Montana Natural Heritage Program Scope of Work Progress Report

Report for FY18

This report provides an overview of progress the Montana Natural Heritage Program (MTNHP) has made towards delivery of core service goals outlined in Appendix 1, Scope of Work (SOW) for operation of the MTNHP, under the Contract for Services between the Montana State Library and the University of Montana for state fiscal years 2018 and 2019 (award number 20171019). Core service goals were taken largely from the MTNHP Strategic Plan for 2015-2020 which received review from MTNHP staff, MSL staff, and state, federal, and private partners. The report lists the core service goals outlined in the core contract using a logic model of INPUTS (resources needed) → OUTPUTS (products produced) → OUTCOMES (patron use) → IMPACTS (impact on patrons) and then reports on them for FY18 using a series of metrics and the following color coding:

Green – activity progressing as expected.
Yellow – activity may be delayed but the delays do not necessarily rise to the level of concern
Red – activity is delayed and attention is warranted
Blue – addition or change to the original work plan

Funding for the staff and expertise required for the core service goals in this SOW is composed of Core, Supplemental Core, MSDI Core, and Project funding as defined below:

Funding Source Definitions

- **Core:** This funding represents the $657,419 included in the MSL-UM contract for "Essential Core Services." Examples of essential core services include: fulfilling information requests across all program disciplines, adding new data to program databases, administering and managing all program databases and systems, maintaining species status, maintaining and improving web delivery of information, and program administration.

- **Supplemental Core:** Funding provided by partners that contribute to the support of essential core services and information and may be allocated at the discretion of the Program for those essential core services. This funding is not specified or allocated in the MSL-UM contract and is provided by partners in recognition of inadequate state funding for essential core services. Examples include data compilation, species or community status reviews, data system maintenance, development of web pages and applications, answering user requests, and providing trainings on the use of MTNHP resources.

- **MSDI Core:** Montana Spatial Data Infrastructure (MSDI) funding is from the Montana Land Information Act account in accordance with the latest Montana Land Information Plan and is dedicated to Wetlands and Land Cover MSDI data development and coordination.

- **Project:** Funding that supports the overall mission of the program, but entails specific deliverable products for partners. Project funding does not allow discretionary spending by the Program and does not directly support essential core services. This funding is not specified or allocated in the MSL-UM contact. Examples include: requests for development of new datasets, web resources, or field surveys to address data needs such as assessments of the status of species or communities.

Impact - Partner Feedback

The ultimate impact of the information resources that are compiled and delivered by MTNHP are probably best measured through partner feedback and are provided here at the beginning of this Scope of Work Report. Partners have provided a great deal of positive feedback on the impact of MTNHP to their organizations through our request router survey, directly to staff who have assisted them, or to the Environmental Quality Council, the Governor, and the State Budget Director in the past year. Of 397 patrons that filed mediated requests and submitted a survey describing their experience: (1) 98% said they got the information they needed or even more information than they expected; (2) 97% said the information would be very difficult to get elsewhere or was only available from the MTNHP; (3) 98% said they received the information on or before they date they requested it by. Written feedback in the past year includes the following:

- My small business relies on on-line data from a variety of sources across the United States. My staff and I have always been impressed, amazed really, at the quality of the data at the Montana State Library both in terms of quantity, quality, and digital organization. Truly Montana's data sets are superior to any other states, including large states such and California and Washington.
- Over the years, I have accessed data and other information from Natural Heritage Programs in numerous western states. MTNHP by far provides the easiest and most expeditious access to data and other information on the status and distribution of biota in Montana, and this access is free of charge. I believe these attributes to be, at least in part, due to MTNHP's integral association with NRIS and the Montana State Library, where the dissemination of information to agencies, the public, and industry is a priority.
- It would not be an exaggeration to say that Montana State Library data save large infrastructure and energy projects hundreds of thousands of dollars in high-level analysis because there is no need for on-the-ground data collection.
- The Montana datasets are cumulatively worth millions of dollars to projects each year. Those data need to be managed and updated. It would be a colossal disappointment if the quality of Montana's data decreased because the Governor or legislature did not allocate enough funding simply because they misunderstand the utility of those data to industry and the Montana economy.
- Not only are the actual data on the status and known distribution of biota in relation to a particular project important, but the associated literature reviews, compiled reference lists, and modeling that predicts species distributions are equally important. MTNHP and NRIS represent a "one-stop-shop" source of publically-available baseline information for any project in Montana, which aids in defining the level of literature review and field effort needed for a particular project. Access to this substantial source of compiled information subsequently accelerates environmental review and permitting processes, which represents additional monetary savings. Depending on the size of a project, the time and effort saved through accessing MTNHP services can be substantial. I believe a conservative estimate of monetary savings would range from thousands of dollars for smaller projects to tens of thousands of dollars (or more) for larger projects. The savings for a project could be even more substantial (exceeding a hundred thousand dollars) where it helps site a large project such as transmission line and pipeline through locations with fewer sensitive wildlife concerns.
- This program is awesome, I use it dozen times a year, but have never filled out this survey. After hearing about the funding short falls I felt it necessary to conduct this survey. If the agencies need this information to permit projects, then the state needs to step up and provide funding.
- I want to start by saying I love the MTNHP. It is an excellent resource. One think I've noticed, however, is that it seems like plant observation data is a bit sparse for most species. I wonder if MTNHP could collaborate with other agencies to beef up their database.
- The responsiveness of MTNHP is excellent. They always provide prompt responses.
- This program is invaluable, funding should always be available to better is effort. I heard funding was cut back in 2018 which should be a crime. The wetlands mapper, the species prediction models, SOC data is needed in this regulatory environment.

- MTNHP routinely saves our business and clients thousands of dollars by providing historical plant and wildlife observations that inform development decisions and study plans.
- I don’t know of any way to get the information from a single other source - by contacting multiple agencies, NGO's and individuals maybe but not the 'one stop shop' of the MNHP.
- MTNHP routinely saves our business and clients 10s or 100s of hours by providing historical plant and wildlife observations that inform development decisions and study plans.
- Thank you for your prompt and complete response regarding the bird field guide. The guide is truly fascinating in its totality! My daughter is a new Wildlife Biology graduate with a passion for raptors. She's as gobsmacked by the depth of information you've organized as I. Kudos and appreciation for all the work you and the team have done. It is valued!

Sustainable funding is secured to achieve the statutory mission of the program			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Program Coordinator and other staff time to summarize funding needs and mission status. State, local, federal, and nongovernmental partner input and support.	Communicate state core funding needs through the executive planning process and to the Montana legislature. Communicate supplemental core funding needs to State, local, federal, and non-governmental partners that are dependent on MTNHP services. Empower partners to articulate the value of MTNHP information and data delivery services to help secure adequate funding.	Montana's governor and legislature and State, local, federal, and nongovernmental partners recognize the importance of providing adequate core and project funding to maintain program staff, expertise, and information services. Statutory mission of being "a program of information acquisition, storage, and retrieval for data relating to the flora, fauna, and biological community types of Montana" (MCA 90-15-102) is achieved for all species and biological communities of the state. All core staff positions are funded to work on the core mission of the program. Staff expertise can be recruited, retained, and enhanced.	Partners have complete trust and confidence that MTNHP information is comprehensive, up-to-date and authoritative on distribution, status, and general biology of all species and biological communities of the state and can easily access this information to save time and money, speed environmental reviews, and inform decision making.

Metrics: core, supplemental core, and project funding applications and awards; staff recruitment and retention; partner feedback.

Core Funding

Core funding for the FY18-FY19 biennium was reduced by $230,808 to $657,419 as a result of passage of Senate Bill 261 by the 2019 legislature and a projected revenue shortfall. There has been a 58% reduction in buying power of core funding provided by the Montana legislature since FY08. On its own, core funding is now only able to fully support 3 of the program's 11 core services positions. The recent funding cuts caught the attention of the Environmental Quality Council (EQC) and MTNHP program services and funding are being reviewed by that interim legislative committee. The State Librarian, Digital Library Director, and MTNHP Program Coordinator presented the EQC with an overview of services provided by the program (9/28/17), funding of the program (1/17/18), and use statistics relative to funding (3/21/18). The EQC is now exploring ways of increasing the programs funding by $311,291 per year to provide $650,000 per year in core funding; EQC meeting archives can be accessed at http://leg.mt.gov/css/Committees/Interim/2017-2018/EQC/default.asp

Supplemental Core Funding

An MTNHP partners meeting was held via Go-To-Meeting on June 15, 2017 to fully inform partners of the status of the cuts to core funding and inquire about their ability to provide supplemental core and project funding. Partners responded with $282,500 in supplemental core funding in FY18, an 86% match to state funding and a $29,250 increase from supplemental core funding provided in FY17. The MTNHP is very grateful to the following partners for their financial

support in FY18: Bureau of Land Management ($60,000), UM VP for Research and Creative Scholarship ($50,000), U.S. Forest Service ($45,000), NatureServe ($40,000), Natural Resource Conservation Service ($25,000), Montana Department of Agriculture ($20,000), Montana Department of Transportation ($10,000), Montana Land Information Act ($10,000), The Nature Conservancy ($10,000), Bonneville Power Administration ($6,000), U.S. Fish and Wildlife Service ($5,000), Weyerhaeuser ($1,500).

Project Funding

Staff have worked with partners to develop meaningful projects that support MTNHP's overall mission of documenting the distribution and conservation status of the plants, animals, and biological communities of Montana and making that information available to partners for environmental planning, review, and permitting efforts. Project funding levels in FY18 have been very consistent with recent years and will likely total around $900,000. Staff are currently managing about 40 partner sponsored projects along the lines of those outlined at http://mtnhp.org/about/projects.asp

Staff Recruitment and Retention

Despite the budget cuts imposed by Senate Bill 261, MTNHP has been able to maintain all 23 staff that were present before the cuts, including the 9.5 core services positions present before the cuts; there are 11 core services positions in total, but MTNHP had already lost 1.5 core service positions before the latest cuts. Unfortunately, as a result of the cuts, a number of core service positions have had to take on project work that does not directly relate to core services (e.g., creation of a botany database for the state of Utah by our Database Manager or creation of an online field guide for the states of Wyoming and Utah by the Web Programmer). This has created heavier workloads to fill requests for partners and the public and a growing backlog of core work tasks, both of which are causing a noticeable increase in staff stress which may hinder staff retention in the long run.

MTNHP began a recruit effort for a full time Spatial Analysis Lab Director in October of 2017 in order to build bridges with University of Montana faculty/researchers, meet partner needs for improved vegetation and other landscape-scale mapping products, and install new leadership in the Ecology Program given the approaching retirement of the Senior Ecologist, Linda Vance, who had simultaneously been the Spatial Analysis Lab Director. A lengthy national recruitment resulted in the hiring of Jessica Mitchell as the new Spatial Analysis Lab Director. Jessica has a great remote sensing background with projects that have included mapping invasive species, various native habitats, biomass, biodiversity, forage quality, and declines of native species impacted by exotics. Jessica has already started building bridges between the academic community on the UM campus and the Heritage Program and its partners. In addition to a lengthy interview process in both Missoula and Helena, she undertook a second interview process with representatives from the W.A. Frank College of Forestry and, pending filing of paperwork, will also be an Assistant Research Professor under the Department of Ecosystem Conservation Sciences in the W.A. Frank College of Forestry. During this search, numerous faculty and staff on the UM campus noted that they were pleased to see elevation of the Spatial Analysis Lab on campus and looked forward to collaborations with the Heritage Program to make the latest science available to agency resource managers. MTNHP's Senior Ecologist, Linda Vance, intends to continue to lead wetland and terrestrial habitat assessment efforts for the near term and MTNHP is lucky to retain her in these challenging budgetary times.

Botanical information (vascular plants, non-vascular plants, lichens, fungi, diatoms and other algae) is comprehensive, up-to-date, and authoritative			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Botany and Information Services staff time. Expert input. State, local, federal, and nongovernmental partner input on prioritization.	Comprehensive, up-to-date, and authoritative coverage for: - taxonomic representation - general information - observations/surveys - species occurrence polygons for environmental reviews - predictive distribution models - conservation status ranks	State, local, federal, and nongovernmental partners have complete trust and confidence that MTNHP information is comprehensive, up-to-date and authoritative on distribution, status, and general biology of all botanical species. Botanical information is readily available for MEPA, NEPA, other permitting and planning processes, and responses to natural and human caused disasters (e.g., fires, oil spills).	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, reducing duplication of effort, and avoiding litigation. Stewardship of botanical species is improved. Botanical species listings as a result of lack of information are avoided.

Metrics: statistics on taxonomic representation; photos, descriptions, habitat, references, and other general information added or updated on the Montana Field Guide or other web pages; botanical literature and web links compiled; observations, surveys, species occurrences, predictive models, range polygons, and habitat associations added/created; conservation status ranks reviewed or updated; presentations made; trainings conducted; projects undertaken; reports and publications completed; and partner feedback.

Taxonomic Representation

Vascular Plants – There are currently 2,918 species, subspecies, or varieties listed in MTNHP databases as present, potentially present, having the potential to invade Montana; 2,326 native, 475 exotic, and 117 of unknown/undetermined origin. These taxa are fully represented in the MTNHP database and on the Montana Field Guide, 1,930 species were recently assigned Coefficient of Conservatism values, and the Program Botanist is working on completing an updated Vascular Plant Checklist; the last one was produced in 2013.

Mosses - There are currently 536 species, subspecies, or varieties listed as present or potentially present in Montana in MTNHP databases; 528 natives, 2 exotic, and 6 of unknown/undetermined origin. Of these taxa, 387 have updated accounts on the Montana Field Guide while 149 are shell accounts with only the taxonomy listed. The Program Botanist is collaborating with Dr. Joe Elliot on an updated Moss Checklist for Montana; the last one was produced in 1993.

Liverworts/Hornworts – There are currently 136 species, subspecies, or varieties listed as present or potentially present in Montana in MTNHP databases; 135 natives and 1 of unknown/undetermined origin. Of these taxa, only 5 have any account information beyond a general listing on the Montana Field Guide. The Program Botanist has no funding to revise the taxonomy, investigate conservation value, or complete accounts.

Algae/Diatoms – Only 4 algae (2 native, 2 exotic) and 1 diatom (exotic) are represented in MTNHP databases and only *Nitellopsis obtusa* has a fully developed account. There are an unknown number of algae and at least 1,100 species of diatoms known from Montana that are not currently represented in MTNHP databases or on the Montana Field Guide.

Lichens – MTNHP contracted with Lichenologist Tim Wheeler in 2018 to develop the first Montana lichen checklist using the latest taxonomic information on Montana lichens. The Program Botanist is currently working with NatureServe to finalize the list of more than 1,000 lichen species. will likely be represented in MTNHP databases and on the Montana Field Guide in the future.

Fungi - are not represented in MTNHP databases or on the Montana Field Guide. The Program Botanist has no time/funding to investigate Montana's species and their conservation status.

Conservation Status Ranks

State conservation status ranks were reviewed and finalized for 35 vascular plant species and initial review work was undertaken on an additional 35 species in FY18. A backlog of 258 vascular plant taxa are listed as Status Under Review because their conservation status needs to be reviewed in detail so that they can be properly addressed in project reviews and local and regional planning efforts.

Observations

21,447 observation records for native species (19,168 vascular plant, 1,891 algal, 385 moss, 2 liverwort, and 1 lichen, records) were added to the MTNHP observation database in FY18. Additionally, 6,080 native species observation records (5,817 vascular plant, 146 moss, and 117 lichen records) had spatial or tabular information updated to improve the records in FY18. The Program Botanist collaborated with the University of Montana Herbarium on a grant that if funded would geo-reference about 2,500 observations. Additional funding is required to bring another 7,000 moss observations into MTNHP databases. Similarly, at least 150,000 records of diatom observations are awaiting screening for inclusion into MTNHP databases.

Species of Concern Occurrence Records for Environmental Reviews

A total of 3,965 Species of Concern Occurrence records for 400 species were added to the MTNHP database in FY18 and are now available for use in environmental reviews and permitting processes as follows (3,851 occurrences for 353 vascular plant species, 89 occurrences for 34 moss species, and 25 occurrences for 13 lichen species). Additionally, Species Occurrence mapping was systematically reviewed and updated to current standards for Spalding's Catchfly (*Silene spaldingii*), a federally Threatened species. Additional cleanup on the mapping of older Species Occurrences is needed to bring this important information layer fully up to current standards.

Range Polygons

FY18 is the first year that MTNHP has created range maps for botanical species. Range maps were created for 48 Species of Concern (44 vascular plants, 3 mosses, and 1 lichen) and these are now showing on the Montana Field Guide and Map Viewer web applications.

Predicted Habitat Suitability Models and Range Maps

FY18 is the first year that MTNHP has created modern predicted habitat suitability models and associated reports for botanical species. Predicted habitat suitability models were created and reports were finalized for 41 Species of Concern (27 vascular plants, 3 mosses, and 1 lichen) and 1 USFS Sensitive species in FY18; reports are posted at http://mtnhp.org/models/ Predicted habitat suitability output can be viewed in the Map Viewer web application under the Single Species Overview and Environmental Summary tasks. Initial model runs were completed for an additional 140 vascular plant species listed as BLM Sensitive,

USFS Sensitive, or Montana Species of Concern in FY18. However, acceptability and value of these models has not been assessed and reports have not yet been finalized.

Field Guide Species Accounts

Field Guide species accounts were created for 15 native vascular plants and 11 aquatic invasive species in FY18.

Current representation general descriptions and habitat use summaries for botanical taxa on the Montana Field Guide is as follows:

Vascular Plants – 2,658 of 2,918 species have general descriptions and 2,602 of 2,918 species have habitat needs summarized in species accounts on the Montana Field Guide.

Mosses – 386 of 536 species have general descriptions and 384 of 536 species have habitat needs summarized in species accounts on the Montana Field Guide.

Liverworts/Hornworts – 5 of 136 species have general descriptions and habitat needs summarized in species accounts on the Montana Field Guide.

Algae/Diatoms – 1 of the 4 taxa have general descriptions and habitat needs summarized in species accounts on the Montana Field Guide.

Lichens – 36 of the 611 species have general descriptions and 40 of 611 species have habitat needs summarized in species accounts on the Montana Field Guide.

Fungi – no representation in MTNHP databases.

Photos

A total of 3,320 photos of botanical taxa have been added to the MTNHP database in FY18 and 1,508 of these were attributed for display on the Montana Field Guide. Current photo representation on the Montana Field Guide is as follows:

Vascular Plants – 1,938 of 2,918 species have images showing on the Montana Field Guide.

Mosses – 135 of 536 species have images showing on the Montana Field Guide.

Liverworts/Hornworts – 5 of 136 species have images showing on the Montana Field Guide.

Algae/Diatoms – 3 of the 4 taxa currently represented have images showing on the Montana Field Guide.

Lichens – 19 of the 611 species currently represented have images showing on the Montana Field Guide.

Fungi – no representation in MTNHP databases.

Botanical Literature and Website Links

136 botanical literature references have been added to the MTNHP reference management database allowing 242 reference listings to be added to species accounts in the Montana Field Guide in FY18.

The Botany related website links page was reviewed, broken links were fixed, and 10 website links were added. Additionally, 2 website links were added to the Class Links in the Montana Field Guide.

Habitat associations added/created

No associations between ecological systems and individual botanical species were created in FY18.

Presentations and Trainings

The following presentations/trainings were given in FY18:

- Wetland Plant Identification Training to Wetland Ecology Class at Rocky Mountain College. Billings, MT. November 6, 2017.
- Taught Lichen Identification for general public through Montana Native Plant Society. January 23, 2018.
- Conservation Status of *Howellia aquatilis* in Montana. Tenth Montana Plant Conservation Conference, Helena, MT. February 21, 2018. Co-authored with Steve Shelly, Maria Mantas, and Jamul Hahn
- A Snapshot View of Ute Ladies'-tresses Across it's Range in Montana. Tenth Montana Plant Conservation Conference, Helena, MT. February 21, 2018.
- Plant Information Resources at the Montana Natural Heritage Program. Tenth Montana Plant Conservation Conference, Helena, MT. February 21, 2018.
- Does Montana Need a Rare Plant Conservation Strategy. Tenth Montana Plant Conservation Conference, Helena, MT. February 22, 2018.
- Two proposed Key Conservation Areas for the recovery of the threatened Spalding' Catchfly on the Flathead Indian Reservation. *Silene spaldingii* Technical Team Meeting, Spokane, WA. April 25-26, 2018.
- Taught Lichen Identification for general public through Montana Native Plant Society. May 5, 2018.

Projects

The Botany Program worked on the following projects in FY18:

- Supporting Weed Management with Plant Status Reviews, 2017 – Montana Department of Agriculture, Noxious Weed Trust Fund Grant
- Supporting Weed Management with Plant Status Reviews, 2018 – Montana Department of Agriculture, Noxious Weed Trust Fund Grant
- Developing a Montana Rare Plant Conservation Strategy – Montana Native Plant Society
- Spalding's Catchfly (*Silene spaldingii*) population monitoring at two key conservation areas – U.S. Fish and Wildlife Service
- Botanical and Biotic Crust Information for the Eastern District – Montana/Dakotas Bureau of Land Management State Office
- Howell's Gumweed Genetic Diversity Monitoring – Lolo National Forest
- Beaverhead-Deerlodge National Forest Inventory for *Penstemon lemhiensis* – Beaverhead-Deerlodge National Forest
- Plant Predicted Habitat Suitability Monitoring to Support NEPA Analyses – Region 1 Office of the U.S. Forest Service
- Species Accounts and Taxonomy Management for Non-native Species – Montana Department of Natural Resources and Conservation
- Beals Hill Radio Station Vegetation Survey – Bonneville Power Administration
- Coefficient of Conservatism Rankings for Flora of Montana: Part III – Montana Department of Environmental Quality

Reports/Publications

The following reports were finalized in FY18 and are available on the MTNHP Botany Publications web page :

Pipp, Andrea. 2017. ***Coefficient of Conservatism Rankings for the Flora of Montana: Part III. December 15th***. Report to the Montana Department of Environmental Quality, Helena, Montana. Prepared by the Montana Natural Heritage Program, Helena, Montana. 107 pp.

Williams, E and A. White. 2017. ***Howell's Gumweed (Grindelia howellii) Genetic Diversity and Conservation Lab Report***. National Forest Genetics Laboratory (NFGEL) Project #333. Prepared by Chicago Botanic Garden, Glencoe, Illinois under contract with NFGEL, Placerville, California. Prepared for Karen Stockmann, USFS Botanist, Lolo National Forest, Missoula, Montana.

Pipp, Andrea. 2018. ***Three-Year Baseline Monitoring Studies for Silene spaldingii on the Flathead Indian Reservation: Year 2017***. Prepared for the Confederated Salish & Kootenai Tribes of the Flathead Reservation, Pablo, MT and U.S. Fish and Wildlife Service, Montana Ecological Services Field Office, 22 pp.

* Additionally, the Program Botanist contributed to the ***Draft Post-Delisting Monitoring Plan for Water Howellia (Howellia aquatilis)***. Submitted to USFWS, Washington D.C. November 2017.

Ecological information (terrestrial and aquatic biological communities, land cover mapping, wetland and riparian mapping) *is comprehensive, up-to-date, and authoritative*			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Ecology and Information Services staff time. Expert input. State, local, federal, and nongovernmental partner input on prioritization.	Comprehensive, up-to-date, and authoritative coverage for: - distribution, status, and general information for terrestrial communities - distribution, status, and general information for wetland and aquatic communities - land cover mapping - wetland and riparian mapping	State, local, federal, and nongovernmental partners have complete trust and confidence that MTNHP information is comprehensive, up-to-date and authoritative on distribution, status, composition, structure, and dynamic processes for Montana's terrestrial and aquatic biological communities. Terrestrial and aquatic biological community information is readily available for MEPA, NEPA, other permitting and planning processes, and responses to natural and human caused disasters (e.g., fires, oil spills).	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, reducing duplication of effort, and avoiding litigation. Stewardship of terrestrial and aquatic biological communities is improved and species listings are avoided as a result.

Metrics: statistics on status of statewide wetland and riparian mapping; status of land cover mapping; photos and text added or updated on the Montana Field Guide or other web pages; field surveys and assessments of key ecological community types; ecological literature and web links compiled; conservation status ranks for ecological systems reviewed or updated; presentations made; trainings conducted; projects undertaken; reports and publications completed; and partner feedback.

Wetland and Riparian Mapping

In FY18, modern wetland and riparian mapping was completed in 55 1:24,000 scale U.S. Geological Survey quadrangle maps. A total of 96,836 acres of wetland and riparian habitats were mapped (90,718 acres of wetlands and 6,118 acres of riparian). A total of 2,424 quads have now been mapped (85% of Montana) with a total of 3,208,060 acres; 2,531,638 acres of wetlands and 676,422 acres of riparian. The wetland and riparian mapping effort is described at http://mtnhp.org/nwi/ Due to dwindling funding for wetland and riparian mapping, a partner meeting was convened on May 16, 2018 with attendance from 20 plus partners from 17 organizations. All partners expressed appreciate for the benefits they get from having modern wetland and riparian mapping in place and interest in having it completed for the entire state. Several partners reaffirmed their commitment by indicating they would contribute funding to keep the effort moving forward and it now appears promising that partners will fund completion of mapping in all quads in Park, Sweet Grass, Stillwater, Carbon, and Yellowstone Counties as well as all of the quads that currently have only NWI Scalable mapping in those counties and Big Horn County in FY19.

Land Cover Mapping

In FY18, a new 2017 land cover layer was produced for which users can either download or utilize map services from the State Library's GIS data list. Updates completed in the 2017 land cover layer include: updates to recently burned cover types from the latest Geomac fire polygons, updates to agricultural crops classifications from the 2017 Final Land Use (FLU) categorizations from the Department of Revenue, updates to roads from the statewide transportation layer,

updates to structures from the statewide structures layer, and reclassification of previously burned areas back to ecological systems as appropriate for the ecological setting and timing of the burn.

Conservation Status Ranks for Ecological Systems

Core and supplemental core funding is not adequate to systematically assess conservation status ranks for ecological systems.

Field Guide Accounts for Ecological Systems

Only minor updates were made to ecological system accounts in the Montana Field Guide in FY18.

Field Surveys and Assessments of Key Ecological Community Types

In FY18, field crews conducted the following surveys of key ecological community types:

- 2,028 rangeland sites in the Beaverhead National Forest for the presence and abundance of 80+ plant species in 2017.
- 5 in-depth Wetland Ecological Integrity Assessments (EIA) in 2017, including a comparison of the results obtained from Montana DOT's function-based assessment at the same sites.
- Forest surveys of the Flathead National Forest beginning on June 20, 2018.
- Completion of the third environmental impact assessment on slope wetlands in the Dillon area in 2018.
- Completion of the fourth environmental impact assessment on reference wetlands in the Billings area in 2018.

Photos

A total of 19,774 wetland, riparian, and terrestrial habitat assessment photos have been added to the MTNHP database in FY18. These photos will eventually be added to the georeferenced photos section of the Map Viewer web application to serve as visual documentation of habitat status at a point in time and to guide mappers and modelers at MTNHP and other agencies in land cover and habitat mapping and modeling.

Ecological Literature and Website Links

71 ecological literature references have been added to the MTNHP reference management database in FY18.

The Ecology related website links page was reviewed and broken links were fixed, and 10 website links were added.

Presentations and Trainings

The following presentations/trainings were given in FY18:

- Poster, Wetlands of Special Significance: A Geospatial Approach, Region 8 conference, Boulder, CO, October 4, 2017
- Poster, Linking Wetland Function to Landscape: LLWW in Montana, EPA Region 8 conference, Boulder, CO, October 4, 2017
- Poster, An Index of Alien Invasibility for Montana, EPA Region 8 conference, Boulder, CO, October 4, 2017
- Presentation, Monitoring and Assessment to Improve Decision-Making, EPA Region 8 conference, Boulder, CO, October 4, 2017
- Presentation, Wetland mapping, inventory, assessment and monitoring by Natural Heritage Programs in the Rocky Mountain West. Interagency riparian and wetland assessment meeting: Best practices, innovative approaches, and opportunities for collaboration. Fort Collins, CO, December 12, 2017

- Presentation, Mapping, Inventory, assessment and monitoring: scales and approaches. Interagency riparian and wetland assessment - Best practices, innovative approaches, and opportunities for collaboration. Fort Collins, CO, December 12, 2017

Projects

Ecology Program staff worked on the following projects in FY18:

- Species Accounts and Taxonomy Management for Non-native Species – Montana Department of Natural Resources and Conservation
- Blackfoot-Swan Landscape Restoration Project – United States Forest Service
- Rangeland data collection and mapping, Beaverhead-Deerlodge National Forest—United States Forest Service
- Forest data collection and mapping, Flathead National Forest—United States Forest Service
- Crown of the Continent habitat mapping – The Wildlife Society
- Geospatial data development – Bureau of Land Management
- Value-added mapping, monitoring and outreach for Montana –U.S. EPA
- Developing wetland assessment and monitoring tools, capacity-building datasets, professional development and other resources for Montana–U.S. EPA

Reports/Publications

The following reports were finalized in FY18 and are available on the MTNHP Ecology Publications web page :

Hart, Melissa and Linda Vance. 2017. ***Developing a landscape-level reference standard wetland profile for the Prairie Pothole Region, Montana***. Report to the US EPA. Montana Natural Heritage Program. Helena, MT. 27p.

Tobalske, Claudine and Linda Vance. 2017.***Predicting the distribution of Russian Olive stands in eastern Montana valley bottoms using NAIP imagery***. Report to the US EPA. Montana Natural Heritage Program. Helena, MT. 40pp.

Westfall, Camie and Linda Vance. 2017. ***Montana Wetland Index of Alien Impact (IAI)***. Report to the US EPA. Montana Natural Heritage Program. Helena, MT. 93pp.

Zoological information (vertebrates and invertebrates) is comprehensive, up-to-date, and authoritative			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Zoology and Information Services staff time. Expert input. State, local, federal, and nongovernmental partner input on prioritization.	Comprehensive, up-to-date, and authoritative coverage for: - taxonomic representation - general information - observations/surveys - species occurrence polygons for environmental reviews - predictive distribution models - conservation status ranks	State, local, federal, and nongovernmental partners have complete trust and confidence that MTNHP information is comprehensive, up-to-date and authoritative on distribution, status, and general biology of all animal species. Animal information is readily available for MEPA, NEPA, other permitting and planning processes, and responses to natural and human caused disasters (e.g., fires, oil spills).	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, reducing duplication of effort, and avoiding litigation. Stewardship of animal species is improved. Animal species listings as a result of lack of information are avoided.

Metrics: statistics on taxonomic representation; photos, descriptions, habitat, references, and other general information added or updated on the Montana Field Guide or other web pages; zoological literature and websites compiled; observations, surveys, species occurrences, predictive models, range polygons, and habitat associations added/created; conservation status ranks reviewed or updated; presentations made; trainings conducted; projects undertaken; reports and publications completed; and partner feedback.

Taxonomic Representation

Vertebrates – There are currently 698 vertebrate species or subspecies listed as present, potentially present, present on an accidental/nonregular basis, or having the potential to invade Montana in MTNHP databases; 632 native, 65 exotics, and 1 of unknown/undetermined origin. These taxa are fully represented in the MTNHP database and on the Montana Field Guide representing the following taxonomic groups: 101 fish, 15 amphibians, 20 reptiles, 447 birds, and 115 mammals.

Invertebrates - There are currently 3,147 invertebrate species or subspecies listed as present, potentially present, present on an accidental/nonregular basis, or having the potential to invade Montana in MTNHP databases; 3019 natives and 128 exotics. We know that there are likely more than 10,000 additional invertebrates that occur in Montana or have the potential to invade Montana that are not currently represented in MTNHP databases, but we lack sufficient resources to incorporate that information. The invertebrate taxa that are currently represented in MTNHP databases include: 2 freshwater sponges, 1 myxozoan, 46 bivalves, 1 turbellarian, 23 fairy/tadpole shrimp, 21 shrimp/amphipods/isopods, 3 flatworms, 3 round worms, 9 earthworms, 26 millipedes, 1 springtail, 157 slugs/snails, 341 spiders, and 2,514 insects. Of the invertebrates represented on the Montana Field Guide, accounts are reasonably well developed for only 534 (17%) while over 83% are only shell accounts that lack general descriptions or information on habitat use.

Conservation Status Ranks

State conservation status ranks were reviewed for 118 vertebrate species in FY18. The Montana Species of Concern Committee (joint committee of 3 FWP staff and 3 MTNHP staff) reviewed these rankings in the spring of 2018 and they are currently being finalized. Final versions of rank reviews will be posted on individual species accounts on the Montana Field Guide to allow agency partners and the public direct access to ranking information. An example can be seen under the State Rank Reason section of the Sprague's Pipit species account at: http://fieldguide.mt.gov/speciesDetail.aspx?elcode=ABPBM02060
Conservation status ranks have not been reviewed since before 2002 for 86 (61%) of Montana's Invertebrate Species of Concern and 181 (33%) of Montana's vertebrate non-SOC. Furthermore, 2,446 (84%) of Montana's invertebrate non-SOC have never had their conservation status ranks reviewed in detail. Ideally, conservation status ranks for all species in MTNHP databases would be reviewed in detail every 10 years so that species can be properly addressed in project reviews and local and regional planning efforts.

Observations

115,814 observation records for native species (115,366 vertebrate and 448 invertebrate records) were added to the MTNHP observation database in FY18. Additionally, 1,211 previously existing native species observation records (1,991 vertebrate and 20 invertebrate records) had spatial or tabular information updated to improve the record in FY18. A growing backlog of observation records were not able to be entered into MTNHP databases in FY18 as a result of recent budget cuts. These records have been stored and will be entered as time and resources allow.

Structured Survey Locations

3,287 structured survey locations where specific protocols were used to detect animal species were added to the MTNHP database in FY18. In addition, structured survey locations were updated for Greater Sage-Grouse and all fisheries surveys from Montana Fish, Wildlife, and Parks. A growing backlog of structured survey location records were not able to be entered into MTNHP databases in FY18 as a result of recent budget cuts. These records have been stored and will be entered as time and resources allow.

Species of Concern Occurrence Records for Environmental Reviews

A total of 2,972 Species of Concern Occurrence records for 73 species (2,895 occurrences for 52 vertebrate species and 77 occurrences for 21 invertebrate species) were added to the MTNHP database in FY18 and are now available for use in environmental reviews and permitting processes.

Range Polygons

Range maps were updated for 164 species (112 vertebrates and 52 invertebrates) to account for new observations and/or other improvements in our understanding of their known geographic distribution and these are now showing on the Montana Field Guide and Map Viewer web applications.

Predicted Habitat Suitability Models

Predicted habitat suitability models were created and reports were finalized for 91 vertebrate species(24 Species of Concern, 31 Potential Species of Concern, and 36 non-Species of Concern of management interest to the USFS and BLM (13 amphibians, 18 reptiles, 28 birds, and 31 mammals) in FY18; reports are posted at http://mtnhp.org/models/ Predicted habitat suitability output can be viewed in the Map Viewer web application under the Single Species Overview and Environmental Summary tasks.

Field Guide Species Accounts

General descriptions and habitat needs summaries were added for 9 species accounts (4 vertebrates and 5 invertebrates) in the Montana Field Guide in FY18. Current representation of this information on the Montana Field Guide is as follows:

Fish – 95 of 101 species have general descriptions and 94 of 101 species have habitat needs summarized in species accounts on the Montana Field Guide.

Amphibians – 14 of 15 species have general descriptions and 15 of 15 species have habitat needs summarized in species accounts on the Montana Field Guide.

Reptiles – 17 of 20 species have general descriptions and 17 of 20 species have habitat needs summarized in species accounts on the Montana Field Guide.

Birds – 446 of 447 species have general descriptions and 286 of 447 species have habitat needs summarized in species accounts on the Montana Field Guide.

Mammals – 96 of 115 species have general descriptions and 110 of 115 species have habitat needs summarized in species accounts on the Montana Field Guide.

Invertebrates – Only 648 of 3,147 species have general descriptions and only 670 of 3,147 species have habitat needs summarized in species accounts on the Montana Field Guide.

Photos

A total of 4,718 photos of animal species have been added to the MTNHP database in FY18 and 457 of these were attributed for display on the Montana Field Guide. Current photo representation on the Montana Field Guide is as follows:

Fish – 100 of 101 species have images showing on the Montana Field Guide.

Amphibians – 15 of 15 species have images showing on the Montana Field Guide.

Reptiles – 20 of 20 species have images showing on the Montana Field Guide.

Birds – 440 of the 447 species have images showing on the Montana Field Guide.

Mammals – 102 of the 115 have images showing on the Montana Field Guide.

Invertebrates – Only 1,804 (57%) of the 3,147 species currently represented have images showing on the Montana Field Guide.

Zoological Literature and Website Links

127 zoological literature references have been added to the MTNHP reference management database allowing 3,817 reference listings to be added to species accounts in the Montana Field Guide in FY18; the majority of these were for butterflies.

The Zoological related website links page was reviewed, broken links were fixed, and 3 website links were added. Additionally, 7 website links were added to the Class Links in the Montana Field Guide.

Habitat associations added/created

Associations between ecological systems were reviewed and updated for 47 species in FY18 (14 amphibians, 18 reptiles, and 15 bats).

Presentations and Trainings

The following presentations/trainings were given in FY18:

- Identifying Biological Resources in Caves. Training to BLM personnel. Pryor Mountains, MT. June 5, 2018.
- Bat ecology and management training to state and federal partners. Dillon, MT. July 11 – 13, 2017.
- Biology of Montana's Caves. Northern Rocky Mountain Grotto Cave Camp, Monarch, MT. October 7, 2017.

- Understanding use of caves by bats prior to the spread of *Pseudogymnoascus destructans* to Montana. Montana Chapter of the Society for Conservation Biology Research Symposium. November 7, 2017.
- Update on Zoology Projects and Future Work, Montana Natural Heritage Program Annual Partners Meeting, December 14, 2017.
- Montana Bat Working Group Meeting. Montana Chapter of the Wildlife Society Annual Meeting , Butte MT. February 20, 2018.
- Use of Talus and other Rock Outcrops by Bats in Western Montana. Butte MT. Montana Chapter of the Wildlife Society Annual Meeting , February 22, 2018.
- Assessment of Bridges in Eastern Montana to Identify Active Season Bat Roosts. Montana Chapter of the Wildlife Society Annual Meeting, Butte MT. February 22, 2018.
- Bats Roosting and Hibernation in Talus Slopes. Montana Chapter of the Wildlife Society Annual Meeting, Butte MT. February 22, 2018.
- Measurements, body condition, and reproductive status of bats captured in Montana, northern Idaho, and western South Dakota. Presentation to the National WNS Coordination Group, March 15, 2018.
- Results of Long-term Acoustic Monitoring at the Spion Kop Wind Energy Site. A Presentation to the Spion Kop Technical Advisory Committee, March 20, 2018.
- Measurements, body condition, and reproductive status of bats captured in Montana, northern Idaho, and western South Dakota. Presentation to the Western Bat Working Group Monthly Coordination Call, April 2, 2018.
- Update on the Use of Montana's Caves by Bats. Annual Meeting of the Northern Rocky Mountain Grotto, Lewis and Clark Caverns. April 7, 2018

Projects

The Zoology Program worked on the following projects in FY18:

- Northern Myotis Range Surveys- US Fish and Wildlife Service Grant
- Surveys for Cave Roosting Bats – Bureau of Land Management and US Forest Service Grants
- Establishing Statewide Baseline Distribution and Activity Levels for Bats– Bureau of Land Management and US Forest Service Grants
- White-Nose Syndrome/ Pd Surveillance at hibernacula – Conducted in collaboration with Montana Fish Wildlife and Parks, Bureau of Land Management and US Forest Service
- NABat Monitoring in USFS Region 1- US Forest Service Grant
- Characterization of Rock Outcrop Use by Bats - US Fish and Wildlife Service Grant
- Long-term Acoustic Monitoring of the Spion Kop Wind Energy Site – North Western Energy Grant
- Long-term Acoustic Monitoring of Coal Mines in Central and Southeastern Montana – Montana Department of Environmental Quality Grant
- Identification of Bat Roosts in Bridges across Eastern Montana - US Fish and Wildlife Service White-Nose Syndrome Grant
- Conservation Status Review for Native Species – Montana Fish Wildlife and Parks Grant

Reports/Publications

The following reports were finalized in FY18 and are available on the MTNHP Zoology Publications web page:

Bachen, D.A., A. McEwan, B. Burkholder, S. Blum, and B. Maxell. 2018. **Acoustic assessment of bat activity and diversity at Spion Kop Wind Energy Facility.** Report to Northwestern Energy. Montana Natural Heritage Program, Helena, Montana. 54 pp. plus appendices

McEwan, A., and Bachen, D.A. ***Use of Talus and other Rock Outcrops by Bats in Western Montana.*** Report to U.S. Fish and Wildlife Service. Montana Natural Heritage Program, Helena, MT. 9 pp

Bachen, D.A. 2017. ***Update on Northern Myotis (Myotis septentrionalis A.K.A Northern Long-eared Bat) Surveys in Eastern Montana.*** Montana Natural Heritage Program, Helena, MT. 11 pp. plus appendices

Bachen, D., McEwan, A., Burkholder, B., Blum, S., and Maxell, B. 2018. ***Long-term acoustic assessment of bats at coal mines across southcentral Montana and management recommendations for bats***. Report for Montana Department of Environmental Quality. Air, Energy, and Mining Division. Coal Section. Montana Natural Heritage Program, Helena, MT. 169 pp. + appendices

Bachen, D.A., A.L. McEwan, B. Burkholder. 2018. ***Evaluation of Indicators of Environmental Sensitivity with Respect to Bats and their Native Habitats near Albeni Falls Dam and Lake Pend Oreille, Idaho***. Montana Natural Heritage Program, Helena, MT. 18 p. plus appendices.

Bachen, Dan, Bryce Maxell, Ellen Whittle. 2017. ***Measurements, body condition, and reproductive status of bats captured in Montana, northern Idaho, and western South Dakota***. Montana Natural Heritage Program, Helena, MT. 13p.

Maxell, B.A. 2017. ***Amphibian, reptile and bat surveys on and around the Dillon Field Office of the Bureau of Land Management: 2009-2011***. Report to Dillon Field Office of the Bureau of Land Management. Montana Natural Heritage Program, Helena, MT. 67p. plus appendices.

Information on Montana's species and biological communities is readily available to State, local, federal, and nongovernmental partners through mediated requests and MTNHP web applications, web pages, and web services			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Web Projects Manager and Information Services, Botany, Ecology, and Zoology staff time. State, local, federal, and nongovernmental partner feedback.	The following web applications and web pages are fully integrated with MTNHP's data management systems, use the latest coding standards, and are easy to use and reliable: - Field Guide - Species Snapshot - Map Viewer - Species of Concern - Information requests - Data Submissions - Related Websites - Program, Botany, Ecology, and Zoology information pages - Announcements and general program information	State, local, federal, and nongovernmental partners have common easy access to MTNHP information resources. Government partners are able to self-serve information and reports from MTNHP web applications and web pages that they can use directly in their MEPA, NEPA, permitting, and other planning processes. Partners heavily use MTNHP web applications and web pages as a gateway to other information sources on plants, animals, and biological communities that assist them in their planning and management efforts.	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, and improving the stewardship of Montana's plants, animals, and biological communities.

Metrics: mediated request statistics; web application and web page use statistics; web code development and maintenance efforts; partner feedback from surveys and annual partners meeting.

Mediated Requests

In FY18, total mediated requests for Environmental Summary Reports and/or geodatabases of MTNHP information was reduced to 651 (34% reduction from the 985 received in FY17) as a result of developing the Environmental Summary Report task in Map Viewer and training agency personnel to self-service their information needs using this tool. It seems plausible that an additional 60 or so requests may be able to be eliminated in FY19 as a result of this self-service tool, but most of the remaining requests are from private consultants or are geodatabase related.

Additionally, Botany, Ecology, Zoology, and Information Services staff collectively answer 5-10 requests on the average work day related to accessing MTNHP information resources or requiring specific botanical, ecological, or zoological expertise (e.g., how to conduct a survey for a rare plant or animal).

Self-Serve Downloads

Environmental Summary Report

In FY18, there were 646 downloads of MTNHP Environmental Summary Reports by agency-level users of the Map Viewer website. The new MTNHP Environmental Summary Report download option was first implemented early in the calendar year of 2017 and trainings to agency resource managers and biologists continued throughout FY18. Thus, there are no statistics available for previous years.

Custom Field Guide PDF Downloads

In FY18, there were 6,521 downloads of custom field guides from the Montana Field Guide (4,387), Species Snapshot (215), and Map Viewer Environmental Summary Report (2,119) web pages. These downloads were implemented in FY17 and FY18 was the first-year statistics were gathered. Thus, there are no statistics available for previous years.

Excel Downloads

In FY18, there were 2,749 excel downloads of species lists for particular geographic areas from the Map Viewer (2,599) and Species Snapshot (150) websites. These downloads were implemented in FY17 and FY18 was the first-year statistics were gathered. Thus, there are no statistics available for previous years.

Web Use:

Home Page

Users = 20,787 (1.6% increase)
Sessions = 41,407 (8.8% increase)
Average Session Duration = 3 minutes, 35 seconds (9.1% increase)
Page Views = 120,052 (12.5% increase)
Average Use Per Work Day = 9.5 hours (18.6% increase)

Field Guide Use in FY18 (change compared to FY17) was:

Users = 300,552 (5.2% increase)
Sessions = 409,704 (5.8% increase)
Average Session Duration = 2 minutes, 14 seconds (no change)
Page Views = 1,365,282 (4.8% increase)
Average Use Per Work Day = 58.5 hours (4.5% increase)

Map Viewer

Total individuals with accounts = 1,938 (1,164 with agency-level access, 774 with general public access)
Total Users in FY18 = 863
Total Hours of Use = 207
FY18 Users by Agency
Department of Agriculture = 9
Department of Environmental Quality = 50

Department of Fish, Wildlife, and Parks = 76
Department of Natural Resources = 92
Department of Transportation = 15
Montana Natural Heritage Program = 15
University System = 9
Unidentified State Agency = 51
Army Corps of Engineers = 16
Bureau of Land Management = 64
National Park Service = 1
Natural Resource Conservation Service = 15
Tribal = 2
U.S. Fish and Wildlife Service = 23
U.S. Forest Service = 140
U.S. Geological Survey = 2
Unidentified Federal Agency = 24
General Public Users = 259

Web Development and Maintenance

Home Page

We have had plans to update the MTNHP home page to simplify it and make it more compatible with use on mobile devices for over a year and a half now. However, we do not have adequate funding/staffing to undertake this task for the foreseeable future.

Field Guide

The code base that runs the Montana Field Guide is out-of-date, but we do not have adequate funding/staffing to modernize this website using core and supplemental core funding. However, the Wyoming Natural Diversity Database and Utah Conservation Data Center provided project funding in FY18 to create online field guides for those NatureServe Network member programs. Early versions of these guides can be seen at http://fieldguide.wyndd.org/ (Wyoming) and http://fieldguide.mt.gov/utah/ (Utah). These efforts have allowed us to develop a thoroughly modern code base for portions of a future Montana Field Guide and, with support from other NatureServe network member programs, we have a vision for creating a field guide platform that any NatureServe network program across the Western Hemisphere can use to create an online field guide. A common platform along these lines would expose a great deal of network information (most importantly from states and provinces adjacent to Montana so that our users have a better context for the overall status and distribution of Montana species) that is currently only available in behind-the-scenes databases and documents and it will allow programming expertise to be shared across the network into the future to support all programs.

Species Snapshot

In FY18, code was developed and deployed that:

- Adds additional spatial filters requested by partners.
- Includes invasive/pest and nonnative species filters as well as summaries of these species groups in the output

- Allows our partners to directly link to Species Snapshot query results and custom field guide downloads directly from their web site. For example, any town, library, Forest, State Park, Fishing Access Site, could have a link on their website that provides an up-to-date custom field guide PDF download for the species documented in those areas.

Map Viewer

In FY18, code was developed and deployed that:

- Added a variety of spatial filters to Land Cover, Wetland and Riparian Mapping, and Environmental Summary tasks.
- Allows users to add additional species to the Environmental Summary Report output above and beyond various status filters in order to better fit agency needs in National Environmental Policy Act Analyses.
- Adds Environmental Summary Reports for the exact boundaries of a variety of pre-determined spatial filters (e.g. Forests, BLM Field Offices, FWP Regions, etc.). Users simply turn on the spatial layer they want to summarize by and then click on the polygon (including multipart polygons) of interest.
- Allows invasive and pest species to be queried out in the Point Observations and Single Species Overview tasks.
- Allows various invasive species survey protocols to be queried out in the Survey Protocol task.
- Includes invasive species documented in project areas in the Environmental Summary Report task.
- Adds cadastral information as a base map layer.

Mobile Data Collection Applications

In FY18, code was developed and deployed using Survey123 for ArcGIS to create the following data collection applications in order to facilitate data flow from partners into MTNHP databases:

- Heritage Obs Collector 2.0 for collection of a variety of plant and animal data as well as structured surveys for animals by all MTNHP partners. Agency biologists on an approved list will have animal data appended directly to MTNHP databases upon upload so that it is viewable on MTNHP web sites the following day.
- Chimney Swift 1.0 to facilitate collection of survey data for Chimney Swift by FWP.
- Lentic Herp Survey to facilitate collection of data on amphibians and aquatic reptiles at surveys of standing water bodies by the USFS.
- Long-billed Curlew Survey 1.1 to facilitate collection of survey data for Long-billed Curlew by FWP.
- Nocturnal Calling Survey 1.0 to facilitate the collection of survey data for nocturnal calling amphibians and birds by all MTNHP partners.

State, local, federal, and nongovernmental partners are aware of MTNHP information resources and services and are trained in their appropriate use			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Program Coordinator, Botanist, Ecologist, and Zoologist time. MSL Training and Development Specialist and State GIS Coordinator assistance. State, local, federal, and nongovernmental partner feedback.	Regular trainings are conducted for state, local, federal, and nongovernmental partners that can make use of MTNHP information resources. User guides are made readily available on MTNHP web applications and web pages. Staff respond in a timely manner to mediated requests for MTNHP information and staff expertise. Announcements of new and improved MTNHP resources are posted on MTNHP's homepage and social media accounts.	State, local, federal, and nongovernmental partners have individual and institutional knowledge of the information resources provided by MTNHP and how to easily access those information resources by self-servicing on MTNHP websites or through the assistance and expertise of MTNHP staff. State, local, federal, and nongovernmental partners provide feedback on how MTNHP information resources can be improved and, where possible, those suggestions are implemented.	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, and improving the stewardship of Montana's plants, animals, and biological communities.

Metrics: Numbers of agency personnel with Map Viewer accounts; trainings held; presentations made; user guides developed; partner feedback from surveys and annual partners meeting.

Map Viewer Accounts

In FY18, 114 individuals created new Map Viewer accounts (86 with agency-level access (7.9% increase), 28 with general public access (3.8% increase)). The total number of individuals with Map Viewer accounts is currently 1,938 (1,164 with agency-level access, 774 with general public access).

Trainings/Presentations

Thirty-one presentations/trainings were given in FY18 by the MTNHP Program Coordinator as follows:

- MTNHP information overview to Montana Department of Environmental Quality staff. Helena, MT. August 2, 2017.
- MTNHP information overview to Bureau of Land Management biologists and resource managers. Billings, MT. August 8, 2017.
- MTNHP information overview to Montana Environmental Quality Council legislative support staff. Helena, MT. August 28, 2017.
- MTNHP information overview to legislative librarians from across the United States. Helena, MT. September 15, 2017.
- MTNHP information overview to Montana Association of Planners. Miles City, MT. September 27, 2017.
- MTNHP information overview to Dillon Field Office of the Bureau of Land Management. Dillon, MT. October 11, 2017.

- Invasive species information resources at the Montana Natural Heritage Program to members of the Montana Weed Control Association. Butte, MT. October 11, 2017.
- Russian Olive and Tamarisk mapping and invasive species information resources at the Montana Natural Heritage Program to the Russian Olive and Tamarisk working group meeting. Great Falls, MT. October 25, 2017.
- MTNHP information overview to Beaver Restoration Workshop attendees. Missoula, MT. October 26, 2017.
- MTNHP information overview to Montana Department of Environmental Quality air quality staff. Helena, MT. November 2, 2017.
- MTNHP information overview to Governor Bullock's Natural Resource Policy Advisor, Patrick Holmes. Helena, MT. November 7, 2017.
- Sharing wetland and riparian information with MTNHP partners to EPA Region 8 representatives. Helena, MT. November 8, 2017.
- MTNHP information overview to Montana Department of Environmental Quality public policy staff. Helena, MT. November 16, 2017.
- MTNHP information overview to Malta Field Office of the Bureau of Land Management. Malta, MT. January 25, 2018.
- Updates on bird and other information resources at the MTNHP to Montana Bird Conservation Partnership attendees. Great Falls, MT. February 1, 2018.
- MTNHP information overview to Butte Field Office of the Bureau of Land Management. Butte, MT. February 14, 2018.
- MTNHP information overview to Dillon Field Office of the Bureau of Land Management. Dillon, MT. February 14, 2018.
- MTNHP information overview to Beaverhead-Deerlodge National Forest. Dillon, MT. February 14, 2018.
- MTNHP information overview to Montana/Dakotas State Office and Billings Field Office of the Bureau of Land Management. Billings, MT. February 15, 2018.
- Plant information resources at the Montana Natural Heritage Program to Montana Plant Conservation Conference attendees. Helena, MT. February 21, 2018.
- MTNHP information overview to Miles City Field Office of the Bureau of Land Management. Miles City, MT. February 28, 2018.
- MTNHP information overview to Montana Natural Resource Conservation Service staff. Webinar. March 2, 2018.
- Use of crowd sourced information by the Montana Natural Heritage Program. Fort Hall, ID. March 6, 2018.
- Use of MTNHP information resources for management decisions on private ranches in eastern Montana. Webinar. March 13, 2018.
- MTNHP information overview to Montana staff of The Nature Conservancy. Helena, MT. March 20, 2018.
- MTNHP information overview to Lewistown Field Office of the Bureau of Land Management. Lewistown, MT. April 4, 2018.
- Integration of invasive species information into MTNHP information resources to Department of Agriculture weed and pest management staff. Helena, MT. April 26, 2018.
- MTNHP information overview to Conservation District representatives. Helena, MT. June 14, 2018.
- Species distribution modeling and model delivery lessons from Montana to NatureServe Network Member Programs. June 14, 2018
- Using MTNHP information resources in State Parks to FWP Americorps workers. Lewis and Clark Caverns State Park, MT. June 26, 2018.
- MTNHP information overview to Montana librarians. Helena, MT and webinar. June 28, 2018.

User Guides and other Self-Serve Training Materials Developed

The following guides and training materials were created in FY18:

- A How To Use Guide was developed for the Environmental Summary Report task in Map Viewer in order to allow agency biologists and resource managers to self-service their needs for environmental reviews and permitting processes. The guide is posted within the question mark link for this task within the Map Viewer application.
- A video was created to show partners how to download and use the Heritage Obs Collector 2.0 Survey123 application: https://vimeo.com/275316562

Invasive species information is fully integrated into MTNHP data management systems and is readily available to State, local, federal, and nongovernmental partners through MTNHP web applications, web pages, and web services			
Inputs	**Outputs**	**Outcomes**	**Impacts**
Botany, Ecology, Zoology, and Information Services staff time. State, local, federal, and nongovernmental partner input.	Comprehensive, up-to-date, and authoritative coverage for: - Aquatic invasive species - Noxious weeds - Forest pests - Agricultural pests - Biocontrols - Other exotic species	State, local, federal, and nongovernmental partners have complete trust and confidence that MTNHP information is comprehensive, up-to-date and authoritative on current and potential distribution, invasiveness, general biology, and effective management and control efforts for aquatic invasive species, noxious weeds, forest pests, agricultural pests, biocontrols, and other exotic species. Invasive species information is readily available for MEPA, NEPA, other permitting and planning processes, and responses to natural and human caused disasters (e.g., fires) in association with information on native Species of Concern.	State, local, federal, and nongovernmental partners make informed decisions from a common information resource in a timely manner, saving time and money, reducing duplication of effort, and avoiding litigation. Control efforts on invasive species are improved and more easily prioritized. Invasive species management efforts can be more easily considered during MEPA, NEPA, and other permitting and planning processes.

Metrics: statistics on numbers of aquatic invasive, noxious weed, forest pest, agricultural pest, biocontrol, and other exotic species represented in MTNHP data management systems; photos, descriptions, habitat, references, and other general information added or updated on the Montana Field Guide or other web pages; observations, surveys, predictive models, range polygons, and habitat associations added/created; presentations made and trainings conducted; projects undertaken; statistics on information downloads; and partner feedback.

Species Representation in MTNHP Databases

In FY18, a major effort was made to add invasive species information to MTNHP databases with project funding from the DNRC Aquatic Invasive Species Grant Program. Taxonomic information and listings on the Montana Field Guide were made for 34 aquatic invasive species, 42 state-listed noxious weed species, 44 county-listed noxious weeds in 43 counties, 15 forest pest species, 24 agricultural pest species, 63 Biocontrol Species, and 508 additional non-native species not listed with any official designation. This is the first major emphasis that MTNHP has been able to make on management of information on exotic/invasive species throughout the program's history.

Observations and Structured Survey Locations

187,253 observations and 42,378 structured survey locations for 689 non-native species were added to the MTNHP observation database in FY18 as follows:

Status	Total Number of Species	Total Number of Observations	Total Number of Surveys
Aquatic Invasive Species	33	7,843	30,540
Noxious Weeds 1a	4	72	11,838
Noxious Weeds 1b	7	759	
Noxious Weeds 2a	9	1,587	
Noxious Weeds 2b	16	98,747	
Regulated Weeds	5	440	
Agricultural Pest Species	23	24	0
Forest Pest Species	13	0	0
Biocontrol Species	62	14	0
Other Non-native Species	517	77,767	N/A

Range Polygons

Range maps were created or updated for 77 non-native species and these are now showing on the Montana Field Guide and Map Viewer web applications.

Predicted Habitat Suitability Models

A predicted habitat suitability model for American Bullfrog was created in FY18 and is the only invasive species for which a model has been created so far. A report for the model is posted at http://mtnhp.org/models/ Predicted habitat suitability output can be viewed in the Map Viewer web application under the Single Species Overview and Environmental Summary tasks.

Montana Field Guide Species Accounts

In FY18, species accounts were fully developed for 26 of Montana's 34 Aquatic Invasive Species:

American Bullfrog http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=AAABH01070
American Water-lily http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDNYM05090
Asiatic Clam http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMBIV48010
Brazilian Waterweed http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PMHYD02010
Chinese Mysterysnail http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMGASE7010
Common Carp http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=AFCJB08010
Curly-leaf Pondweed http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=PMPOT03060
Eurasian Watermilfoil http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=PDHAL040B0
European Common Reed http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PMPOA4V012
Fishhook Waterflea http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=ICBRA24010
Flowering Rush http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=PMBUT01010
Hydrilla http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PMHYD05010
Mud Bithynia http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMGASF3010

New Zealand Mudsnail http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMGASY1010
Parrotfeather Water-milfoil http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDHAL04020
Purple Loosestrife http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDLYT090B0
Quagga Mussel http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMBIVAE020
Round Goby http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AFCQN34010
Ruffe http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AFCQC06010
Rusty Crayfish http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=ICMAL11290
Starry Stonewort http://fieldguide.mt.gov/speciesDetail.aspx?elcode=NACHL09010
Spiny Waterflea http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=ICBRA13010
Tench http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AFCJB43010
Virile Crayfish http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=ICMAL11670
Yellowflag Iris http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PMIRI090T0
Zebra Mussel http://fieldguide.mt.gov:81/speciesDetail.aspx?elcode=IMBIVAE010

Photos

A total of 2,782 photos of non-native species have been added to the MTNHP database in FY18 and 2,463 of these were attributed for display on the Montana Field Guide. Current photo representation on the Montana Field Guide is as follows:

Status	Total Number of Photos
Aquatic Invasive Species	128
Noxious Weeds 1a	12
Noxious Weeds 1b	18
Noxious Weeds 2a	119
Noxious Weeds 2b	120
Regulated Weeds	33
Agricultural Pest Species	64
Forest Pest Species	34
Biocontrol Species	204
Other Non-native Species	1,731

Literature and Website Links

81 literature references for non-native species have been added to the MTNHP reference management database allowing 118 reference listings to be added to species accounts in the Montana Field Guide in FY18.

13 website links were added to the Class Links in the Montana Field Guide in FY18. Additionally, 5 to 7 resource management links were added to individual species accounts for all Aquatic Invasive Species, Noxious Weeds, and Biocontrol species.