



MONTANA
**State
Library**



ADMINISTRATION OF THE MONTANA NATURAL HERITAGE PROGRAM

A proposal to the Montana State Library Commission

December 11, 2019

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Summary

The Montana State Library (MSL) staff recommends to the State Library Commission (Commission) that the Commission act to approve a transition of the administration and operation of the Montana Natural Heritage Program (MTNHP) from the University of Montana to the State Library over an eighteen-month period concluding at the end of the 2021 biennium. This recommendation is made after careful analysis conducted over the past four months which is detailed below. Though not a guarantee of future funding, this recommendation is based on MSL's view that the current contract model serves as a barrier to stable funding as is evidenced over the past ten years of funding loss.

MSL values the work of the MTNHP, the staff, the Program partners, and our on-going relationship with the University of Montana (University). It is in the best interest of all stakeholders to ensure the long-term stability of the MTNHP. As the legal entity responsible for the success of the MNTHP and the fulfillment of its statutory responsibilities, it is the responsibility of MSL to ensure the stability and positive strategic direction of the MTNHP. These are not responsibilities for which we should contract, these are responsibilities we should administer.

Background

Since 1985 it has been the statutory responsibility of the MSL to operate the MTNHP as part of its Natural Resource Information System.¹ This program, which collects, studies, manages, and provides access to information about Montana's plants, animals, and habitats, is a model for the efficient data management that is responsive to the needs of the Programs users.

As allowed by statute, MSL has always operated the MTNHP through contract, rather than directly administering the program. The program was originally formed through a contract with The Nature Conservancy (TNC) and, in 2006, the contract was transferred to the University. It makes sense that the MTNHP was originally created under a contract because the functions of the MTNHP were not functions of MSL at the time and TNC was operating heritage programs in other states, provinces and countries. It also makes sense that, as a library, MSL would be given statutory responsibility for the MTNHP to ensure the neutral, non-regulatory access to the data managed by the MTNHP.

The MTNHP is part of NatureServe which is a network of Heritage Programs that exist in every state, Canadian province as well as countries in Latin America. The administration of programs varies; many

¹ **90-15-302. Natural heritage program.** (1) There is a Montana natural heritage program to be operated by the library. In order to establish the program, the library may contract with an independent contractor or may employ necessary staff. In order to minimize costs, the library or other state agencies may make available state resources and facilities to an independent contractor as part of a contract for services.

(2) The Montana natural heritage program shall be designed to be compatible with similar programs in other states. This program is to be an initial step in the formulation of the comprehensive natural resource information system referred to in **90-15-301** and is to be considered a part of the system.

are operated by natural resources or fish and game agencies or universities. The MTNHP is the only program whose statutory responsibility falls to a library.

It is for this reason that we believe that we attribute much of the success of the Program. As a neutral, non-regulatory agency, MSL and its programs, including the MTNHP, are regarded with much trust and MSL is considered the State's authoritative source for the data it provides. MSL also values the input of partners in all aspects of our work. One of three strategies of the MSL Strategic Framework is that MSL foster partnerships because partnerships are necessary to ensure that Montanans thrive and through partnerships, MSL and those we serve will continue to move Montana forward.² Because of its position in MSL, the MTNHP adopted a model of seeking partner feedback about its data collections and how the program delivers its data. The model of partner involvement is now being adopted by other programs in the country.

From the standpoint of many, the MTNHP is "not broken." Its data and web applications, including the scientific integrity of the data, is unsurpassed. MTNHP's partners hold the program in high regard.

However, and despite significant effort on the part of MSL, MSL funding for the core services has not kept pace with rising costs and increasing demands on the Program. Though there is not direct evidence that the contractual nature of the relationship between MSL and MTNHP is the cause for the decline in funds, the State does not automatically fund increases in contracts and anecdotally, when advocating for funding increases, MSL staff have heard confusion voiced by staff of the Governor's Office and the Legislature about who is responsible for funding the MTNHP.

In order to maintain the MTNHP programs and services MTNHP staff generate additional revenue in the form of supplemental core agreements from state, federal and private partners (moneys that fund core functions without specific deliverables) and grants and contracts. In FY 2019, MSL funding accounted for \$412,418 of the overall MTNHP budget. Supplemental core and project dollars accounted \$1,976,066 for a total budget of \$2,388,484. As the agency responsible for the success of the program, MSL staff find it concerning that the stability and strategic direction of the program are increasingly dependent on external soft funding. Some MTNHP staff have expressed similar concern due to the stress of keeping up with projects.

Over the last four months MSL staff have considered the question of whether to directly administer the program. Throughout the process MSL staff sought feedback and information from MTNHP staff, partners, the MSL Commission, the University of Montana, legal counsel, the Office of the Commissioner of Higher Education, and the Governor's Office of Budget and Program Planning. MSL staff carefully considered the financial implications of such a decision, the impact to MTNHP staff and partners, MSL's relationship with the University and our preferred vision for the program.

Financial overview

Core Funding

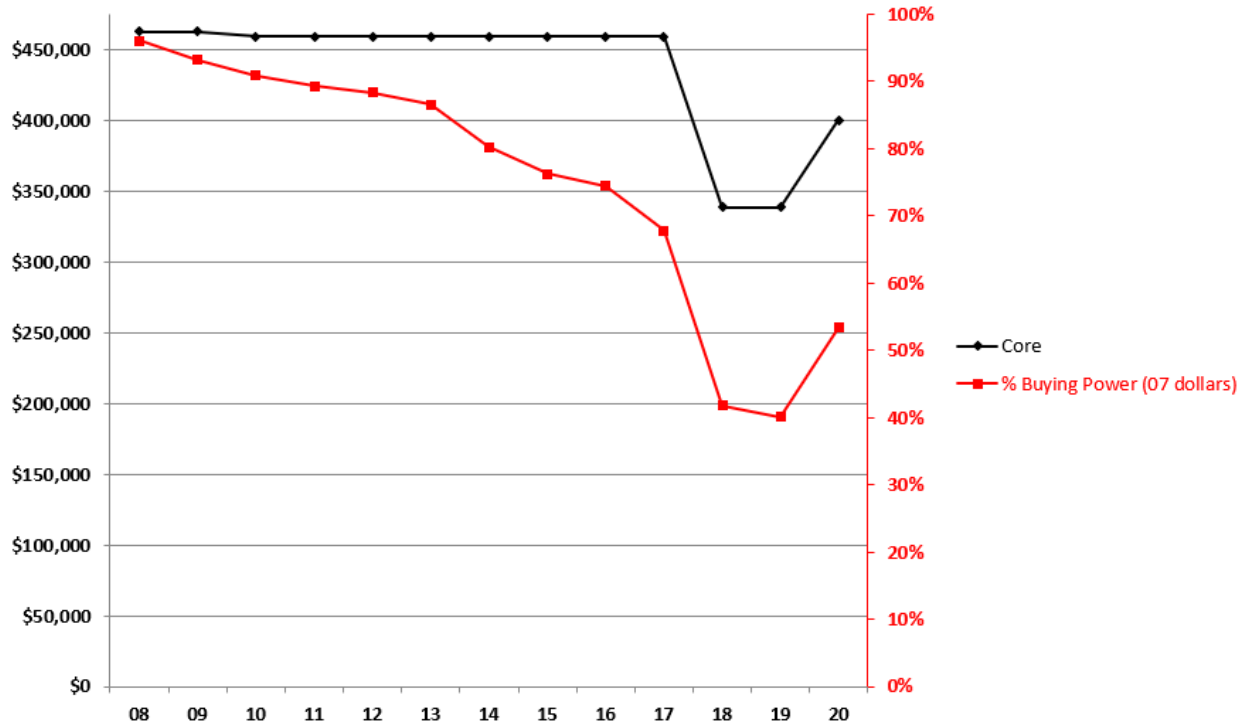
The budget for the core services contract between MSL and the University of Montana to operate the MTNHP provided \$442,680 in FY 2008. Due to state budget cuts, funding declined to \$439,113 in in FY

² Montana State Library Strategic Framework, Adopted December 14, 2016, updated October 2019: http://docs.msl.mt.gov/aboutweb/documents/strategic_framework.pdf

2010. Despite developing executive planning proposals to increase state funding for the program in every subsequent biennium, core funding remained flat until the 2017 biennium. As a result of dramatic budget cuts contained in Senate Bill 261, the core contract was cut to \$328,710 in FY 2018.

The proposed budget in the current draft contract for the current biennium contract is for \$400,000 in FY 2020 and \$410,000 in FY 2021. Additionally, MSL directly pays \$37,500 for rent and \$36,000 annually for phone and information technology costs for the MTNHP staff.

Decline in Core Contract and Buying Power



Contract and grant funding

The core contract for services acknowledges that the MTNHP receives grants and contracts and requires that the University “ensure that any contracts, grants and/or funding opportunities complement and enhance the mission of the MTNHP and the Library as defined in statute, in the MTNHP Scope of Work (Appendix 1) and Strategic Plan.”³ The contract further requires the University to “[e]nsure that special projects do not directly compete with, or create the perception of competing with, the private sector.”⁴

MTNHP currently manages approximately 60 grants, contracts and supplemental core agreements from state, federal and private sector partners. In FY 2019 these agreements totaled \$1,976,066. The University collected an average indirect cost rate of 18%. One third (1/3) of the indirect dollars are returned to the program plus an additional \$50,000 annually.

³ <http://mtnhp.org/about/announce.asp#StrategicPlan2015>

⁴ Fiscal Year 20-21 Core Contract, University Responsibilities, w.

The number of external agreements managed by MTNHP is substantially higher than the average number of agreements managed by MSL. The workload associated with contract management is addressed below. Of note, MSL recognizes that with the addition of grants and contracts comes the increased responsibility for their proper management and the associated audit risks.

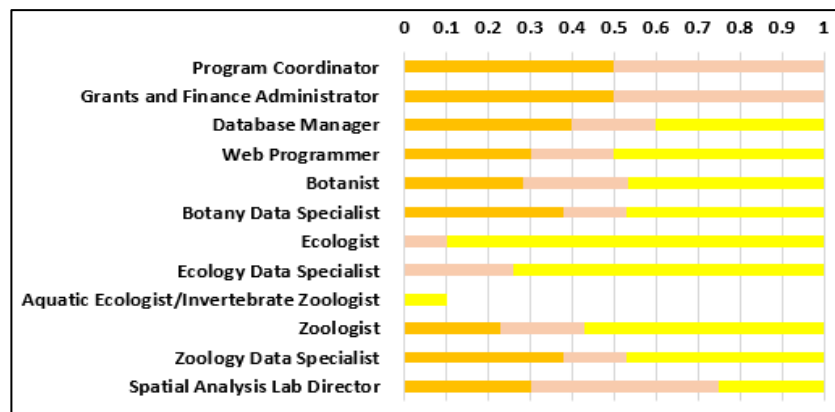
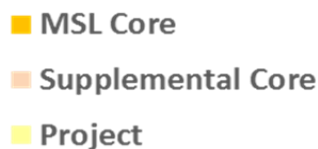
While these dollars are necessary to sustain current MTNHP staffing, programs and services, the reliance on soft money creates increased pressure on staff to generate revenue. Some MTNHP staff have expressed anxiety over their ability to raise revenue for their positions and stress about keeping up with contract work. Some MTNHP staff have also noted that the need to generate revenue puts the program at risk of letting the dollars drive the work rather than making strategic decisions about the MTNHP's future. The Program is already in a position to prioritize projects over core work. Without an influx of dedicated funding, this pressure and risk to the program exists regardless of who administers the program and amplifies the need for stable, core funding.

MSL and MTNHP staff agree that grants and contracts are valuable to the MNTHP not only for the revenue and gathering field and remotely sensed data and centralizing information from other sources, but also for the assurance that through externally funded projects, the Program is best meeting the needs of its partners. Everyone also agrees that more stable funding and a funding ratio of MSL dollars that prioritizes core work rather than project work is necessary to the future success of the MTNHP.

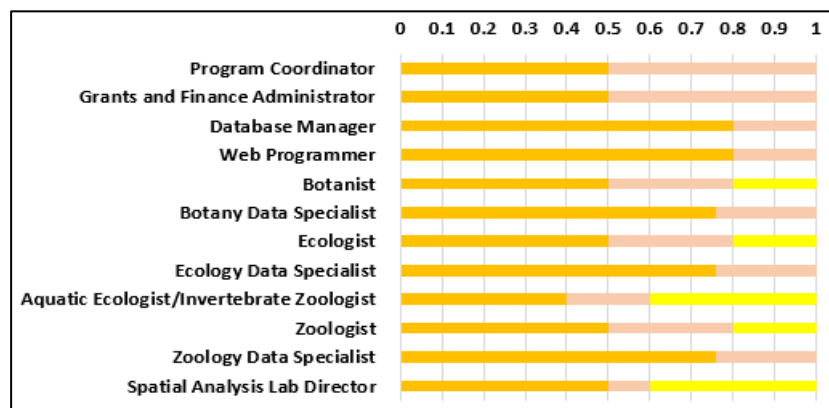
Staffing and Organizational Structure

MTNHP currently employees seventeen permanent staff and numerous temporary staff who work on grants and contracts. Two employees are considered classified staff and the rest are hired under letters of appointment which are renewed each year. No permanent staff is funded wholly through MSL core contract dollars. As the buying power of the core contract has declined due to increasing costs for expenses such as employee benefits, the proportion of funding for salaries has also declined.

2019 Core Staff Funding



Sustainable Core Staff Funding Mix



Salaries and Classification

The State Department of Administration Human Resources Division (DOA HR) is currently evaluating the job descriptions of MTNHP staff. They have stated that there are similar classifications for all positions within state government. DOA HR is creating a cross walk of University positions to state positions to help us fully understand what a transition would mean for individual employees. While waiting for this cross walk, MSL staff made a preliminary comparison of current MTNHP salaries to salaries in comparable positions in state government. Staff found that university salaries were comparable to or slightly lower than state salaries.

Leave and benefits

Annual and sick leave benefits are largely comparable between the University and the State. While insurance benefits are also similar, individual analysis of insurance costs from some MTNHP employees demonstrated additional out of pocket expenses under the State insurance plans for premiums, co-pays, deductibles and medical travel. The University also offers tuition waivers for staff and dependents, a benefit not offered by the State.

MTNHP employees currently accrue longevity for years of service. Longevity increases the amount of annual leave employees receive over time. Unlike for state employees, longevity does not result in increased pay overtime for permanent MTNHP staff because of their status as Letters of Appointment and Contract Professionals.

Annual and sick leave for all MTNHP employees is fully transferable to the State as is longevity. Over time, staff would begin to receive longevity pay increases as state employees.

MTNHP employees are fully vested in their University contributions to their retirement plan through TIAA-CREF. No retirement benefits would be lost if an administrative change occurs.

Recruitment

MSL researched options for the transfer of MTNHP staff through a governmental reorganization. The guidance that we received was that a reorganization was not an option because the program is operated under a contract. For this reason, MSL would have to recruit current MTNHP employees for their current positions. Though DOA HR provided good guidance to MSL about how to streamline the recruitment process, this fact creates additional anxiety for staff as well as an increased, though temporary, workload for MSL Central Services. It is MSL's intent to provide greater long-term stability for the Program. MSL staff are pleased and supportive of the ongoing work. Despite MSL's best intentions that this recommendation cause minimal impact to the day to day work of MTNHP staff, there is some risk that individual employees would choose to not apply for their positions.

Organizational Structure

Except for business office employees, MSL is not considering MTNHP organizational changes as part of this study. The program structure, lines of supervision, and work priorities would not change.

In order to support the increased workload that comes with managing a significantly increased number of staff and grants and contracts, MSL would need to hire additional Central Services staff including a budget analyst/accountant, a human resources specialist and a contracts manager. These services are currently handled by the University funded through overhead dollars that the University collects MTNHP grants and agreements. Additional Central Services staff would benefit all MSL and some MTNHP staff

have expressed appreciation for the opportunity to have more ready access to these staff. Long-term funding for Central Services staff would come through overhead dollars on grants and contracts as well as other MSL revenue including Library Services Technology Act and Montana Land Information Act dollars.

Staffing considerations

Though not a universal concern, some MTNHP staff have articulated the importance of academic credibility that is tied to the reputation of the MTNHP. These staff have expressed concern that not being employees of the University may make recruitment of new staff more difficult. With regard to staff, important long-term measures of success to MTNHP include:

- The general ability to recruit and retain staff through appropriate compensation and sustainable workloads;
- The ability to support appropriate staffing levels to maintain currency and completeness of existing core service products; and
- The ability to support appropriate staffing levels to fully develop core service products that are currently nonexistent or underdeveloped.

Core Services Status

The biennial contract for core services is intended to fund core work documented in the contract statement of work. Unlike many contracts however, this contract acknowledges that the lack of funding means that many of the known core service needs will not be addressed. MTNHP program staff prepared this summary of the status of core services:

At current core and supplemental core funding levels, staff are not able to spend as much time working on core services as is needed to best meet the mission of the program. While all the contracts meet the mission of the MNTHP and in most cases staff have found creative ways to ensure these projects will provide support to core needs, MTNHP staff are currently working on contracts that address needs of other states and heritage programs and program priorities are being driven by contract funding rather than the Program's core mission. For example, in order to generate revenue and retain staff to map wetlands in Montana, some staff will be mapping wetlands in Colorado and Alaska. Additionally, staff are building common field guide applications for states including Utah, California and Wyoming. While these common field guides do benefit MTNHP, Partners and NatureServe, work on certain MTNHP information technology needs, like a website update, have not been addressed.

An administrative change is not a silver bullet that will immediately result in new core monies to correct this problem, but MSL staff believe it is a necessary first step that will have positive impact in MSL's ability to slowly increase funding over time.

Partners

MTNHP has forged strong relationships with a wide variety of state, federal, and private partners. These partners provide funding in the form of grants, contracts and supplemental core agreements. MTNHP holds annual partner meetings to share program updates and for partners to provide feedback to MTNHP staff and MSL about their priorities that might inform future MTNHP and MSL data, applications and services development. For many years partners have expressed concern over the lack of stable

funding for the program. Even so these partners hold MTNHP in high regard. Several partners have offered testimony to the Legislature in support of additional program funding.

Staff discussed the possibility of an administrative transition of the MTNHP to MSL at a meeting of the Partners on November 25th. Feedback from Partners was similar to questions and comments from MTNHP staff. No state agency expressed concerns over the ability to contract with MSL vs. UM. Staff from two federal partners, the Bureau of Land Management and the Forest Service, stated they would need to research whether they could transfer cooperative agreements (supplemental core) from the University to MSL because those types of federal agreements are being phased out. Some partners noted the importance of access to academia and the research affiliation. Others suggested that a transition not be considered unless a major benefit could be demonstrated.

Long term evaluation of the success of the MTNHP regardless of how the program is administered is based on the success of our partners. MSL and MTNHP must have the ability to provide partners with stable long-term access to core services products through web pages and applications and other tools that are easy to use, the ability to outreach to and train stakeholders; and the ability to adapt and respond to changing user needs.

Deeper analysis of the impact to partners might be addressed through questions such as the following.

- Would MSL's direct administration of MTNHP improve the services the program provides to partners?
- Would direct administration result in better maintenance, more rapid development, and greater availability of core service products?
- Would direct administration improve servicing of partner needs for field surveys and assessments and development of ancillary natural resource information products?
- Would direct administration result in more comprehensive data and service delivery through deeper integration with the programs of MSL?

Without an influx of new monies, these are questions that can only be properly evaluated over time. More immediate benefits for partners may develop through improved customer service as MSL librarians are able to handle some basic inquiries and requests for information, especially when MTNHP staff is in the field.

University of Montana relationship

Of all partners, none have been more essential to the success of the MTNHP over the last thirteen years than the University of Montana. The University is very generous in the funding they provide back to the program. Though this study did not evaluate the administrative support provided by the University, nothing in this study is intended to reflect concern of their operation of the MTNHP. When discussing the benefits of the current administrative model, MTNHP staff point to the freedom and flexibility offered by affiliations with both the University and the state, access to academia and academic credibility. The exact nature of these benefits is hard to quantify but comments reflected a more positive perception of the University than for state government. For these reasons MTNHP staff and partners urge MSL to continue to maintain a strong relationship with the University and this is something MSL is committed to.

Spatial Analysis Lab

One way MSL desires to maintain a long and mutually beneficial relationship with the University through the shared operation of the Spatial Analysis Lab. The Lab develops landscape-scale ecological information through partnerships with agency personnel, research groups, and conservation organizations to support effective management of terrestrial, wetland and aquatic communities.

Maintaining the Lab on campus provides deeper integration with academic departments on campus. Funding the Director as a Research Professor of the University continues opportunities for research funding that might not otherwise be available to non-academics. Through a suggested Memorandum of Agreement with the University, MSL and the University may continue current collaborations that support Montana Spatial Data Infrastructure themes including Wetlands and Land Cover. MSL and the MTNHP have also discussed how the Lab may support MSL's investment in LiDAR and the Elevation theme.

MSL supports the opportunities the Lab affords the University to bring in additional research dollars through research grants and by attracting post docs to work in the Lab who would generate additional dollars for the University.

House Bill 633 implications

MTNHP staff have raised the question, why now if House Bill 633 (the Legislative Interim Study that is considering funding models for MSL) may provide new funding for MSL? HB 633 *may* result in new revenue sources but there is no guarantee. The results of the study may not guarantee that any new revenue will continue to increase over time. If MTNHP continues to be administered under a contract any new revenue would only become available to the MTNHP through contract negotiations. HB 633 has the potential to address the current revenue shortfall for MTNHP. By contrast, the administrative change recommendation in this document is intended to address the long-term stability of the program.

Proposal and timeline

MSL staff proposes to administer and operate the MTNHP. Given the number of MTNHP staff as well as the number of grants and contracts that would need to transfer to MSL, the MSL staff propose a staged transfer of programs following initial development of MSL's Central Services office. MSL staff further recommends use of most of MSL's House Bill 2, fiscal year 20 and 21 one-time appropriation to fund increased staff in the Central Services office during the transition period as well as any ancillary costs associated with the transfer. An administrative change of this kind would inevitably be disruptive. MSL staff believe the following timeline that allows for the needed capacity to ensure a slow transition will create the best possible outcomes.

Timeline

December 11, 2019	<ul style="list-style-type: none">• Commission Action
January through March 2020	<ul style="list-style-type: none">• Recruit and hire Central Services Staff

May through June 2020	<ul style="list-style-type: none"> Recruit and hire Information Services staff and Program Coordinator Transfer IT and supplemental core agreements
July 1, 2020	<ul style="list-style-type: none"> Initial MTNHP staff are hired and agreements transferred
September 2020	<ul style="list-style-type: none"> Recruit and hire Zoology staff Transfer Zoology agreements
October 1, 2020	<ul style="list-style-type: none"> Zoology staff are hired and agreements transferred
October 2020	<ul style="list-style-type: none"> Recruit and hire Botany staff Transfer Botany agreements
November 1, 2020	<ul style="list-style-type: none"> Botany staff are hired and agreements transferred
November through December 2020	<ul style="list-style-type: none"> Recruit and hire Ecology staff Transfer Ecology agreements
January 1, 2021	<ul style="list-style-type: none"> Ecology staff are hired and agreements transferred
Winter 2021	<ul style="list-style-type: none"> Recruit and hire field season staff
June 30, 2021	<ul style="list-style-type: none"> Finalize Memorandum of Agreement for the operation of the Spatial Analysis Lab

Transition funding

Heritage Transition																			
	FY 2020						FY 2021												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Salary/Benefits	-	21,486	21,486	21,486	21,486	21,486	56,891	56,891	56,891	67,997	74,271	74,271	108,752	108,752	108,752	108,752	108,752	108,752	
Total Revenue	-	25,000	25,000	25,000	25,000	25,000	77,583	77,583	77,583	77,583	77,583	77,583	120,250	120,250	120,250	120,250	120,250	120,250	
Net	-	3,514	3,514	3,514	3,514	3,514	20,692	20,692	20,692	9,586	3,313	3,313	11,498	11,498	11,498	11,498	11,498	11,498	

Items to note:

- Analysis does not include operational costs (IT, rent, supplies) because those costs are already paid by MSL.
- Does not include staff travel.
- Revenue includes projected vacancy savings, one time only funding, as well as current Heritage funding (core, supplemental core, and project dollars) as staff are transitioned.
- Project revenue is based on historical averages and assumes current MTNHP agreements administered by the University would transfer to MSL.
 - MSL requested a legal opinion regarding whether MSL has a legal right to current agreements. Attorney Mike Manion from the Department Administration advised MSL that MSL has the greater legal claim to such agreements.
- Estimates are all conservative to leave room for unanticipated expenses.

Future funding

Future funding of the MTNHP would be integrated into the overall budget approved annually by the State Library Commission. Without an influx of new revenue, the budget for staff and operations would remain largely the same. Staff estimates an ongoing budget that assumes a mix of current MSL appropriations, supplemental core, and project dollars based on historic averages. MSL does not have a negotiated indirect rate. It takes several years to demonstrate a history of indirect need. MSL will negotiate an indirect rate when that history can be proven. Staff financial analysis demonstrates that, based on a 3-year average, indirect rates necessary to fund the administration of the Program would be remain largely the same.

Conclusion

The proposal to assume administration of the MTNHP is not a silver bullet that will resolve the longstanding funding challenges faced by MSL and the MTNHP. Immediate benefits to MTNHP and MSL include increased administrative capacity that will alleviate pressure on staff across the agency and should improve project management. The MTNHP will also benefit from direct information technology support provided by MSL as well as procurement of IT equipment from MSL.

In time MSL staff believe that through direct administration MSL and MTNHP will eliminate the confusion that exists about the operation of the MTHP that may have created barriers to increasing funds. More importantly, staff strongly believe that direct administration is the best option to ensure the long-term stability and viability of the program and therefore the best option to exercise our responsibility for the stability and strategic direction of the MTNHP as is granted to and required of MSL by statute.

Montana Natural Heritage Program Scope of Work Progress Report

Report for FY19

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 FY19 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 contract. 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, individual Legislators, the Governor, and the State Budget Director in the past year. For mediated requests where patron's submitted a survey describing a their experience: (1) 100% of responses said they got the information they needed or even more information than they expected; (2) 85% or responses said the information would be very difficult to get elsewhere or was only available from the MTNHP; and (3) 100% or responses said they received the information on or before they date they requested it by. Written feedback in the past year includes the following:

- Just wanted to thank you for the information you sent. This is the first time I have requested an Environmental Summary and was not sure what to expect. I was impressed with the information provided. It is easy to interpret and professionally done. I complete wildlife consulting in other states and they provide services similar to this, but with an annual subscription rate and you have to do all the searches.
- An example of how Weyerhaeuser uses the NHP is in our implementation of the Sustainable Forestry Initiative (SFI). SFI is the largest forest environmental certification program in North America, enrolling 250 million acres. Mandatory performance measures within SFI require the use of regional databases on plant and animal distribution in resource management planning. NHP fits this requirement perfectly, providing not only site-specific locations of endangered and threatened species, but also map-based information that can be used to display and evaluate landscape scale implications of forest management programs. Weyerhaeuser recently collaborated with NHP, the Montana Tree Farm Program and others to produce a brochure on bat biology and habitat management for Montana's forest and woodlot owners. In summary, the NHP and NRIS provide valuable services to Montana's citizens, businesses, and landowners. In particular, the information compiled and distributed by NHP positively informs the management of Montana's fish, wildlife, and plant community resources. Weyerhaeuser supports the continued funding of NHP and NRIS to improve Montana's biological resource information.
- We often hear about the inefficiency of government, but I am here to tell you that the Montana State Library, and in particular the Montana Natural Heritage Program is an example of government that works. The data are the best in our region, it is available, easy to access, and the staff are courteous and efficient. In short it is the perfect example of what any business or state agency should aspire to.
- You set the bar high for customer service! Thanks for the help.
- Holy Cow that was fast! Thank you so much for the Environmental Summary Report!
- Thank you very much for the prompt response and data retrieval.
- Thanks for the quick turnaround!
- Thank you as always! That was quick, I'm talking record time....
- You all are always so timely - so appreciated.
- Thank you- I appreciate the thoroughness and quick response!
- Thanks for doing such a fast and thorough job. This is a really nice resource to have available and helps our fisheries management work considerably!
- Thank you for the report. I really like the format and detail that MNHP has incorporated into these now. As always, you guys are fast and extremely thorough!!
- Thank you for the information. As always the MTNHP produced an excellent set of data.
- Really love the Montana Field Guide Website, thank you for doing such good work on it and making it available for everyone.....

- Check it out! A watershed organization using the snapshot tool :-) The Ruby Valley Conservation District has used the Montana Natural Heritage Program's Species Snapshot Tool to create a field guide for the Mammal Species in the Ruby Valley. [You can find it here!](#)
- Thank you for getting me these data so quickly! I really appreciate all of your help. I will contact you if I have any additional questions.
- Found the attached document ([Montana Bat and White-nose-Syndrome Surveillance Plan](#)) on the internet - just wanted you to know it is HUGELY useful as someone just getting a bit serious about bat calls. Thanks!
- Saved 5 to 10 hours of my time that would have been spent combing through data online.
- I'm not sure of how to put a monetary value on the data, but access to data, like this, is essential to what we do.
- Very detailed and more specific to the area of interest than I could do on my own.
- Some information you have may have been available elsewhere, but time consuming and difficult to track down. Grateful for MTNHP's help on the phone and quick response to my online request!
- First time getting report, so it contained much more information that I had anticipated. Nice job!
- The excel spreadsheet summary is very valuable and helps to assess other areas besides the SOC.
- I expected it to take longer. I was very pleased with the prompt response!
- Was first time ordering an Environmental Summary for a project. Was very happy with amount of information provided. Very detailed, easy to interpret, and professionally done. Thanks!
- MNHP is always fast and thorough.
- This is a very valuable service - thank you!
- The MTNHP continually provide incredibly prompt services to my requests. I greatly appreciate how quickly staff respond and post the Env Summary Reports. Thanks!
- I am thankful for the data and services MTNHP provides. They make my job a little easier.
- I appreciate the quick responses and help from all of you. Keep up the great work!
- Very helpful!
- This service is incredibly valuable to me and to the agencies I work for. The site specific information really helps to focus environmental assessments and planning. Thank you!!
- Very fast friendly service

<i>Sustainable funding is secured to achieve the statutory mission of the program</i>			
Inputs	Outputs	Outcomes	Impacts
Program Coordinator and other staff time to summarize funding needs and mission status.	Communicate state core funding needs through the executive planning process and to the Montana legislature. Communicate supplemental core funding needs to State, local,	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.	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

<p>State, local, federal, and nongovernmental partner input and support.</p>	<p>federal, and non-governmental partners that are dependent on MTNHP services.</p> <p>Empower partners to articulate the value of MTNHP information and data delivery services to help secure adequate funding.</p>	<p>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.</p> <p>All core staff positions are funded to work on the core mission of the program.</p> <p>Staff expertise can be recruited, retained, and enhanced.</p>	<p>state and can easily access this information to save time and money, speed environmental reviews, and inform decision making.</p>
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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 56% 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 12 core services positions. The recent funding cuts caught the attention of the Environmental Quality Council (EQC). That interim legislative committee conducted a review of the program, explored several options to increase funding, and recommended that the Governor propose an increase in state funding for the program of \$600,000 per biennium (EQC meeting archives can be accessed at <http://leg.mt.gov/css/Committees/Interim/2017-2018/EQC/default.asp>). During the 2019 Legislative Session, Representative’s Llew Jones (committee chair), Bradley Hamlett, and other members of the Joint Appropriations Subcommittee on Education expressed a great deal of support for adequate funding of the program and programs of the State Library in general. Representative Hamlett, sponsored House Bill 633 which was passed by the full House and Senate and signed by the Governor. This legislation: (1) creates a special revenue account to fund digital library services at the State Library; (2) appropriates \$100 to the account; and (3) directs the Legislative Finance Committee to conduct a study of a funding formula to adequately and fairly distribute the cost of administering and operating the National Resource Information System (including the Montana Natural Heritage Program) and other digital library services among state agencies and private or commercial entities during the 2019-2020 interim. The Education Subcommittee of the Legislative Finance Committee has scheduled the first discussions on this new funding model for September of 2019.

Supplemental Core Funding

MTNHP partners continued to be very supportive of the MTNHP during FY19. Partners provided \$281,000 in supplemental core funding in FY19, an 85% match to state funding and within \$1,500 of the supplemental core funding provided in FY18. The MTNHP is very grateful to the following partners for their financial support in FY19: 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), and U.S. Fish and Wildlife Service (\$5,000).

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 FY19 have been very consistent with recent years and will likely total around \$1,000,000. Staff are currently managing about 45 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 the staff positions that were present before the cuts and has added a full time Spatial Analysis Lab Director, Jessica Mitchell, to take the lead on the Land Cover layer and assisting partners with their remote sensing and vegetation mapping needs. Unfortunately, as a result of the cuts, a number of the 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, Utah, and California by the Web Programmer). This has created heavier workloads for staff in order to maintain rapid responses to information requests 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. For example, in the recent departure of our Wetland Mapping Coordinator, he cited the lack of reliable funding for wetland mapping as a key reason for his departure.

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: <ul style="list-style-type: none"> - 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 about 2,927 species, subspecies, or varieties listed in MTNHP database as present, reported with no documentation, or have the potential to invade Montana: 2,327 native, 491 exotic, and 109 of unknown/undetermined origin.

Mosses - There are currently about 541 species, subspecies, or varieties listed as present or reported with no documentation in Montana in the MTNHP database: 520 natives and 2 exotics. Of these taxa, 387 have updated accounts on the Montana Field Guide while 154 are shell accounts with only the taxonomy listed. A new Montana Moss checklist with county distributions has been published on the MTNHP website (see MTNHP botany publications) with county distributions, current nomenclature, is supported by verified specimens, and is reflected on the Moss Field Guide. The History, Biogeography, and Species of Montana Mosses (1880-2018) by Joe Elliott and Andrea Pipp was published in a peer-reviewed Journal, *Evansia* 26(2): 39-58.

Liverworts/Hornworts – There are currently about 135 species, subspecies, or varieties listed as present or potentially present in Montana in MTNHP databases; 134 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 identified a knowledgeable Bryologist who can update Liverwort field guide account. The Program Botanist has also located where the herbarium collection of Montana Liverworts is housed (Providence College, Great Falls). As time and funding allow the program Botanist will pursue contact with the herbarium.

Algae/Diatoms – In FY19, 1,205 diatoms were added to MTNHP databases and these will be shown on the Montana Field Guide once a new “Microscopic Life Forms” guide is added to the Montana Field Guide. There are now 1,205 native diatom species and 4 algal species (2 native, 2 exotic) represented in MTNHP databases; only *Nitellopsis obtusa* has a fully developed species account in the Montana Field Guide. There are an unknown number of algae known from Montana that are not currently represented in MTNHP databases or on the Montana Field Guide.

Lichens – Montana has 1,045 lichen taxa (species or varieties): 1,044 native and 1 exotic. The first Montana Lichen checklist has been developed based on documented specimens. The new lichen checklist is reflected on the Lichen Field Guide and represents current nomenclature and taxonomy. Lichen Field Guide accounts need to be updated to represent current useful information.

Fungi – True fungi are not well represented in MTNHP databases or on the Montana Field Guide; currently only 9 species of true fungi are represented in MTNHP databases (2 native and 7 exotic). The Program Botanist has identified two mycologists and will pursue future tasks aimed at creating a Montana checklist.

Conservation Status Ranks

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. Of these 36 plant taxa are currently being assessed and funding has been found to assess another 31 plant taxa in the next fiscal year.

Observations

521,680 observation records for native species (496,547 vascular plant, 492 algal, 3365 moss, 49 liverwort, and 2,059 lichen records) were added to the MTNHP observation database in FY19. Additionally, 67,625 native species observation records (67,552 vascular plant, 58 moss, 3 liverwort, 12 lichen records) had spatial or tabular information updated to improve the records in FY19. The Program Botanist collaborated with the University of Montana Herbarium on a grant that if funded would geo-reference about 2,500 observations. At least 150,000 records of diatom observations are awaiting screening for inclusion into MTNHP databases when staff funding and time allows for it.

Species of Concern Occurrence Records for Environmental Reviews

A total of 304 Species of Concern Occurrence records for 145 species were added to the MTNHP database in FY19 and are now available for use in environmental reviews and permitting processes as follows (298 occurrences for 139 vascular plant species, 2 occurrences for 2 moss species, and 4 occurrences for 4 lichen species). Cleanup on the mapping of older Species Occurrences is ongoing to bring this important information layer fully up to current standards; this effort is approximately 50% complete.

Range Polygons

In FY19 range maps were created for 264 vascular plant species and these are now showing on the Montana Field Guide and Map Viewer web applications.

Predicted Habitat Suitability Models and Range Maps

In FY19, predicted habitat suitability models were created for 41 vascular plant Species of Concern and finalized for 29; 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

In FY19, Field Guide species accounts were newly created for 36 noxious weed species and 5 aquatic invasive species and updated for 33 vascular plant species. Current representation for general descriptions and habitat use summaries for botanical taxa on the Montana Field Guide is as follows:

Vascular Plants – 2,672 of 2,927 species have general descriptions and 2,617 of 2,927 species have habitat needs summarized in species accounts on the Montana Field Guide. Other fields in Montana Field Guide Species Accounts for vascular plants need additional work to bring them up to the latest standards.

Mosses – 385 of 541 species have general descriptions and 383 of 541 species have habitat needs summarized in species accounts on the Montana Field Guide.

Liverworts/Hornworts – 5 of 135 species have general descriptions and habitat needs summarized in species accounts on the Montana Field Guide.

Algae/Diatoms – 3 of the 1,209 taxa have general descriptions and habitat needs summarized in species accounts on the Montana Field Guide.

Lichens – 35 of 1,045 species have general descriptions and 39 of 1,045 species have habitat needs summarized in species accounts on the Montana Field Guide.

Fungi – 3 of 9 species have general descriptions and habitat needs summarized in species accounts in the Montana Field Guide.

Photos

A total of 24,056 photos of botanical taxa have been added to the MTNHP database in FY19 and 10,584 of these were attributed for display on the Montana Field Guide. Current photo representation on the Montana Field Guide is as follows:

Vascular Plants – 2,505 of 2,927 species have images showing on the Montana Field Guide.

Mosses – 135 of 541 species have images showing on the Montana Field Guide.

Liverworts/Hornworts – 5 of 135 species have images showing on the Montana Field Guide.

Algae/Diatoms – 4 of the 1,209 taxa currently represented have images showing on the Montana Field Guide.

Lichens – 93 of the 1,045 species currently represented have images showing on the Montana Field Guide.

Fungi – 7 of the 9 species currently represented have images showing on the Montana Field Guide.

Botanical Literature and Website Links

77 botanical literature references have been added to the MTNHP reference management database allowing 133 reference listings to be added to species accounts in the Montana Field Guide in FY19.

The [Botany related website links page](#) was reviewed and broken links were fixed. 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 FY19.

Presentations and Trainings

The following presentations or trainings were given in FY19:

- “What is the Montana Natural Heritage Botany Program”, Botany 320 Class, University of Montana, Missoula, MT. September 14, 2018.
- “Interactive Botany Databasing Lab”, Botany 320 Class, University of Montana, Missoula, MT. September 14, 2008.
- Conducting the First Non-vascular Surveys in Mussellshell County, Montana. Northwest Scientific Association conference, Lewiston, Idaho. March 28, 2019.
- Montana Rare Plant Conservation Strategy Kick-off Meeting, Helena, MT. April 26, 2019. Hosted, presented talks, and facilitated discussions among 19 folks representing 20 partnering affiliations (Federal, State, Academia, and Non-Governmental Organizations). This work was done in conjunction with a Steering Committee represented by USFS, BLM, Montana Native Plant Society, and MTNHP.
- Population Updates on select Spalding’ Catchfly Species Occurrences on the Flathead Indian Reservation. *Silene spaldingii* Technical Team Meeting, Spokane, WA. April 30-May 1, 2019.
- Ground Layer Indicator for Rangelands training to MTNHP Ecology field crew, Helena, MT. May 15, 2019
- Co-Lead on Lichen and Vascular Plant Hikes in the Cypress Hills Inter-Provincial Park for the Montana & Saskatchewan Native Plant Societies. Saskatchewan, Canada. June 21-23, 2019.

Projects

The Botany Program worked on the following projects in FY19:

- 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 grant
- Spalding’s Catchfly (*Silene spaldingii*) Population Monitoring at Two Key Conservation Areas – U.S. Fish and Wildlife Service Section 6 grant
- Species Accounts and Taxonomy Management for Non-native Species – Montana Department of Natural Resources and Conservation
- Databasing and georeferencing the University of Montana moss collection – Institute of Museum and Library Services
- Wetland and Riparian Plant Surveys on the Milton Ranch - Montana/Dakotas Bureau of Land Management
- Butte and Greer Radio Station Vegetation Surveys – Bonneville Power Administration

Reports/Publications

The following reports were finalized in FY19 and are available on the [MTNHP Botany Publications web page](#) :

- Pipp, Andrea. 2018. An Exploratory Study Using the Ground Layer Indicator Method for Montana Rangelands – Montana/Dakotas Bureau of Land Management. October 23rd.
- Pipp, Andrea. 2019. *Three-Year Baseline Monitoring Studies for Silene spaldingii on the Flathead Indian Reservation: Year 2018*. Prepared for the Confederated Salish & Kootenai Tribes, Flathead Indian Reservation, Pablo, MT and U.S. Fish and Wildlife Service, Montana Ecological Services Field Office, 31 pp.
- Pipp, Andrea. 2019. Spalding’s Catchfly (*Silene spaldingii*) Species Occurrence Re-visits on the Flathead Indian Reservation. Memorandum to the Confederated Salish & Kootenai Tribes and U.S. Fish and Wildlife Service. May 2nd. 14 pp.
- Elliott, Joe and Andrea Pipp. 2019. A Checklist of Montana Mosses (1880-2018). Updated May 5th. Montana Natural Heritage Program, Helena, MT. 73 pp.
- Elliott, Joe and Andrea Pipp. 2019. History, Biogeography, and Species of Montana Mosses (1880-2018). *Evansia* 26(2).

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: <ul style="list-style-type: none"> - 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 FY19, modern wetland and riparian mapping was completed in 24 1:24,000 scale U.S. Geological Survey quadrangle maps. A total of 2,448 quads have now been mapped (86% of Montana) with a total of 3,183,018 acres; 2,515,459 acres of wetlands and 667,559 acres of riparian. The wetland and riparian mapping effort is described at <http://mtnhp.org/nwi/> During recent meetings, partners have expressed appreciation for the benefits they get from having modern wetland and riparian mapping in place and interest in having it completed for the entire state. However, funding for wetland and riparian mapping has dwindled, especially for mapping quads that are dominated by private lands. Partners have provided funding for mapping another 91 quads in FY20 and beyond.

Land Cover Mapping

The land cover layer was not updated in FY19. However, Jessica Mitchell, has begun working on a partnership-driven plan for creating and systematically updating the land cover layer and associated metadata to utilize the latest Landfire data, better integrate it with other MSDI layers such as hydrography and wetland and riparian mapping, and provide more ready access to information on the classification accuracy of individual land cover types. This effort will also assess partner interest in the development of new land cover products such as lidar derived vegetation mapping products, assessment of changes in land cover over time, continuous percent cover products instead of categories, and incorporation of georeferenced photographs that document current and historic land use. While partners like the NRCS have expressed interest in contributing funding to these efforts, they may be hampered to some extent by the lack of Montana Land Information Act funding that is available to support this work. Current and historic MSDI layers have been reorganized into a single geodatabase

with metadata for individual layers. This updated geodatabase is available for download through the MSL website. Updated text for the Land Cover home page has been drafted and will be finalized in coordination with Erin Fashoway.

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

No updates were made to ecological system accounts in the Montana Field Guide in FY19, but no updates were really needed.

Field Surveys and Assessments of Key Ecological Community Types

In FY19, field crews conducted the following surveys of key ecological community types:

- Forest surveys of the Flathead National Forest beginning in 2018.
- Ecological assessments of slope wetlands in Southwest Montana.
- Ecological assessments of wetlands to add to our statewide wetland reference network.
- Identification and baseline ecological surveys of fire-affected wetlands.
- Identification and baseline ecological surveys of “sentinel wetlands” to track change over time.
- Ecological assessments of rangeland and aquatic condition for the BLM’s Assessment Inventory and Monitoring program in 2019.
- Collaborated with federal and non-profit partners to run a Beaver Restoration Assessment Tool to identify optimal sites for installation of beaver analog structures. This model will be rerun in Fall of 2019 with new inputs and a new script.
- Ground and remote surveys of invasive grass species in UL Bend and Willow Creek areas of the Charles M Russell National Wildlife Refuge.
- Remote surveys of invasive grass in the Centennial Valley.
- Collaborated with Bureau of Land Management to identify existing and historic surveys of “wooded draws and ravines” in eastern Montana. The information will be used to support comprehensive updates to the MSDI Land Cover theme.

Photos

A total of 1,540 wetland, riparian, and terrestrial habitat assessment photos were added to the MTNHP database in FY19. 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

No ecological literature references were added to the MTNHP reference management database in FY19.

The [Ecology related website links page](#) was reviewed and broken links were fixed, and 8 website links were added.

Presentations and Trainings

The following presentations/trainings were given in FY19:

- Poster, Baseline Data Collection at Fire-Affected Wetlands, 11th National Monitoring Conference, Denver, CO, March 27, 2019.

- Presentation, Wetlands and Fire: Reframing the Questions, 11th National Monitoring Conference, Denver, CO, March 26, 2019
- Meeting: Indicators of Wetland Change: Lessons from the Field. Montana Wetland Council, March 21, 2019. Meeting organized and sponsored by the MTNHP Ecology Program.
- Meeting: Spatial Analysis Lab Introductions, Governor's Montana Land Information Advisory Council Meeting, August 8th, 2018, Helena MT
- Presentation: Remote Sensing for Heritage Program Applications, The 2018 Natural Heritage West Conference, Lake Tahoe, CA, October 30th, 2018 - November 1st, 2018
- Presentation: Spatial Analysis Lab Introductions, Department of Geography Colloquium, Missoula, MT, November 13th, 2018
- Presentation, Big Sky GeoCon, April 1st-4th, 2019, Butte, MT
- Presentation: Assessing Functional Diversity in a Dryland Ecosystem using Full Waveform Lidar and a bit more ..., American Geophysical Union Fall Meeting, Washington, D.C., December 10th-14th, 2018
- Presentation: Spatial Analysis Lab Introductions, Systems Ecology Seminar Series, Missoula, MT, April 18th, 2019
- Poster: Research Outreach: Leveraging NEON Data to Investigate Remote Sensing of Biodiversity Variables, NSF Macrosystems Biology PI Meeting, Boulder, CO, May 15th – 17th, 2019 (Jessica Mitchell, co-author but not presenter)
- Presentation: Macroscale Ecology in the Classroom: An EREN Partnership Using NEON Data. The Northeast Natural History Conference, Springfield, Massachusetts, April 12th-14th, 2019 (Jessica Mitchell, co-author but not presenter)
- Presentation: Applying the Beaver Restoration Assessment Tool in Montana, Montana Chapter of American Fisheries Society Annual Meeting, Billings, MT, January 29th – February 1st

Projects

Ecology Program staff worked on the following projects in FY19:

- Rangeland Health Assessments, Bureau of Land Management
- Aquatic Health Assessments, Bureau of Land Management
- Monitoring Tools for Decision Makers: US EPA
- Species Accounts and Taxonomy Management for Non-native Species – Montana Department of Natural Resources and Conservation
- 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
- Biodiversity mapping using NEON data – National Science Foundation, Macrosystems Biology
- Mapping mariana fruit bats in Guam – University of Montana Math Department
- Predicting arthropod distributions – Montana Fish Wildlife and Parks
- Invasive grass species mapping on the Charles M Russell National Wildlife Refuge - USFW
- Cheatgrass mapping in the Centennial Valley – USFWS
- Ventenata mapping on the National Bison Range - USFWS

Reports/Publications

The following reports/publications were finalized in FY19:

- Dashti, H., Glenn, N.F., Ustin, S., **Mitchell, J.J.**, Qi, Y., Ilangakoon, N.T., Flores, A.N., Silván-Cárdenas, J.L., Zhao, K., Spaete, L.P. and de Graaff, M.A., 2019. Empirical Methods for Remote Sensing of Nitrogen in Drylands May Lead to Unreliable Interpretation of Ecosystem Function. *IEEE Transactions on Geoscience and Remote Sensing*, 57(6), pp.3993-4004.
- J. J. Mitchell**, N. F. Glenn, K. M. Dahlin, N. T. Ilangakoon, H. Dashti, and M. C. Maloney*, “Integrating Hyperspectral and LiDAR Data in the Study of Vegetation.,” *in* Hyperspectral Remote Sensing of Vegetation (Volume I), II Ed., P. S. Thenkabail, J. G. Lyon, and A. Huete, Eds. London, New York: CRC Press- Taylor and Francis group, 2018, p. 449.
- Ilangakoon, N.T., Glenn, N.F., Dashti, H., Painter, T.H., Mikesell, T.D., Spaete, L.P., **Mitchell, J.J.** and Shannon, K., 2018. Constraining plant functional types in a semi-arid ecosystem with waveform lidar. *Remote Sensing of Environment*, 209, pp.497-509.

Spatial Analysis Lab Website Development and Maintenance

A website was created for the Spatial Analysis Lab <http://www.umt.edu/spatial-analysis-lab> The site can be accessed from the Montana Natural Heritage Program home page and is scheduled to be accessible from University of Montana Department of Geography and Department of Ecosystems and Conservation Sciences websites, as well as MontanaView.

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 699 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 natives and 67 exotics. 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, 448 birds, and 115 mammals.

Invertebrates - There are currently 4,452 (**41% increase from FY18**) 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 that are currently showing on the Montana Field Guide; 4,168 natives and 284 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 quickly incorporate that information. The invertebrate taxa that are currently represented in MTNHP databases include: 2 freshwater sponges, 2 myxozoan, 37 bivalves, 1 turbellarian, 24 fairy/tadpole shrimp, 2 copepods, 21 crayfish/shrimp/amphipods/isopods, 97 round worms, 2 tapeworms, 6 leeches, 23 earthworms, 27 millipedes, 1 springtail, 157 slugs/snails, 354 spiders, 1 cockroach, 391 beetles, 97 flies and mosquitos, 136 mayflies, 1 rock crawler, 44 true bugs, 326 bees/wasps, 2,071 butterflies/moths, 3 mantis, 2 alderflies, 1 lacewing, 99 dragonflies/damselflies, 131 grasshoppers/crickets, 126 stoneflies, 2 thrips, 265 caddisflies. Of the invertebrates represented on the Montana Field Guide, accounts are reasonably well developed for only 544 (12%) while 88% are only shell accounts that lack general descriptions or information on habitat use.

Conservation Status Ranks

State conservation status ranks were reviewed and updated for 15 vertebrate and 1 invertebrate species in FY19 in coordination with FWP (the Montana Animal Species of Concern Committee is jointly composed of 3 FWP staff and 3 MTNHP staff). Rank scoring is now posted on 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 Snapping Turtle species account at: <http://fieldguide.mt.gov/speciesDetail.aspx?elcode=ARAAB01010>

Conservation status ranks have not been reviewed since before 2002 for 86 (60%) of Montana's Invertebrate Species of Concern and 181 (33%) of Montana's vertebrate non-SOC. Furthermore, 3,750 (87%) 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

26,280 observation records for native species (24,032 vertebrate and 2,248 invertebrate records) were added to the MTNHP observation database in FY19. Additionally, 16,670 previously existing native species observation records (16,665 vertebrate and 5 invertebrate records) had spatial or tabular information updated to improve the record in FY19. A growing backlog of observation records were not able to be entered into MTNHP databases in FY19 as a result of recent budget cuts. These records have been stored and will be entered as time and resources allow.

Structured Survey Locations

73,227 structured survey locations where 37 specific protocols were used to detect animal species were added to the MTNHP database in FY19. In addition, 145 structured survey locations were updated to improve Raptor Nest Survey locations. A growing backlog of structured survey location records were not able to be entered into MTNHP databases in FY19 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 144 Species of Concern Occurrence records for 80 species (140 occurrences for 76 vertebrate species and 4 occurrences for 4 invertebrate species) were added to the MTNHP database in FY19 and are now available for use in environmental reviews and permitting processes.

Range Polygons

Range maps were updated or added for 133 species (112 vertebrates and 21 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 7 vertebrate species and 6 invertebrate species (3 Species of Concern, 2 Potential Species of Concern, and 8 non-Species of Concern of management interest in FY19; 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 19 species accounts (4 vertebrates and 15 invertebrates) in the Montana Field Guide in FY19.

Current representation of this information on the Montana Field Guide is as follows:

Fish – 101 of 101 species have general descriptions and 98 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 – 405 of 448 species have general descriptions and 292 of 448 species have habitat needs summarized in species accounts on the Montana Field Guide.

Mammals – 92 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 663 (15%) of the 4,452 species that are showing on the Montana Field Guide have general descriptions and only 683 (15%) have habitat needs summarized.

Photos

A total of 3,239 photos of animal species have been added to the MTNHP database in FY19 and 415 of these were attributed for display on the Montana Field Guide for 241 species (205 vertebrates and 36 invertebrates). Current photo representation on the Montana Field Guide is as follows:

Fish – 101 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 – 447 of the 448 species have images showing on the Montana Field Guide.

Mammals – 107 of the 115 have images showing on the Montana Field Guide.

Invertebrates – Only 1,824 (41%) of the 4,452 species currently represented on the Montana Field Guide have images showing.

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

No associations between ecological systems and individual animal species were created or updated in FY19.

Presentations and Trainings

The following presentations/trainings were given in FY19:

- Bat ecology and management training to state and federal partners. Helena, MT. July 23 – 25, 2018.
- Use of Caves by bats in Montana. National Speleological Society Conference, Helena MT. August 2, 2018
- Bats of the Montana. Workshop at the National Speleological Society Conference, Helena, MT. August 1, 2018
- Bat acoustic and roost monitoring in Montana. Natural Heritage West Conference. October 30, 2018.

- Update on Zoology Projects and Future Work, Montana Natural Heritage Program Annual Partners Meeting, December 6, 2018.
- Northern Myotis Status and Distribution in Montana. Mountain-Prairie Region WNS Coordination Call. December 19, 2018
- Montana Bat Working Group Meeting. Montana Chapter of the Wildlife Society Annual Conference, Helena, MT. February 26, 2018.
- Digital Tools for Wildlife Data Collection. Workshop at the Montana Chapter The Wildlife Society Annual Conference. February 27, 2018.
- Establishing Range of Montana's Rarest Bat Species the Northern Myotis. Presentation at the Montana Chapter The Wildlife Society Annual Conference. February 29, 2018.
- Biology of Lick Creek Cave. Presentation at Lick Creek Cave Management Meeting. Helena, Mt. April 29, 2019
- Update on the Use of Montana's Caves by Bats. Annual Meeting of the Northern Rocky Mountain Grotto, Lewis and Clark Caverns. April 6, 2019

Projects

The Zoology Program worked on the following projects in FY19:

- 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
- Bat species monitoring at Coal Mines in Central Montana – Montana Department of Environmental Quality Grant
- Identification of Bat Roosts in Bridges across Northern Montana – Montana Fish Wildlife and Parks Agreement
- Conservation Status Review for Native Species – Nature Serve Agreement

Reports/Publications

The following reports and posters were finalized in FY19:

Bachen, D.A. et al. Produced 93 reports summarizing bat species presence and activity for data from our long-term acoustic monitoring sites.

Stagliano, D.M. 2019. Freshwater Mussels of Montana (revised). Helena, Montana. 21 pp.

Stagliano, D.M., B.M. Maxell, and D.A. Bachen. Freshwater Mussels of Montana Poster. Helena, Montana.

Bachen, D.A. and B.M. Maxell. Turtles and Lizards of Montana Poster. Helena, Montana.

Bachen, D.A. 2018. **Update on Northern Myotis (*Myotis septentrionalis* A.K.A Northern Long-eared Bat) Surveys in Eastern Montana.** Report to the US Fish and Wildlife Service. Montana Natural Heritage Program, Helena, Montana. 10 pp. plus appendices.

Bachen, D.A. 2019. **Roost features used by bats in the Northern Rocky Mountains and Great Plains.** Report to Montana Department of Environmental Quality. Montana Natural Heritage Program. Helena, MT.

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
<p>Web Projects Manager and Information Services, Botany, Ecology, and Zoology staff time.</p> <p>State, local, federal, and nongovernmental partner feedback.</p>	<p>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:</p> <ul style="list-style-type: none"> - 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 	<p>State, local, federal, and nongovernmental partners have common easy access to MTNHP information resources.</p> <p>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.</p> <p>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.</p>	<p>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.</p>

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 FY19, total mediated requests for Environmental Summary Reports and/or geodatabases of MTNHP information was reduced to 411 (37% reduction from FY18) as a result of developing the Environmental Summary Report task in Map Viewer and training agency personnel to self-serve their information needs using this tool. Most agency personnel are now self-servicing their information needs with Map Viewer and remaining requests are mostly 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 FY19, there were 1,508 downloads of MTNHP Environmental Summary Reports (133% increase) by agency-level users of the Map Viewer website. Trainings to agency resource managers and biologists on the MTNHP Environmental Summary Report continued throughout FY18 and FY19 and feedback gathered during these trainings has continued to be used to improve this web application.

Custom Field Guide PDF Downloads

In FY19, there were 7,277 downloads of custom field guides (11.6% increase from FY18) from the Montana Field Guide (3,918 - 10.7% decrease), Species Snapshot (169 – 21.4% decrease), and Map Viewer Environmental Summary Report (3,190 – 50.5% increase) web pages. It appears that in FY19 users are primarily having their custom field guide download needs met through the field guides included in the Environmental Summary Report package rather than having to do secondary downloads from the Montana Field Guide or Species Snapshot after receiving a list of species included in the Environmental Summary Report as in earlier years when agency personnel were not fully trained on the Environmental Summary Report.

Excel Downloads

In FY19, there were 2,519 (12% decline) Excel downloads of species and habitat reports for particular geographic areas from the Map Viewer (2,441 – 6% decline) and Species Snapshot (78 – 48% decline) websites. These statistics are reflective of more heavy use of the Environmental Summary Report tool in FY19. The Environmental Summary Report tool includes one Excel file that contains summaries of Species of Concern, species observed, structured surveys, land cover, wetland and riparian mapping and land management. So, rather than downloading 6 different Excel files from different tasks within Map Viewer, users are preferentially downloading a single Excel file from the Environmental Summary Report task. There was a 133% increase in download of Environmental Summary Reports in FY19 so overall, much more information was shared in FY19 in a more efficient manner for our users as compared to FY18 when the Environmental Summary Report was new.

Web Use:

Home Page Use in FY19 (change compared to FY18) was:

Users = 26,612 (28% increase)

Sessions = 47,476 (14.7% increase)

Average Session Duration = 3 minutes, 1 second (15.8% decline)

Page Views = 120,658 (0.5% increase)

Average Use Per Work Day = 9.2 hours (3.1% decline)

Field Guide Use in FY19 (change compared to FY18) was:

Users = 353,243 (17.5% increase)

Sessions = 469,114 (14.5% increase)

Average Session Duration = 2 minutes, 10 seconds (3% decline)

Page Views = 1,445,485 (5.9% increase)

Average Use Per Work Day = 65.4 hours (11.8% increase)

Map Viewer

In FY19 there were 2,047 (5.6% increase over FY18) total individuals with accounts with 1,237 (6.3% increase) with agency-level access and 810 (4.6% increase) with general public access.

Total Users in FY19 based on a combination of User Key and IP Address = 929 (7.6 % increase)

Total Hours of Use for all sessions less than 3 hours of duration in FY19 = 1,462 hours (not tracked in same way in earlier years)

FY19 Number of User Sessions by Agency

Conservation District/Weed District = 125

Department of Agriculture = 17

Department of Environmental Quality = 321

Department of Fish, Wildlife, and Parks = 424

Department of Natural Resources = 200

Department of Transportation = 33

Montana Natural Heritage Program = 1853

University System = 36

Unidentified State Agency = 685

Army Corps of Engineers = 304

Bureau of Land Management = 507

Bureau of Reclamation = 7

Federal Emergency Management Agency = 112

Federal Highways Administration = 7

National Park Service = 23

Natural Resource Conservation Service = 107

Tribal = 4

U.S. Fish and Wildlife Service = 237

U.S. Forest Service = 704

U.S. Geological Survey = 2

Unidentified Federal Agency = 56

Consultants and General Public Users = 558

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 2 and a half years 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 live version of the Montana Field Guide is becoming more and more out-of-date and we do not have adequate funding/staffing to modernize this website using core and supplemental core funding. However, the Wyoming Natural Diversity Database, Utah Conservation Data Center, and California Natural Diversity Database all provided project funding in FY19 to create online field guides for those NatureServe Network member programs. Early versions of these guides can be seen at <http://fieldguide.wyndd.org/> for Wyoming and <http://fieldguide.mt.gov/utah/> for Utah. These efforts have allowed us to develop a more 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 using Amazon Web Services 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 agency partners 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. Early versions of the Montana, Utah, Wyoming, and NatureServe field guides are now running in the Amazon Web Services environment and a number of other NatureServe Network programs have expressed interest in launching field guides under this common field guide platform; Oregon and Washington are likely to be the next guides launched after California's.

Species Snapshot

No updates were made to the Species Snapshot web application in FY19. Google Analytics usage statistics on the Species Snapshot indicate that it is not well utilized relative to the Montana Field Guide. Because of this and because this web application primarily provides species list and field guides for particular locations, we plan to integrate the filters of this site into the Field Guide and eventually eliminate Species Snapshot.

Map Viewer

Trainings to agency resource managers and biologists on Map Viewer, and the Environmental Summary Report in particular, continued throughout FY19 and feedback gathered during these trainings was used to continue to refine this web application. In FY19, no major updates were made to the outward appearance of Map Viewer, but behind the scenes a variety of code was refined, consolidated, and modularized in order to make the website run more efficiently and allow future updates to be made and deployed more easily across the 10 major tasks that agency-level users can see in Map Viewer.

Mobile Data Collection Applications

In FY19, code was developed and deployed using Survey123 for ArcGIS to add the following data collection applications:

- Bat Surveys 1.0 for gathering data during Cave/Mine, Building, Bridge, and Mistnet surveys; a bat identification key is included that walks users through the identification of bat species based on morphology and geographic location.

In FY19, code was refined and deployed using Survey123 for ArcGIS to update the following data collection applications:

- Heritage Obs Collector 2019 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 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
<p>Program Coordinator, Botanist, Ecologist, and Zoologist time.</p> <p>MSL Training and Development Specialist and State GIS Coordinator assistance.</p> <p>State, local, federal, and nongovernmental partner feedback.</p>	<p>Regular trainings are conducted for state, local, federal, and nongovernmental partners that can make use of MTNHP information resources.</p> <p>User guides are made readily available on MTNHP web applications and web pages.</p> <p>Staff respond in a timely manner to mediated requests for MTNHP information and staff expertise.</p> <p>Announcements of new and improved MTNHP resources are posted on MTNHP’s homepage and social media accounts.</p>	<p>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.</p> <p>State, local, federal, and nongovernmental partners provide feedback on how MTNHP information resources can be improved and, where possible, those suggestions are implemented.</p>	<p>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.</p>

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 FY19, 151 individuals created new Map Viewer accounts; 111 with agency-level access and 40 with general public access. With closures of some accounts associated with retirements or departures, the total number of individuals with Map Viewer accounts is currently 2,047 (5.6% increase over FY18); 1,237 with agency-level access (6.3% increase over FY18) and 810 with general public access (4.6% increase over FY18).

Trainings/Presentations

Twenty-six presentations/trainings/posters were given in FY19 by the MTNHP Program Coordinator as follows:

- Resource materials for State Prison inmates to Montana State Prison Librarian. Helena, MT. July 16, 2018.
- MTNHP and general library resources at a booth at the Lewis and Clark County Fair. Helena, MT. July 28, 2018
- Common Field Guide presentation to NatureServe Network member programs across the United States. Webinar. August 16, 2018
- Overview of the Biology and Ecology of Bats and Research on Montana Bats. Lewis and Clark Caverns State Park. August 17, 2018
- MTNHP information overview to Montana Fish, Wildlife, and Parks Region 1 staff. Kalispell, MT. September 11, 2018.

- MTNHP information overview packet for Environmental Quality Council Interim Legislative Committee. Helena, MT. September 12-13, 2018.
- MTNHP information overview to Montana Fish, Wildlife, and Parks Region 2 staff. Missoula, MT. September 17, 2018.
- Rapid Response Tool for Invasive Mussels to Montana Fish, Wildlife, and Parks and Department of Natural Resources staff. Webinar. Sept 21, 2018.
- Biocontrol species models available in Map overview to International Biocontrol Conference. Whitefish, MT. October 9, 2018.
- Mussel StoryMap presentation to Montana Fish, Wildlife, and Parks and Department of Natural Resources staff. Helena, MT. October 15, 2018.
- Great EO Debate a more complete data framework for the NatureServe Network. Natural Heritage West Conference. Fallen Leaf Lake, CA. Oct. 30, 2019.
- Common Field Guide Platform for NatureServe Network. Natural Heritage West Conference. Fallen Leaf Lake, CA. Oct. 30, 2019.
- Partners Meetings for NatureServe Network Programs. Natural Heritage West Conference. Fallen Leaf Lake, CA. Oct. 31, 2019.
- Poster on table on How Natural Resource Managers can Access Information on Invasive Species. Governor's Invasive Species Summit. Helena, MT. November 15-16, 2018.
- Environmental Summary Report training for Montana Weed Coordinators. Webinar. November 19, 2018.
- Pollinator Information Resources at MTNHP. Montana Pollinator Working Group. Helena, MT. December 14, 2018.
- Invasive Species Information to Support Weed Control Efforts. Montana Weed Control Association Annual Meeting. Great Falls, MT. Jan 9, 2019.
- MTNHP information table at Watershed Day in the Montana State Capital Rotunda. Helena, MT. January 28, 2019.
- MTNHP information overview to Montana Watershed Coordination Council. Helena, MT. January 29, 2019.
- Common Field Guide Platform for NatureServe Network. NatureServe Canada and Canadian Conservation Data Centres. Webinar. Feb 13, 2019.
- MTNHP information overview to Montana Fish, Wildlife, and Parks Region 5 staff and BLM and USFS employees. Billings, MT. February 20, 2019
- MTNHP information overview to Montana Fish, Wildlife, and Parks Region 6 staff and BLM employees. Glasgow, MT. February 21, 2019
- MTNHP information overview to Montana Fish, Wildlife, and Parks Region 7 staff and BLM employees. Miles City, MT. February 22, 2019.
- Invasive Species Information at the Montana Natural Heritage Program. Montana Chapter of the Wildlife Society Meetings. Helena, MT. March 1, 2019.
- MTNHP information resources and invasive species data. Weed Trust Fund Grant Application Hearing. Helena, MT. March 5, 2019.
- MTNHP information resources for Big Sky Watershed Corps members. Bozeman, MT. May 3, 2019.

User Guides and other Self-Serve Training Materials Developed

- The How To Use Guide was updated for the Environmental Summary Report task in Map Viewer in order to allow agency biologists and resource managers to self-serve their needs for environmental reviews and permitting processes. The updated guide is posted within the question mark link for this task within the Map Viewer application.
- An updated handout was made for MTNHP Survey123 data collector applications to guide agency personnel in downloading Survey123 and the survey applications of interest to them.

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
<p>Botany, Ecology, Zoology, and Information Services staff time.</p> <p>State, local, federal, and nongovernmental partner input.</p>	<p>Comprehensive, up-to-date, and authoritative coverage for:</p> <ul style="list-style-type: none"> - Aquatic invasive species - Noxious weeds - Forest pests - Agricultural pests - Biocontrols - Other exotic species 	<p>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.</p> <p>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.</p>	<p>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.</p> <p>Control efforts on invasive species are improved and more easily prioritized.</p> <p>Invasive species management efforts can be more easily considered during MEPA, NEPA, and other permitting and planning processes.</p>

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 both FY18 and FY19, a major effort was made to add invasive species information to MTNHP databases with project funding from the DNRC Aquatic Invasive Species Grant Program. Species accounts are now showing on the Montana Field Guide for 851 non-native species that are either present or have the potential to become established; this includes 32 species that are deemed Aquatic Invasive Species, 45 state-listed noxious weeds, 44 county-listed noxious weeds in 43 counties, 13 forest pest species, 23 agricultural pest species, 63 Biocontrol Species, and 635 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 and partners have responded that they very much appreciate having this information available in conjunction with information on native species.

Observations and Structured Survey Locations

349,004 observations were added to the MTNHP observation database for 521 invasive species in FY19 as follows:

Status	Total Number of Species	Total Number of Observations
Aquatic Invasive Species	9	4122
Noxious Weeds 1a	3	105
Noxious Weeds 1b	6	838
Noxious Weeds 2a	10	18,664
Noxious Weeds 2b	16	257,589
Regulated Weeds	2	8,361
Agricultural Pest Species	6	120
Forest Pest Species	4	105
Biocontrol Species	14	144
Other Non-native Species	451	58,956

21,692 structured survey locations were added to the MTNHP data system in FY19 for the following survey protocols for invasive species:

Protocol_Name	Total Number of Survey Locations
Artificial Substrate for Invasive Mussels	30
Japanese Beetle Trapping Surveys	110
eDNA for Invasive Mussels	296
Plankton tows for veligers of Invasive Mussels	1828
Noxious Weed Road-based Visual Surveys	1380
Rake tows/pulls for Eurasian Water-milfoil	3738
Visual Encounter Surveys for Aquatic Invasives on Shorelines or Underwater	8888
Eastern Heath Snail Survey	4087
Kicknet Collection Survey for Invasive Mussels and Snails	1335

Range Polygons

Range maps were created or updated for 297 non-native species in FY19 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 for 42 species and finalized with complete write ups and made available on MTNHP websites for 29 species in FY19. 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 FY19 species accounts in the Montana Field Guide were fully developed for the following invasive species:

- 11 Aquatic Invasive Species; fully developed accounts are now available for all Aquatic invasive species
- 36 State-listed Noxious Weeds; fully developed accounts are now available for all State-listed Noxious Weeds
- 13 Forest Pest Species

Photos

A total of 2,142 photos of non-native species have been added to the MTNHP database in FY19 and 1,874 of these were deemed appropriate 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	106
Noxious Weeds 1a	12
Noxious Weeds 1b	19
Noxious Weeds 2a	42
Noxious Weeds 2b	128
Regulated Weeds	33
Agricultural Pest Species	83
Forest Pest Species	46
Biocontrol Species	208
Other Non-native Species	1,833

Literature and Website Links

267 literature references for non-native species have been added to the MTNHP reference management database allowing 328 reference listings to be added to species accounts in the Montana Field Guide in FY19.

3 additional resource management links were added to individual species accounts for all Aquatic Invasive Species, Noxious Weeds, and Biocontrol species.