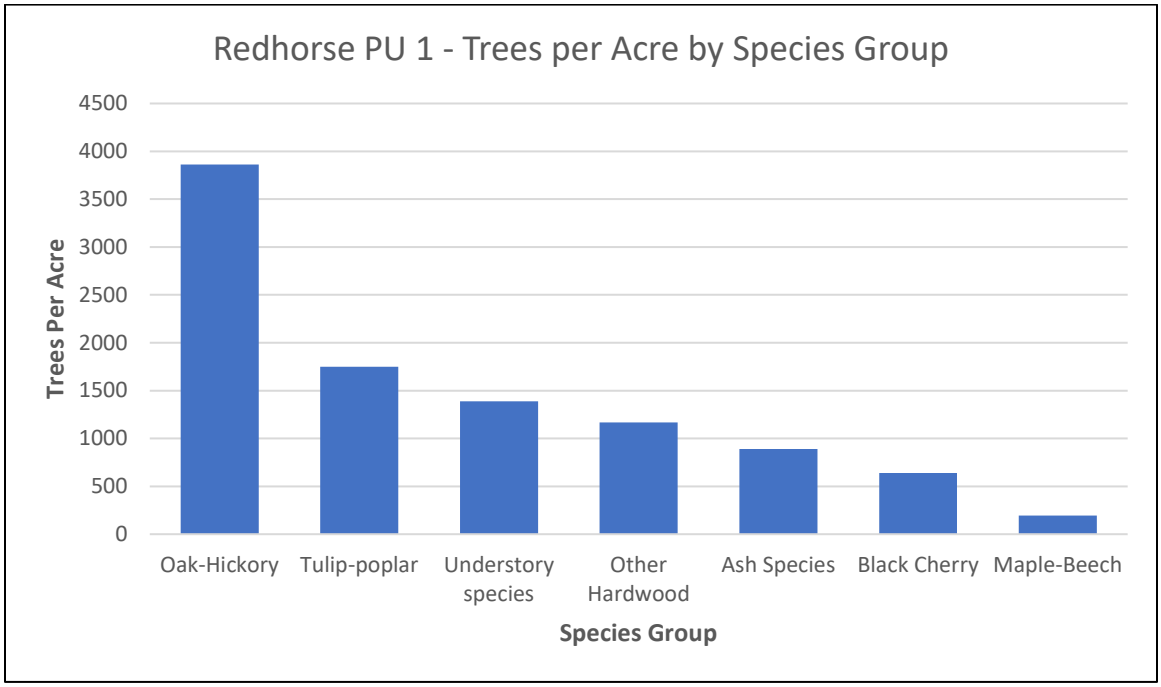
Results

In accordance with Forest Service Manual 2470.3, regeneration harvests and reforestation practices must be designed to assure that lands are satisfactorily restocked within 5 years of regeneration harvest. As of 2021, 100 percent of regeneration harvests on the Forest have been certified as

regenerated within 5 years. Most sites on the Forest regenerate naturally. Forest management activities do influence the species composition in some treatment areas by using tools such as prescribed fire to favor fire tolerant species. In other areas, herbicides have been used to release native species that are being out competed by non-native invasive species such as *Ailanthus altissima* (Tree of Heaven). Both treatments have been successful and are important tools for continued success.

Discussion

The Forest completes stocking surveys during the leaf-on period after the first and third growing season following treatment. This includes a combination of walk-through and plot surveys. Walk-through surveys are conducted by walking through the treatment area and making ocular observations of number and type of reproduction stems. Plot surveys utilize 1/500th acre randomly placed plots within the treatment area to collect quantitative data including the number, height, and species of reproduction stems. The figure below summarizes results of plot-based data collected after the first growing season following a shelterwood regeneration treatment in the Uniontown North Restoration Project. Forest Plan guidelines require at least 150 crop trees per acre to certify the oak-hickory forest type as regenerated. In areas where oak-hickory isn't an emphasis, the same number is used. Exams have shown several thousand trees per acre after harvest, so regeneration hasn't been a problem on the Forest.



Results of plot-based stocking surveys following a shelterwood treatment in payment unit 1 of the Redhorse Timber Sale - Tell City Ranger District, Hoosier National Forest.

Monitoring Indicator 2: Forest soil properties

Results

Soil quality monitoring is conducted annually to ensure soil conservation practices and management prescriptions designed to maintain soil quality have been implemented and are effective. The intent is to

determine if site-specific project design features maintained the soil resource in an acceptable condition. Effectiveness monitoring on the HNF is primarily done through qualitative assessments using the standardized Forest Soil Disturbance Monitoring Protocol developed by the Rocky Mountain Research Station and San Dimas Technology and Development Center which provides a statistically robust rapid assessment method for consistent monitoring of both pre and post-activity soil disturbance on National Forest System lands (Page-Dumreose et al. 2009a and b, Napper et al. 2009). Selected harvest and prescribed burn units are evaluated for detrimental soil conditions such as rutting, compaction or erosion and charring that may result from heavy equipment used in harvest or burn activities. The degree, extent and distribution of soil disturbance is documented and compared to the Regional soil quality standards. Additional quantitative monitoring may be conducted when qualitative assessments of management practices appear to have produced unacceptable results.

During fiscal years 2020 and 2021, HNF monitored and recorded soil resource impacts from timber harvest activities on 8 harvest units on 3 timber sales (Good Neighbor, Redhorse, and Six). Pre-monitoring was done on 3 harvest units on 1 timber sales (Longhorn). One post monitoring disturbance was done for a prescribed burn at Roland Wetland. Units were evaluated quantitatively by transecting the units using the standardized protocol, with both approaches assessing the degree and extent of soil compaction, rutting, displacement and erosion. Information and findings were documented for each harvest unit sampled. All other harvest areas monitored were well below soil quality threshold values for detrimental soil disturbance from harvest activities and were in compliance with Regional soil quality standards and Forest Plan soil guidelines.

Discussion

Although all soil disturbance monitoring done for 2019-2020 indicated no detrimental effects to the watershed, landings and main skid trails to the landing are an area of concern still due to compaction. The Hoosier is still involved with a research project within Region 9 involving researchers and sites at other forests to see what adaptive management strategies would mitigate compaction and revegetation at faster rates. Subsoiling, biochar application, and using pollinator vegetation are all new practices to be researched.

Forest Service personnel applying biochar to a timber landing.

Recommendations

First and third year stocking surveys should continue to be utilized to assess regeneration of native hardwood species following regeneration treatments. Establishment of adequate amounts of new hardwood reproduction will continue to be an important indicator for this monitoring question.

New and adaptive management strategies need to be assessed in mitigating compaction and erosion. Highly disturbed areas, where landings and skid trails are located, need more intensive management strategies such as: seeding in season, subsoiling, revegetating with native plants for pollinators, and adding nutrients. These adaptive strategies should help recover soil productivity lost in these highly disturbed areas.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to the LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Page-Dumroese, D.; Abbott, A.M., Rice; T.M. 2009a. Forest soil disturbance monitoring protocol, volume 1 – rapid assessment. FS-WO-82a. Moscow, ID: USDA, FS, Rocky Mountain Research Station, 29p

Page-Dumroese, D.; Abbott, A.M.; Rice, T.M. 2009b. Forest soil disturbance monitoring protocol, volume 2 – supplementary methods, statistics, and data collection. FS-WO-82b. Moscow, ID: USDA, FS, Rocky Mountain Research Station, 64p

Napper, C.; Howes, S.; Page-Dumroese, D. 2009. Soil-disturbance field guide. 0819 1815-SDTDC. San dimas, CA: San Dimas Technology Center. 103p

5.29 -- Is ecosystem health maintained or improved?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Wood Frog population trends

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

This monitoring question addresses one element in 36 CFR 219.12:

> (iii) The status of focal species to assess the ecological conditions required under 219.9

Desired condition is the component that this question is tied to. The 2012 Planning Rule requires that a Forest has a focal species to monitor.

Monitoring Indicator: Wood Frog population trends

Results

Because most amphibian species possess a complex life cycle (distinct aquatic larval and terrestrial juvenile-adult phases), the loss or alteration of either aquatic or terrestrial habitats by timber extraction or other land management can negatively affect them. Furthermore, although aquatic habitats are necessary for reproduction, juveniles and adults of most species spend the majority of their lives in terrestrial environments (Semlitsch et al. 2009). They also possess small home ranges and have relatively limited dispersal capacity, compared with mammals or birds.

Anurans may be more suitable than salamanders for environmental monitoring because vocalizations by males and presence of egg masses during the breeding season can provide two population indices. Specifically, wood frogs (*Lithobates sylvaticus*) are suitable for investigations into animal dispersal (Regosin et al. 2005, Patrick et al. 2008), hydroperiods (Karraker and Gibbs 2009), timber harvest (Blomquist and Hunter 2010, Popescu et al. 2012), prescribed fire (Ford et al. 1999), and urbanization (Skidds et al. 2007).

In 2021, four ponds were surveyed within the Buffalo Springs Restoration Project area. Two of the ponds contained green sunfish, while the other two were either dominated by wood frogs, Jefferson salamanders, or spotted salamanders. Amphibians are an integral part of aquatic and riparian habitats, as they constitute both top predators in some environments and essential prey in others.

Discussion

The current methods and strategies for monitoring wood frogs have been inconsistent, exacerbated by government shutdowns, the covid pandemic, and the current state of being understaffed. It will take a couple more years to get a consistent dataset to see any changes in the use of habitat. Once we have a set of ponds that are used annually by wood frogs, we can monitor not only annual use, but also the number of egg masses and clutches found annually.

Recommendations

None

Evaluation of Monitoring Question and Indicator(s)

Since this is a new indicator, it's difficult to evaluate the effectiveness. It will not be until after the Forest establishes baseline data and then commences a project that could have impacts on wood frog populations, that the effectiveness of this indicator can be evaluated.

References

Blomquist, S. M., and M. L. Hunter, Jr. 2010. A multi-scale assessment of amphibian habitat selection: Wood frog response to timber harvesting. Ecoscience 17:251-264.

Ford, W. M., M. A. Menzel, D. W. McGill, J. Laerm, and T. S. McCay. 1999. Effects of a community restoration fire on small mammals and herpetofauna in the southern Appalachians. Forest Ecology and Management 114:233-243.

Karraker, N. E., and J. P. Gibbs. 2009. Amphibian production in forested landscapes in relation to wetland hydroperiod: A case study of vernal pools and beaver ponds. Biological Conservation 142:2293-2302.

Patrick, D. A., E. B. Harper, M. L. Hunter, Jr., and A. J. K. Calhoun. 2008. Terrestrial habitat selection and strong density-dependent mortality in recently metamorphosed amphibians. Ecology 89:2563-2574.

Popescu, V. D., D. A. Patrick, M. L. Hunter, Jr. , and A. J. K. Calhoun. 2012. The role of forest harvesting and subsequent vegetative regrowth in determining patterns of amphibian habitat use. Forest Ecology and Management 270:163-174.

Regosin, J. V., B. S. Windmiller, R. N. Homan, and J. M. Reed. 2005. Variation in terrestrial habitat use by four pool-breeding amphibian species. Journal of Wildlife Management 69:1481-1493.

Semlitsch, R. D., B. D. Todd, S. M. Blomquist, A. J. K. Calhoun, J. W. Gibbons, J. P. Gibbs, G. J. Graeter, E. B. Harper, D. J. Hocking, M. L. Hunter, Jr., D. A. Patrick, T. A. G. Rittenhouse, and B. B. Rothermel. 2009. Effects of timber harvest on amphibian populations: Understanding mechanisms from forest experiments. BioScience 59:853-862.

Skidds, D. E., F. C. Golet, P. W. C. Paton, and J. C. Mitchell. 2007. Habitat correlates of reproductive effort in wood frogs and spotted salamanders in an urbanizing watershed. Journal of Herpetology 41:439-450.

5.3 – Maintain and Restore Watershed Health

5.31 – Are select watersheds functioning properly?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Number and species richness (fish and benthic macroinvertebrates)

Index of Biotic Integrity (fish and macroinvertebrates)

Qualitative Habitat Evaluation Index

Monitoring Frequency

This is monitored annually and report biennially.

Fish sampling crew collecting fish.

Background & Driver(s)

This monitoring question addresses one element in 36 CFR 219.12:

(i) The status of select watershed conditions

Desired condition is the component that this question is tied to. In 2020 and 2021, stream surveys commenced in the Buffalo Springs Restoration Project area. This project area is unique in that it is drained by two large watersheds: the Patoka River and the Lost River. Most of the project area is in the Patoka River watershed, with a small portion in the Lost River watershed.

Monitoring aquatic communities in the watersheds within project areas allows the Forest a view into the impact of large-scale restoration efforts on the landscape. Species Richness, Index of Biotic Integrity (IBI), and Qualitative Habitat Evaluation Index (QHEI) are tools that adequately describe conditions within a watershed. The IBI is an index used to categorize fish communities in streams. The Indiana Department of Environmental Management uses the IBI as one tool to decide if a stream is put on the 303d list for impaired waters. QHEI is used to categorize the quality of stream habitat at each sampling site. The IBI and QHEI are explained in further detail below. Macroinvertebrate communities can also be monitored. The Forest is currently in the middle of a 5-year challenge cost share agreement to survey benthic macroinvertebrate communities across the forest.

Monitoring Indicator 1: Number and species richness

Results

2020-2021 Buffalo Springs - Fish Species		
Genus	**Species**	**Common Name**
Lampetra	aepyptera	least brook lamprey
Dorosoma	cepedianum	gizzard shad
Esox	americanus	grass pickerel
Notemigonus	crysoleucas	golden shiner
Semotilus	atromaculatus	creek chub
Campostoma	anomalum	central stoneroller
Pimephales	notatus	bluntnose minnow
Chrosomus	erythrogaster	southern redbelly dace
Luxilus	chrysocephalus	striped shiner
Lythrurus	umbratilis	redfin shiner
Catostomus	commersoni	white sucker
Moxostoma	erythrurum	golden redhorse
Hypentelium	nigricans	northern hogsucker
Minytrema	melanops	spotted sucker
Noturus	gyrinus	tadpole madtom
Ameiurus	natalis	yellow bullhead
Aphredoderus	sayanus	pirate perch
Fundulus	notatus	blackstripe topminnow
Cottus	carolinea	banded sculpin
Morone	mississippiensis	yellow bass
Ambloplites	rupestris	rock bass
Lepomis	cyanellus	green sunfish
Lepomis	gulosus	warmouth
Lepomis	macrochirus	bluegill
Lepomis	megalotis	longear sunfish
Lepomis	microlophus	redear sunfish
Micropterus	dolomieu	smallmouth bass
Micropterus	salmoides	largemouth bass
Etheostoma	spectabile	orangethroat darter
Etheostoma	nigrum	johnny darter
Etheostoma	blennioides	greenside darter
Etheostoma	caeruleum	rainbow darter
Etheostoma	flabellare	fantail darter
Percina	caprodes	logperch

Percina	maculata	blackside darter

2020 Buffalo Springs - Fish Survey Results						
Stream	**Station**	**# Species**	**IBI**	**Rating**	**QHEI**	**Rating**
French Lick Creek	CR 590W	19	40	Fair	67.5	Good
Cane Branch	CR 990S	6	34	Poor	58.5	Good
Youngs Creek	CR 560S	7	42	Fair	55	Good
Hogs Defeat Tributary	CR 700S	4	14	Very Poor	55	Good
Patoka River	CR 175W	18	44	Fair	67	Good
Patoka River	CR 910S	19	44	Fair	62	Good
Patoka River	CR 425E	14	40	Fair	66	Good
Patoka River Tributary	CR 425E	Dry at time of sampling				

2021 Buffalo Springs - Fish Survey Results						
Stream	**Station**	**# Species**	**IBI**	**Rating**	**QHEI**	**Rating**
French Lick Creek	CR 590W	19	52	Good	68.5	Good
Cane Branch	CR 990S	8	30	Poor	64	Good
Youngs Creek	CR 560S	9	40	Fair	63.5	Good
Hogs Defeat Tributary	CR 710S	7	40	Fair	66.5	Good
Hogs Defeat Tributary	CR 700S	3	24	Very Poor	59	Good
Patoka River	CR 175W	20	36	Poor	69	Good
Patoka River	CR 910S	21	44	Fair	60	Good
Patoka River	CR 425E	12	40	Fair	67	Good
Patoka River Tributary	CR 425E	3	32	Poor	55	Good

Discussion

Nine sites were chosen to be sampled, 1 in the Lost River watershed and 8 in the Patoka River watershed. Eight of the nine sites were sampled in 2020, as one site was dry and thus contained no fish. All nine locations were sampled in 2021. These sites will be sampled again in 2022 to get a three-year baseline of aquatic conditions and stream health before the start of the timber harvesting efforts within the project area. Drainage areas of the sample sites range from 0.46 mi^2 to 46.77 mi^2.

The fish communities observed in the streams within the project boundary are a mix of common species found in southern Indiana (Simon 2011). Fantail darters (*Etheostoma flabellare*) are species indicative of headwater streams, and this species was present at 6 of 9 sampling sites. Headwater streams are an extremely important part of any riverine ecosystem (Lowe and Likens 2005). Primary production takes place in headwater streams and the energy produced is cycled downstream to fuel biological

communities. Headwater streams are important as spawning, nursery, and rearing areas for native fish species. The reason many fish species move upstream in the spring is to spawn in headwater tributaries.

Several of the most abundant species collected are considered pioneer species (Simon and Dufour 2005). This includes bluntnose minnow, orangethroat darter, creek chub (*Semotilus atromaculatus*) and a few others. The term pioneer species usually has a negative connotation. Pioneer species refers to species that are the first to re-colonize an area after a disturbance or impact. In these streams, the largest disturbances are the extremely flashy nature of the local hydrology that leaves much of the stream dry during the summer and can quickly rise and flood during spring rains. These pioneer species can sustain themselves in shallow pools until rain events affect the flow regime. In these watersheds, this is a natural phenomenon. However, these streams are very susceptible to other anthropogenic disturbances.

Monitoring Indicator 2: Index of Biotic Integrity

Results

See above tables for Index of Biotic Integrity results.

Discussion

The Index of Biotic Integrity (IBI) is the system that is used to assess the local fish communities. The IBI was developed by Dr. James Karr in 1981 as a tool for assessing water/stream quality based on the fish communities that are present. The IBI is a great tool in that complex biological information can be analyzed to provide measurements of stream quality for non-biologists and members of the general public. The IBI is comprised of 3 broad categories (species composition, trophic composition, and fish condition) which are broken down into 12 smaller categories, known as metrics. These metrics are given a score based on their similarity to least impacted (reference) sites. One of 3 scores can be given for each metric: 1 (not similar to reference conditions), 3 (somewhat similar to reference conditions), or 5 (very similar to reference conditions). In general, the total score for a site will range from 12 to 60, but in an instance where no fish are present at a site, a score of 0 is given. These scores can then be graphed and placed into 1 to 5 classifications (very poor, poor, fair, good, or excellent), which describes the overall condition of the fish community being monitored.

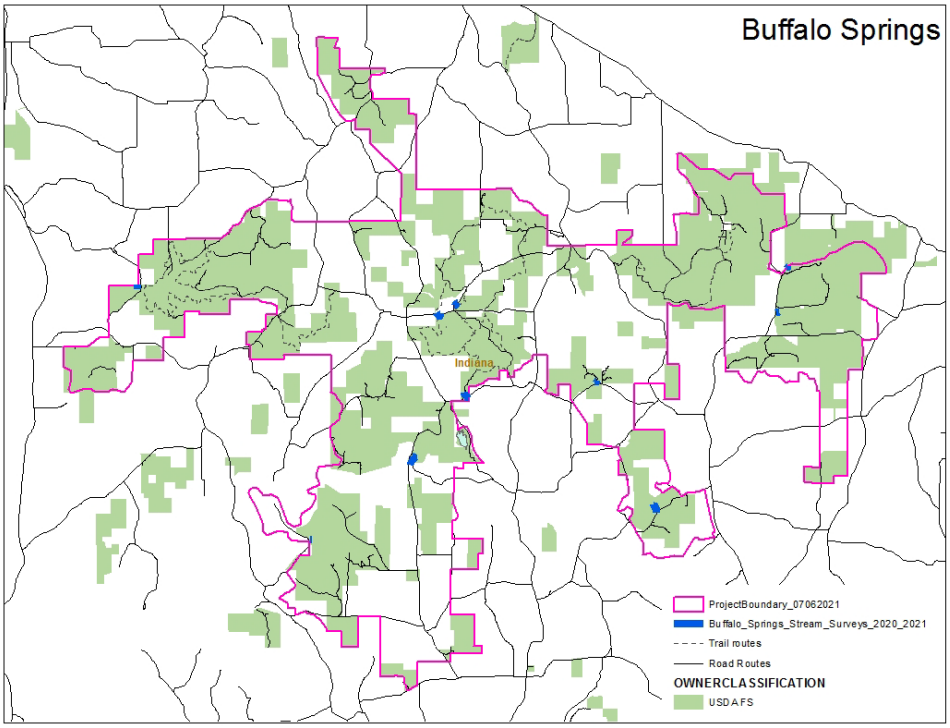
Buffalo Springs

As can be observed from the above tables, IBI scores are fairly correlated with number of species. Hence the more species collected, the higher the IBI in most cases for these 9 sites. The outlier site in 2021 was the most downstream Patoka River Site. While Patoka River CR 175W had nice diversity, many of the species collected are classified as tolerant and pioneer species. Many of these species are also omnivores. IBI scores also get higher as we move downstream in the watershed and the individual sites have a larger drainage area. For this watershed, it makes sense since the upper reaches start to dry up and cannot support large numbers of fish or high diversity. The low IBI scores on the upstream sites are attributed to the hydrology and the number of tolerant and pioneer species present at the time of sampling. IBI scores increase slightly as sampling moved downstream. More species were present and larger numbers of intolerant and specialist species were collected.

None of the 9 sites sampled could be labeled as extremely healthy stream reaches from a biological standpoint. The Indiana Department of Environmental Management (IDEM) states that an IBI score of

36 or higher means the stream is at least minimally functioning for aquatic life usage. Three of the nine sites fall below this line and would be eligible to be placed on the 303(d) list for impaired waters.

However, IBI scores can sometimes be misleading. It is currently the best tool we have to assess in stream aquatic health. The fact that an average of 13 species were found in Patoka River at CR 425E with a drainage area less than 5 square miles is quite impressive. Over 20 native species were collected at the other 2 Patoka River sites.



Project boundary and stream sampling locations for Buffalo Run

Monitoring Indicator 3: Qualitative Habitat Evaluation Index

Results

See above tables for Qualitative Habitat Evaluation Index results.

Discussion

The Qualitative Habitat Evaluation Index (QHEI) is similar to the IBI in its structure. It was developed by Ed Rankin of Ohio EPA in 1988 to complement the IBI for use in Midwestern streams. The QHEI has 6 broad categories which are broken down into 21 smaller categories or metrics. This index will have a final score of 0 to 100 and the scores will be classified as excellent, good, fair-good, poor, and very poor. This assessment helps determine to what extent the IBI scores are being affected by habitat. It can also help identify specific habitat degradation issues that need to be addressed.

Buffalo Springs

QHEI scores all rated good for the 9 sites, so habitat does not seem to be a limiting factor. The extremely flashy hydrology is playing a major role in the ecological health of these watersheds. Water

quality data were collected at these sites. There are no concerns with water temperature, dissolved oxygen, or pH at any of the 9 sites.

In 2020, 6 sites were sampled for benthic macroinvertebrates within the project area. Specimens were identified to the lowest taxonomic level feasible for data analyses methodologies. The taxa were then categorized based on tolerance, habit values, and functional feeding groups. Calculation of the Macroinvertebrate IBI (mIBI) adhered to the methods outlined in the Ohio EPA biological criteria manual (IDEM, 2020).

As shown in the tables below, all but one of the streams sampled in 2020 were deemed to be not impaired, based on Indiana Department of Environmental Management (IDEM) standards. A stream with an mIBI score of less than 36 is deemed "impaired" or "not supportive" of quality aquatic life (IDEM, 2020). Those with an mIBI score of 36-44 qualify as a "fair" integrity class and usually means intolerant and sensitive species are absent, while a score of 45-52 qualifies as "good" and may mean sensitive species are present and there is a particular decrease in tolerant species. This evaluation is similar to that of fish IBI scores and attributes. The breakdown of the mIBI calculations can be seen below. The mIBI of each stream is then compared to the narrative rating breakdown of similar streams in corresponding ecoregions.

French Lick Creek's low mIBI score can be correlated to the larger percentage of collectors/filterers versus predators, shredders/scrapers, and sprawlers. This suggests an imbalance in the trophic structure, which can give an insight into the patterns of consuming and producing organisms that are affected by different impairments (Office of Water, 2002). The overwhelming presence of collectors/filterers is indicative of an abundance of good quality fine particulate organic matter (FPOM) food supply.

Macroinvertebrate results for stream sites within the Buffalo Springs Project Area watershed, July 15-17, 2020.

Buffalo Springs Sampled Sites for Macroinvertebrates								
Stream	**Station**	**Drainage (mi^2)**	**Indiana DEM mIBI score**	**Indiana DEM mIBI Rating**	**Indiana DEM mIBI Rating**	**Qual. Sample #EPT taxa**	**Qual. Sample #Sensitive**	**Ohio EPA Narrative Rating**
Cane Branch	CR 990S	1.497	46	Good	Not impaired	11	9	Good
French Lick	CR 590W	7.644	34	Poor	Impaired	12	7	Marginally Good
Patoka R.	CR 910S	20.3	44	Fair	Not impaired	14	13	Good
Patoka R	CR 175W	46.77	42	Fair	Not impaired	19	14	Very Good
Patoka R Trib	CR 425 E	1.09	42	Fair	Not impaired	12	12	Good
Youngs Ck.	CR 560S	2.15	46	Good	Not impaired	15	14	Very Good

Other Sites

Macroinvertebrate sampling was performed in 2020 within 6 sites outside of the Buffalo Springs Project area. The results from the sampling are in the table below. The macroinvertebrate data is collected through an agreement. The availability of this data for future years is budget dependent. It is recommended to try and obtain as much of this data as possible to have a full understanding of the aquatic communities.

Macroinvertebrate results for stream sites outside of the Buffalo Springs Project Area watershed, July 15-17, 2020.

Stream	Station	Drainage	Indiana DEM mIBI score	Indiana DEM mIBI Rating	Qual. Sample #EPT taxa	Qual. Sample #Sensitive	Ohio EPA Narrative Rating
Henderson	Ust HumbackBridge	13.5	44	Not impaired	8	6	Marginally Good
Little Blue R.	Governors Trace	33.5	38	Not impaired	16	17	Good
Little Blue R.	SR 237	83.9	42	Not impaired	21	20	Exceptional
Mill Cr.	Mill Creek Rd.	5.59	34	Impaired	6	5	Fair
Otter Ck.	Governers Trace	18.6	40	Not impaired	12	9	Marg. Good
Stinking Fork	Esary Rd.	21.6	40	Not impaired	10	6	Marginally Good

Appendix Table A-1. Indiana Macroinvertebrate IBI metrics and values from the Hoosier National Forest sampled by MBI in 2019.

River Mile	Date	Drainage Area (sq mi)	Total Organisms	Number of: Total Taxa	EPT Taxa	Dipteran Taxa	% Orth/Tany as Chiro-nomids	Percent: Non-Insect minus Crayfish	Intol. Taxa	Tol. Taxa	Predators	Shredders/ Scrapers	Collector/ Filterers	Sprawlers	*MIBI*
Little Blue River (94-240)															
Year: 2020															
2.00	07/16/2020	83.95	154(3.0)	30(3.0)	14(5.0)	3(1.0)	0(5.0)	16.9(5.0)	33.8(5.0)	3.2(5.0)	9.1(1.0)	28.6(5.0)	18.8(3.0)	0.6(1.0)	42.0
3.00	07/16/2020	33.54	190(3.0)	34(3.0)	13(5.0)	7(3.0)	56(1.0)	7.9(5.0)	35.3(5.0)	0.0(5.0)	12.1(1.0)	21.1(5.0)	42.6(1.0)	1.6(1.0)	38.0
Stinking Fork (94-241)															
Year: 2020															
1.00	07/16/2020	21.65	92(1.0)	23(3.0)	12(5.0)	5(1.0)	0(5.0)	2.2(5.0)	67.4(5.0)	2.2(5.0)	2.2(1.0)	13.0(3.0)	5.4(5.0)	1.1(1.0)	40.0
Mill Creek (94-242)															
Year: 2020															
1.00	07/16/2020	5.59	48(1.0)	17(1.0)	4(3.0)	8(3.0)	14(5.0)	4.2(5.0)	27.1(3.0)	0.0(5.0)	4.2(1.0)	8.3(1.0)	4.2(5.0)	2.1(1.0)	34.0
Henderson Creek (94-704)															
Year: 2020															
1.00	07/17/2020	0.00	92(1.0)	24(3.0)	11(5.0)	4(1.0)	0(5.0)	9.8(5.0)	52.2(5.0)	9.8(5.0)	19.6(3.0)	39.1(5.0)	5.4(5.0)	0.0(1.0)	44.0
French Lick Creek (94-740)															
Year: 2020															
1.00	07/15/2020	7.64	99(1.0)	22(3.0)	9(5.0)	1(1.0)	0(5.0)	9.1(5.0)	65.7(5.0)	4.0(5.0)	9.1(1.0)	7.1(1.0)	54.5(1.0)	1.0(1.0)	34.0
Cane Branch (94-741)															
Year: 2020															
1.00	07/15/2020	1.50	96(1.0)	22(3.0)	11(5.0)	2(1.0)	0(5.0)	5.2(5.0)	62.5(5.0)	2.1(5.0)	5.2(1.0)	35.4(5.0)	1.0(5.0)	21.9(5.0)	46.0
Youngs Creek (94-742)															
Year: 2020															
1.00	07/15/2020	2.75	80(1.0)	23(3.0)	8(5.0)	4(1.0)	0(5.0)	15.0(5.0)	46.3(5.0)	1.3(5.0)	5.0(1.0)	35.0(5.0)	3.8(5.0)	17.5(5.0)	46.0

River Mile	Date	Drainage Area (sq mi)	Total Organisms	Number of			% Orth/Tany as Chiro-nomids	Percent:							MIBI
				Total Taxa	EPT Taxa	Dipteran Taxa		Non-Insect minus Crayfish	Intol. Taxa	Tol. Taxa	Predators	Shredders/ Scrapers	Collector/ Filterers	Sprawlers	
Otter Creek (94-744)															
Year: 2020															
1.00	07/16/2020	18.63	79(1.0)	24(3.0)	8(5.0)	4(1.0)	50(1.0)	5.1(5.0)	54.4(5.0)	6.3(5.0)	21.5(3.0)	30.4(5.0)	1.3(5.0)	2.5(1.0)	40.0
Patoka River (94-900)															
Year: 2020															
1.00	07/15/2020	46.77	173(3.0)	32(3.0)	15(5.0)	8(3.0)	11(5.0)	2.3(5.0)	67.6(5.0)	2.9(5.0)	8.1(1.0)	17.9(3.0)	41.6(1.0)	4.0(3.0)	42.0
2.00	07/15/2020	20.34	118(1.0)	36(3.0)	12(5.0)	5(1.0)	0(5.0)	9.3(5.0)	33.1(5.0)	4.2(5.0)	22.0(3.0)	29.7(5.0)	9.3(5.0)	0.8(1.0)	44.0
Patoka River Trib (94-905)															
Year: 2020															
1.00	07/17/2020	1.09	93(1.0)	29(3.0)	11(5.0)	9(3.0)	50(1.0)	8.6(5.0)	58.1(5.0)	5.4(5.0)	9.7(1.0)	35.5(5.0)	14.0(3.0)	26.9(5.0)	42.0

HHEI & Further Stream Health

To further assess the health of the stream and aquatic habitat, salamander surveys were conducted in primary headwater streams with a drainage area of one square mile or less. In 2020, Cane Branch was surveyed to find two larval Southern Two-Lined (*Eurycea cirrigera*) salamanders, an adult Long-Tailed Salamander (*Eurycea longicauda*), and an adult Cave Salamander (*Eurycea lucifuga*). In 2021, the Trib to Hogs Defeat yielded the most salamanders of any survey so far, with 12 Southern Two-Lined (*Eurycea cirrigera*) (10 larval, 2 adults) and 4 Long-Tailed (*Eurycea longicauda*) (1 larval, 3 adults). With smaller streams, it is not uncommon for amphibians to become the dominant vertebrate fauna, replacing fish. These salamander surveys were conducted to determine species presence, quantity, and life stages of individuals. Breeding populations of stream-dwelling salamander species can be indicators of stream quality due to the complexity of the larval (gilled) life stage of salamanders and their ability to undergo cutaneous respiration (Fath, 1-4).

Recommendations

Recommendations include continuing to collect biological data along with habitat data. The monitoring design follows the principles of adequate monitoring and assessment (Yoder 1998; Yoder and Barbour 2009) by employing two biological assemblages and with supporting chemical/physical data.

Evaluation of Monitoring Question and Indicator(s)

The indicators are adequate.

References

Fath, N. A., & Thompson, D. K. (2008). (rep.). *AMPHIBIAN AND REPTILE SPECIES SURVEY AND HABITAT ASSESSMENT: INCORPORATING ENVIRONMENTAL EDUCATION AND OUTREACH*. Oxford, OH: Miami University.

Grabarkiewicz, J. D., & Davis, W. S., An introduction to freshwater fishes as biological indicators (2008). Washington, D.C.; U.S. Environmental Protection Angecy, Office of Environmental. 69.

IDEM, IDEM'S 2020 CONSOLIDATED ASSESSMENT AND LISTING METHODOLOGY (CALM) (2020). IDEM. Retrieved February 18, 2022, from https://www.in.gov/idem/nps/files/ir_2020_apndx_g_calm.pdf.

Karr, James R. (1981). Assessment of Biotic Integrity Using Fish Communities, Fisheries, 6:6, 21-27

Office of Water, & EPA, Methods for evaluating wetland condition 6 developing metrics and indexes of Biological Integrity (2002). Washington, D.C.; United States Environmental Protection Agency, Office of Water. 9.

Rankin, E. T. (1989). The Qualitative Habitat Evaluation Index (QHEI). Rationale, methods, and applications. Division of Water Quality Planning and Assessment, Ecological Analysis Section. Columbus, Ohio.

Simon, Thomas P. 2011. Fishes of Indiana. A Field Guide. Indiana University Press. Bloomington, IN.

5.32 – Are standards and guidelines implemented and effective regarding maintenance and restoration of watershed health and function?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Best Management Practices (BMP's) implementation and effectiveness

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

Best management practices (BMPs) for water quality are a requirement as project work and land management takes place. BMPs must be implemented and effective to maintain and restore watershed health. The purpose of the National BMP program is to provide a standard set of core BMPs and a consistent means to track and document the use and effectiveness of BMPs on NFS lands across the country. The objectives of the National BMP Program are as follows:

1) To establish uniform direction for BMP implementation to control nonpoint source pollution on all NFS lands to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that will meet the intent of the Federal and State water quality laws and regulations, Executive Orders, and USDA and Forest Service directives.
2) To establish a consistent process to monitor and evaluate Forest Service efforts to implement BMP's and the effectiveness of those BMPs at protecting water quality at national, regional, and forest scales.
3) To establish a consistent and creditable process to document and report agency BMP implementation and effectiveness. (USDA FS, April 2012)

This monitoring question addresses two elements in 36 CFR 219.12:

(i) The status of select watershed conditions

(viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

Monitoring Indicator: Best Management Practices (BMP's) implementation and effectiveness

Results

Monitoring data is collected using the National Best Management Practices for Water Quality Management on National Forest System Lands technical guide standards. Aquatic management zones (AMZs) are identified as the at-risk areas of the site. AMZs can be a stream or drainage crossing, land adjacent to a stream, wetland, pond, lake or floodplain. The site is evaluated on written implementation needs to establish required BMPs and effectiveness from BMPs employed on the ground. Implementation and effectiveness are used to rate how well the site is sustaining good water quality standards. Some basic observations made during inspection are as follows: chemical spills in or outside the AMZ, types of erosion occurring in and outside the AMZ, signs of sedimentation within the AMZ, BMPs employed or not employed, other point sources of contamination, unauthorized access contributing to soil and water disturbance, disturbance to water body, and weather conditions during disturbance (rutting/compaction). Forest Service staff monitored 12 sites in 2020 and 2021 to ensure BMPs for water quality management are implemented and effective. The data was entered into the National BMP database. The BMP database established a composite rating based on implementation and effectiveness.

The table below does not represent all BMP monitoring specifics done on forest such as harvest inspections and day to day project site monitoring. Half the project sites listed below are chosen randomly and the other half are chosen specifically to analyze and report. The BMP reports indicate if the Forest Service is using BMPs effectively and if adaptive management strategies are being implemented.

2020 BMP Sites and Ratings

Site Name	HUC 12 Watershed	Date Monitored	Implementation	Effectiveness	Composite Rating
Negro Creek AOP	Negro Creek-South Fork Salt Creek	8/12/2020	Fully	Effective	Excellent
Maumee Pond Invasive Spraying	Negro Creek-South Fork Salt Creek	8/12/2020	Marginal	Effective	Good
Rainbow Lake Prescribed Burn	Watson Run-Ohio River	8/19/2020	Fully	Effective	Excellent

Indian Celina Recreation Area Boat Ramp	Headwaters Middle Fork Anderson River	8/19/2020	Not	Effective	Good
FS Road 1272.220 Decommissioning	Mitchel Creek-Anderson River	9/04/2020	Mostly	Effective	Excellent
Uniontown South Cert Harvest Unit 1 Timber Sale	Headwaters Middle Fort Anderson River	8/19/2020	Fully	Effective	Excellent
Uniontown South Thunderchicken TS Unit 4	Stinking Fork	8/19/2020	Not	Excellent	Good

2021 BMP Sites and Ratings

Site Name	HUC 12 Watershed	Date Monitored	Implementation	Effectiveness	Composite Rating
Initial Point Bank Stabilization	Youngs Creek-Patoka River	8/18/2021	Fully	Effective	Excellent
Houston Pinoak Wetland Treatment	Little Salt Creek	5/24/2021	Fully	Effective	Excellent
Roland Wetland Levee Repair	Sams Creek-Lost River	8/30/2021	Marginal	Effective	Good
Lake Celina Boat Ramp	Headwaters Middle Fork Anderson River	09/30/2021	Fully	Effective	Excellent
FS Road 1272.01 Stream Crossing	Mitchel Creek-Anderson River	9/01/2021	Mostly	Effective	Excellent
Uniontown South Uniontown Pine TS	Headwaters Middle Fork Anderson River	8/30/2021	Mostly	Effective	Excellent

Discussion

Most of the Hoosier National Forest projects and activity have good ratings when it comes to implementing good BMPs with effective results. Small maintenance projects that do not have a significant Operation and Maintenance plan have marginal implementation plans, but they are effective when employed due to sound on-the-ground practices during the project.

Recommendations

None.

Evaluation of Monitoring Question and Indicator(s)

This question is a practical one that can be monitored easily and accurately with the National Best Management Practices for Water quality database.

References

USDA Forest Service, April 2012, National Best Management Practices for Water Quality Management on National Forest Service Lands FS-990a

5.33 -- Are roads degrading watershed health and function?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Miles of high-risk roads in Transportation Analysis Process

Monitoring Frequency

This is monitored annually and report biennially.

Background & Driver(s)

Roads have the potential to degrade watershed health and function if not properly constructed, maintained and decommissioned. This monitoring question addresses two elements in 36 CRF 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities
>
> (viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

The question “Are Roads Degrading Watershed Health and Function” is best addressed by the Goal “Maintain and Restore Watershed Health”, which is one of the primary reasons the Hoosier National Forest was established, to stabilize and restore eroding lands and protect watersheds from sedimentation. First, consider the activities associated to managing a road system.

Many road management activities contribute to maintaining and restoring watershed health. The following is a list of those activities:

- Travel Management Planning and Analysis
- Road Location and Design
- Road Construction and Reconstruction

- Road Operations and Maintenance
- Temporary Roads
- Road Storage and Decommissioning
- Stream Crossings
- Snow Removal and Storage
- Parking and Staging Areas
- Equipment Refueling and Servicing
- Road Storm-Damage

All of the above management activities take place on the Hoosier National Forest with exception of snow removal and storage since we do not have much of a snow load annually and for the most part do not plow Forest Service system roads. All of the activities have a monitoring component associated with them. It is important to plan for the right road, in the right location, with a proper design, and proper constructruction. Most of this work has already taken place on the Hoosier NF. The focus of our monitoring effort is on the activity with the greatest potential on an annual basis for degrading watershed health and function, road operations and maintenance.

As discussed in FS-990a (National Best Management Practices (BMPs) for Water Quality Management on National Forest System Lands (NFSLs), control of road use and operations and appropriate maintenance can protect road investment, as well as soil, water quality, and riparian resources. Properly maintained road surfaces and drainage systems can reduce adverse effects to water resources by encouraging natural hydrologic function. Maintenance planning is important to prioritize road maintenance work on road sections where road damage is causing, or potentially could cause, adverse effects to soil, water quality, and riparian resources.

It is important to note that within the highly fragmented lands of the Hoosier NF, which have been acquired gradually over time and relatively recently, there are a great many roads that cross the national forest but are under the jurisdiction of the county government in which they are located. This analysis only pertains to roads owned and maintained by the Hoosier NF and not to county roads.

Monitoring Indicator 1: Miles of high-risk roads in Transportation Analysis Process

Results

Miles of road by maintenance level on the Hoosier NF

Maintenance Level	Road Miles
1 – Basic custodial care (Closed to public / admin use only)	392
2 – High clearance vehicles	67
3 – Suitable for passenger vehicles	30
4 – Moderate degree of user comfort	13
5 – High degree of user comfort	2.4
Total Miles	**482.4**

Miles of Road Maintained to Standard by Maintenance Level

Maint. Level	Road Maint. (miles) 2016	Road Maint. (miles) 2017	Road Maint. (miles) 2018	Road Maint. (miles) 2019	Road Maint. (miles) 2020	Road Maint. (miles) 2021	Road Maint. (miles) 2022*	
1	6.52	.52	.537	.506	4.707	0	0.018	
2	4.92	2.84	1.831	0	11.419	0	2.475	
3	17.15	18.65	13.016	4.352	14.684	18.18	11.642	
4	2.41	2.41	9.159	8.334	9.739	0	7.536	
5			2.409	2.409	2.409	2.409	2.409	
Total	20.45	24.56	32.419	26.829	42.958	20.59	24.080	

*based on 2021 road maintenance task order mileage only

Miles of Road Improvement to standard by Maintenance Level

Maint. Level	Road Improvement (miles) 2017	Road Improvement (miles) 2018	Road Improvement (miles) 2019	Road Improvement (miles) 2020	Road Improvement (miles) 2021	Road Improvement (miles) 2022
1	0	0	0	0	0	0.356
2	0	.26	.406	0	0	0.935
3	0	.20	.790	0	0	1.644
4	0	0	0	0	0	0.1
5	0	0	0	0	0	0
Total	0	.46	1.196	0	0	3.035

Discussion

The Forest Plan (LRMP) has Standards and Guidelines for maintaining and restoring watershed health that specifically apply to operation and maintenance of system roads. These standards and guidelines are addressed during our operation and maintenance activities to include monitoring. The Logging and Forestry BMPs for Water Quality in Indiana (IDNR 1998) are used and integrated into the Standards and Guidelines for the LRMP. Engineering staff at the Hoosier NF have also adopted the USDA National BMPs for Water Quality Management on National Forest System Lands to assist in implementing LRMP direction on the Hoosier.

Data Interpretation

The first table above displays the total miles of Forest Service System Roads on the Hoosier by maintenance level. The bulk of these roads are in level 1 custodial care. These roads are used for administrative purposes only. Level 2 roads are open to the public for high clearance traffic not passenger cars. Level 3 & 4 roads are open to the public for passenger cars with Level 4 having a more comfortable ride and higher speed limits.

The second table above breaks down the miles of road maintained to standard by maintenance level. The maintenance Level 1 and 2 roads are normally used for access to timber sales, fires and for other administrative use. Level 3 and 4 roads are used for general access to National Forest System Lands by Forest Service employees and the general public. Table 2 shows that greater than 30 percent of our Level 3 roads are maintained each year. That's down 20% from the last report from 2018 to 2019. Most of our Level 4 and 5 roads are asphalt pavement. These paved roads contribute the least amount to watershed degradation; however, they are costly to maintain over time.

The third table above displays Miles of Road Improved by Maintenance Level. Road improvement miles are a higher level of road maintenance to include work to the subgrade, rock surfacing, culverts etc. Most of the road improvement miles are for providing high-clearance adequate access to timber sales.

Monitoring

Monitoring is largely accomplished through our annual Road Maintenance Plan (RMP). This RMP includes both short-term and long-term maintenance. The roads are scheduled for maintenance to improve traveler comfort, protect the investment in the road system, and to reduce degradation or watershed health and function. Monitoring is a big part of the RMP as engineers and technicians throughout the year are inspecting the roads for maintenance needs and during the road maintenance contract work. As shown in the above tables, a lot of maintenance is taking place on the Hoosier's road system giving attention to the highest priority needs. By following the BMP standards in the Logging and Forestry BMPs for Water Quality in Indiana and USDA National BMPs for Water Quality Management on National Forest System Lands, we are meeting the objectives of the Forest LRMP. Our maintenance items are in line with the BMPs and are helping to maintain and restore watershed health.

Recommendations

None

Evaluation of Monitoring Question and Indicator(s)

Miles of roads maintained to standard and miles of road improvement to standard are adequate monitoring indicators at this time.

References

None

5.4 – Protect our Cultural Heritage

5.41 -- Are cultural resource sites being identified, evaluated, protected, and interpreted?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Heritage program managed to a standard

Presence of a curation agreement

Acres surveyed and sites evaluated

Direct protection efforts

Number of interpretive products

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

This monitoring question addresses the following element in 36 CFR 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

The "Heritage Program Managed to Standard" target measures our ability to reach program goals, protect historic properties, share their values with the public, and contribute information and perspectives to land management. The seven target elements are 1) presence of a heritage program plan, 2) Section 110 inventory to locate significant sites, 3) site evaluation/nomination to the National Register of Historic Places (NRHP), 4) condition assessment of priority heritage assets, 5) stewardship activities, 6) public outreach and 7) volunteerism.

Monitoring Indicator 1: Heritage program managed to a standard

Results and Discussion

In both FY 2020 and 2021, the Hoosier National Forest Heritage Program again exceeded the 45-point threshold (with a score of 47 and 48 respectively) for obtaining a heritage program managed to standard. We continue to implement heritage resource goals and objectives as identified in the 10 Year Heritage Program Plan (Krieger 2012).

Monitoring Indicator 2: Presence of curation agreement

Results and Discussion

Hoosier National Forest staff have all collections curated in accordance with 36 CFR 79 in two separate instruments.

We administer an existing Memorandum of Understanding (MOU) with the Indiana State Museum for curation of artifacts from the Lick Creek African American Settlement (2017-2022).

We administer an existing Challenge Cost Share (CCS) partnership agreement with Indiana University Glenn A. Black Laboratory of Archaeology (IU-GBL) for in perpetuity curation of Forest collections (2018-2023).

Indicator 3: Acres surveyed and sites evaluated

Results and Discussion

Surveys and evaluations were conducted through a combination of IDIQ contract task orders, a Master Challenge Cost Share (CCS) agreement and Supplemental Project Agreements (SPAs) with a university, and small projects conducted in-house.

In 2020 we completed 908 acres of survey in 12 projects, recorded 14 new sites, and evaluated four sites for eligibility to the NRHP. We also issued four new task orders under an ongoing IDIQ contract.

In 2021 we completed 3,946 acres of survey in 11 projects, recorded 109 new sites, and evaluated three sites for eligibility to the NRHP. We also issued two new task orders under an ongoing IDIQ contract, and one new SPA under an ongoing Master CCS agreement with a university.

Monitoring Indicator 4: Direct protection efforts

Results and Discussion

In 2020, we instituted additional direct protection measures (as in 2019) at the Cox's Woods Site (12Or0001) in the Pioneer Mothers buffer area after large trees blew over displacing artifacts within the archaeological site (Koscielniak 2020). We also instituted direct protection measures at the Axsom Stone House Site (12Br0360), which included the cleanup of vandalism and trash and the installation of a security camera and signs to prevent future vandalism. A security camera was also installed at the Rockhouse Hollow Site (12Pe0100) after soil disturbance was discovered.

In 2021, we replaced a broken window at the Rickenbaugh House (12Pe0784). We also instituted direct protection measures at the Brooks Cabin (12Cr0417), which included the cleanup of vandalism and the installation of signs to prevent future vandalism.

Monitoring Indicator 5: Number of interpretive products

Results and Discussion

In 2020, we were involved in the following interpretive efforts, listed below, and provided heritage and tribal content for use in social media posts throughout the year.

- Provided a presentation on the Lick Creek African American Settlement to all Hoosier National Forest employees in honor of Black History Month.
- The Buffalo Trace National Scenic Byway and the Buffalo Trace Educational Boxes were honored with the Innovation Award for 2020 from the National Scenic Byway Foundation.
- Provided a presentation on the National Register of Historic Places to all Hoosier National Forest employees.
- Shared an audio presentation forest-wide – Ten Minutes of Tribal Relations – that was recorded for a training program covering the Native American Graves Protection and Repatriation Act and tribal consultation.
- Continued work on the creation of three new interpretive signs for the Buffalo Trace.

In 2021, we were involved in the following interpretive efforts, listed below, and provided heritage and tribal content for use in social media posts throughout the year.

- Recorded a video presentation disseminated to the public about the prehistory, history, and archaeology of the Buffalo Springs Area of Interest.
- Facilitated a tribal history presentation event to invite the Miami Tribe of Oklahoma and the Osage Nation to speak to all Hoosier National Forest employees about their respective tribal histories, cultures, and ties to the land.
- Completed work on and installed three new interpretive signs for the Buffalo Trace.

Presented a brief overview of the prehistory, history, and archaeology of the Hoosier National Forest to volunteers at the Earth Day Volunteer Work Day in the Charles C. Deam Wilderness (CCDW).

Provided a virtual guest lecture on the Lick Creek African American Settlement for an archaeology course on African American Diaspora at Southern Illinois University.

Public Affairs staff participated in a teacher workshop for use of the Buffalo Trace Educational Boxes

Recommendations

Develop a new 10 Year Heritage Program Plan as the current one expires at the end of 2022.

IU-GBL has recently changed their name to Indiana University Museum of Archaeology and Anthropology (IUMAA). The current CCS partnership agreement IU-GBL expires in 2023. Establish a new partnership agreement with IUMAA and continue to curate our collections at the facility. Renew the MOU with Indiana State Museum for curation of the Lick Creek collection.

Establish a new IDIQ as the current one expires in November 2022. With the potential influx of infrastructure funding, consider including more than one contractor in the IDIQ to increase pace of survey. Train more Heritage staff members to be CORs to keep up with oversight of more contract projects.

Continue existing partnerships and develop new partnerships with universities for survey and site evaluation projects.

Continue to monitor sensitive sites to identify direct protection needs. As funding becomes available, stabilize and restore the Rickenbaugh House and the German Ridge CCC structures.

The Covid pandemic has limited our ability to engage with the public in 2020 and 2021 as much as we have in the past, especially through in-person public events. As the pandemic subsides, engage with the public as much as possible and stress preservation ethics. Be mindful to not encourage visitation of sensitive areas or showcase archaeological resources to the point of over-saturation.

Ensure Forest Protection Officers (FPOs) are aware of sensitive sites to periodically monitor to discourage looting and vandalism.

Continue to encourage use of the Buffalo Trace Educational Boxes in the classroom both by teachers and our internal conservation education efforts.

Continue to invite Tribes to provide presentations to employees on tribal history and the importance of their cultures and sensitive sites.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Koscielniak, Ann. 2020. FY 2020 Direct Protection Measures. U.S. Forest Service. Filed as Cultural Resource Reconnaissance Report No. R2020091204450 with Hoosier National Forest, 811 Constitution Ave., Bedford, IN.

Krieger, Angie R. 2012. 10 Year Heritage Program Plan, Hoosier National Forest. U.S. Forest Service. Filed with Hoosier National Forest, 811 Constitution Ave., Bedford, IN.

5.42 – Are the project design criteria and mitigation measures being followed during implementation?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Number of sites disturbed

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

There are numerous active projects on the Forest, many of which contain sites that require implementation of protective measures as described in the National Environmental Policy Act (NEPA) and in the National Historic Preservation Act (NHPA) Section 106.

This monitoring question addresses the following element in 36 CFR 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

Monitoring Indicator: Number of sites disturbed

Results and Discussion

No incidents of site disturbance resulting from project implementation were identified in 2020 or 2021.

In 2020 and 2021, no additional sites that require protective measures were added for projects we are currently implementing. There are currently a total of 344 sites that require protection within nine active projects: Forest Openings-Brownstown, Lost River Habitat Improvement, Mifflin Restoration, Oriole Restoration, Tell City Barrens Restoration, Tell City Openings, Uniontown North Restoration, Uniontown South Restoration, and Houston South (implementation on hold pending litigation).

In 2020, eleven sites were monitored, and buffer zones flagged for protection prior to project implementation. Sites in Tell City Barrens include 12Pe0570, 12Pe0583, 12Pe0822, 12Pe0824, and 12Pe0878. Sites in Lost River Habitat include 12Or0382 and 12Or0821. Sites in Houston South include 12J0665, 12J0727, 12J0730, and 12Lr0132. No disturbance was noted (Villalobos 2020).

Also in 2020, seven Priority Heritage Assets (PHAs) were visited and condition assessments made: 12Cr0059, 12Or0600, 12Or0784, 12Or0882, 12Or1023, 12Pe0098, and 12Pe0100. Ongoing maintenance needs were noted at 12Pe0784 (Rickenbaugh House). Disturbance from potential looting was observed

at 12Pe0100 (see below for more information). This disturbance was unrelated to project implementation activities. No damage was noted at any of the other sites (Koscielniak 2020).

In 2021, two sites were monitored, 12-Or-0568 and 12Pe1283, in association with volunteer work. No disturbance was noted. Also in 2021, five PHAs were visited and condition assessments made at sites 12Cr0175, 12Mn0202, 12Mo0272, 12Mo1179, and 12Pe0763. No disturbance was noted (Villalobos 2021).

A Heritage Resources section was included in the New Employee Orientation in 2021. This is critical to include to ensure that all forest personnel are aware of the sensitive nature of heritage resources and the legal requirements and internal processes we have in place to protect them.

Recommendations

Due to improved mobile GIS capabilities and accuracy, in 2021 a shift was made to providing site protection buffer zones within ESRI Collector software to Fire and Timber specialists rather than an archaeologist flagging the buffer zones on the ground. The implementation geodatabase created in 2019 for prescribed burning is now also being used for timber sale project implementation as well. This allows the Fire and Timber specialists to flag the protected locations as needed and helps with implementation planning. In 2020 and 2021, Heritage specialists continued to update site polygons using site forms and sketch maps. With increased Heritage staffing levels in 2022, the site polygon updates should also include field visits to further improve accuracy of the data and site protection.

As the need for site visits for flagging and site boundary verification is reduced, a post-implementation monitoring system should be established to ensure a representative sample of sites continue to be visited each year to monitor protection efforts. This will ensure that the new site protection system is effective, and that project design criteria and mitigation measures are being followed during project implementation.

Continue active engagement by Heritage program staff with Interdisciplinary Teams, and project implementers to continually improve overall protection efforts. Continue to develop and distribute information pertaining to the Heritage and Tribal programs for inclusion in new employee orientation/onboarding purposes.

Continue efforts to complete site evaluations, which may reduce the number of sites requiring protection.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Koscielniak, Ann. 2020. FY 2020 Priority Heritage Asset Condition Assessments. U.S. Forest Service. Filed as Cultural Resource Reconnaissance Report No. R2020091204425 with Hoosier National Forest, 811 Constitution Ave., Bedford, IN.

Villalobos, Tesa. 2020. FY 2020 Site Monitors. U.S. Forest Service. Filed as Cultural Resource Reconnaissance Report No. R2020091204436 with Hoosier National Forest 811 Constitution Ave. Bedford, IN.

Villalobos, Tesa. 2021. FY 2021 Priority Heritage Asset Condition Assessments. U.S. Forest Service. Filed as Cultural Resource Reconnaissance Report No. R2020091202385 with Hoosier National Forest, 811 Constitution Ave., Bedford, IN.

5.43 – Are cultural resource sites being damaged?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Number of sites disturbed

Number of Archeological Resource Protection Act violations

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

This monitoring question addresses the following element in 36 CFR 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

Monitoring Indicator 1: Number of sites disturbed

Results and Discussion

Rickenbaugh House (12Pe0784) and German Ridge CCC Complex buildings (12Pe1376) are deteriorating and have critical maintenance needs. The Rickenbaugh House is listed on the NRHP and the German Ridge CCC Complex has been determined eligible to the NRHP. Funding for maintenance for these sites, has been requested through the Great American Outdoors Act funding process that is coordinated through the R9 Regional Office. We hope to secure funding for this work in FY23.

Natural and cultural resource damage is ongoing along the shores of Monroe Lake due to wave wash erosion and high levels of visitor use in the CCDW. In 2021, we secured funding through the Wilderness Stewardship Performance program to conduct archaeological work at 12Mo0301, a site listed on the NRHP and is located within the CCDW on the Monroe Lake shoreline. The evaluation will assess the current integrity of the site and recommend protection and mitigation measures for the ongoing resource damage.

Moreover, we are continuing public education efforts regarding the extensive natural and cultural resource damage occurring in the CCDW to mitigate and reduce undesirable impacts from Forest users. Additional public use management efforts may be considered in the future to protect these resources if conditions do not improve.

Monitoring Indicator 2: Number of Archeological Resource Protection Act violations

Results and Discussion

In 2020, disturbance from potential looting was observed at 12Pe0100. This disturbance was unrelated to project implementation activities. The potential looting was reported to law enforcement and a

Damage Assessment Report was completed (Villalobos 2020). No perpetrator was identified, and the case has been closed. A camera has been installed to monitor the site. No further damage has occurred.

One incident of illegal artifact collection became known in 2021, but the case is still open so more details will be provided at a future date.

Recommendations

Forest Law Enforcement Officers (LEOs) should continue to be provided with opportunities to attend ARPA training. Once the new LEOs are fully trained and on Forest, plan a heritage resources orientation for them to get them acquainted with past and ongoing issues, and some of the more sensitive sites.

Continue to seek funding for stabilization and rehabilitation of the Rickenbaugh House and the German Ridge Recreation Complex. Complete the work once funding is secured.

Monitor the Mesmore Cliffs Upland and re-engage with Crawford County and Conservation Officers if damage from ATVs is continuing.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Villalobos, Tesa. 2020. Archaeological Damage Assessment Report: Unauthorized Damage to Archaeological Resource 12-Pe-0100 Rockhouse Hollow Rockshelter in the Mogan Ridge Area of Perry County, Indiana. U.S. Forest Service. Filed as Cultural Resource Reconnaissance Report Number R2020091204455 with Hoosier National Forest, 811 Constitution Ave. Bedford, IN.

5.5 – Provide for a Visually Pleasing Landscape

5.51 -- Are the existing scenic resources meeting or trending toward desired conditions?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Acres of retention

Partial retention

Modification and preservation met or exceeded in areas of high use and visitation

Monitoring Frequency

This is monitored every 5 years and reported every 10 years.

Background & Driver(s)

This monitoring question is tied to the Forest Plan goal to “Emphasize natural appearing landscapes, with attention given to views from roads, trails, and high use areas. Visual quality will be considered in all management activities. To the extent possible, Forest management activities, roads, and facilities are to blend with their setting. Long-term visual goals are not necessarily negated by short-term disruption of visual character (Forest Plan 2-4, 2006). In addition, Forest-wide guidance states that the Forest is to “Meet the visual quality objectives (VQOs) indicated on the VQO map in Appendix J where not

overridden by management area guidance. Further, “Rehabilitate the visual aspects of most projects as soon as possible.” (Forest Plan 3-19, 2006).

The monitoring indicators were chosen because at the time of the Forest Plan Revision, VQOs were measured by acres of retention, partial retention, and modification. Since April 12, 2016 when this question was added there have been some vegetative treatments in modification areas of high use and visitation, particularly in the Indian-Celina Recreation Area boundary and the Oriole East Trail.

This monitoring question addresses the following element in 36 CFR 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

Monitoring Indicator 1: Acres of retention

Results

Retention is a visual quality objective in which management activities are not evident to the casual Forest visitor. Some vegetative treatments occurred in acres of retention areas on the Forest due to overall resource assessment indicating only an effective treatment can be done by including those acres. The retention areas are bounded by major highways with high visibility and river corridors, and special areas such as Management Areas 2.4, 5.1, 6.2, 6.4, 8.1, and 8.2, and are displayed on the Hoosier National Forest Visual Quality Objective Maps 2A and 2B. Forest Plan guidance in Management Area 6.4 states to the extent feasible, maintain visual quality objectives along most streams, trails, or roads at a minimum of retention (Forest Plan 3-41, 2006).

Discussion

The Forest has made progress in implementing the Forest Plan direction with respect to acres of retention in decade 1 of the Forest Plan. Monitoring consisted of determining where vegetative treatments occurred on the Forest and in which management areas they occurred. This implementation monitoring shows we are consistent with the Forest Plan goal of “Providing for a Visually Pleasing Landscape.” Forest management activities, roads, facilities, etc. blend in with their settings in retention areas (Forest Plan 2-4, 2006). This Effectiveness Monitoring shows we were effective in maintaining majority of acres within retention areas. There were no timber sales in retention areas in 2020 or 2021.

Monitoring Indicator 2: Acres of partial retention

Results

Partial retention is a visual quality objective in which management activities may be evident but must remain subordinate to the characteristic landscape. There have been no vegetative treatments occurring in acres of partial retention areas on the Forest. The partial retention areas surround major creeks and Monroe Lake. Partial retention occurs in Management Areas 2.4, 6.4, and 8.2, and are displayed on the Hoosier National Forest Visual Quality Objective Maps 2A and 2B. Management Area 2.4 protects and enhances water-based recreation opportunities, visual quality, and riparian values; and is associated with canoeable and fishable streams, rivers, lakes, and reservoirs (Forest Plan 3-25, 2006). The acres of partial retention are reaching the goal of the Forest Plan to provide natural appearing landscapes, with attention given from roads, trails, and high-use areas.

Discussion

The Forest has made progress in implementing the Forest Plan direction with respect to acres of partial retention in decade 1 of the Forest Plan. Monitoring consisted of determining where vegetative treatments occurred on the Forest and in which management areas they occurred. This implementation monitoring shows we are consistent with the Forest Plan goal of "Providing for a Visually Pleasing Landscape." In partial retention areas forest management activities may be evident but remain subordinate to the characteristic landscape (Forest Plan A-12 2006). Monitoring demonstrates the Forest was effective with maintaining acres of partial retention areas. There were no treatments in areas of Partial Retention in 2020-2021.

Monitoring Indicator 3: Modification and Preservation met or exceeded in areas of high use and visitation

Results

Modification is a visual quality objective in which management activities may dominate characteristic landscape but at the same time must borrow from naturally established form, line, color, or texture (Forest Plan A-10 2006). In the Uniontown North project area there are 6,798 acres of modification. Most of these acres are in Management Area 3.3 which emphasizes diversity for wildlife species requiring a mix of early and late successional vegetative types and age classes. Management is more intensive than in other management areas, but blends with the natural environment. Site-specific decisions result in many variations within this management area. This management area will have the most concentrated areas of vegetative management activities. Vegetation management is more intense in this area than elsewhere in the Forest with as much as 16 percent of the forest in the 0-9 age class. Pine will also be harvested, and the sites converted to native hardwoods. After treatment, woody debris from vegetative management and prescribed burning receive special treatment along the visual foreground of frequently traveled roads, trails, and streams to meet the visual quality objective (Forest Plan 3-31-32 2006). There were several treatments in Management Area 2.8. This management area is general forest with large areas of old forest and scattered openings associated with a variety of forest plant communities. There is ample evidence of human activities, most of which blends well with the natural environment. Habitat in these areas is best suited to wildlife that uses large hardwood trees and a mosaic of different-aged hardwood forests. The Forest manages the area primarily for plant and animal habitat diversity and timber harvest is an appropriate tool for use in this area.

The visual quality objectives were met in the Modification areas. 100.0 percent of the harvest areas are in modification areas rather than partial retention or retention. The treatments are as follows: Hardwood Selection – 176 acres, Hardwood Thinning – 73 acres, Shelterwood Prep – 36 acres, Shelterwood Removal – 27 acres, Pine Thinning – 39 acres, Pine Clearcut – 200 acres. There are slash disposal zones adjacent to trails and roads. Some of these treatments are visible from Forest area recreation roads and trails, and the Forest is working on interpreting those areas for visitors.

Discussion

Monitoring consisted of determining where vegetative treatments occurred on the Forest and in which management areas they occurred. This implementation monitoring shows we are consistent with the Forest Plan goal of "Providing for a Visually Pleasing Landscape."

Recommendations

Design and layout of timber harvests should pay close attention to areas of retention and either avoid those acres as much as possible or line officer should explain rationale for impacting those acres.

Evaluation of Monitoring Question and Indicator(s)

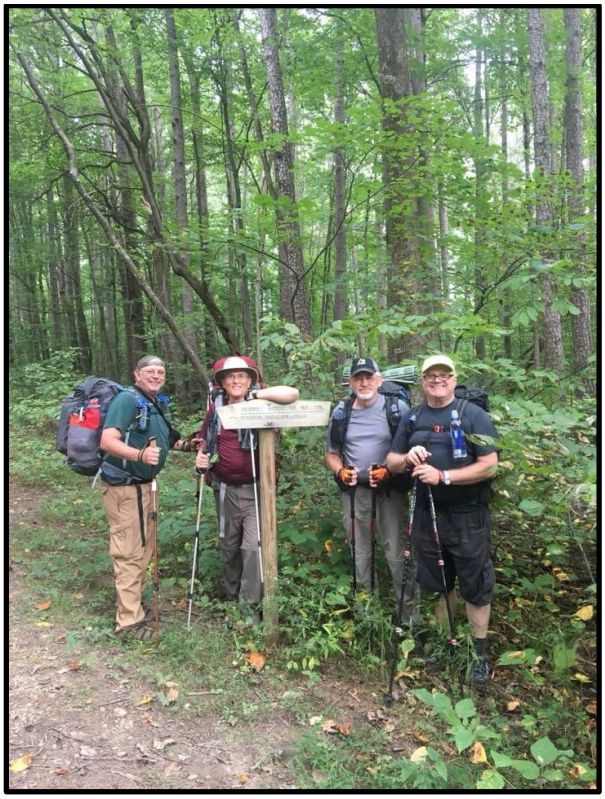
The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

U.S. Forest Service. 2016. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

5.6 -- Provide for Recreation in Harmony with Natural Communities

5.61 -- Is trail user satisfaction trending up?



Hikers using a trail in the Charles C. Deam Wilderness

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

National Visitor Use Monitoring Surveys

NVUM trail counters

Monitoring Frequency

This is monitored every 5 years and reported every 5 years.

Background & Driver(s)

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including providing multiple use opportunities

This monitoring question also ties to the Forest Plan goal to "Provide a trail system for diverse users that provides for both user safety and resource protection." The Forest provides an opportunity for outdoor recreational experiences consistent with protection of natural resources, including over 260 miles of trails for hiking, horseback riding and mountain biking. The Forest fills a much-needed niche in Indiana by offering recreational experiences not readily available or otherwise in short supply such as long distance trails (Forest Plan 2-4, 2006). One of the components of this goal is to "Provide a trail system for use by hikers, mountain bikers, and horse riders." Further, "When possible, design roads, trails, and other facilities to enhance recreational experiences. Consider public health and safety, accessibility, and environmental quality as integral parts of recreation facility design and management." Specific to trails, the Forest Plan direction (Forest Plan 3-20, 2006) for trails includes the following:

- Design trails to meet the standard of the highest impact user
- Allow horses, and other pack stock, on trails designated as open to horse use
- Allow mountain bicycles on trails designated as open to mountain bicycle use
- Provide single and multiple-use trails
- Harden trails with appropriate material if conditions dictate. Motorized earth moving equipment may be used for trail maintenance
- Designate trails as system trails or special use permit trails
- Maintain a Forest-wide trail plan

The monitoring indicators were selected to ensure that user needs are being met while ensuring that resource concerns for soil erosion are also addressed, which ultimately will lead to greater user satisfaction. This monitoring is done, in part, through conducting of standardized National Visitor Use Monitoring Surveys.

National Visitor Use Monitoring (NVUM) occurred on the Forest in Fiscal Year 2019 (Oct. 2018 – Sept. 2019), during which time sixty-nine (69) survey days were conducted specific to trail use and another forty-two (42) survey days were conducted specific to Wilderness and trail use. The NVUM program provides information about recreation visits to national forests. To improve public service, the agency's Strategic and Annual Performance Plans require measuring trends in user satisfaction and use levels. This assists the Forest Service in making sound decisions that best serve the public and protect valuable natural resources by providing science-based, reliable information about the type, quantity, quality, and location of recreation use on public lands. This data is useful for planning and decision making. Satisfaction information can help management decide where best to place limited resources that would result in improved visitor satisfaction. Additionally, this information can be useful in considering visitor

capacity issues. Visitation is estimated through a combination of traffic counts and surveys of exiting visitors. Both are obtained on a random sample of locations and days distributed over an entire forest for a year. All the surveyed recreation visitors are asked about their visit duration, activities, annual usage, etc. About one-third are also asked a series of questions about their satisfaction.

An important element of outdoor recreation program delivery is evaluating customer satisfaction with recreation setting, facilities, and services provided. This information helps managers in determining where to invest resources and allocate resources to improve customer satisfaction. Most recently, NVUM surveys conducted in 2019 indicated an overall satisfaction rating (very satisfied) of 72.5%. A satisfaction rating (very satisfied) of 74.6% was reported during the previous round of NVUM surveys in 2014, which is consistent with findings from the 2009 NVUM. Based on this data, user satisfaction is maintaining and consistent over recent years, but not necessarily trending up.

Monitoring Indicator 1: National Visitor Use Trail Surveys

Results

The following table is the Annual Visitation Estimate from the **2019** NVUM surveys. These results incorporate visits by trail users in these locations:

Visit Type	Visits (1,000s)	90% Confidence Level (%)#
Total Estimated Site Visits*	400	±23.4
→ Day	46	±21.1
→ Overnight Use Developed Site	39	±13.0
→ General Forest Area Visits	258	±34.9
→ Designated Wilderness Visits†	58	±42.5
Total Estimated National Forest	288	±
→ Special Events and Organized	0	±0.0

* A Site Visit is the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time.

† Designated Wilderness visits are included in the Site Visits estimate.

‡ Special events and organizational camp use are not included in the Site Visit estimate, only in the National Forest Visits estimate. Forests reported the total number of participants and observers so this number is not estimated; it is treated as 100% accurate.

§ A National Forest Visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A National Forest Visit can be composed of multiple Site Visits.

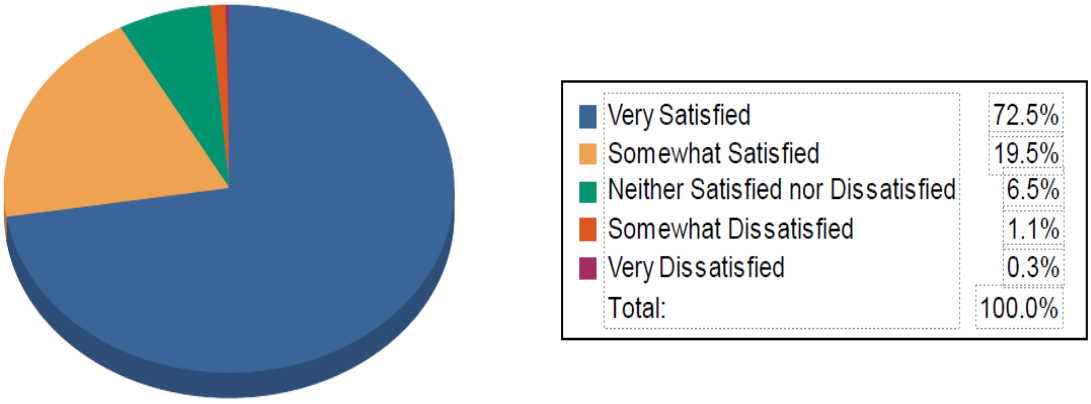
This value defines the upper and lower bounds of the visitation estimate at the 90% confidence level, for example if the visitation estimate is 100 +/-5%, one would say "at the 90% confidence level visitation is between 95 and 105 visits."

Of the reported activities participated in on the Hoosier National Forest during the **2019** NVUM surveys, hiking/walking was the number one activity reported, with approximately 39% of visits involving this mode of recreation. 25% of visits involving these activities were reported in 2014. Fishing (12%) and developed camping (10%) were identified as other popular activities in 2019. Horseback riding was reported as comprising 7% of activities in 2019, and 10% in 2014. Backpacking and bicycling comprised approximately 2% of all visits, each in 2019 and 2014.

Just over 72% of people visiting indicated they were **very satisfied** with their overall recreation experience. Another 20% were **somewhat satisfied**. The results for the composite indices were also

high. Satisfaction ratings for perception of safety were over 89% for all types of sites. Satisfaction rating for the other composites was over 80% in both developed sites and Wilderness.

Percent of National Forest Visits by Overall Satisfaction Rating (NVUM, 2019)



Discussion

Although National Visitor Use Trail Surveys data does not specifically interpret trail satisfaction, it is factored in within overarching data sets for *Day Use Developed Sites, Overnight Developed Sites, Undeveloped Areas, and Designated Wilderness*. Of these four data sets, one of four indicated needing more concentration on trails condition (NVUM, 2019).

Recommendations

Agency consideration of NVUM data collection and necessary improvements, particularly for Region 9, to effectively in implement the Eastern Region Sustainable Recreation Strategy, is needed. Visitor satisfaction is comparable across the Region and may not be an effective measure for funding levels or determining trail satisfaction levels by visitors.

Evaluation of Monitoring Question and Indicator(s)

The agency recognizes that NVUM has gaps in data as well as needs for overall improvement of the survey tools. NVUM data is useful to a certain degree but does not provide indicators of visitor satisfaction specific to trails. NVUM data is oftentimes lacking integrity in some respects and does not fully gauge visitor satisfaction specific to trails.

Monitoring Indicator 2: National Visitor Use Trail Counts

Results

Trail counts are collected as part of the overall NVUM program and occur for a 24-hour period for a particular location. The counts themselves do not provide specific information on user satisfaction but do determine use rates of trails based on visitor use counts.

Additionally, the Recreation Program utilizes trail counters to gauge use on high use versus low use trails for comparison needs to help determine appropriate recommendations for management actions. In 2021, four trails (two on each district) were monitored for trail use data.

Field Monitoring Reports also capture trailhead vehicular counts, which is another indicator of trail use.

Discussion

Over the past two years, field observations and monitoring reports support a national trend in higher recreation use across public lands. Higher trail use in the Charles C. Deam Wilderness (north end), Pate Hollow Trail, Hickory Ridge Trail System, Hemlock Cliffs Trail, and German Ridge Trail System were all noted.

Recommendations

Continue utilizing trail counters as a means to gauge popularity of trails and identify trails receiving little to no use, as it pertains to the Eastern Region Sustainable Recreation Strategy and Priority Use Areas/Iconic Places.

Evaluation of Monitoring Question and Indicator(s)

NVUM lacks integrity in some respects and does not fully gauge visitor satisfaction on trail use. Because NVUM is the best tool for analyzing visitor satisfaction and use, continuing with this measure is currently appropriate.

References

U.S. Forest Service. 2021. Eastern Region Sustainable Recreation Strategy. On file with Hoosier National Forest, Supervisor's Office.

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

U.S. Forest Service. 2020. National Visitor Use Monitoring Report 2019. On file with the Hoosier National Forest, Supervisor's Office.

5.62 -- Are forest trails meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Trails maintained to a standard through Trail Assessment and Condition Surveys (TRACS)

Monitoring Frequency

It is required that 2% of all trail miles are monitored and reported annually. Sampling sites are assigned at random from the Washington Office (WO) of the USDA Forest Service, using a national standardized monitoring format known as the Trail Assessment and Condition Survey (TRACS). However, the Forest aims to achieve a greater amount than 2% each year, with the goal being to complete a 100 percent survey of all trails by 2023 or 2024.

Background & Driver(s)

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including providing multiple use opportunities

This monitoring question is also tied directly to the Forest Plan goal "Provide a trail system for diverse users that provides for both user safety and resource protection." The Forest provides an opportunity for outdoor recreational experiences consistent with protection of natural resources, including over 260 miles of trails for hiking, horseback riding and mountain biking. The Forest fills a much-needed niche in Indiana by offering recreational experiences not readily available or otherwise in short supply such as - long-distance trails (Forest Plan 2-4, 2006). One of the components of this goal is to "Provide a trail system for use by hikers, mountain bikers, and horse riders". Further, "When possible, design roads, trails, and other facilities to enhance recreational experiences. Consider public health and safety, accessibility, and environmental quality as integral parts of recreation facility design and management." Specific to trails, the Forest Plan direction (Forest Plan 3-20, 2006) for trails includes the following:

- Design trails to meet the standard of the highest impact user
- Allow horses, and other pack stock, on trails designated as open to horse use
- Allow mountain bicycles on trails designated as open to mountain bicycle use
- Provide single and multiple-use trails
- Harden trails with appropriate material if conditions dictate. Motorized earth moving equipment may be used for trail maintenance
- Designate trails as system trails or special use permit trails
- Maintain a Forest-wide trail plan

Per the 2007 Hoosier NF Trail Plan, "the goal of the Hoosier National Forest trail program is two-fold: 1) Provide quality and safe trail opportunities year-round to as many users as possible, and 2) Adequately protect Forest resources while providing these opportunities." This is done through conducting of TRACS surveys.

A TRACS survey consists of three basic components: Inventory + Assessment + Prescription.

- **Inventory**: Accurate identification of basic information about the trail and constructed features along the trail, including key dimensional information, material type, and quantities.
- **Assessment**: Objective evaluation of the current conditions of the trail and constructed features, compared against Trail National Quality Standards and trail-specific expectations outlined in Trail Management Objectives (TMOs).
- **Prescription**: Systematic identification and assignment of tasks needed to meet standard and the TMO.

TRACS compliments the INFRA trails database by providing trail-specific field data needed for program management and planning. The completion of trail condition surveys is an on-going process agency-

wide, with the goal of developing a complete trails inventory, and subsequently updating trails data on a recurring, sustainable schedule. TRACS surveys help identify needed work and cost to meet standards.

As resources allow, all trails receive an informal inspection once annually and after major storm events. The Forest soil scientist may randomly select trails for annual monitoring as well. As time allows, trail use is also monitored. Trail maintenance needs are determined based on the results of the inspections and surveys conducted. Public comments regarding trails are also received at times and these are taken into consideration in performing trail maintenance.

Trails are constructed and maintained per direction found in Forest Service Handbook 2309.18 (USDA Forest Service 2016). Each trail on the Forest is listed by Trail Class. Each Trail Class corresponds to specific standards of construction and maintenance for that particular level of trail development and managed use type (hiking, biking, horseback riding), as defined in Forest Service Handbook 2309.18. Higher trail classes indicate a higher level of trail development and thus, a higher level of maintenance and frequency of that maintenance. Maintenance tasks address three components, those being Forest Mission, Health and Safety, and Resource Protection.

Results

TRACS Survey results are not yet available for 2021. The trails surveyed were those assigned by the Washington Office of the USDA Forest Service as needing to be conducted in 2019 and 2020, as well as additional miles surveyed. The table below represents TRACS Surveys reported for both FY 2019 and 2020.

Trail Name	INFRA No.	EMP (Ending mile post)	Last Surveyed
Buzzard Roost	106.10	0.4315	Surveyed 10/18
Birdseye 2	113.20	0.6840	Surveyed 10/18
German Ridge 3	101.30	3.4147	Surveyed 12/18
Oriole East 2	111.20	0.1730	Surveyed 10/18
Oriole West 2	110.20	0.3220	Surveyed 10/18
Springs Valley 2	201.20	2.8995	Surveyed 12/18
Shirley Creek 3	301.30	1.3800	Surveyed 10/18
Shirley Creek 4	301.40	0.4492	Surveyed 10/18
Hickory Ridge 1	301.010	1.5189	Surveyed 10/18
Hickory Ridge 3	401.030	3.8200	Surveyed 3/19
Hickory Ridge 4	401.040	4.2196	Surveyed 12/18
Hickory Ridge 5	401.050	0.7310	Surveyed 2/19

Hickory Ridge 6	401.060	1.0650	Surveyed 10/18
Hickory Ridge 7	401.070	0.6890	Surveyed 10/18
Hickory Ridge 8	401.080	0.8102	Surveyed 11/18
Hickory Ridge 9	401.090	1.1698	Surveyed 11/18
Hickory Ridge 11	401.110	1.0452	Surveyed 2/19
Hickory Ridge 12	401.120	1.2857	Surveyed 2/19
Hickory Ridge 13	401.130	0.6568	Surveyed 2/19
Hickory Ridge 14	401.140	0.9587	Surveyed 2/19
Hickory Ridge 15	401.150	2.1334	Surveyed 2/19
Hickory Ridge 16	401.160	5.8873	Surveyed 8/20
Hickory Ridge 17	401.170	1.9103	Surveyed 8/19
Hickory Ridge 18	401.180	4.9130	Surveyed 3/19
Hickory Ridge 19	401.190	1.7694	Surveyed 5/19
Hickory Ridge 20	401.200	1.0530	Surveyed 9/19
Hickory Ridge 21	401.210	1.0577	Surveyed 2/19
Hickory Ridge 22	401.220	1.9797	Surveyed 5/19
Axsom Branch	405.30	2.6070	Surveyed 3/19
Hays Trail	405.70	2.4618	Surveyed 3/19
Terrill Ridge Trail	405.90	1.8640	Surveyed 5/19
Pate Hollow 1	410.10	6.0644	Surveyed 9/19
Pate Hollow 2	410.20	0.8670	Surveyed 9/19
Brown Co. "D"	409.10	2.1050	Surveyed 4/19
Hardin Ridge	403.10	2.0739	Surveyed 8/20
Cope Hollow	405.20	6.1089	Surveyed 8/20
Sycamore	406.10	4.8010	Surveyed 9/20

The table below indicates the trails surveyed in 2018:

Trail Name	**INFRA No.**	**EMP (Ending mile post)**
German Ridge Trail 3	101.3	3.4147

Saddle Lake Trail 1	103.10	2.4528
Mogan Ridge West Trail 1	104.10	3.9310
Buzzard Roost Trail 1	106.10	0.4315
Oriole West Trail 2	110.20	0.3220
Oriole East Trail 2	111.20	0.1730
Birdseye Trail 2	113.20	0.6840
Springs Valley Trail 2	201.20	2.8995
Shirley Creek Trail 3	301.30	1.3800
Hickory Ridge Trail 1	4010.010	1.5189
Hickory Ridge Trail 2	401.020	6.3406
Hickory Ridge Trail 4	401.040	4.2196
Hickory Ridge Trail 6	401.060	1.0650
Hickory Ridge Trail 7	401.070	0.6890
Hickory Ridge Trail 8	401.080	0.8102
Hickory Ridge Trail 9	401.090	1.1698
Hickory Ridge Trail 10	401.100	0.7922
Hickory Ridge Trail 10 Spur 1	401.101	0.0580
Hickory Ridge Trail 16	401.160	5.8873
Nebo Ridge Trail 2	407.20	0.1090

Trail maintenance is defined as falling into one of the following three categories:

- **Annual Maintenance** – Minor, routine annual maintenance of trails includes such items as clearing blowdowns, brushing, cleaning or replacing drainage control structures, marker replacement, spot gravelling, litter removal, tread reshaping, and slough and berm removal. Features (water bars, drainage dips, puncheons, turnpikes, etc.) are functioning as designed and no repair is needed to bring them to required standards.
- **Deferred Maintenance** – Features such as drainage or erosion control devices are in disrepair and may or may not be useable or functioning as designed. Repair or rehabilitation is needed to bring the feature to standard. This may also indicate that the feature is dysfunctional and beyond its designed lifecycle or has deteriorated to a point where unable to perform as designed or constructed. These features are replaced in-kind. It also includes decommissioning features that are no needed for operation of the trail or that are inappropriate for the setting of the trail so should be removed. No replacement of these

features is planned. Heavy, deferred maintenance includes the use of construction equipment to install or reshape drainage devices, establishing trail tread, and installing gravel. The exception to this is that mechanical equipment is not allowed in the Charles C. Deam Wilderness. When this type of work needs to be conducted in the Wilderness, hand crews and/or stock is used. Grade and soil type generally determine placement and number of drainage devices as well as grade of gravel used, which is the finest mix that will withstand the expected use and slope. Typically, this is grade 73 or finer, which contains a large number of fines that compact to assist in holding the gravel in place on the trail bed.

- **Capital Improvement** – This category includes expansion, alteration and installing new features or trail. Expansion indicates that a feature is functioning as designed but is undersized, so would be lengthened or widened. Alteration is a modification to change the function of a feature to increase capacity or change the durability of a feature.

The results of the TRACS surveys conducted on the trails listed above indicated that there were several maintenance items in all categories needing to be accomplished. The minor, routine annual maintenance items are completed annually to meet standards.

Discussion

The focus of the results of the TRACS surveys is on the Deferred Maintenance and Capital Improvement tasks, particularly those that fall into the category of addressing Health and Safety issues, as these may pose a risk for trail users. Therefore, while TRACS surveys may indicate tasks needing to be accomplished, they may not be done within that year or the next dependent upon the trail use type. Typically, unless a task is one needing to be addressed because it potentially poses a Health and Safety risk, those tasks identified on hiker only trails may continue to be deferred in favor of correcting needs identified on multiple use, bicycle, or horse trails first, as these trails typically incur more damage than hiker only trails. Health and Safety items are corrected as soon as possible once found either through a TRACS survey or other monitoring activity.

Maintenance can include log water bars, drainage dips, etc. that are placed on the trail to continually divert water off the trail. As stated above, the slope and soil type where the trail is located generally dictates the number of erosion control devices needed. Due to many of the trails on the Hoosier being placed on old, pre-existing roadbeds instead of having been laid-out and designed, erosion is a major concern. This is the same reason that many of the trails also need tread re-established and aggregate added.

Trail needs identified on TRACS surveys also may be deferred in favor of other trail maintenance needs identified by Forest Service trail professionals that they have found through personal observation and deem to be of more critical nature. Personal observation and firsthand, on-the-ground knowledge of current trail conditions is often more valuable in determining maintenance needs than those found on assigned trails during TRACS surveys.

Recommendations

TRACS surveys will continue to be completed as assigned (none assigned by the Washington Office for 2022) with additional trails being surveyed as time allows in conjunction with other critical work. Critical Health and Safety issues will continue to be prioritized over other deferred maintenance needs that is not of as high a priority as those maintenance needs to correct potential health and safety risks to users. However, other work, both regular annual maintenance and deferred maintenance needs will be addressed as time and budget allows.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

Forest Service Handbook 2309.18 Trails Management Handbook (USDA Forest Service 2016)
Hoosier National Forest Trail Plan, 2007

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

TRACS 2008 User Guide, USDA Forest Service, 2008

5.63 -- What is the status and trend of visitor use and visitor satisfaction?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Customer comments received

Monitoring Frequency

This is monitored and reported every 5 years. NVUM surveys were last conducted on the Hoosier NF in Fiscal Year 2019 with results being available mid-2020. Prior to that, surveys were conducted in 2014.

Background & Driver(s)

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including providing multiple use opportunities

This monitoring question also ties to the Forest Plan goals of "Provide for Recreation Use in Harmony with Natural Communities" and "Provide a Useable Landbase" (Forest Plan 2-4, 2006). The Forest provides an opportunity for outdoor recreational experiences consistent with protection of natural resources, including dispersed, developed, and day use recreation opportunities. The Forest fills a

much-needed niche in Indiana by offering recreational experiences not readily available or otherwise in short supply in the state of Indiana. The Hoosier NF Niche Statement is as follows:

"The HNF provides recreation opportunities on large blocks of public land and water-based facilities that complement other recreation activities in south-central Indiana. Visitors use the Forest as a weekend get-away close to home."

With only four percent of Indiana's land base being in public ownership and with the state having a high population density, there is high demand for limited outdoor recreation opportunities. There is no "typical" visitor to the Hoosier National Forest; rather, there is a high degree of diversity among visitors. The Hoosier contains lands in nine counties, and studies have shown that most visitors to the Hoosier NF reside in nearby communities with nearly all visitors being from Indiana. The State Comprehensive Outdoor Recreation Plan (SCORP) states that most people in Indiana are not willing to drive more than a couple hours from home for their favorite recreation activity. This makes the Hoosier NF a recreation destination point for many local residents, a "backyard" weekend recreation opportunity versus a regional or national destination site.

In order to obtain reliable information about recreation visits to the Hoosier National Forest, every five years the Forest conducts National Visitor Use Monitoring. Visitation is estimated using a combination of traffic counts and surveys of exiting visitors obtained through a random sample of locations on the Forest for an entire year. During the survey interviews, exiting visitors are asked about the amount of time they spent on the Forest, what activities they participated in, whether it be camping, hiking, observing nature, picnicking, horseback riding, biking, fishing, etc. These surveys were conducted at day use developed sites, overnight developed sites, general forest areas, and in the Charles C. Deam Wilderness Area. Amongst other questions, about one-third of the visitors surveyed were asked a series of questions about satisfaction of their visit, including such things as condition of facilities, restroom cleanliness, employee helpfulness, recreation information available, road condition, feeling of safety, signage, trail condition, value for fee paid in all of the settings listed above. Visitors were asked not only about their satisfaction with facilities and services provided, but also about how important those items were to their experience. They rated these on a 5-point scale as follows:

Satisfaction	**Importance**
1 = Very Dissatisfied	1 = Not Important
2 = Somewhat Dissatisfied	2 = Somewhat Important
3 = Neither Satisfied or Dissatisfied	3 = Moderately Important
4 = Important	4 = Important
5 = Very Satisfied	5 = Very Important

The information collected is crucial for determining the quantity and quality of recreation visits, which is then used by management to make sound, science-based decisions regarding the type, quantity, quality, and location of recreation use on public lands to improve public service.

Monitoring Indicator: Customer comments received

Results

The first table below is the Annual Visitation Estimate from the **2019** NVUM surveys. These results incorporate visits by trail users in these locations:

Annual Visitation Estimate

Visit Type	Visits (1,000s)	90% Confidence Level (%)#
Total Estimated Site Visits*	400	±23.4
→ Day	46	±21.1
→ Overnight Use Developed Site	39	±13.0
→ General Forest Area Visits	258	±34.9
→ Designated Wilderness Visits†	58	±42.5
Total Estimated National Forest	288	±25.2
→ Special Events and Organized	0	±0.0

* A Site Visit is the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time.

† Designated Wilderness visits are included in the Site Visits estimate.

‡ Special events and organizational camp use are not included in the Site Visit estimate, only in the National Forest Visits estimate. Forests reported the total number of participants and observers so this number is not estimated; it is treated as 100% accurate.

§ A National Forest Visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A National Forest Visit can be composed of multiple Site Visits.

This value defines the upper and lower bounds of the visitation estimate at the 90% confidence level, for example if the visitation estimate is 100 +/-5%, one would say "at the 90% confidence level visitation is between 95 and 105 visits."

The top and bottom tables below, display the number of visitor contacts and the number of completed interviews, respectively, by site type and survey form type.

Number of Individuals Contacted by Site Type

Site Type	Total Individuals Contacted	Individuals Who Agreed to be Interviewed	Recreating Individuals Who Are Leaving for the Last Time That Day
Day Use Developed Sites	160	129	61
Overnight Use Developed Sites	230	192	76
Undeveloped Areas (GFAs)	612	489	312
Designated Wilderness	250	211	140
Total	**1,252**	**1,021**	**589**

Number of Complete Interviews* by Site Type and Form Type

Form Type**	Developed Day Use Site	Developed Overnight	Undeveloped Areas (GFAs)	Wilderness	Total
Basic	20	30	114	57	221
Economic	24	23	103	44	194
Satisfaction	17	23	95	39	174
Total	**61**	**76**	**312**	**140**	**589**

*Complete interviews are those in which the individual contacted agreed to be interviewed, was recreating on the national forest and was exiting the site for the last time that day.

**Form type is the type of interview form administered to the visitor. The Basic form did not ask either economic or satisfaction questions. The Satisfaction form did not ask economic questions and the Economic form did not ask satisfaction questions.

Visitors were interviewed whether they were recreating at the site or not; however, the interviews were discontinued if it was determined that the reason for visiting the site was not recreation. Of the persons who agreed to be interviewed, 82% were there for the purposes of recreation. Of the 589 completed interviews with departing recreationists, 174 of those persons completed the Satisfaction survey.

Per the results of the 2014 NVUM surveys, "overall satisfaction results are good. About 75% of people visiting indicated they were very satisfied with their overall recreation experience. Another 18% indicated they were somewhat satisfied." Only 4.4% of people visiting indicated they were neither satisfied nor dissatisfied, with 2.4% indicating they were dissatisfied and only 0.1% of people visiting indicating they were very dissatisfied. Satisfaction ratings for perception of safety were over 88% in all settings. Per the results of the 2019 NVUM surveys, "the overall satisfaction results are quite good. Just over 72% of people visiting indicated they were very satisfied with their overall recreation experience. Another 20% were somewhat satisfied. The results for the composite indices were also very good. Satisfaction ratings for perception of safety were over 89% for all types of sites. Satisfaction rating for the other composites was over 80 percent in both developed sites and Wilderness. Thus between 2014 and 2019 satisfaction has remained somewhat consistent.

The table below displays the aggregate Percent Satisfied Index (PSI) scores for the Hoosier NF. This is the "proportion of all ratings for the elements in the category where satisfaction ratings had a numerical rating of 4 or 5" per the 2019 NVUM Visitor Use Report.

Percent Satisfied Index* Scores for Aggregate Categories

Satisfaction Element	Satisfied Survey Respondents (%)		
	Developed Sites (Day Use and Overnights)+	Undeveloped Areas (GFA's)	Designated Wilderness
Developed Facilities	86.5	86.8	100.0
Access	89.1	84.1	88.4
Services	83.5	67.7	81.1
Feeling of Safety	89.2	96.3	96.6

*This is a composite rating. It is the proportion of satisfaction ratings scored by visitors as good (4) or very good (5). Computed as a the percentage of all ratings for the elements within the sub grouping that are at or above the target level, and indicates the percentage of all visitors that are reasonably well satisfied with agency performance.

+ This category includes both Day Use and Overnight Use Developed Sites.

An examination of customer comment cards submitted for the 2022 camping season showed a high level of satisfaction at the Forest's concession operated campgrounds, which includes Hardin Ridge Recreation Area, Indian-Celina Recreation Area, and Tipsaw Lake Recreation Area. Campers to these areas are requested to complete a Campground Comment and Evaluation Form. Of the respondents to this request, the following are the results:

Visitor Comment Card Summary – Concession Operated Campgrounds

Conditions Rated	Satisfaction Ratings (Number of Respondents)					
	1 = Unsatisfactory	2 = Poor	3 = Average	4 = Good	5 = Excellent	Total
Overall Cleanliness of the Area	0	0	0	6	66	72
Safety of Area	1	0	0	0	71	72
Accessibility of Personnel	1	0	1	4	66	72
Was information provided and questions answered?	1	2	2	3	65	72
Were personnel courteous and helpful?	2	0	1	3	66	72
Are facilities functional, safe, and well maintained?	1	2	3	4	62	72
Total	6	4	7	20	396	432

The most common positive comments received included that hosts and staff were friendly, helpful and great to deal with, restrooms were very clean, beautiful campsites and facilities. The most received negative comments included rude hosts, do a better job of mowing, more electricity and water at the campsites and more playgrounds for children.

An examination of the 64 comments on the Recreation.gov website submitted for the 2022 camping season for the three concessionaire campgrounds were very positive for the most part such as very friendly staff, quiet campgrounds, beautiful scenery, and clean restrooms and showers. The negative comments included ticks, lack of WIFI, restroom not clean, older restrooms, and unlevel campsite spurs.

Discussion

National Visitor Use Monitoring occurred again on the forest in Fiscal Year 2019. Compared to the 2014 results they are consistent and remained about the same. Many factors influence user satisfaction and the results of the 2014 and 2019 surveys were based on a snapshot in time. Weather conditions can play a large role in user satisfaction. In wet years people may not visit the forest as much as in drier years. Heat and humidity can also play a factor in the amount of visitation and in overall satisfaction. In years when staffing is low due to budget constraints, this may also result in some areas not being maintained to the extent the public is accustomed to, which can also lead to poor user satisfaction. The results in 2014 and 2019 would indicate that most visitors are either somewhat satisfied or very satisfied, with overall satisfaction being quite good.

Most visitors express a high level of satisfaction with the developed campgrounds on the Forest that are concession operated. Concessionaires deal quickly and appropriately with complaints and investigate negative feedback to see where improvements can be made.

Recommendations

None currently. Comment cards from each camping season are reviewed upon receipt to ensure any critical items are addressed that might be affecting user satisfaction.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

Visitor Use Report, Hoosier National Forest, USDA Forest Service, Region 9, National Visitor Use Monitoring Data collected FY 2014.

Visitor Use Report, Hoosier National Forest, USDA Forest Service, Region 9, National Visitor Use Monitoring Data collected FY 2019.

5.64 -- Are forest recreation sites and facilities meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Recreation Site Condition Surveys

Engineering Rec Building Condition Surveys

Monitoring Frequency

20% of developed recreation sites monitored and reported annually.

Background & Driver(s)

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including providing multiple use opportunities

This monitoring question also ties to the Forest Plan goals of "Provide for Recreation Use in Harmony with Natural Communities" (Forest Plan 2-4, 2006), "Provide a Useable Landbase" (Forest Plan 2-4, 2006). The Forest provides an opportunity for outdoor recreational experiences consistent with protection of natural resources, including dispersed, developed, and day use recreation opportunities. The Forest fills a much-needed niche in Indiana by offering recreational experiences not readily available or otherwise in short supply in the state of Indiana. The Hoosier NF Niche Statement is as follows:

"The HNF provides recreation opportunities on large blocks of public land and water-based facilities that complement other recreation activities in south-central Indiana. Visitors use the Forest as a weekend get-away close to home."

With only four percent of Indiana's land base being in public ownership and with the state having a high population density, there is high demand for limited outdoor recreation opportunities. There is no "typical" visitor to the Hoosier National Forest, with a high degree of diversity. The Hoosier contains lands in nine counties, and studies have shown that most visitors to the Hoosier NF reside in nearby communities and most all visitors at least being from Indiana. The State Comprehensive Outdoor Recreation Plan (SCORP) states that most people in Indiana are not willing to drive more than a couple hours from home for their favorite recreation activity. This makes the Hoosier NF a recreation destination point for many local residents, a "backyard" weekend recreation opportunity versus a regional or national destination site.

To provide forest-wide recreation sites and facilities that meet health, safety, accessibility, and maintenance requirements and achieve resource and social objectives, a set of National Quality Standards has been established. As relates to Forest level management of recreation facilities, these provide for satisfied visitors, clear priorities, explicit standards, quality work, accurate inventory, clear management direction, responsiveness to changing needs, and known budget needs. This process "uses inventories, condition surveys and other data to derive and calculate costs to meet National Quality Standards."

Developed Recreation Sites are managed to enhance opportunities for recreation within our niche. Developed recreation sites include campgrounds, day use areas such as beaches, picnic areas, and boat ramps, trailheads/horse camps, visitor centers such as Brooks Cabin, and sewage treatment plants such as the one at Hardin Ridge Recreation Area. The following standards are used to manage these areas (* Denotes "**Critical Standards**"):

Key Measure: HEALTH AND CLEANLINESS

*** Visitors are not exposed to human waste.**
*** Water, wastewater, and sewage treatment systems meet federal, state and local water quality regulations.**
Garbage does not exceed the capacity of garbage containers.
Individual units and common areas are free of litter including domestic animal waste.
Facilities are free of graffiti.
Restrooms and garbage locations are free of objectionable odor.
Constructed features are clean.

Key Measure: RESOURCE SETTING

*** Effects from recreation use do not conflict with environmental laws (such as ESA, NHPA, Clean Water, TES, etc).**
Recreation opportunities, site development, and site management are consistent with Recreation management system (ROS, SMS, BBM) objectives, development scale, and the Forest land management plan.
Landscape character at the Recreation site is consistent with the Forest scenic integrity objectives.
Visitors and vehicles do not exceed site capacity.

Key Measure: SAFETY & SECURITY

*** High-risk conditions do not exist in Recreation sites.**
*** Utility inspections meet federal, state, and local requirements.**
Laws, regulations and special orders are enforced.
Visitors are provided a sense of security.

Key Measure: RESPONSIVENESS

*** When signed as accessible, constructed features meet current accessibility guidelines.**
Visitors feel welcome.
Information boards are posted in a user-friendly and professional manner.
Visitors are provided opportunities to communicate satisfactions (needs, expectations).
Visitor information facilities are staffed appropriately during seasons of use and current information is available.
Recreation site information is accurate and available from a variety of sources and outlets.

Key Measure: CONDITION OF FACILITIES

Constructed features are serviceable and in good repair throughout the designed service life.
Constructed features in disrepair due to lack of scheduled maintenance, or in non-compliance with safety codes (e.g. life safety, OSHA, environmental, etc.) or other regulatory requirements (ABA/ADA, etc.), or beyond the designed service life, are repaired, rehabilitated, replaced, or decommissioned.
New, altered, or expanded constructed features meet Forest Service design standards and are consistent with an approved site development plan, including an accessibility transition plan.

Condition Surveys on all constructed features and buildings in the developed recreation sites are conducted every five years to ensure they are meeting the key measures outlined above. Ideally, 20% of all sites and all buildings have these comprehensive condition surveys conducted on them every five years, so that no condition survey is ever older than five years. These developed recreation site condition surveys look at minor constructed features that include such things as tables, fire rings, parking spurs, sidewalks, water fountains, fences, information boards and signs, etc. and the need for simply routine annual maintenance, repair, replacement or new/expanded or altered features. The building condition surveys look specifically at the buildings and other surveys are conducted on both drinking water systems and wastewater systems and again looks at the need for routine annual maintenance, repair, replacement, or new/expanded or altered buildings or features. The data collected is entered into several different modules within the Infra database, including the developed recreation sites module, the engineering buildings module, the engineering drinking water system module, and the engineering wastewater system module. These condition surveys then provide total deferred maintenance (**DM**) and cost replacement value (**CRV**) for minor constructed features, buildings, drinking water systems, and wastewater systems. These results are then used to determine the overall **Facility Condition Index (FCI)** for that site. The Facility Condition Index (FCI) for each Recreation Site is used as a national performance measure reported in the Department of Agriculture Asset Management Plan and to Office of Management & Budget (OMB) as part of the Forest Service Strategic Performance Measures and the Forest Service Strategic Plan. The name of the performance measure is Recreation Sites Maintained to Standard. These “standards” tell us if the Forest recreation sites and facilities are

meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives. An example of how they are calculated is below:

FCI = 1 - (Total Deferred Maintenance / Total Current Replacement Value)
Or 1 - (Total DM / Total CRV)

An FCI of .90 or higher means the Recreation Site is maintained to standard. Any site less than .90 FCI is not to standard.

Example 1: The equation for a site with a CRV of $100,000 and DM of $15,000 would look like this:
1 - ($15,000/$100,000) = **0.85**
This site is **not** maintained to standard.

Example 2: Deferred Maintenance (DM) = $40,000 and Current Replacement Value (CRV) = $1,200,000
1 – (DM/CRV) = 1 – (40,000/$1,200,000) = **0.967**

This example site is **TO STANDARD**.

Monitoring Indicator 1: Recreation Site Condition Surveys and Monitoring Indicator 2: Building Condition Surveys (combined)

Results

The table below shows the results of the 2018 Site Condition Surveys for the Developed Recreation Sites on the Hoosier NF. Site Condition Surveys were conducted on Brownstown Ranger District in 2021, however the data analysis is not yet available.

Site Name	Development Scale	Site Performance Rating	Total FCI	Total DM ($)	Total CRV ($)
Blackwell Horsecamp	2	NOT TO STANDARD	0.882	29,292	248,946
Brooks Cabin	3	TO STANDARD	0.993	1,472	221,567
Buzzard Roost	2	TO STANDARD	1.000	-	152,506
Celina Amphitheater	3	TO STANDARD	1.000	-	76,200
Celina Boat Ramp	4	NOT TO STANDARD	0.717	60,518	214,076
Celina Northface Loop	4	TO STANDARD	0.998	641	487,794
Celina Recreation Area	4	NOT TO STANDARD	0.835	288,220	175,396
Celina Southslope Loop	5	TO STANDARD	0.99	5,637	57,652
German Ridge Beach	2	TO STANDARD	0.927	33,547	462,558
German Ridge CG	3	TO STANDARD	0.981	5,157	281,289
German Ridge PG	2	TO STANDARD	1.000	-	7,295
Hardin Ridge Beach	5	TO STANDARD	0.986	7,335	49,870
Hardin Ridge Bluegill Loop	5	TO STANDARD	0.994	4,752	943,270

Hardin Ridge Boat Ramp	4	TO STANDARD	0.997	1,273	424,847
Hardin Ridge Cabins	4	TO STANDARD	0.985	3,714	252,781
Hardin Ridge Eads Loop	4	TO STANDARD	0.988	3,319	284,675
Hardin Ridge Holland Loop	5	TO STANDARD	0.983	3,774	224,508
Hardin Ridge Pine Loop	5	TO STANDARD	0.995	3,703	849,714
Hardin Ridge Southern Point Loop	4	TO STANDARD	0.988	9,509	827,418
Hardin Ridge Sycamore Flats	5	TO STANDARD	0.989	5,261	497,334
Hardin Ridge Twin Oaks	4	TO STANDARD	0.997	4,064	1,565,888
Hardin Ridge White Oak Loop	5	TO STANDARD	0.991	3,737	415,333
Hardin Ridge Recreation Area	5	NOT TO STANDARD	0.132	706,282	813,699
Hickory Ridge Horsecamp	2	TO STANDARD	0.991	931	113,326
Hickory Ridge Tower Site	2	TO STANDARD	.971	515	18,191
Indian Lake Boat Ramp	4	NOT TO STANDARD	0.641	60,000	167,467
Mano Point Boat Ramp	3	TO STANDARD	0.959	4,373	109,183
Rickenbaugh House	4	TO STANDARD	1.000	-	1,079,465
Saddle Lake Boat Ramp	2	TO STANDARD	1.000	-	16,586
Saddle Lake Recreation Area	2	TO STANDARD	0.952	111,850	249,728
Shirley Creek Horsecamp	2	TO STANDARD	0.950	5,697	114,012
Springs Valley Boat Ramp	3	TO STANDARD	0.986	1,684	128,003
Sundance Pond	1	NOT TO STANDARD	0.891	1,700	15,675
Tipsaw Beach	4	NOT TO STANDARD	0.692	287,703	936,033
Tipsaw Boat Ramp	4	NOT TO STANDARD	0.637	60,481	214,076
Tipsaw Campground	4	NOT TO STANDARD	0.898	162,796	1,602,546
Tipsaw Catbrier RV Loop	4	TO STANDARD	0.996	663	200,971
Tipsaw Dogwood Loop	4	TO STANDARD	0.972	9,348	341,167
Tipsaw Goldenrod Group Site	4	TO STANDARD	1.000	-	38,646
Tipsaw Jackpine Loop	5	TO STANDARD	0.982	8,281	469,585
Tipsaw Primrose Group Site	3	TO STANDARD	1.000	-	38,620
Youngs Creek Horsecamp	2	TO STANDARD	0.938	10,995	179,099

In 2018, 31 out of 42 Developed Recreation Sites were found to be meeting standard which is 74% of the developed recreation sites on the Forest. Because the condition surveys completed look at all of the Key Measures listed above, this indicates that these sites and facilities are meeting health, safety,

accessibility, and maintenance requirements and achieving resource and social objectives. Of the sites listed as "not to standard," it appears to be due to a high amount of deferred maintenance needs and high-cost replacement value of either minor constructed features, drinking water systems, waste-water treatment, or all of those combined. This is particularly the case at Hardin Ridge Recreation Area, where there is low deferred maintenance on minor constructed features but where both deferred maintenance and cost replacement value is high on the wastewater treatment system, as well as high cost replacement values on several buildings, which contribute to the overall Total FCI value as shown in Table 1.

Discussion

We will continue to perform condition surveys on both developed recreation sites and buildings to assess overall facility condition. Critical health and safety issues will be addressed as priority issues and other tasks will be prioritized based on need and available funds. However, sites where critical health and safety issues are not able to be immediately addressed will be closed from public use until the issue can be resolved. Granger-Thye fee offset funds from the concession areas will continue to be used to the fullest in order to assist in completing needed deferred maintenance items to improve the recreation areas. This is done under a Granger-Thye Fee Offset Agreement with the concessionaires. This agreement allows the permit fee to be offset by the value of Government Maintenance and Reconditioning projects that are performed at the Holder's (concessionaire) expense. Government maintenance or reconditioning is defined as "maintenance or reconditioning that arrests deterioration and appreciably prolongs the life of the property." This will assist in ensuring that concession operated recreation sites and facilities meet health, safety, accessibility, and maintenance requirements and achieve resource and social objectives. Unfortunately, the high cost of deferred maintenance on the wastewater treatment plant at Hardin Ridge Recreation Area, along with high-cost replacement value of the treatment plant itself, makes it unlikely that the system will be upgraded without a major influx of funding through the Capital Investment process or Great American Outdoors Act and will continue to affect the overall facility condition rating for the Hardin Ridge Recreation Area complex. This is also the case at Indian-Celina and Tipsaw Lakes Recreation Areas deferred maintenance on the drinking water systems in comparison to cost replacement value. In some cases, deferred maintenance in the INFRA database is higher than current replacement value. Over the next several years, Forest Service staff will collect and update the data in the INFRA database to correct some of these types of questions that have become apparent through this reporting exercise. Therefore, while most developed recreation facilities do meet objectives for health, safety, accessibility, and maintenance requirements, the overall recreation complexes will continue to show as not being managed to standard until this data can be corrected.

Recommendations

None

Evaluation of Monitoring Question and Indicator(s)

No changes recommended at this time to the monitoring question or indicators; however, separating the two indicators is not necessary. The results of both the developed recreation site condition surveys and the engineering building condition surveys are used to determine the overall Facility Condition Index, which tells us whether or not the forest recreation sites and facilities are meeting health, safety, accessibility, and maintenance requirements and achieving resource and social objectives.

References

National Quality Standards for Recreation Sites; Recreation, Heritage and Volunteer Resources Integrated Business Systems internal website.

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

Hoosier National Forest Recreation Niche statement, Hoosier National Forest Facility Master Plan, 2006.

Campground Concession Desk Guide, FS-611, USDA Forest Service, Recreation, Heritage, and Wilderness Resources, 1997.

5.65 -- Is the wilderness moving toward desired future condition?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Surveys and inventories for each element selected under Wilderness Stewardship Performance (WSP); measure as time allows

Monitoring Frequency

This is monitored every 5 years and reported biennially.

Background & Driver(s)

This monitoring question exists to better understand and evaluate if the Charles C. Deam Wilderness (Deam) is meeting the goals of Wilderness Character protection. The five qualities of Wilderness Character include the following: 1) untrammeled, 2) natural, 3) undeveloped, 4) opportunities for solitude or primitive and unconfined recreation, and 5) other features (geological and educational).

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

The Hoosier National Forest Land and Resource Management Plan indicates that this monitoring question addresses if wilderness is moving toward a desired future condition. There are four indicators for this monitoring question. 1) Wilderness managed to standard. 2) Wilderness Stewardship Performance (WSP) elements being met. 3) Trail counts and use trends. 4) Trends in mechanized/motorized incursions; both illegal and approved.

The first indicator is based on the WSP measure. WSP is a 10-year measure based on 10 elements to obtain the minimum score of 60 pts (managed to standard). The Charles C. Deam Wilderness is currently scoring 64 pts in the seventh year of this challenge. The Deam has met the minimum score of being 'managed to standard' since the end of fiscal year 2018. The four points increase is regarding the Cultural Resources Element. WSP funding received twice to support work to improve the score of this

element, was essential to completing the tasks. The Deam will continue Wilderness Character Monitoring in FY 2022.

The second indicator references 10 elements in which the Deam is scored by within the WSP measure. Each element has its own set of requirements for obtaining points toward being 'managed to standard'. The Hoosier National Forest is making adequate progress in element scores based on the 10-year timeframe of WSP. Progression is based on workforce capacity and funding availability to support the work.

Within the WSP measure, the third indicator is addressed through monitoring "use trends". Data is collected on an intermittent basis, dependent on the element that is being worked on. In fiscal year 2017 extensive use data was collected regarding the 'opportunities for solitude' element. This met the requirements for the Enhanced Solitude Monitoring Plan. Use counts included: trail use, number of stock, campsite use and tracking of number of vehicles at trailheads. Additionally, data collection at designated campsites was collected and continue to be collected at undesignated campsites through a Recreation Site Inventory, as part of the Recreation Sites element. Additional 'baseline' data will be collected again in the spring of 2020, to assist in implementing a Public Engagement Strategy for these heavily used campsites and vicinity, while gauging use trends. From 2020 to present, the Deam Wilderness has had an increase in visitation based on field observations and internal monitoring reports.

The fourth indicator is more difficult to assess. Illegal incursions are monitored but may go unnoticed or unreported. Approved incursions typically occur for emergency search and rescue purposes and only on a very limited basis. Approved incursions are reported on an annual basis. No incursions were requested/approved in 2018-2021. Additionally, in 2018, the Forest Service ended a process which allowed for recurring approved incursions by motor vehicle, along with associated route clearing with motorized/mechanized equipment. This change was made to protect employee safety and reduce impacts to Wilderness character and other Forest users.

Monitoring Indicator 1: Surveys

In 1993 a task force was created to conduct a Limits of Acceptable Change (LAC) study. During that study, use counts were evaluated and numerous data have been collected intermittently over time regarding recreation sites and visitor use on trails, campsites, and parking areas. Data collected has been informal and formal in nature, from personnel monitoring reports, to scheduled surveys and data collection through the WSP measure and the 10-year Wilderness Stewardship Challenge prior to WSP.

Discussion

The Hoosier National Forest, in response to the Wilderness Stewardship Performance measure, is making adequate progress towards a desired future condition. Current and cumulative monitored conditions are consistent with the Forest Plan, based on providing valid data collection to assess the four indicators established. Monitored conditions are consistent with laws, regulations, and Wilderness practices. Data collected from 2017 has been analyzed, and a determination was made to develop a Public Engagement Strategy, followed by proposed camping regulation changes to extend the camping footage distance from the shoreline of Monroe Lake. Additionally, substantial funding was received to improve a low-use trail (Cope Hollow Trail) in the southern portion of the Deam, ultimately improving trail user experience. Better distribution of visitor use across the Deam, with the intent of reducing high use at 'hot spots', is the goal. This implementation monitoring that was conducted shows that we are consistent with the goals and requirements of the WSP measure and are meeting the timeline

requirements as well. Previous monitoring (LAC study) and other data collected following the study has been useful in guiding management decisions for the Deam Wilderness. Visitor use data and solitude monitoring will occur again in fiscal year 2024 in conjunction with National Visitor Use Monitoring surveys being conducted. Data will be compared to 2017 data and field monitoring reports from 2020-2022 to see if use trends have changed.

The identified indicators for this monitoring question are appropriate and useful, except for a slight misinterpretation of 'when' the Wilderness should be managed to standard. National direction indicates that being managed to standard is expected within the timeframe of the 10-Year WSP measure. This fiscal year marks year 5 of the 10-Year timeframe. As mentioned previously, the Deam is on track for this timeline and has met the minimum score of being 'managed to standard' since the end of fiscal year 2018. Additionally, it is also hard to determine if the fourth indicator (trends in mechanized/motorized incursions; both illegal and approved) is effective or not. Often, due to a lack of substantial law enforcement, it is hard to determine if we are adequately identifying illegal incursions.

Monitoring Indicator 2: Inventories

Recent data collections are currently being evaluated or analyzed, but pandemic pressure and workforce capacity has slowed the completion. Data analysis is expected to be complete in 2022.

Discussion

Current and cumulative monitored conditions are consistent with the Forest Plan, laws, and regulations and the WSP measure. Although current data has not been analyzed fully, it does indicate use trends at a rough review, thus allowing for management assumptions and practices to be validated. For example, because of high use and heavy impacts to the designated dispersed campsites within the Deam, a management decision was made to incorporate small Leave No Trace signs at these sites. After more analysis occurs, additional management actions are likely to occur, in conjunction with a continuation of the Public Engagement Strategy. Additionally, Wilderness Character Monitoring through WSP is slated for 2022.

Recommendations

Recommendations include continuation of work within the Wilderness Stewardship Performance measure, including thorough data analysis to better identify useful information such as trends and desired condition. Implement Public Engagement Strategy and Wilderness Character Monitoring, followed by BMPs for resource damage from high use.

Evaluation of Monitoring Question and Indicator(s)

Based on the above discussion, it is recommended to reconsider the fourth indicator as it is difficult to monitor and glean useful information. Also, the indicators "Wilderness Managed to Standard" and "Wilderness Stewardship Performance elements being met" are redundant. The element scores are what determine if the Wilderness is "managed to standard," so it is not necessary to have two separate indicators regarding this.

References

U.S. Forest Service. 2019. Public Engagement Strategy. Charles C. Deam Wilderness. Peninsula Area. On file with Hoosier National Forest, Supervisor's Office.

U.S. Forest Service. 2018. Code of Federal Regulations. 219.12 Monitoring. On file with Hoosier National Forest, Supervisor's Office.

U.S. Forest Service. 2016. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

U.S. Forest Service. 2017. Wilderness Stewardship Performance Guidebook. Version 2017.2. 121p. On file with Hoosier National Forest, Supervisor's Office.

Wadzinski, Lester. 1993. Summary and Recommendations Charles C. Deam Wilderness Citizen's Task Force Limits of Acceptable Change study. 19p. + appendices. On file with Hoosier National Forest, Supervisor's Office.

5.7 – Provide a Usable Landbase

5.71 -- Are acquisition of public easements, exchanges of inaccessible parcels, construction of public parking areas and other efforts improving public access to National Forest Service land?

Last Updated

This question was added based on the 2016-2017 Biennial Report recommendation to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Acres of forest with no public access easement

Monitoring Frequency

This is monitored every 5 years and reported every 10 years.

Background & Driver(s)

Adequate public access to NFS lands is an obvious prerequisite condition for the ability of the public to recreate on and enjoy these lands. Although determining "adequate" access clearly contains an inherently subjective component, generally-speaking, access is improved through land adjustment activities (e.g., acquisition of new land or easements). "Access" essentially means that a particular block of NFS land can be legally and physically accessed from a public road. It does not mean that there is vehicular access throughout a particular block of NFS, but rather that there is a legitimate means for the public to reach the area by vehicle and thereafter access the NFS land by foot or other authorized mode of travel.

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

This monitoring question also responds to the *2006 Forest Plan* goal to "Provide a useable landbase."

Land adjustment activities typically are multi-year projects and when measured across the roughly 204,000 acres of the Forest as a whole, meaningful change will only occur over relatively extended time frames. Accordingly, the monitoring and reporting frequency for this goal were initially set at five (5)

and ten (10) years, respectively. The most recent monitoring occurred in 2016, which was reported in FY2017.

Monitoring Indicator: Acres of forest with no public access easement

Results and Discussion

The methodology used in the 2016 monitoring effort involved manually evaluating the legal and physical access to large blocks of NFS land from current public roads. For reasons discussed below, this is a rather coarse assessment of the actual public access needs on the Hoosier NF. The results from the 2016 monitoring assessment identified a total of 3 parcels larger than 225 contiguous acres in size that appear to lack legal public access from an existing public road. This represented a combined 828 acres of NFS land with inadequate public access.

This measure is incomplete. The methodology involved manually reviewing maps of NFS land and comparing large (>225 acre) blocks of contiguous NFS land relative to existing public roads. However, there are many more parcels of isolated NFS land, some as small as 1- 20 acres in size, without current legal or physical access. Forest Service resources may be more efficiently directed toward exchanging these properties for other lands adjoining larger blocks of NFS land, rather than attempting to negotiate and purchase access rights for many, if not most, of these small, isolated tracts of NFS land. In addition, the mere fact that a parcel of NFS land contains frontage along a public road does not necessarily mean there is "adequate" access. For example, there may not be a developed parking area for the public to use or the adjoining terrain (e.g., steep banks alongside the road) may severely limit or even preclude public access to the adjoining NFS land from the road.

Recommendations

Monitor indicators in 2021 and again in 2026; report on progress using indicators in 2026.

Evaluation of Monitoring Question and Indicator(s)

Improving access to existing NFS lands through land adjustment actions (e.g., acquisition of ROW easements or land) is and should always remain an abiding objective for the Hoosier NF, as currently reflected in the 2006 Forest Plan. However, for the reasons outlined above, meaningful evaluation and efforts to accurately monitor progress toward improving public access involve inherently subjective criteria and factors. Moreover, the mere fact that a public road touches or transects a parcel of NFS land in and of itself does not fully answer the inquiry whether there is adequate public access. Use of GIS mapping can only provide partial – and in many places, quite likely inaccurate – answers to the question.

References

None

5.72 – Are land adjustment activities reducing fragmentation?

Last Updated

This question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Ratio of miles of boundary line to total forest acres

Monitoring Frequency

This is monitored every 5 years and reported every 10 years.

Background & Driver(s)

The landownership of the Hoosier NF, which is comprised almost entirely of lands acquired incrementally by the United States beginning in the mid-1930's, is highly fragmented. Such fragmented public land ownership can present challenges in conducting land management activities (e.g., timber harvest, prescribed fire treatments, etc.). In other words, larger, more consolidated blocks of NFS land are more efficiently managed and generally provide higher quality recreational experiences.

This monitoring question addresses two elements in 36 CFR 219.12:

> (v) The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
>
> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

This monitoring question also responds to the *2006 Forest Plan* goal to "Provide a useable landbase."

Although a relatively coarse measure, the most simple and direct measure of NFS land ownership fragmentation is to compare the distance of exterior land boundary with the overall acreage of the Forest. The Forest continues to pursue land adjustment (e.g., purchase, exchange) opportunities, with one of the primary objectives being consolidation of NFS land ownership. Measures for accomplishing this goal, however, are generally not meaningful over short time horizons and therefore, the monitoring and reporting frequency for this goal are five (5) and ten (10) years, respectively. The most recent monitoring and reporting occurred during Fiscal Year 2017.

Monitoring Indicator: Ratio of miles of boundary line to total acres of forest

Results and Discussion

As of March 2017, the Hoosier National Forest contained 1,356.4 miles of exterior boundary for 203,729 acres of NFS land (or 150.2 acres/mile of boundary line). In response for Forest Plan direction, over time this ratio should increase, with a greater number of acres per mile of exterior boundary. This a relatively new measure, added to the Forest's monitoring program in 2016; therefore, the above figure constitutes the baseline from which subsequent progress may be measured.

Recommendations

None

Evaluation of Monitoring Question and Indicator(s)

As previously stated, this is a relatively simplistic and coarse measure of fragmentation versus consolidation of the lands managed and administered by the Hoosier NF. That being said, it is also fairly meaningful in that it provides an empirical measure that can be effectively monitored over time to determine whether the Forest is gradually becoming more consolidated through land adjustments in response to Forest Plan direction. Accordingly, no changes to this monitoring question or measure are recommended at this time.

References

None

5.8 – Provide for Human and Community Development

5.81 -- Are management activities reducing the wildfire risk to communities?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

The number, or proportion, of wildland urban interface (WUI) acres treated relative to the total number of WUI acres in previous two years.

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

Measuring the risk of wildfire to communities is difficult, at best, due to settlement patterns in southern Indiana, the ephemeral nature of wildfires on the Hoosier National Forest, and the proportion of wildfires that are human caused and start on private land. Most of the population within the HNF purchase boundary are not associated with any particular community as Forest ownership is relatively noncontiguous and the interstitial spaces are well settled. Approximately 99% of wildfires on, and around, the Forest are started by human activity with an overwhelming majority starting on private land. In the past ten years no wildfires have been known to start on HNF lands and move onto private land. However, the converse happens with regularity. Human behavior regarding wildfire starts is largely regulated by culture or individual county ordinances. Furthermore, no known fires in the past ten years have extended beyond one operational period before containment has been reached. Therefore, the only direct impact reducing wildfire risk to communities is fuels management in the wildland urban interface (WUI).

This monitoring question addresses the following element in 36 CFR 219.12:

> (viii) The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

Monitoring Indicator: The number, or proportion, of wildland urban interface acres treated relative to the total number of WUI acres in previous two years.

Results

In FY20-21, a total of 7,655 acres were treated by prescribed fire on Forest and partner lands with 2,210 of those acres occurring within the designated WUI (Sprung, 2015). Of the 28 individual burns completed 23 incorporated portions of WUI. Mechanical and herbicide treatments totaled 1,585 acres with 1,057 acres occurring in the WUI (Sprung 2015). The WUI treated acres combine to represent 0.4340% of the WUI within the reciprocal fire protection boundary (RPB). The total acreage of WUI within the HNF RPB is 752,681 acres. The number of HNF owned WUI Acres is approximately 135,163 out of a total of approximately 204,346 acres, or 66%.

Discussion

There has been an active fuels program on the HNF for some time with prescribed burning records dating back to 1992. It is likely that prescribed burning took place prior to then but records corroborating this cannot be located. Additionally, except for a hiatus in the 90's and early 2000's, there has also been an active timber program. The number of acres treated by year has been variable but, in general, is increasing slightly every year. Conducting fuels treatments exclusive of ecosystem management is untenable and not supported by the Forest Plan. Thus, the geographic placement of treatments to meet the goals of the Forest Plan, including sustaining ecosystems and providing for community development, is key.

Using GIS analysis, it was determined that over the last two fiscal years 2,210 acres of prescribed fire and 1,057 of mechanical and herbicide treatments, totaling 3,267 acres, were conducted in the WUI on Forest System and partner lands in shared watersheds. Prescribed burning and mechanical/herbicide treatments in the WUI decreased 785 and 1,660 acres, respectively, from the previous monitoring period.

Since some partner lands in shared watersheds occur outside the RPB, direct year to year comparisons on percentage basis does include a nominal error. However, the acreage of RPB is relatively large and includes variable landscapes similar to partner lands outside the RPB allowing it to act as stable proxy for which to evaluate WUI treatment efforts. The percentage of HNF WUI acres treated in FY20-21 is down 53% from the last monitoring period. This downturn is due to many factors include suspended prescribed fire operations and timber sale contract period extension due to the Covid-19 pandemic. However, overall acres treated, both WUI and non-WUI, did not decrease by a commensurate amount (11,477 total acres in FY18-19 vs 9,240 in FY20-21, or a 19% reduction).

The effectiveness of individual treatments, contributing to the whole, are documented in photo and fuels plots that lie within prescribed burns at the project level. Analysis of individual plots, analyzed and archived by the Fuels Specialist, show an overwhelming reduction in fuel loading thus reducing reoccurring fire behavior and limiting the reoccurrence of fire with varying levels of temporal effects depending on fuel type. Furthermore, the total amount of prescribed burning in the WUI is likely higher than represented as current spatial data does not consider some high value assets such as communication towers and pipelines.

Validation of management actions will come with subsequent monitoring cycles in conjunction with the co-occurrence of wildfire. However, though a matter of judgement, the proportion of fuels treatments occurring in the WUI are not adequate to reduce wildfire risk to communities Forest-wide. However, in distinct individual areas where treatments are concentrated, treatments are effective in reducing wildfire risk to nearby populations and communities.

Recommendations

Given the proportion of Hoosier N.F. ownership that is WUI, any increase in fuels treatments would result in an increased proportion of acres treated in the WUI. Increase in fuels treatments will result in reducing the threat to those individuals in communities situated in the WUI by reducing the availability and number of burnable fuels, thus reducing fire intensity, for 5-12 years after any given fuel treatment. Additionally, updating the WUI layer with high value assets not considered in the original analysis would result in a more accurate representation of actual interface and intermix areas.

Evaluation of Monitoring Question and Indicator(s)

At this juncture monitoring techniques appear to be adequate to answer the question at hand. However, acreage limitations in the Forest Plan, and associated USFWS Biological Opinion (2006), are impacting further fuels projects.

References

U.S. Forest Service. 2006. Hoosier National Forest Land and Resource Management Plan. On file with Hoosier National Forest, Supervisor's Office.

Sprung, Jason. 2015. Social Science in The Wildland Urban Interface: Wildland Fire Management and Risk In The Greater Hoosier National Forest Area; An Integrated Approach. MS Thesis, Ball State University, Muncie, IN.

5.82 -- Are forest product offerings meeting Forest Plan goals?

Last Updated

This question was part of the 2006 Forest Plan.

Monitoring Indicators

Cubic feet of timber sold

Number and diversity of forest product permits issued

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

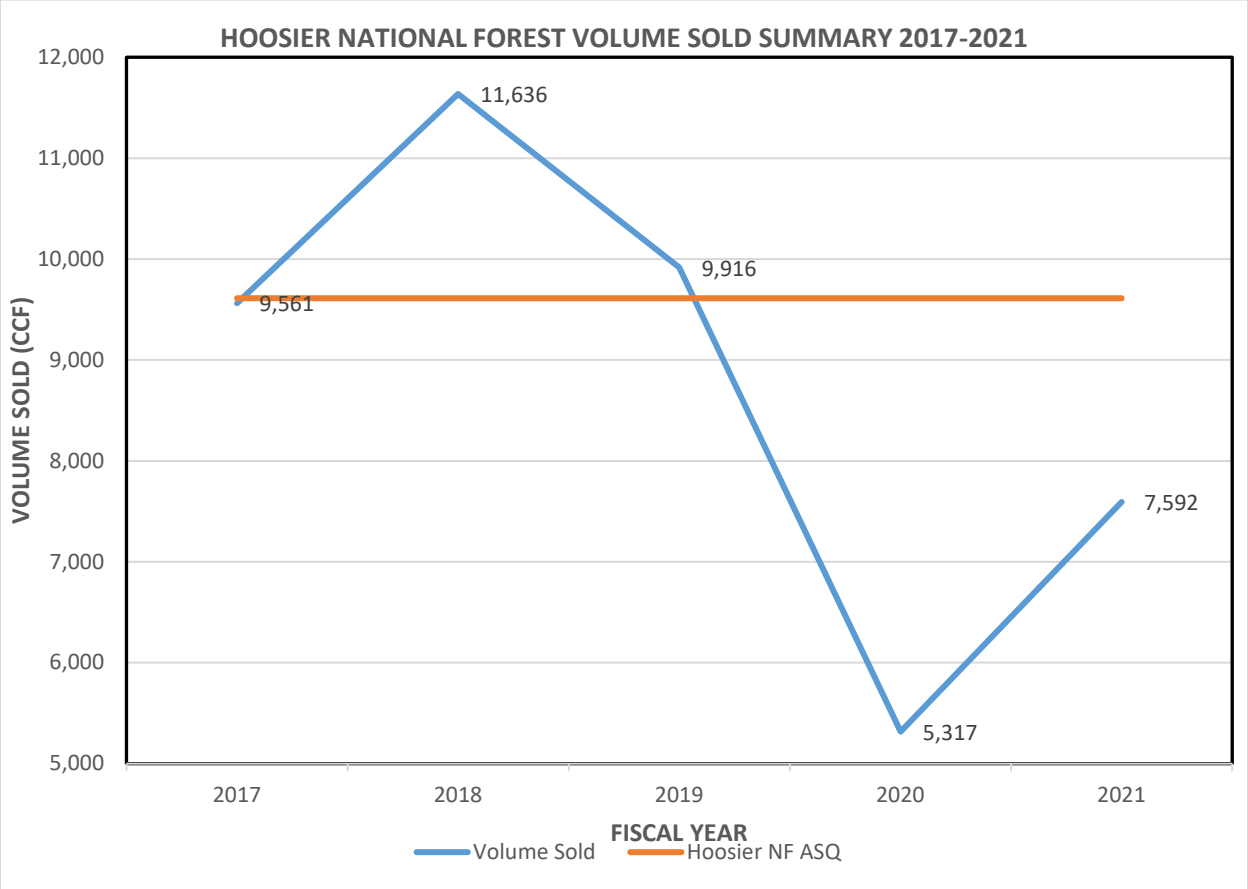
This monitoring question addresses the following element in 36 CFR 219.12:

> (vii) Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities

The average annual Allowable Sale Quantity (ASQ) of timber harvest in the Forest Plan is 5.77 million board feet, approximately 9,612 hundred cubic feet (CCF). It is a component of the goal to provide for human and community development by providing for a balance of forest products within the capabilities of the ecosystems. Timber harvest is used as a tool to help achieve the Forest Plan goals to maintain and restore sustainable ecosystems as well as conservation of threatened and endangered species habitat. This is done to perpetuate and enhance biological diversity by harvest of hardwoods, and by removal of non-native pine species and creation of early successional forest habitat. The percentage of early forest habitat is dependent on the management area in the Forest Plan. The Forest Plan does not define a monitoring item for diversity of forest products. Information on permits is summarized below.

Monitoring Indicator1: Cubic feet of timber sold

Results



Discussion

The above line graph shows the volume sold on the Hoosier the previous 5 fiscal years in comparison to the Forest Plan ASQ of 9,612 CCF. After being near or above ASQ from 2016-2019, timber volume sold dipped well below ASQ in 2020-2021. The Forest Plan direction regarding ASQ is that the ASQ is defined as per decade of the Plan. For the first four decades of the Plan, the ASQ per decade is 57.7 million board feet, or 96,120 CCF. Despite the volume sold in excess of ASQ in some years of the last decade, the 10-year average volume sold through 2021 was only 8,148 CCF per year, well below the Forest ASQ. Yearly volume sold levels the next few fiscal years can increase to accelerate Forest Plan goals associated with this monitoring indicator and still fall under the decade-average ASQ.

Monitoring Indicator2: Number and diversity of forest product permits issued.

Results

HOOSIER NF FOREST PRODUCT PERMITS SUMMARY 2016-2021	
PRODUCT CATEGORY	**# OF PERMITS SOLD**
Firewood	202
Special Forest Products	2
Research Collections	4

Discussion

Forest product permits on the Hoosier are primarily issued for firewood. An average of 40 firewood permits per year have been issued the last 5 years across both Ranger Districts. Permits are frequently issued after timber sales to utilize top wood left on-site after the timber contract has been closed, trees that have fallen across roads, after hazard trees have been cut down in recreation areas or in other areas when alerted to by the Public. A handful of permits have been issued for research purposes. These have included foliage permits for Eastern Hemlock and Black Walnut trees and plant collections. Special forest products included one permit issued for walking sticks the individual made from saplings that had been twisted by vines.

Recommendations

None

Evaluation of Monitoring Question and Indicator(s)

Volume sold varies by treatment type. Hardwood thinning's may average around 4-11 ccf/acre, while pine clearcuts average over 40 ccf/acre. This monitoring item is best looked at together with the monitoring question "Are Forest Plan goals for vegetation composition and age class being met?"

References

Volume sold and permit data obtained from I-Web.

5.83 -- Is our conservation and interpretive program reaching a broad audience?

Last Updated

The question was added 04/12/2016 to meet the requirements of the 2012 Planning Rule.

Monitoring Indicators

Individuals reached

Monitoring Frequency

This is monitored annually and reported biennially.

Background & Driver(s)

The Hoosier National Forest outreach and education program is an important way to promote conservation efforts and wise use of natural resources. It facilitates learning about the environment,

promotes recreational viewing opportunities, and guides people as they experience wildlife, fish, and flowers in their natural setting on public lands.

This monitoring question addresses one element in 36 CFR 219.12:

> (v) Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.

Monitoring Indicator 1: Individuals reached

Results and Discussion

Conservation and interpretation outreach information for fiscal year 2020 and 2021 on the Hoosier National Forest was entered and retrieved from NatureWatch, Interpretation and Conservation Education database.

Hoosier NatureWatch, Interpretation and Conservation Education FY20

Totals Summary

Accomplishments	Audience	Partners	Budget
8	90682	0	$3,000.00

Region/Forest Summary

Region	Forest	Accomplishments	% of Total
EASTERN REGION, REGION 9		8	100%
	HOOSIER NATIONAL FOREST	8	100%

Target Age Group Summary

Age Group	Total Accomplishments	% of Total
ADULTS	4	50%
ELEMENTARY SCHOOL	5	62.5%
HIGH SCHOOL	5	62.5%
MIDDLE SCHOOL	5	62.5%
NOT APPLICABLE	1	12.5%
PRE-K	1	12.5%
YOUNG ADULTS	4	50%

Audience Summary

Audience Type	Audience Reached	% of Total
ACADEMIC: 4TH GRADE STUDENTS	128	0.1%
ACADEMIC: NON-4TH GRADE STUDENTS/YOUTH	1058	1.2%
ACADEMIC: TEACHERS/EDUCATORS	397	0.4%
FOREST VISITORS	736	0.8%
GENERAL PUBLIC	21087	23.3%
NON-ACADEMIC: BOYS YOUTH GROUP	20	0%
NON-ACADEMIC: GIRLS YOUTH GROUP	256	0.3%
NON-ACADEMIC: MIXED GENDER YOUTH GROUP	67000	73.9%

Subject Summary

Subject Type	Subject	Accomplishments	% of Total
Cultural/Heritage Resources		0	0%
Environmental Improvements		0	0%
Fire		1	12.5%
Forests/Grasslands/Rangelands		7	87.5%
Human Dimensions		1	12.5%
Minerals/Geology		0	0%
Other		0	0%
Outdoor Recreation		5	62.5%
Plants/Animals		4	50%
Water/Air/Meteorology		0	0%

Location Summary

Location Type	Location	Accomplishments	% of Total
Academic Related Location		3	37.5%
Non-Academic Location		6	75%
Not Applicable (i.e. program support)		1	12.5%

Hoosier NatureWatch, Interpretation and Conservation Education FY21

Totals Summary

Accomplishments	Audience	Partners	Budget
28	2752	4	$11,217.00

Region/Forest Summary

Region	Forest	Accomplishments	% of Total
EASTERN REGION, REGION 9		28	100%
	HOOSIER NATIONAL FOREST	28	100%

Target Age Group Summary

Age Group	Total Accomplishments	% of Total
ADULTS	11	39.3%
COLLEGE STUDENTS	10	35.7%
ELEMENTARY SCHOOL	13	46.4%
HIGH SCHOOL	11	39.3%
MIDDLE SCHOOL	11	39.3%
NOT APPLICABLE	6	21.4%
PRE-K	9	32.1%
SENIORS	8	28.6%
YOUNG ADULTS	9	32.1%

Audience Summary

Audience Type	Audience Reached	% of Total
ACADEMIC: 4TH GRADE STUDENTS	3	0.1%
ACADEMIC: NON-4TH GRADE STUDENTS/YOUTH	348	12.6%
ACADEMIC: TEACHERS/EDUCATORS	25	0.9%
EMPLOYEES	66	2.4%
FOREST VISITORS	315	11.4%
GENERAL PUBLIC	1902	69.1%
NON-ACADEMIC: BOYS YOUTH GROUP	12	0.4%
NON-ACADEMIC: MIXED GENDER YOUTH GROUP	60	2.2%
VOLUNTEERS	21	0.8%

Subject Summary

Subject Type	Subject	Accomplishments	% of Total
Cultural/Heritage Resources		6	21.4%
Environmental Improvements		10	35.7%
Fire		9	32.1%
Forests/Grasslands/Rangelands		10	35.7%
Human Dimensions		5	17.9%
Minerals/Geology		0	0%
Other		3	10.7%
Outdoor Recreation		15	53.6%
Plants/Animals		8	28.6%
Water/Air/Meteorology		0	0%

Location Summary

Location Type	Location	Accomplishments	% of Total
Academic Related Location		8	28.6%
Non-Academic Location		35	125%
Not Applicable (i.e. program support)		0	0%

Delivery Method Summary

Method	Accomplishments	% of Total
Contest	1	3.6%
Curriculum/Educational Materials	2	7.1%
Hands-On Activity	7	25%
Interpretive Program - Stationary	8	28.6%
Interpretive Program - Walk/Hike/Tour	4	14.3%
Static Interpretive (Kiosk, Sign, Banners, Displays, Interactives)	5	17.9%
Other	2	7.1%
Parade	1	3.6%
Presentation/Demonstration	4	14.3%
Broadcast Media: Radio/TV/Film/Podcast/Video/Website	3	10.7%
Social Media (Facebook, Twitter, Instagram, etc.)	1	3.6%
Staff Table/Exhibit	4	14.3%
Training/Professional Development	1	3.6%
Webinar	1	3.6%

Initiatives Summary

Initiative	Accomplishments	% of Total
Firewise	1	3.6%
Head Start	1	3.6%
Leave No Trace	7	25%
Project Wet	1	3.6%
Women and Girls	1	3.6%

Designated Day Summary

Designated Day	Accomplishments	% of Total
Earth Day	1	3.6%
Get Outdoors Day	1	3.6%
Public Lands Day	1	3.6%

Recommendations

None.

Evaluation of Monitoring Question and Indicator(s)

The monitoring question is still relevant to LRMP monitoring needs. The indicators are adequate to address this monitoring question.

References

NatureWatch, Interpretation and Conservation Education. Version 2.0.8. https://apps.fs.usda.gov/nice

6.0 Summary of Recommendations

Conservation of Threatened and Endangered Species Habitat (5.1)

- Continue cave surveys throughout the Forest – particularly on potential land acquisitions to gather previously unknown data. Finding a new cave being used by bats would assist the Forest Service in land management practices in that area and may elevate the rationale for acquiring that land. It would also add to the census knowledge of potential TE species. (5.11)
- Continue monitoring of new caves when feasible. Re-visit caves that have not been monitored in several years to determine if changes have occurred. Caves in the Wesley Chapel Gulf area need a more specific soil monitoring plan. (5.12)

Maintain and Restore Sustainable Ecosystems (5.2)

- Continue implementing the timber program at the Forest Plan prescribed levels. As time progresses, age classes and forest types will begin to change. (5.21)
- Acquire adequate funding and find qualified participants to re-initiate annual breeding bird surveys on the Hoosier National Forest. (5.22 and 5.24)
- Qualitative analysis is currently sufficient to inform management decisions. As monitoring continues in a systematic matter further analysis of quantitative data to convert it into qualitative data for analysis is recommended. (5.24)
- In the 2019 Monitoring report, we mentioned the need to find funding and a partner to map invasives in the Charles C. Deam Wilderness area to analyze the potential use of herbicide. A potential partner has been identified, that would help with hiring interns and putting them on a payroll. Now, we just need to find funding and work continues to secure funding and initiate an agreement for hiring and invasive mapping. (5.25)
- As implementation of the Forest Plan continues, the density in the areas of the forest where management is appropriate will decrease. This will increase the resiliency of forest stands and will lessen the chance that a significant pest or pathogen outbreak will occur. (5.26)
- As climate modeling improves, the Forest needs to consider that some species may no longer be appropriate for this region while others may become important. The Climate Change Atlas for Tree Species should be utilized when assessing the adaptability of species currently found on Forest. For example, non-native eastern white pine is given the lowest adaptability rating on the Climate Change Atlas for Trees. White pine stands should continue to be converted to native hardwoods to create a more resilient landscape. The Atlas can also help identify species that are predicted to shift into our area as the climate changes and their habitat moves north. Shifts in species will be tracked at the Forest-level by the FSVeg Spatial data table through time. In future monitoring reports, the Forest should expect to see a transition from pine to species groups that are or will become native to the area. (5.27)
- First and third year stocking surveys should continue to be utilized to assess regeneration of native hardwood species following regeneration treatments. Establishment of adequate amounts of new hardwood reproduction will continue to be an important indicator for this monitoring question. New and adaptive management strategies need to be assessed in mitigating compaction and erosion. Highly disturbed areas, where landings and skid trails are located, need more intensive management strategies such as: seeding in season, subsoiling,

revegetating with native/pollinator plants, and adding nutrients. These adaptive strategies should help recover soil productivity lost in these highly disturbed areas. (5.28)

Maintain and Restore Watershed Health (5.3)

- Recommendations include continuing to collect biological data along with habitat data. The monitoring design follows the principles of adequate monitoring and assessment (Yoder 1998; Yoder and Barbour 2009) by employing two biological assemblages and with supporting chemical/physical data. (5.31)

Protect Our Cultural Heritage (5.4)

- Develop a new 10 Year Heritage Program Plan as the current one expires at the end of 2022. IU-GBL has recently changed their name to Indiana University Museum of Archaeology and Anthropology (IUMAA). The current CCS partnership agreement IU-GBL expires in 2023. Establish a new partnership agreement with IUMAA and continue to curate our collections at the facility. Renew the MOU with Indiana State Museum for curation of the Lick Creek collection. Establish a new IDIQ as the current one expires in November 2022. With the potential influx of infrastructure funding, consider including more than one contractor in the IDIQ to increase pace of survey. Train more Heritage staff members to be CORs to keep up with oversight of more contract projects. Continue existing partnerships and develop new partnerships with universities for survey and site evaluation projects. Continue to monitor sensitive sites to identify direct protection needs. As funding becomes available, stabilize, and restore the Rickenbaugh House and the German Ridge CCC structures. The Covid pandemic has limited our ability to engage with the public in 2020 and 2021 as much as we have in the past, especially through in-person public events. As the pandemic subsides, engage with the public as much as possible and stress preservation ethics. Be mindful to not encourage visitation of sensitive areas or showcase archaeological resources to the point of over-saturation. Ensure Forest Protection Officers (FPOs) are aware of sensitive sites to periodically monitor to discourage looting and vandalism. Continue to encourage use of the Buffalo Trace Educational Boxes in the classroom both by teachers and our internal conservation education efforts. Continue to invite Tribes to provide presentations to employees on tribal history and the importance of their cultures and sensitive sites. (5.41)
- Due to improved mobile GIS capabilities and accuracy, in 2021 a shift was made to providing site protection buffer zones within ESRI Collector software to Fire and Timber specialists rather than an archaeologist flagging the buffer zones on the ground. (5.42). The implementation geodatabase created in 2019 for prescribed burning is now also being used for timber sale project implementation as well. This allows the Fire and Timber specialists to flag the protected locations as needed and helps with implementation planning. In 2020 and 2021, Heritage specialists continued to update site polygons using site forms and sketch maps. With increased Heritage staffing levels in 2022, the site polygon updates should also include field visits to further improve accuracy of the data and site protection. As the need for site visits for flagging and site boundary verification is reduced, a post-implementation monitoring system should be established to ensure a representative sample of sites continue to be visited each year to monitor protection efforts. This will ensure that the new site protection system is effective, and that project design criteria and mitigation measures are being followed during project implementation. Continue active engagement by Heritage program staff with Interdisciplinary

Teams, and project implementers to continually improve overall protection efforts. Continue to develop and distribute information pertaining to the Heritage and Tribal programs for inclusion in new employee orientation/onboarding purposes. Continue efforts to complete site evaluations, which may reduce the number of sites requiring protection. (5.42)

- Forest Law Enforcement Officers (LEOs) should continue to be provided with opportunities to attend ARPA training. Once both new LEOs are fully trained and on Forest, plan a heritage resources orientation for them to get them acquainted with past and ongoing issues, and some of the more sensitive sites. Continue to seek funding and for stabilization and rehabilitation of the Rickenbaugh House and the German Recreation Complex. Complete the work once funding is secured. Monitor the Mesmore Cliffs Upland and re-engage with Crawford County and Conservation Officers if damage from ATVs is continuing. (5.43)

Provide for a Visually Pleasing Landscape (5.5)

- Design and layout of timber harvest units should pay close attention to areas of retention and either avoid those acres as much as possible or line officer should explain rationale for impacting those acres. (5.51)

Provide for Recreation in Harmony with Natural Communities (5.6)

- Agency consideration of NVUM data collection and necessary improvements, particularly for Region 9, to effectively implement the Eastern Region Sustainable Recreation Strategy, is needed. Visitor satisfaction is comparable across the Region and may not be an effective measure for funding levels or determining trail satisfaction levels by visitors. Continue utilizing trail counters to gauge popularity of trails and identify trails receiving little to no use, as it pertains to the Eastern Region Sustainable Recreation Strategy and Priority Use Areas/Iconic Places. (5.61)
- TRACS surveys will continue to be completed as assigned (none assigned by the Washington Office for 2022) with additional trails being surveyed as time allows in conjunction with other critical work. Critical Health and Safety issues will continue to be prioritized over other deferred maintenance needs that is not of as high a priority as those maintenance needs to correct potential health and safety risks to users. However, other work, both regular annual maintenance and deferred maintenance needs will be addressed as time and budget allows. (5.62)
- Recommendations include continuation of work within the Wilderness Stewardship Performance measure, including thorough data analysis to better identify useful information such as trends and desired condition. Implement Public Engagement Strategy and Wilderness Character Monitoring, followed by BMPs for resource damage from high use. (5.65)

Provide a Usable Landbase (5.7)

- Monitor indicators in 2021 and again in 2026; report on progress using indicators in 2026. (5.71)

Provide for Human and Community Development (5.8)

- Given the proportion of Hoosier N.F. ownership that is WUI, any increase in fuels treatments would result in an increased proportion of acres treated in the WUI. Increase in fuels treatments will result in reducing the threat to those individuals in communities situated in the WUI by reducing the availability and number of burnable fuels, thus reducing fire intensity, for 5-12

years after any given fuel treatment. Additionally, updating the WUI layer with high value assets not considered in the original analysis would result in a more accurate representation of actual interface and intermix areas. (5.81)