



MONTANA
**Natural Heritage
Program**

<http://mtnhp.org>



DRAFT STRATEGIC PLAN

July 2010 – June 2014

MISSION

The Mission of the Montana Natural Heritage Program is to be Montana's source for reliable, objective information and expertise to support stewardship of our native species and habitats, emphasizing those of conservation concern.

PROGRAM BACKGROUND

The Montana Natural Heritage Program was established by the 1983 Montana State Legislature as part of the Natural Resource Information System at the Montana State Library for acquisition, storage, and retrieval of data relating to the flora, fauna, and biological community types of Montana in order to make that information available to local, state, and federal agencies and the general public (Montana Code Annotated 90-15). The program has been in existence since 1985 and currently operates under the Office for Research and Sponsored Programs at the University of Montana as a contract with the Montana State Library.

INTRODUCTION TO PLAN

This draft strategic plan has been developed by staff and program managers and covers major goals and objectives for the Botany, Zoology, Ecology, and Information Services programs between July 2010 and June 2014. Under each of these headings, we have listed general and specific goals in order of priority given current data deficiencies and funding sources. Strategic plans for each program area cover goals for staffing, data acquisition, data management, and data dissemination over the next four years. It is important to recognize that we do not have the staff capacity to fully meet all goals listed during this time period. However, it is important to identify all of these goals in order to bring them to the attention of others and take advantage of any potential collaborations or funding opportunities that arise. We look forward to feedback from our partners and information users to ensure that this strategic plan can be used to guide the program toward successful achievement of its mission.

BOTANY PROGRAM STRATEGIC PLAN

Four-Year Strategic Plan

July 2010 – June 2014

I. MISSION

The mission of the Botany Program is to collect and maintain reliable and comprehensive data on the diversity, status, biology and conservation needs of Montana's plant and lichen species, focusing on species of conservation concern and to make this information available to resource managers, biologists and the general public to support and promote informed stewardship of Montana's natural resources.

STAFFING

Maintain a staff recognized for their expertise with the taxonomy, biology and status of the flora of Montana. As resources are limited, maintaining a staff that is skilled and knowledgeable in all areas of botany and lichenology is not feasible. However, the Botany Program strives to consist of staff, which: (1) have a thorough knowledge of the taxonomy and identification of Montana's plant and lichen species; (2) are familiar with biology, ecology and management of species, particularly those of conservation concern, as well as literature on inventory, monitoring, and assessment of status; (3) are trained in field techniques appropriate to the detection of various plant taxa; (4) have up-to-date GIS, database, and statistical skills; (5) are involved with professional societies and working groups; and (6) make results of research and data analysis available to resource managers and the general public through web applications, posters, presentations, reports, and peer-reviewed publications.

DATA CONTENT AND ACQUISITION

Collect and manage critical information on the diversity, distribution, abundance and conservation needs of Montana's plant and lichen species with emphasis on Species of Concern. Vascular plants are the highest priority

I. Taxonomic Diversity and Tracking Data

1. Vascular Plant Diversity

Maintain a complete taxonomic list and database of vascular plant taxa occurring in the state along with information on the species' origin (native vs. exotic), global conservation status, state conservation status and related ecological and taxonomic information. This information will be made available on the Montana Field Guide and via a Checklist of Montana Vascular Plants.

2. Bryophyte Diversity (mosses, liverworts and hornworts)

Continue to actively gather information on the diversity of bryophyte taxa in the state with a goal of maintaining a comprehensive taxonomic list of the state's bryophytes.

3. Lichen Diversity

Continue to actively gather information on the diversity of lichen taxa in the state with a goal of maintaining a comprehensive taxonomic list of the state's bryophytes.

4. Other Taxonomic Groups (Fungi, Algae, Diatoms)

Collect information on the occurrence, distribution, taxonomy and ecology of Fungi, Algae and Diatoms pertinent to Montana. Information sources will include reports, publications, specimen collections and input from experts. These taxonomic groups

II. Occurrence and Observation Data

The Botany Program will:

1. Collect and manage occurrence and observation data on plant and lichen Species of Concern and other species of potential conservation interest in the state. Data will be collected from internal and external data sources with high priority sources including:

- a. USFS
- b. NPS
- c. BLM
- d. TNC
- e. Private Contractors
- f. State Agencies (MDT, FWP, DEQ)

2. Collect and maintain observation data records for all plants through the use of:

- a. Associated species records in MTNHP databases.
- b. Digitized herbaria records.
- c. Associated species records of digitized herbaria records.
- d. On-line observation data entry tool for plant species.
- e. Collection and manual data entry of observation records from published and unpublished reports and literature.

III. Field Surveys and Monitoring

Gather data important to documenting the distribution, abundance and status of Montana's plant species, particularly Species of Concern through field surveys and monitoring projects.

1. Conduct field surveys of high priority species (e.g. ESA-listed and globally rare species, species of uncertain conservation status).
2. Conduct field surveys of high priority and under-surveyed geographic areas and habitats (tribal lands, glaciated plains, wetland habitats).
3. Conduct field surveys based on needs of partners agencies with a focus on Species of Concern.
4. Conduct population monitoring of high priority species and occurrences. (e.g. ESA-listed and globally rare species, highly threatened occurrences of plant SOC).

IV. Taxonomic Literature

Compile and maintain a comprehensive database of literature on Montana's plant and lichen species. Information will include taxonomic, biological, ecological, and management-related information.

V. Photos

Compile and maintain database of photos for plant and lichen species with emphasis on SOC. Photos will be collected, which show the general morphology, as well as specific characteristics and life history traits of each plant species.

DATA PRODUCTS

Develop products from information contained in the Heritage Program's databases and scientific literature and from external data sources and consultation that will promote informed stewardship of Montana's flora and habitats.

I. Vascular Plant Species Checklist

Maintain a current and comprehensive checklist of Montana's vascular plant taxa with full synonymy and status information.

II. Status Ranks and Reviews

Regularly review status ranks for Montana's plant and lichen species.

1. Review and assign state status ranks for vascular plant taxa and document rank reasons and methods.
2. Review and assign global status ranks for vascular plant taxa and document rank reasons and methods for those taxa in which MTNHP has accepted the global rank responsibility.
3. Assist other member programs in reviewing and assigning global ranks by providing information for taxa which are of conservation importance in Montana.
4. Review and assign state status ranks for lichen taxa and document rank reasons and methods through external assistance from professional and amateur lichenologists.
5. Review and assign state status ranks for bryophyte taxa and document rank reasons and methods through external assistance from professional and amateur bryologists.

III. Status Designations

Prioritize and categorize Montana plant and lichen species according to their conservation concerns and needs through the designation of Species of Concern and/or other categorization methods.

IV. Montana Fieldguide Species' Accounts

Create and maintain species accounts on the Montana Fieldguide for plants and lichens with emphasis on species of conservation and management concern. Accounts will include information on synonymy, status ranks and designations, status reasons, species' descriptions, habitats, range, identification, general ecology, references, photos and summaries of species' occurrence and observation data.

V. Predicted Habitat Maps

Create predicted habitat models for high priority plant species using available statewide biophysical data layers and plant occurrence data in the botany database. High priority species will generally include species of global conservation concern as well as many species of conservation concern in Montana.

VI. Habitat Associations

Create and maintain habitat associations/crosswalks of high priority plant species with Montana Land Cover, Ecological Systems and/or other relevant habitat-based categories.

VII. Conservation Strategy for Plants

Develop a comprehensive conservation strategy for plant species in Montana in conjunction with agency partners and organizations. The strategy will identify areas important to plant conservation in Montana, focused on plants of global conservation concern. This document will ideally supplement and be incorporated into Montana's State Wildlife Action Plan.

VIII. Unique Habitats and Plant Communities

Develop and maintain a database of fens, unique habitats and important areas for plant conservation in conjunction with other MTNHP Program Areas.

IX. Reports and Publications

Produce reports and peer reviewed publications concerning Montana's plant and lichen resources, with a focus on:

1. Reporting the results of field surveys and monitoring projects.
2. Status reviews of individual species or taxonomic groups.
3. Identification and taxonomy of Montana plant and lichen taxa.

DATA DISSEMINATION AND SERVICES

Provide data products, services and other information from Heritage databases and staff expertise to the scientific, resource management, and education communities, as well as the general public, to inform stewardship of Montana's plant and lichen species and their habitats.

I. Web-based Data Dissemination Tools

Develop and improve web applications for access to information in the Heritage Program's databases in conjunction with and assistance from other MTNHP program Areas.

1. Maintain and improve current web applications, including:
 - a. Montana Fieldguide
 - b. Species of Concern Report
 - c. Natural Heritage Tracker
 - d. Predicted Habitat Models
 - e. Related Websites
2. Develop and/or assist in the development of additional web-based tools and services which improve the dissemination of plant-based data and information.

II. Information Requests and Exchanges

Conduct and/or assist MTNHP Information Technology staff in conducting regular exchanges of information between our databases and the databases of our partners and answer individual information requests requiring botanical expertise.

1. Respond to requests for information on the biology, ecology, conservation status, management, and appropriate survey methods for individual species or taxonomic groups.
2. Provide botanical expertise related to the type and spatial and temporal extent of information that should be provided in requests of digital data.
3. Provide and/or assist MTNHP Information Technology staff in providing or exchanging digital data with state and federal partners to ensure that data in all databases is current and available to the widest possible audience.
4. Conduct and/or assist MTNHP Information Technology staff in conducting regular exchanges of database information with NatureServe to fulfill our statutory mandate of compatibility with the Heritage Network and make our information available for use at the regional and continental scales.

III. Information Outreach and Education

Promote the exchange and availability of information on Montana's plants and their habitats to the scientific community, resource management community, education community, and the general public through the following means:

1. Answering requests for information via phone, email and other formats.
2. Presentations at professional and public meetings.
3. Providing assistance with identification and verification of plant material.
4. Coordination and involvement with key agency partners and organizations.
5. Dissemination of information via reports, publications

ZOOLOGY PROGRAM STRATEGIC PLAN

Four-Year Strategic Plan

July 2010 – June 2014

MISSION

The mission of the Zoology Program is to gather reliable information on the distribution, status, general biology, and conservation needs of Montana's animals (focusing on species of concern) and make this information and staff expertise easily accessible to scientists, resource managers, non-governmental organizations, and the general public in order to promote informed stewardship of Montana's animal species.

STAFFING

Maintaining a staff recognized for their expertise with the biology and status of the fauna of Montana is essential to completing the mission of the Zoology Program. We therefore strive to maintain a staff that: (1) have a thorough knowledge of the natural history of Montana's vertebrate and invertebrate animal species; (2) are familiar with literature on the biology of species, particularly those of conservation concern, as well as literature on inventory, monitoring, and assessment of status; (3) are trained in field techniques appropriate to the detection of various animal taxa; (4) have up-to-date GIS, database, and statistical skills; (5) are involved with professional societies and working groups; and (6) make results of research and data analysis available to resource managers and the general public through web applications, posters, presentations, reports, and peer-reviewed publications.

DATA ACQUISITION GOALS

Gather information critical to describing the distribution, status, and conservation needs of Montana's fauna, particularly animal species of concern.

I. Comprehensive Taxonomic List of Montana Animal Species

Maintain a comprehensive taxonomic list of animal species documented in Montana along with information on their origin as a native or exotic species, higher level taxonomy, global conservation status, distribution status (e.g., breeding, wintering, migratory), and likely range and conservation status in Montana. Make this list available on the Montana Field Guide and through a Checklist of Montana Animal Species.

1. The list of vertebrate taxa is comprehensive, but requires ongoing maintenance with updates to taxonomy
2. Invertebrate taxa of highest priority for review to ensure a comprehensive list include:
 - a. Dragonflies and Damselflies
 - b. Butterflies and Moths
 - c. Aquatic snails
 - d. Spiders
 - e. Flies and Mosquitoes
 - f. Beetles
 - g. Bees, Wasps, and Ants

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

- h. Crickets, Grasshoppers, and Locusts
- i. True Bugs (Hemipterans)
- j. Segmented Worms
- k. Round Worms
- l. Flat Worms / Flukes
- m. Taxa important to the health and economic well being of citizens of Montana (e.g., mosquitoes, pine beetles, viruses, bacteria)
- n. Bacteria and parasites important to the demography and ecology of Montana vertebrates

II. Inventory and Monitoring Schemes*

Provide a framework for describing the distribution and status of species or taxonomic groups of concern in Montana by developing statewide or regional inventory and monitoring schemes and associated databases

1. Taxa of highest priority include:
 - a. Bats
 - b. Harlequin Ducks and other selected stream nesting waterfowl
 - c. Nocturnal birds (e.g., owls, Common Poorwill, American Bittern, Black-crowned Night-heron)
 - d. Northern Bog Lemmings
 - e. Spring, seep, and waterfall dependent fauna (e.g., Coeur d'Alene Salamanders, Black Swifts, globally rare invertebrates)
 - f. Selected terrestrial invertebrates (mollusks, dragonflies, and butterflies are highest priority)
 - g. Species dependent on alpine environments (e.g., Pika, Black Rosy-Finch, Butterflies)
 - h. Cave dependent invertebrates

III. Acquisition of Animal Observation Data from External Sources*

Ensure that animal observation data from the following entities and efforts is being transferred to NHP databases on a regular basis and, where possible, in a digital format

1. State and federal agencies of highest priority include:
 - a. Montana Department of Fish, Wildlife, and Parks
 - b. Bureau of Land Management
 - c. U.S. Forest Service
 - d. U.S. Fish and Wildlife Service
 - e. National Park Service
 - f. U.S. Geological Survey
 - g. Montana Department of Transportation
 - h. Montana Department of Environmental Quality
 - i. Montana Department of Natural Resources and Conservation
 - j. Montana Department of Agriculture
 - k. Natural Resources and Conservation Service
2. Major inventory and monitoring efforts of highest priority include:

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

- a. Breeding Bird Survey
 - b. Statewide Bird Monitoring (currently led by the Rocky Mountain Bird Observatory)
 - c. Landbird Monitoring Program
 - d. Important Bird Areas
 - e. Adopt a Quarter-Quarter Latilong Bird Monitoring Program
 - f. U.S. Forest Service bat inventories
 - g. Christmas Bird Count
 - h. Colonial Waterbird Surveys
 - i. Diversity Monitoring Program (currently led by Heritage and MT FWP)
 - j. Monitoring Avian Productivity and Survivorship
 - k. Breeding Bird Census
 - l. Surveys for Prairie Dog Town Associated Species
 - m. Raptor Survey Routes
 - n. North American Butterfly Association 4th of July Count
3. Taxa of highest priority for data acquisition from partners, taxonomic experts, museums, and literature include:
- a. Fish
 - b. Amphibians
 - c. Reptiles
 - d. Birds
 - e. Mammals
 - f. Terrestrial Mollusks
 - g. Dragonflies and Damselflies
 - h. Butterflies and Moths
 - i. Aquatic snails
4. Other high priority entities for acquisition of animal observations include:
- a. Tribal governments
 - b. General public
 - c. University faculty and theses and dissertations of graduate students
 - d. Scientific collectors permit data through FWP
 - e. Published Literature
 - f. Private Consultants
 - g. Odonata Central Database
 - h. Lepidopterist Society Database

IV. Compilation of Literature*

Gather a comprehensive set of literature relevant to the distribution, status, biology, conservation and management of animal species documented in Montana and make this available in online applications such as the Montana Field Guide and a Bibliographic Database Search Engine

1. Taxa of highest priority for compilation of literature include:
- a. Birds
 - b. Mammals

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

- c. Dragonflies and Damselflies
 - d. Butterflies and Moths
 - e. Terrestrial Mollusks
 - f. Aquatic snails
 - g. Spiders
 - h. Grasshoppers
 - i. Flies and Mosquitoes
 - j. Segmented Worms
 - k. Round Worms
 - l. Flat Worms / Flukes
 - m. Amphibians and Reptiles (relatively comprehensive)
2. Priority methods for literature compilation include the following:
 - a. Systematic review of literature in Heritage element files compared to citations in the Heritage Reference Database
 - b. Systematic queries of library search engines
 - c. Establishment of Really Simple Syndication (RSS) search engine feeds in order to keep the Heritage Reference Database up-to-date
 - d. Systematic review state and federal publication libraries

V. Submission of Animal Observations and Species Information*

Provide data contributors with a range of methods to easily submit animal observations to the point observation databases. Provide taxonomic experts with an easy way of contributing species information to the Montana Field Guide.

1. Improve the data entry tool on the Tracker application
 - a. Ensure that entry can be performed on all of the most commonly used browsers
 - b. Improve the speed of the data entry tool through map caching and taxonomic cascading of species lists
 - c. Provide for taxonomic sorting to facilitate species selection
2. Maintain a simplistic web entry tool to facilitate digital data entry by the general public. Identify and provide for the staffing needed to map these observations and place them in a format compatible with the point observation databases
3. Maintain Excel spreadsheets used to submit digital or hard copy versions of animal observation records
4. Establish a method allowing taxonomic experts to submit text for species accounts on the Montana Field Guide which will be reviewed by staff zoologists
5. Work with partners to ensure that state and federal agency employees, tribal governments, and the general public are aware of and trained on the various data entry tools available

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

VI. Heritage Field Surveys

Gather data critical to documenting the distribution, status, and conservation needs of Montana's animal species, particularly those of concern, by conducting field surveys.

1. Conduct broad-scale inventory and monitoring field surveys in priority focal habitats or landscapes:
 - a. Rock outcrop habitats (e.g., reptiles, bats, and selected bird species)
 - b. Spring/Seep, waterfall spray zone, and headwater stream old growth habitats for Pacific Northwest Fauna (e.g., Coeur d'Alene Salamanders, Idaho Giant Salamanders, terrestrial mollusks, millipedes, Black Swifts, and rare stream invertebrates)
 - c. Sagebrush and grassland habitats (e.g., Pygmy Rabbits, Sagebrush Vole, Merriam's Shrew, Preble's Shrew, Dwarf Shrew, Brewer's Sparrow, Sage Sparrow, Sage Thrasher, Grasshopper Sparrow, McCown's Longspur, Sprague's Pipit, Baird's Sparrow, Chestnut-collared Longspur, and butterflies)
 - d. Lentic wetlands (e.g., Northern Bog Lemming, lentic breeding amphibians, bats, dragonflies, damselflies, and terrestrial mollusks)
 - e. Aquatic, wetland, and terrestrial vegetation communities in rivers and streams threatened by loss of floodplain and beaver dynamics and invasion of exotic plant species (e.g., Plains Spadefoot, Great Plains Toad, Northern Leopard Frog, Western Hog-nosed Snake, Hoary Bat, Black-billed Cuckoo, Eastern Screech Owl, and terrestrial and aquatic mollusks)
 - f. Caves and abandoned mines (e.g., bat roost sites, cave invertebrates)
 - g. Aspen stands (e.g., terrestrial mollusks)
 - h. Alpine Species of Concern (e.g., terrestrial mollusks, butterflies, White-tailed Ptarmigan, Black Rosy-Finch, Gray-crowned Rosy-Finch, Dwarf Shrew, Preble's Shrew)
 - i. Prairie Coteau Species of Concern (e.g., Smooth Greensnake, Sedge Wren, Yellow Rail, LeConte's Sparrow, Nelson's Sparrow, Arctic Shrew, Short-tailed Shrew, Pygmy Shrew)
 - j. Wyoming Basin Species of Concern (e.g., Greater Short-horned Lizard, White-tailed Prairie Dogs, Pallid Bat, Spotted Bat)
 - k. Tribal lands (comprehensive inventories)
2. Conduct field surveys requested by partners that entail inventory and monitoring surveys or treatment versus control assessments for native Species of Concern
3. Conduct field surveys to document exotic species whose introduction poses a threat to native Montana fauna (e.g., American Bullfrogs predated wetland species; European Starlings using nest cavities of native birds; impacts to wildlife from Russian Olive and Tamarisk)

DATA MANAGEMENT AND ANALYSIS GOALS

Develop products from information contained in the Heritage Program's databases and scientific literature that will promote informed stewardship of Montana's fauna, particularly animal Species of Concern.

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

I. Transition to SQL Database*

Create SQL versions of Biotics Database tables and migrate information from Biotics to SQL to meet the needs of the Zoology Program and allow for greater display of information via web applications.

II. Status Reviews of Species

Coordinate regular status reviews of animal species in conjunction with the Montana Department of Fish, Wildlife, and Parks, the Montana Chapter of the Wildlife Society, the Montana Chapter of the American Fisheries Society, and species or taxa experts. Specific goals under this strategic plan include:

1. Using the NatureServe scoring model, assess the conservation status of all regularly occurring vertebrate species approximately every 5 years
2. Using the NatureServe scoring model, assess the conservation status of all invertebrate Species of Concern and Potential Species of Concern approximately every 5 years
3. Create and populate a SQL database table to document information underlying the various NatureServe ranking criteria for each species*
4. Provide a summary of the information used to assess the status of Species of Concern and Potential Species of Concern in the online Species of Concern Report and in the Montana Field Guide*

III. Range Polygons*

Create and maintain polygons that document current understanding of the ranges of regularly occurring native and introduced vertebrate and invertebrate species documented in the Heritage Program's databases (e.g., year-round, summer breeding, wintering, migratory, historical, and introduced). Display these range polygons in maps on the Montana Field Guide and Natural Heritage Tracker web applications. Use the range polygons to limit the extent of deductive and inductive models as well as identify questionable records in the point observation databases

IV. Species Occurrence Polygons*

Maintain an up-to-date set of Species Occurrence polygons based on records in the point observation databases and incorporating literature on habitat use and home range size

V. Montana Field Guide Species Accounts*

Create and maintain species accounts for the Montana Field Guide. Each account ideally includes: photos, status summary, general and diagnostic descriptions, Montana and Western Hemisphere range maps, maps and charts summarizing the spatial and temporal distribution of observation records in Montana, and summaries of migration, habitat use, food requirements, general ecology, reproduction, and management. Species accounts will be properly supported with citations and a list of literature cited. Taxa of highest priority for fully developed species accounts include:

1. Species of Concern

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

2. Potential Species of Concern
3. Terrestrial Mollusk Species
4. Dragonflies and Damselflies
5. Butterflies
6. Amphibians
7. Reptiles
8. Birds
9. Mammals
10. Fish

VI. Bibliographic Database*

Create and maintain a comprehensive reference list. Specific goals include:

1. Create a reference management system using a combination of proprietary software and SQL database tables
2. Populating the database with all references in the current Biotics database and with hard copy references in the element files
3. Working with Montana State Library staff to create digital copies of element file materials in order to make them accessible
4. Spatial referencing of literature using map coordinates and keywords (e.g., counties)
5. Adding other references of high priority:
 - a. Montana conservation plans for amphibians and reptiles, bats, and loons.
 - b. The Montana Department of Fish, Wildlife, and Parks references database
 - c. Literature Review on the Effects of Energy Development on Wildlife
 - d. Bibliographic Database on the Effects of Recreation on Rocky Mountain Wildlife
 - e. Montana Fish, Wildlife, and Park's 1993 report, "A Bibliography of Montana Wildlife Literature Through 1992"
 - f. Montana Department of Natural Resources and Conservation's 1976 report, "An Index to Montana Wildlife Literature 1950-1976"
 - g. Montana Wildlife Legacy

VII. Animal Associations with Ecological Systems

Identify associations of animal species with ecological systems in the Montana Land Cover map. For each species, identify whether the system is low, medium, or high habitat quality.

Taxa, ranked by highest priority, include:

1. Species of Concern
2. Potential Species of Concern
3. Vertebrate Species
4. Terrestrial Mollusk Species
5. Dragonflies and Damselflies
6. Butterflies
7. Other invertebrate species

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

VIII. Inductive Predicted Distribution Models

Create inductive models predicting the distribution of Montana animal species using available statewide environmental data layers and records in the point observation databases. Taxa, ranked by highest priority, include:

1. Species of Concern
2. Potential Species of Concern
3. Vertebrate Species
4. Terrestrial Mollusk Species
5. Dragonflies and Damselflies
6. Butterflies
7. Other invertebrate species

IX. Reports and Publications

Produce reports, books, and peer reviewed publications analyzing and interpreting data from field surveys (e.g., Montana bird distribution, terrestrial mollusk field guide, summaries of statewide amphibian and reptile inventory work, summaries of statewide bat and small mammal inventory work)

DATA DISSEMINATION

Provide data products and other information from Heritage databases to the scientific, resource management, and education communities, as well as the general public, to inform stewardship of Montana's fauna.

I. Web Applications*

Develop and improve web applications for access to information in the Heritage Program's databases

1. Maintain and improve current web applications, including:
 - a. Montana Field Guide in collaboration with Montana Fish, Wildlife and Parks
 - b. Natural Heritage Tracker
 - c. Species of Concern Report
 - d. Predicted Suitable Habitat Models download page
 - e. Key web links for various animal taxa
2. Develop new web applications, including:
 - a. Ecological Systems and Associated Species (predicted species lists)
 - b. Bibliographic Database Search Engine

III. Information Requests and Exchanges*

Provide for regular exchanges of information between our databases and the databases of our partners and answer individual information requests requiring zoological expertise

1. Respond to requests for information on the biology, ecology, conservation status, management, and appropriate survey methods for individual species or taxonomic groups

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

2. Provide zoological expertise on the type and spatial and temporal extent of information that should be provided in requests of digital data
3. Complete regular exchanges of digital data with state and federal partners to ensure that data in all databases is current and available to the widest possible audience
4. Complete regular exchanges of database information with NatureServe to fulfill our statutory mandate of compatibility with the Heritage Network and make our information available for use at the regional and continental scales.

IV. Information Outreach

Promote exchange and availability of information on Montana animal groups to the scientific community, resource management community, education community, and the general public through the following means:

1. Direct communication through presentations at professional and public meetings, phone conversations and email exchanges
2. Outreach to key partners to distribute information within their agencies and organizations (e.g., Montana Fish, Wildlife, and Parks Information Management and Community Education Bureaus, Office of Public Instruction, regional BLM, USFS, and NRCS offices)
3. *Host listservs for various working groups, including: the Montana Bird Conservation Partnership, Harlequin Duck Working Group, Prairie Dog Working Group, Herpetofauna Working Group, Loon Working Group, and Bat Working Group
4. Promptly post professionally produced project PowerPoint presentations to partners on our provocative website
5. Develop posters for animal Species of Concern (e.g., turtles and lizards, bats, grassland birds of global importance, freshwater mussels, and dragonflies and damselflies) or exotic species representing a threat to native species (American Bullfrogs)
6. Disseminate reports, books, and peer reviewed publications on the distribution and status of animal taxa to all heritage partners (e.g., terrestrial mollusk field guide, 7th Edition of P.D. Skaar's Montana Bird Distribution, summaries of statewide amphibian and reptile inventory work, summaries of statewide bat and small mammal inventory work)

* A goal which involves collaboration between Zoology Program Staff and Information Services Staff.

ECOLOGY PROGRAM STRATEGIC PLAN

Four-Year Strategic Plan

July 2010 – June 2014

MISSION

The mission of the Montana Natural Heritage Program's Ecology Program is to gather reliable information on the distribution, status, community composition and successional dynamics of Montana's ecological systems and communities (focusing on systems and communities of concern) and provide this information to scientists, managers, and the general public to promote informed stewardship of our biological heritage.

To this end, the Ecology Program focuses on mapping, modeling and spatial analysis of wetland and terrestrial habitats (Landscape Ecology); description, assessment and analysis of wetlands (Wetland Ecology); description, assessment and analysis of plant communities and ecological systems (Vegetation Ecology); classification, description, assessment and analysis of aquatic communities (Aquatic Ecology); and development of management and restoration practices for terrestrial and wetland habitats (Restoration Ecology). These focus areas are distinct but highly integrated.

The strategic plan below outlines general and specific goals designed to achieve this mission between 2010 and 2015 as funding allows. It is important to recognize that we do not have the staff capacity to fully meet these goals during this time period. However, we feel it is important to identify all of these issues to bring them to the attention of others and to take advantage of any potential collaborations or funding opportunities. General goals of the Ecology Program are listed first, followed by specific goals for each Program component.

GENERAL GOALS

I. Maintain a staff recognized for expert knowledge and understanding of the distribution, status, community composition and successional dynamics of Montana's ecological systems and communities (focusing on systems and communities of concern).

Specific goals under this strategic plan include:

- A. Maintain a staff with current knowledge of the identification, classification, assessment, analysis and management and restoration of Montana's wetland, upland and aquatic communities;
- B. Maintain a staff skilled in GIS analysis, image interpretation, modeling, survey design and relational databases;
- C. Present project findings at scientific, professional, and technical meetings
- D. Promote staff involvement with a wide range of professional societies (e.g., wetland science, range management, forestry, GIS and remote sensing, wildlife, fisheries, etc)

II. Provide information to the scientific, management and restoration communities and to the general public to promote informed stewardship of Montana's ecological systems and communities, emphasizing those of conservation concern.

Specific goals under this strategic plan include:

1. Maintain direct communication with the scientific, management and restoration communities, and with the general public through presentations and phone and email interactions;
2. Develop and promote web-based access to map products, GIS data, and assessment information
3. Produce reports, field guides, data summaries, technical guidance, and training materials, and make these available through the NHP website;
4. Make information accessible and interesting to the general public through materials such as a roadside guide to Montana's ecological systems;
5. Author scientific papers, posters and pamphlets;
6. Collaborate in the development and use of decision-support tools for agency partners.
7. Promote use of Heritage tools and products through outreach and training.

III. Compile state status rankings for terrestrial, wetland and aquatic ecological systems and communities, and develop an Ecological Systems of Concern list.

Specific goals under this strategic plan include:

1. Develop an Ecological Systems of Concern review process
2. Survey partners to determine the usefulness of an Ecological Communities of Concern lists, and the data required for and available to support that list.
3. Crosswalk ecological systems of concern and plant/animal species of concern

LANDSCAPE ECOLOGY GOALS

I. Provide a framework for describing the distribution and status of wetland and riparian habitats by developing statewide mapping and descriptive materials.

Specific goals under this strategic plan include:

1. Develop a timeline and funding strategy to coordinate mapping and characterization of wetlands and riparian areas across the state at a 1:12,000 scale, working with partners to prioritize completion of the following main areas of the state:
 - a. Southwest
 - b. Southeast, east and southcentral
 - c. The Hi-line
 - d. Northwest and northcentral
 - e. Central

II. Work with Information Services to develop web applications that support dissemination of wetland maps, GIS data, descriptive materials and survey results.

Specific goals under this strategic plan include:

1. Make provisional GIS data, downloadable hard copy maps, and descriptive information available from the main Wetland and Riparian Mapping Center web page.
2. Maintain a linked web page showing the status of the statewide mapping effort, updated monthly, with a companion map identifying mapping areas associated with specific partners;
3. Develop a web application, or an addition to an existing application, that allows for interactive display of wetland and riparian maps and survey data.

III. Provide a framework for describing and evaluating the distribution and status of terrestrial habitats by developing statewide mapping and descriptions of ecological systems.

Specific goals under this strategic plan include:

1. Develop and implement a plan and protocols for systematic correction and improvement of statewide landcover mapping at a 1:100,000 scale, focusing on ecological systems;
2. Correction and refinement of existing descriptive materials for ecological systems, and development of descriptive materials for key ecological alliances and associations (integrated with Vegetation);
3. Collection of vegetation data to support vegetation classification and mapping efforts;
4. Interpretation and integration of legacy vegetation data and data from other monitoring efforts (e.g. birds, small mammals, wetlands) that enhance classification accuracy.

IV. Work with Information Services to develop and maintain a web application, web pages and solutions that support dissemination of vegetation maps, GIS data, descriptive materials and survey results.

Specific goals under this strategic plan include:

1. On an annual basis, update land cover mapping to include new, reclassified, or consolidated ecological systems, and specific ecological systems (e.g. wetlands, agriculture, burned areas) that have been mapped statewide at a higher resolution;
2. Maintain a land cover web page with links to the ecological systems field guide, ecological systems rankings, and other information supporting interpretation of the land cover map.
3. Develop data acquisition tools within the ecological systems mapping application to allow interactive data submission and/or interactive mapping.

WETLAND ECOLOGY GOALS

I. Design statewide and regional sampling schemes, hard copy and digital data forms, standardized data collection protocols, data analysis tools and databases for assessing and monitoring the condition of herbaceous and woody wetlands and riparian areas.

II. Produce classification crosswalks, field operations manuals and training materials to support collection and exchange of wetland and riparian location data by multiple agencies

III. Gather data critical to describing the condition and conservation needs of Montana's wetland systems and communities (particularly wetland systems and communities of concern) by conducting field surveys.

Specific goals under this strategic plan include:

1. Conducting rotating basin assessments of wetland condition, linking the assessment schedule to wetland map development;
2. Carrying out target surveys of wetland and riparian condition emphasizing the following focal habitats:
 - a. Riparian areas associated with large rivers;
 - b. Riparian areas and wetlands in headwater areas;
 - c. Springs and seeps in semi-arid environments;
 - c. Riparian corridors along rivers and streams associated with critical wildlife habitat and or corridors, as identified by partners.

VEGETATION ECOLOGY GOALS

I. Design statewide and regional sampling schemes, hard copy and digital data forms, standardized data collection protocols, remote sensing tools, data analysis methods and databases for evaluating the extent and status of the following groups of terrestrial ecological systems, in order of their priority:

- a. Sage steppe and shrubland
- b. Alpine communities subject to climate change
- c. Grasslands
- d. Woody draws and ravines
- e. Low elevation forests susceptible to insects and disease

II. Conduct field surveys and assessments of critical upland habitat types identified by partners to meet multiple objectives:

- a. Refining ecological systems mapping and descriptions of ecological communities; particularly grassland, steppe, and alpine communities'
- b. Identifying relationships between disturbances and condition to support further development of desktop-based landscape integrity models;
- c. Collecting vegetation data to support current and future NHP's and partner agencies vegetation classification and mapping efforts;

- d. Identifying high-quality occurrences of systems and communities of conservation concern,

III. Develop coordinated approaches to the collection, compilation and dissemination of information on terrestrial ecological systems and communities, including data collected by others.

Specific goals under this strategic plan component include:

1. For vegetation plot data, create web-based training materials and reference documents that will facilitate data compatibility. The National Vegetation Classification Standard (NVC) will be the focus. Materials and reference documents will include:
 - a. Summaries, handouts and presentations on the NVC;
 - b. Crosswalks between the NVC hierarchy and
 - i. ecological systems used in 1:100,000 mapping;
 - ii. agency-specific classification schemes, as identified and prioritized by partners;
 - c. Field data collection protocols, field forms and training materials that will encourage use of Plots 3.0, the NVC-based Naturereserve/USGS/NPS database
2. Survey all partners to identify current approaches to vegetation data collection; any impediments to adoption of the NVC; and training needs to facilitate NVC-compatible data collection protocols. High priorities will be federal agencies required to crosswalk classification data to the NVC. Identify any organizational impediments to entering data into Plots 3.0, and devise strategies to ensure that data not entered into Plots 3.0 can be made available to the NHP.
3. Develop standardized protocols and practices for collecting and maintaining ecological site data.
4. Gather literature specific to Montana's vegetation communities; crosswalk to ecological systems and develop into bibliographic database with online access.

IV. Collaborate with the Zoology and Botany programs and NHP partners to develop and implement analytic tools for evaluating habitat extent and quality.

AQUATIC ECOLOGY GOALS

I. Provide a framework for describing the distribution and status of aquatic ecological systems and communities by developing statewide mapping and descriptive materials.

Specific goals under this strategic plan include:

1. Develop and implement a plan and protocols for systematic correction and improvement of statewide aquatic ecological system classification and mapping at a 1:100,000 scale;
2. Correction and refinement of existing descriptive materials for aquatic ecological systems, and development of descriptive materials for key ecological alliances and associations;

3. Collection of macroinvertebrate and fish data to support classification and mapping efforts;

II. Design statewide and regional sampling schemes, hard copy and digital data forms, data analysis tools and databases for assessing and monitoring the condition of the following aquatic communities, in order of their priority:

- a. Dragonflies, damselflies and wetland invertebrates
- b. Large river macroinvertebrate communities, including freshwater mussels
- c. Perennial spring and headwater source stream communities
- d. Coldwater fish assemblages
- e. Warmwater fish assemblages

III. Collect and compile information on aquatic ecological systems (AES) and communities collected by others.

Specific goals under this strategic plan include:

1. For fish community data, create database linkages to MFISH (Montana Fish Wildlife and Parks Database) that will incorporate AES indicator species to differentiate aquatic ecological systems and pull them across to the AES database.
2. For macroinvertebrate community data collected in the state, create database linkages to EDAS (MT Department of Environmental Quality's Data System) and BLM's BugLab Database that will incorporate AES indicator species to differentiate aquatic ecological systems and pull them across to the AES database.
3. Construct and disseminate field data collection protocols and field forms based on the Aquatic Ecological Systems field guide. Train partners collecting aquatic field data on the use of the AES field guide.
4. Conducting surveys of critical aquatic habitats and communities, emphasize the following high priority habitats and communities:
 - a. Lentic wetlands and associated macroinvertebrate communities;
 - b. Large prairie and valley river ecological systems and communities, including freshwater mussels
 - c. Perennial spring and headwater source stream communities

IV. Work with Information Services to design and maintain a web application, web pages and solutions that support dissemination of maps, GIS data, descriptive materials and survey results.

Specific goals under this strategic plan include:

1. Using the 1:100,000 National Hydrography Dataset as a base map, develop an interactive aquatic ecological systems map that provides rapid visual characterization of systems and allows users to explore expected biological communities;
2. Link this map with the ecological systems map, and/or with any wetland map application that allows for exploration and display of survey data.

RESTORATION ECOLOGY GOALS

I. Establish a plan for development of this component of the Ecology Program, including objectives, partnerships, funding sources, outreach and activities.

II. Build a reputation for expertise in management and restoration of terrestrial and wetland ecological systems by creating and maintaining a web page with links to information and resources on best management practices and restoration strategies, and incorporating management and restoration information into ecological systems descriptions;

III. Develop restoration guidelines and strategies for Montana's wetland and riparian ecological systems.

INFORMATION SERVICES STRATEGIC PLAN

Four-Year Strategic Plan

July 2010 – June 2014

MISSION

The Systems and Services section of the MTNHP provides information technology and services support to the other science programs within the MTNHP. It is responsible for the delivery of information and services for our users. We provide these services through our internet site and its various applications as well as through personal services.

STAFFING

I. General Staffing

- A. Work to maintain competitive salaries for critical IT positions – especially web programming and database administration
- B. Ensure that there are adequate resource to provide professional development and on going training opportunities for critical web programming and database administrative positions

II. Information Technology Support for MTNHP

- A. Add one FTE to provide IT support
- B. Work with NRIS to help them acquire a database administrator for NRIS/NHP databases
- C. Work with NRIS to properly identify, acquire, and maintain the necessary IT infrastructure to support MTNHP information management and service delivery

STRATEGIC GOALS

I. Actively disseminate information using highly effective tools and formats, and provide staff expertise and support to ensure that users can find, interpret and successfully utilize information for effective resource management and decision-making.

- A. Design, develop and deploy the next generation of the Montana Natural Heritage TRACKER.

This new version would include such features as:

- 1. Fully customizable as to what data layers (base layers and NHP data) are displayed
- 2. Ability to configure analytical and overlay tools
- 3. Ability to customize report functions
- 4. Cached map data
- 5. Modular code construction

- B. Design, develop, and deploy a “Mid-level” functional access to MTNHP Species of Concern, habitat and species list information to support planning and resource management activities of local government, private consultants, and conservation organizations efforts of tracker.
 - 1. Users: counties, private sector, conservation groups, and public
 - 2. Improve and develop functions within existing applications such as Field Guide and SOC Report to enable users to obtain sufficient information at a local level while still protecting the sensitive location information
 - 3. Make species lists and other data available as a Google Earth service that may be displayed in Google Earth and queried at the PLSS Township level
 - 4. No training or certification, but no detailed locational information provided
 - 5. Provide general training and help information to support the use of the information

- C. Ecology Core Services Web Applications
 - 1. Aquatic app
 - 2. Ecological systems

- D. Create map services for NHP data....
 - 1. Work with NRIS to create services....
 - 2. Stewardship map service
 - 3. Land cover map service

- E. Continue to maintain and to improve the public website with content and applications that are easy to use, well designed and documented, and provide users with effective access to information that serves their needs.
 - 1. Continue to add key data types of value to users.
 - 2. Add landscape/site information to web applications in spatially searchable formats.
 - 3. Build access to interpreted observation and element occurrence data (i.e., species associations for ecological systems, predicted suitable habitat model products, etc.)
 - 4. Add rank documentation to the Montana Field Guide
 - 5. Develop tools for overlaying and intersecting NHP and related data layers to better enable users to characterize and visually analyze geographic areas of interest.
 - 6. Integrate species search with NRIS Digital Atlas and the GIS Portal to produce a more unified and integrated approach for accessing spatial/attribute data on biological features and related features.
 - 7. Improve users’ ability to select, “package” and export data and information of interest from the NHP website.
 - 8. Expand access to images of species and habitats, building linkages to the MTNHP photo archive database and integrating photos and MTNHP re[ports with MSL catalog resources.
 - 9. Further develop customized internet applications that provide partner agencies with detailed information about the lands and resources they manage.

F. Increase web programming staff by 2 FTE and data base administration by 1 FTE in the next five years in order to develop new web applications and the supporting databases, and to maintain and improve existing web information delivery capabilities.

1. Look for opportunity to increase core funding to contribute to the web and database positions
2. Develop additional annual service agreement funding to support the increased positions
3. Develop internship and work study opportunities as ways to “home grow” web and database staff
4. Work with NRIS to help them acquire advanced web programming resources and/or staff

G. Improve an ongoing support program to train and inform agency partners in effectively using technical resources, services and applications.

1. Give presentations and workshops at key user meetings to describe resources available and demonstrate data access methods.
2. Conduct on-site training with partner agencies in use of specialized applications for accessing data on lands and resources that they manage.
3. Provide regular updates (at least quarterly) on the website and through emails as new resources become available (including reports, web tools, field guide enhancements, etc.)
4. Regularly gather information from users about their information needs, format/access preferences, and the effectiveness of our delivery systems and tools. Involve users in applications development and testing to ensure that the tools produced meet user needs as effectively as possible.
5. Work with agency partners to provide technical assistance in applying biological information in their programs and management activities, emphasizing priority species and habitats.
6. Conduct occasional field workshops to increase partners awareness of and ability to survey and manage for different habitats and species groups.

H. Improve efficiency and effectiveness in responding to information requests

1. Improve efficiency, minimizing staff time for routine responses and maximizing the “value added” for staff time invested in the mediated request services.
2. Evaluate the feasibility of empowering users to self-serve basic data requests via web applications and services.

II. Improve overall data management capability, efficiency and security by completing the transition to the new dual data server system with an internal editing environment and an external web-facing environment.

A. Create a reference database in SQL to replace the reference database in BIOTICS

1. Use Reference Manager as the client for entering citation information
2. Regularly transfer reference database from RM to SQL
3. Link the new SQL database to existing web applications that use references

- B. Create a species (element) database interface to replace Biotics Tracker.
 - 1. Create and populate the final species database tables in the element SQL database
 - 2. Create web data entry and editing clients to manage the element SQL database

 - C. Create species geodatabases in SQL to replace the species occurrence (SO) database in BIOTICS
 - 1. Implement the current botany geodatabase in SQL
 - 2. Create a new zoology species occurrence (SO) geodatabase in SQL
 - 3. Develop methods to roll up zoology observations (POD and BirdPOD points) into the new SO geodatabase.

 - D. Develop methods to continue MTNHP data exchange with NatureServe outside of the Biotics environment to assure that we are meeting our statutory requirements and to improve the currency and accuracy of the information that NatureServe provides in its multi-jurisdictional data services.
 - 1. Develop web services for NatureServe to use to acquire species and element occurrence data from Montana
 - 2. Work with NatureServe to assist it in developing web services for global species information for MTNHP to refresh its databases.

 - E. Create a new Stewardship database in SQL Server to replace the Biotics and other Stewardship databases.
 - 1. Decide what information is important to maintain
 - 2. Develop a SQL Server database to manage that information
 - 3. Develop a maintenance strategy for keeping Stewardship data up-to-date and seek funding for it.

 - F. Move existing SQL Server databases to new internal server and design roll-up strategies for the web-facing server
 - 1. Document what data is currently being used for web applications.
 - 2. Clean up redundant and outdated data
 - 3. Move all data editing operations to internal server
 - 4. Design databases for web-facing server that efficiently roll-up data from internal server

 - G. Develop a strategy for migrating the Ecology information currently in Biotics to the new SQL database
 - 1. Community Elements
 - 2. Community EO's
 - 3. Sites
- III. Improve field data collection efficiency and accuracy for MTNHP staff and partners by empowering new and existing hand-held data collection and communication technologies.

- A. Improve data collection methods by using handheld data loggers and GPS units that facilitate the initial collection and subsequent transfer of field data into MTNHP databases.
 - 1. Develop web tools to allow the uploading of GPS data collection points and observations into the MTNHP Point Observation Database (POD)
 - 2. Develop web tools to allow easier entry, editing and content input of observations into the POD database
- B. Improve speed and accuracy of using spatial data and MTNHP species and habitat data in the field by using high speed data communication methods for two-transmission of information.

IV. Work with the MSL Digital Library staff to effectively cross reference and integrate MTNHP information and data with the MSL catalog, search methods, and reference services.

- A. Ensure that all MTNHP reports and data are properly cataloged in the MSL catalog system.
 - 1. Full implementation of Reference Manager as the source for the Montana Field Guide and other MTNHP web applications and databases
 - 2. Work with the MSdL Staff to ensure that relevant MSL and MTNHP documents and resources are properly geo-referenced to better enable geographic searches.
 - 3. Develop methods for the integration and linkage of full-text MTNHP documents into the Montana Field Guide, MTNHP Tracker, and the SOC Report
 - 4. Develop search tools in MTNHP applications that search the full MSL catalog and the Montana Shared catalog by subject, keywords, and geographic location