

Progress Report

Floristic Inventory of Fort Laramie National Site

Executive Summary

Baseline floristic inventory at Fort Laramie National Historic Site (NHS) was identified as a priority by the National Park Service under the Inventory and Monitoring initiative, based on the compilation and interpretation of the known and potential vascular flora at Fort Laramie NHS (Fertig 2001). To address this need, five days of survey in addition to partial days of survey were conducted by University of Wyoming researchers to document the flora associated with under-represented habitats, phenological periods, and taxonomic groups. Surveys were also conducted for Wyoming plant species of special concern, and the floristic list was cross-referenced to the vegetation map of Fort Laramie. As a result of survey in 2003, the flora was expanded 78.8%, from 179 species to 320 species; adding 141 species. Six Wyoming species of concern were documented, in addition to a regional endemic that was considered rare in the state until recently. Two species of concern reported for the area have not been relocated to date, and select habitats, phenological periods, and taxonomic groups may also be under-reported. At this point, baseline inventory may approach the 90% confidence level, but select targets were not covered and a few plants were noted but not collected. Fieldwork addressing these gaps is slated for completion in 2004.

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Introduction

The vascular plant flora of Fort Laramie National Historic Site (NHS) was compiled by Walter Fertig, Wyoming Natural Diversity Botanist (Fertig 2000), based on voucher plant specimens at the Rocky Mountain Herbarium (RM) and the Fort Laramie National Historic Site Herbarium (FOLA), in addition to the species listed in a vegetation mapping project (The Nature Conservancy 1997).

As summarized by Fertig, little was known about the vascular plant flora of Fort Laramie National Historic Site until 1994, when B. Ernie Nelson of the Rocky Mountain Herbarium (RM) at the University of Wyoming visited the Historic Site on several occasions while conducting a

general floristic survey of public lands in southeastern Wyoming (Hartman and Nelson 1995, Nelson and Hartman 2001). Nelson's voucher specimens were deposited at the RM and FOLA herbaria. Hollis Marriott and Jim Drake of The Nature Conservancy also compiled a brief list of plant species during their vegetation mapping project (TNC 1997). These studies and other historical records were synthesized by Fertig into a single checklist, with special attention to the Wyoming species of concern (Fertig 2000). That list was contained 177 plant taxa, including five plants considered "species of concern" by WYNDD at the time, and 35 non-native species.

To determine which additional species might be present but as yet undocumented at Fort Laramie NHS, a query of county-level distribution for Goshen County based on the data presented in Dorn (2001) was conducted. Species not known from the vicinity, as determined from the RM "Atlas of the Vascular Plants of Wyoming" (Hartman and Nelson 1998) or from vegetation types represented at Fort Laramie (The Nature Conservancy 1997) were eliminated. The remaining 182 species were assigned high or moderate probabilities of occurring in Fort Laramie NHS, concluding that the Fort Laramie NHS flora might be expanded by anywhere from 52-182 additional species, depending on whether only high-probability species or both moderate-and-high-probability species documented elsewhere in the county are present.

In June 2001, Dan Licht of the National Park Service, in coordination with Fort Laramie National Historic Site staff, contracted with the Wyoming Natural Diversity Database (WYNDD) to conduct floristic inventory of the vascular plant flora on Fort Laramie NHS. The primary objective was to document at least 90% of the vascular plant species occurring at the Historic Site, using scientifically sound methods. Inventory emphasis was placed on possibly overlooked habitats including wetland/riparian habitats and disturbed habitats, on possibly overlooked phenological periods including spring and fall months, and on possibly overlooked taxa identified in Fertig (2001) including some of the largest families in the state flora: Asteraceae, Brassicaceae, Fabaceae, Poaceae, and Cyperaceae, as well as non-native weeds in general. Voucher specimens were to be collected for each species addition. In addition, there were secondary objectives of making qualitative assessment of the abundance of each species, and recording the location and distribution of species listed as endangered, threatened, or species of concern by the federal government or the State of Wyoming.

Study Area

Methods

Floristic References

The list of confirmed and predicted species prepared by Fertig (2001) was entered by NPS staff into the NPSpecies database, and the export of that list served as the reference for inventory fieldwork. The NPSpecies database list for Fort Laramie NHS recorded 196 species. It required cross-checks in taxonomic synonymy, and those species with no supporting source information (reported as “no data” in the source column) were mostly synonyms. One additional species addition was represented at RM (*Verbesina encelioides*). It also appears that the list of Fertig (2001) had at least two species that were accidentally omitted on the NPS list, and which boosted the tally to 179 confirmed species.

The NPSpecies list export also included the 182 species that had been predicted to occur in Fort Laramie NHS (Fertig 2001). The annotated NPS list was used as the master list of confirmed and potential species and was formatted to highlight those species that had yet to be confirmed. Then it was sequenced by scientific name for quick reference in the field.

A species list had been prepared in vegetation work at Fort Laramie NHS (Olmstead and Perez 1986) that had not been incorporated in the checklist of known or potential species by Fertig (2001). These investigators did not report collecting vouchers, so the species on it were treated as reported but unconfirmed. An additional 16 taxa were identified in Olmstead and Perez (1986) that were not on the lists of predicted species in Fertig (2001).

The annotated floristic list derived from the NPSpecies list export that was used at the start of field inventory, with the species additions to it described above, is presented in Table 1.

The floristic reference routinely used in the field was Dorn (2001), with use of the Great Plains flora (Great Plains Flora Technical Committee 1986) for more detailed information, other select floras for the sedges (Larson 1993, Johnston, Hurd et al.) and limited use of other references (e.g., Hitchcock et al. 1973). Plant identifications were generally made in the field to the finest level (species level for most taxa), and identifications were cross-checked in RM after the field season.

Survey Methods Used, Timing and Personnel

Full-day surveys were conducted by Bonnie Heidel to visit all vegetation types, all quarter sections of land, and all potential habitat for the five species of concern identified in Fertig (2000). The work took place July 17-19 and September 4-6, with the assistance of Luanne Lum in July and Dr. Amy Symstad (NPS) on September 4. In the July visit, investigators sought the array of habitats and geographic corners of the Historic Site. In the September visit, investigators

sought the potential habitat for species of concern associated with the Laramie River and disturbed habitats not visited in July.

Partial day surveys were conducted by Dr. Robert Dorn in species-rich areas mainly in early and late periods of the growing season. Collections were made on 5 June, 27 July, 28 August, and 1 October. These intensive and extensive approaches complemented one another in baseline documentation.

All floristic results were cross-referenced noting those species that are native, non-native (Fertig 1999), planted (includes both native and non-native species), noxious weeds in particular (Wyoming Department of Agriculture 2003), and/or Wyoming species of concern. For species of concern, sensitive plant survey forms were filled out, their numbers were estimated, their extent was recorded with GPS readings and cross-referenced to maps, and they were photographed if in flower.

Targets Set by Habitats, Phenology, and Taxonomy

Intensive inventory focused on possibly-overlooked groups of species as indicated by habitat, phenology, and taxonomy. Habitat targets included wetland/riparian settings and disturbed habitats. Phenology targets included special collecting trips in early summer and late fall. Taxonomy targets included possibly-overlooked families identified in Fertig (2001) including some of the largest families in the state flora: Asteraceae, Brassicaceae, Fabaceae, Poaceae, and Cyperaceae, plus non-native weeds in general.

Extensive inventory targeted the full the array of habitat settings and full extent of the study area. Of the 15 vegetation types, all were visited at least once. Of the 14 quarter sections that comprise the Historic site in part or in full, all were inventoried at some level at least once except for former croplands in the SE $\frac{1}{4}$ of Section 21 and the south side of the Laramie River in the SW $\frac{1}{4}$ of Section 27.

During both intensive and extensive inventory, the list of predicted species (Table 1) was used for reference. Information was regularly exchanged between researchers over the course of the growing season.

Results

As a result of fieldwork in 2003, the flora was expanded 78.8 %, from 179 species to 320 species; adding 141 species. Six Wyoming species of concern were documented, in addition to a regional endemic that was considered rare in the state until recently. Two species of concern reported for the area have not been relocated to date, and select habitats, phenological periods, and associated taxonomic groups may also be under-reported. Baseline inventory may approach the 90% confidence level, and is slated for completion in 2004. Results are presented in Table 2. It includes the family name to cross-reference results to initial targets. It is set up using the preferred scientific treatment in the NPSpecies database, cross-referenced to the taxonomic treatment in Dorn (2001) and in the Wyoming checklist (Nelson and Hartman 1994) in cases where the treatment is different.

Vouchers Collected and Repository

All of the 141 new additions to the flora have been collected and voucher specimens are being submitted to Fort Laramie National Historic Site. A duplicate set was also collected for most species to make the results most available to the research community, since the floristic information for the Historic Site is also significant from a state and regional perspective. Thus, duplicates will be submitted on National Park Service loan to Rocky Mountain Herbarium (University of Wyoming, Laramie).

The majority of the newly confirmed species at Fort Laramie NHS were on the list of predicted species, but not all. [CALCULATE]

For each voucher taken, information was collected on the phenological state (flowering, fruiting, vegetative), location (township, range, section), elevation, slope, aspect, soil, vegetation type (The Nature Conservancy 1997), relative frequency of the species in each vegetation type, and associated species. Initial efforts were made to note species' composition and relative species abundance in each vegetation type.

In the dry, hot conditions of the 2003 growing season, some species were collected even though they did not produce flowers, and collecting of others was deferred for the same reason, so there is arguably a case for better documentation.

Species Not Documented But Possibly Present

In addition to the 141 species additions that were documented, at least six species were observed that have yet to be collected. In addition, a survey of the spring flora, more complete survey of the weed flora, more complete survey of the Laramie River mouth (including south shore), revisit to the south BLM tract including the valley bottom that was not visited, and expanded surveys associated with the rare upland species would be likely to expand the flora. In addition, survey has not included the recently planted grounds due east of the Fort complex, where native species were in the restoration project. Finally, conducting a second year of floristic inventory under climate conditions that are likely to be different from the first year provides a more robust set of results.

A schematic diagram for the 2003 field season involves app. 4 days of fieldwork in at least two separate trips of late May and early August.

Phenology Targets	Late May	Early June	Late June	Early July	Late July	Early Aug	Late Aug
Early flora							
Weed flora							
S. tract grassland							
Rare upland spp							
Laramie R mouth							
Planted flora							

It was not the original intent to include documentation of the planted flora in the project scope. The few horticultural plantings in the Historic Site are biological contrasts to the rest of the flora. Even the most heavily visited landscape, include the Fort Complex, was never planted into non-native species. Most of the planting was carried out decades ago prior to National Park Service acquisition, so there is no record. They were provisionally added because plantings are so few in this setting, and their documentation potentially contributes to horticultural site history. Persistence of agricultural plantings has not been checked.

Species on Park Expected List But Probably Not Present

At this point, there is limited basis for ruling out species that were predicted, though some are habitat specialists and their specialized habitat does not appear to be present. An evaluation will be provided with project completion.

Species of Concern (Due to Regional Rarity, State or Federal Designation, Exotic, etc.)

Six Wyoming plant species of special concern were documented, including three that were previously known, all along the Laramie River, and three that were additions to the Fort Laramie NHS flora. One of the added species occurs along the Laramie River, Shining flatsedge (*Cyperus bipartitus*), and two of the new species occur on the northern BLM tract administered by the National Park Service, Golden prairie-clover (*Dalea aurea*) and Six-angle spurge (*Euphorbia hexagona*). In addition, one regional endemic no longer tracked as a state species of concern was documented in the northern BLM tract, Alpine feverfew (*Parthenium alpinum*). Two species of concern that were collected in the Fort Laramie area have not been relocated to date, and they were treated in the previously vouchered flora. This remains to be confirmed. Note: The Common elderberry is no longer tracked as a state species of concern because it is thought that all records represent escapes from horticultural plantings. These results for state species of concern are discussed below and summarized in Table 3.

Name	Common Name	Setting	Global rank/ State rank ¹
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¹ The global and state-rank codes are as follows:

- G Global rank: rank refers to the rangewide status of a species.
- T Trinomial rank: rank refers to the rangewide status of a subspecies or variety.
- S State rank: rank refers to the status of the taxon in Wyoming. State ranks differ from state to state.

Each taxon is ranked on a scale of 1-5 from most vulnerable to extirpation to least.

<i>Agalinus tenuifolia</i> var. <i>parviflora</i>	Slender False-foxglove	River	G5T4/S1
<i>Cyperus bipartitus</i>	Shining flatsedge	River	G5/S1
<i>Dalea aurea</i>	Golden prairie-clover	Upland tract	G5/S1
<i>Euphorbia hexagona</i>	Six-angle spurge	Upland tract	G5/S1
<i>Eustoma grandiflorum</i>	Showy gentian	TO BE CONFIRMED	G5/S1
<i>Lobelia siphilitica</i>	Great blue lobelia	River	G5/S1
<i>Parthenium alpinum</i>	Alpine feverfew; also Wyoming feverfew	Upland tract	G3/S3
<i>Sambucus nigra</i> var <i>canadensis</i>	Common elderberry	TO BE CONFIRMED	G5/SA?
<i>Sorghastrum nutans</i>	Indian grass	River, Roadside	G5/S1

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- 1 Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.
 - 2 Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.
 - 3 Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).
 - 4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
 - 5 Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.

The work on these six species will contribute to state species abstracts for each of them, including expanded field guide information and highlighting of their status in the state. This will provide a succinct product on each species to the National Park Service and information resource for the state in general.

Only seven species on the Wyoming noxious weed list were found in limited amounts.

The floristic list will also be cross-referenced as to which species are native, non-native, and planted.

Recommendations to Park Management

Long-term Monitoring Recommendations (Methods, Indicator Species, Habitats, etc.)

Habitat Enhancement or other Conservation Recommendations

Potential Impacts to Species

Visitors

Prescribed Fire

Roads

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