

Looking Outward and Looking Inward: Wyoming Plant Data Deficits

Prepared for
Bureau of Land Management
Cheyenne, WY

By Bonnie Heidel and Joy Handley
Wyoming Natural Diversity Database
University of Wyoming
Laramie, WY

Cooperative Agreement No. L12AC20036, Mod. 2

May 7, 2014

ABSTRACT

Data were compiled on rare Wyoming plant species known only from historical records and rare out-of-state species known from records in counties that adjoin Wyoming. The former represents rare plant species that have the least amount of information for addressing in environmental reviews and surveys, and the latter have no information for addressing in environmental reviews and surveys, though located in the immediate vicinity. While there are many forms of botanical data deficits, the sets in this report reflect species that are either scantily addressed or omitted in Wyoming botany work. There are 24 rare plants known only from historical records in Wyoming (28 records total), and 648 rare plants known from the six adjoining states (4767 records total), of which 17 species are within 10 km of the state border but not known from the Wyoming flora. Those 17 species include 11 globally rare species, two of which are Threatened. The Bureau of Land Management (BLM) Rawlins Field Office has the highest numbers of historical species and the BLM Rock Springs Field Office has the highest numbers of species within 10 km of the border not known from Wyoming.

Citation:

Heidel, B. and J. Handley. 2014. Looking outward and looking inward: Wyoming plant data deficits. Prepared for Bureau of Land Management. Wyoming Natural Diversity Database, Laramie, WY.

TABLE OF CONTENTS

INTRODUCTION	1
STUDY AREA	2
METHODS	3
RESULTS	3
DISCUSSION	8
BIBLIOGRAPHY	10

Figures

Figure 1. Bailey Ecoregions in Wyoming

Figure 2. Records for Wyoming plant SOC known only from historical records

Figure 3. Records for plant SOC in the six states bordering Wyoming

Tables

Table 1. Wyoming plant SOC known only from historic records

Table 2. Out-of-state plant species occurrence data as compiled from counties adjoining Wyoming

Table 3. Out-of-state plant records within 10 km of Wyoming but not known from Wyoming flora

ACKNOWLEDGEMENTS

This work is a testimony to collaboration among seven states. We thank natural heritage programs of Colorado, Idaho, Montana, Nebraska, South Dakota and Utah. This work is anchored in that of herbaria and legions of botanists.

The study was developed at the initiative of Wyoming Natural Diversity Database (WYNDD), which takes full responsibility for data sensitivity and report treatment. It was conducted with challenge cost-share support of WYNDD and the Bureau of Land Management, Agreement No. L12AC20036, Modification 2.

INTRODUCTION

Data were compiled on sets of rare plant species that have the least amount of information for addressing in environmental reviews and surveys, and those plant species that have no information for addressing in environmental reviews and surveys though located in the immediate vicinity. The first category is comprised of plant species of concern (SOC) that are known in Wyoming only from historic records as compiled by Wyoming Natural Diversity Database (WYNDD)¹. The second category is comprised of plant species regarded as SOC in the six adjoining states, occurring in those counties bordering Wyoming, with emphasis on those closest to the state line. While there are many forms of botanical data deficits, the sets addressed in this report reflect species that are chronically overlooked, even though proximal data and historical data have reference value in understanding and building in-state information. This compilation should serve as a reference for agencies and researchers, augmented by global ranks (NatureServe), status under the Endangered Species Act (ESA), and agency designations.

Designation criteria used by the Wyoming Bureau of Land Management (BLM) and SOC list criteria used by WYNDD reflect state boundaries. The BLM Sensitive species list is designed precisely to avoid the need for listing, so the species that rise in priorities for inclusion on it are those that are restricted to or concentrated in Wyoming on BLM lands. This strength is also a limitation, not addressing taxa known from meager data, or not taking biological and status information from adjoining states into account, including those that are listed under the ESA and others that are globally rare.

Under the ESA, plants are considered for listing throughout their range or not at all. In the state of Wyoming, four plant species are listed as Threatened or Endangered, and two are Candidates. In addition, the BLM has also designated 36 plant species as Sensitive; they are collectively referred to as Special Status Species (SSS). WYNDD maintains a plant SOC list that is non-regulatory. The SOC list contains, in addition to the 42 SSS, another 392 species that are rare from global or state perspectives (Heidel 2012).

Botanists in Wyoming have amassed a wealth of distribution and status information on the rarest plant species since the interest spurred by the ESA in 1974 (Heidel 2013). The ESA fostered federal agency development of SSS policies, support for state natural heritage programs, and spurred botanical fieldwork activity. For Wyoming, much of the latter took place in floristic inventories, championed by the Rocky Mountain Herbarium (RM) and Robert Dorn, and manifested in floras and checklists (Dorn 2001, Nelson and Hartman 1994). Floristic inventories provide a whole-flora context for rare species work, while broadening the base of rare species documentation. There have also been advances in understanding distribution and status in light of new information resources including online herbarium databases (Rocky Mountain Herbarium 2014) and collaboration between state natural heritage programs.

¹ Plant species are assigned the state rank of “historical” if all collections pre-date 1970, corresponding with an approximate turning point in Wyoming floristic documentation and collection label detail.

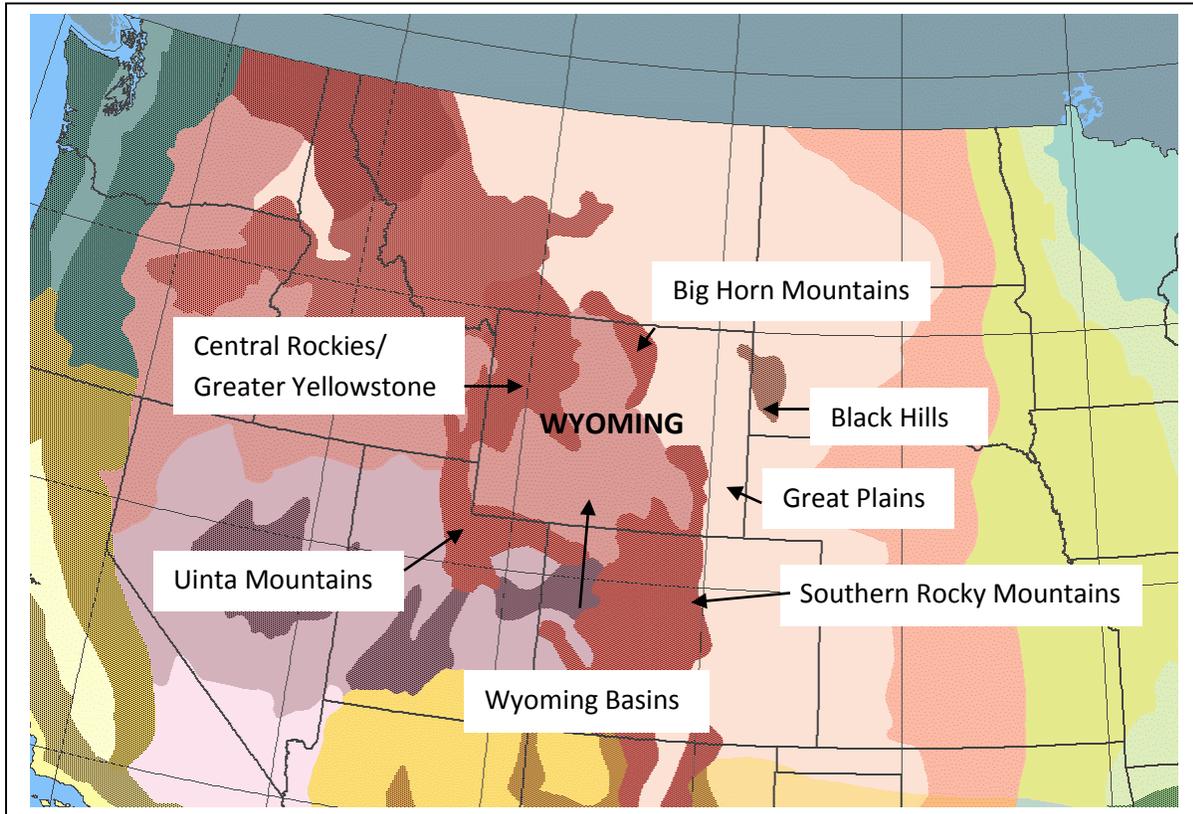


Figure 1. Bailey Ecoregions in Wyoming, from Bailey et al. (1994) as posted: <http://www.nationalatlas.gov/mld/ecoregp.html>

STUDY AREA

Wyoming extends from about the 104th meridian on the east to the 111th meridian on the west, and from the 41st parallel on the south to the 45th parallel on the north (276 miles x 375 miles). This rectangular area of 97,914 square miles spans an elevation range of over 10,000 ft (3,100-13,875 ft; Porter 1962). These state boundaries follow cardinal compass directions and have no relation to biogeographic boundaries. Of the seven physiographic regions in the state, only one is almost contained within state boundaries (the Wyoming Basins Ecoregion), and all regions straddle the state line. Among the ten BLM Field Offices (FO) in the state, eight border state lines. Out-of-state data in shared physiographic regions may have as great a relevance in understanding species' distributions as within-state data.

METHODS

The WYNDD database was queried for all species that are only known from historical records (State Rank=SH). Most, but not all, historic species are known from a single historical collection and most information associated with collections of historical species is vague. State ranks are revised at the time of periodic list updates and as new data become available. Current ranks are reflected in the most recent list (Heidel 2012) and there have been edits since that time of a few species states, including one species subsequently changing from SH to S1 to reflect recent discoveries.

Out-of-state data were requested and compiled in cooperation with natural heritage programs in the six adjoining states (Colorado, Idaho, Montana, Nebraska, South Dakota and Utah). WYNDD requested GIS layers of vascular plant records in counties that adjoin Wyoming, including all species that are recognized as Track or Watch on the contributing state lists. All accompanying information on status under the Endangered Species Act, BLM sensitive species designation (of Colorado, Idaho, Montana and Utah) and U.S. Forest Service regional lists (U.S. Forest Service Regions 1, 2, 4 and 6) were cross-referenced. Each out-of-state species was also cross-referenced as to whether or not it is known from Wyoming. A final step was to identify just those species that are found within 10 km of the state border in order to determine the numbers of species and records in this zone, and highlight those that are not known from the state.

RESULTS

There are 24 native species that are known in Wyoming only from historic records (Table 1, Figure 2). Of these, five species are on the threshold of global rarity (Global Rank of vulnerable = G3 or G3G4). The other species on this list are peripheral, i.e., widespread species at the edge of their range in Wyoming (Heidel 2012). The 24 historical species are known or suspected to have been collected on six of the ten BLM field offices, and others are known or suspected to have been collected in what is now national forest, national park or national wildlife refuge. The historical records are concentrated around the borders, particularly in the southern third of the state, with the highest number of species and highest concentration of those with global rarity in the BLM Rawlins FO (Table 1, Figure 2).

Table 1. Wyoming plant SOC known only from historic records²

Scientific Name	Common Name	Global Rank	State Rank	BLM FO
<i>Aletes humilis</i>	Larimer aletes	G2G3	SH?	-
<i>Arceuthobium douglasii</i>	Douglas-fir dwarf-mistletoe	G5	SH	-
<i>Asclepias hallii</i>	Hall's milkweed	G3	SH	Rawlins?
<i>Asclepias subverticillata</i>	Bedstraw milkweed	G4G5	SH	Rawlins?
<i>Asclepias uncialis</i>	Dwarf milkweed	G3G4	SH	Rock Springs?
<i>Bromus pubescens</i>	Hairy wood brome	G5	SH	-
<i>Clarkia pulchella</i>	Large-flower clarkia	G5?	SH	-
<i>Collomia grandiflora</i>	Large-flower collomia	G5	SH	-
<i>Draba glabella</i>	Rock whitlow-grass	G4G5	SH	-
<i>Draba spectabilis</i> var. <i>oxyloba</i>	Showy draba	G3G4T3Q	SH	-

² The global ranks of species that are globally rare are highlighted in red font.

<i>Elymus triticoides</i>	Creeping wildrye	G4G5	SH	-
<i>Ephedra viridis</i> var. <i>viridis</i>	Cutler's Mormon-tea	G5T4T5	SH	Rock Springs
<i>Euphorbia exstipulata</i>	Square-seeded spurge	G5	SH	Casper?
<i>Froelichia gracilis</i>	Slender cottonweed	G5	SH	-
<i>Heterocodon rariflorus</i>	Western pearl-flower	G5	SH	-
<i>Hymenopappus tenuifolius</i>	Chalk-hill woollywhite	G5	SH	-
<i>Lithospermum multiflorum</i>	Many-flowered gromwell	G4G5	SH	-
<i>Oxytheca dendroidea</i>	Tree-like oxytheca	G4G5	SH	Lander?, Rock Springs?, Worland?
<i>Penstemon watsonii</i>	Watson beardtongue	G5	SH	Kemmerer?
<i>Polemonium micranthum</i>	Annual polemonium	G5	SH	-
<i>Polystichum scopulinum</i>	Rock holly-fern	G5	SH	-
<i>Potentilla ambigens</i>	Giant cinquefoil	G3	SH	Rawlins?
<i>Ranunculus flabellaris</i>	Yellow water-crowfoot	G5	SH	Kemmerer?
<i>Townsendia florifera</i>	Showy Easter-daisy	G5	SH	-

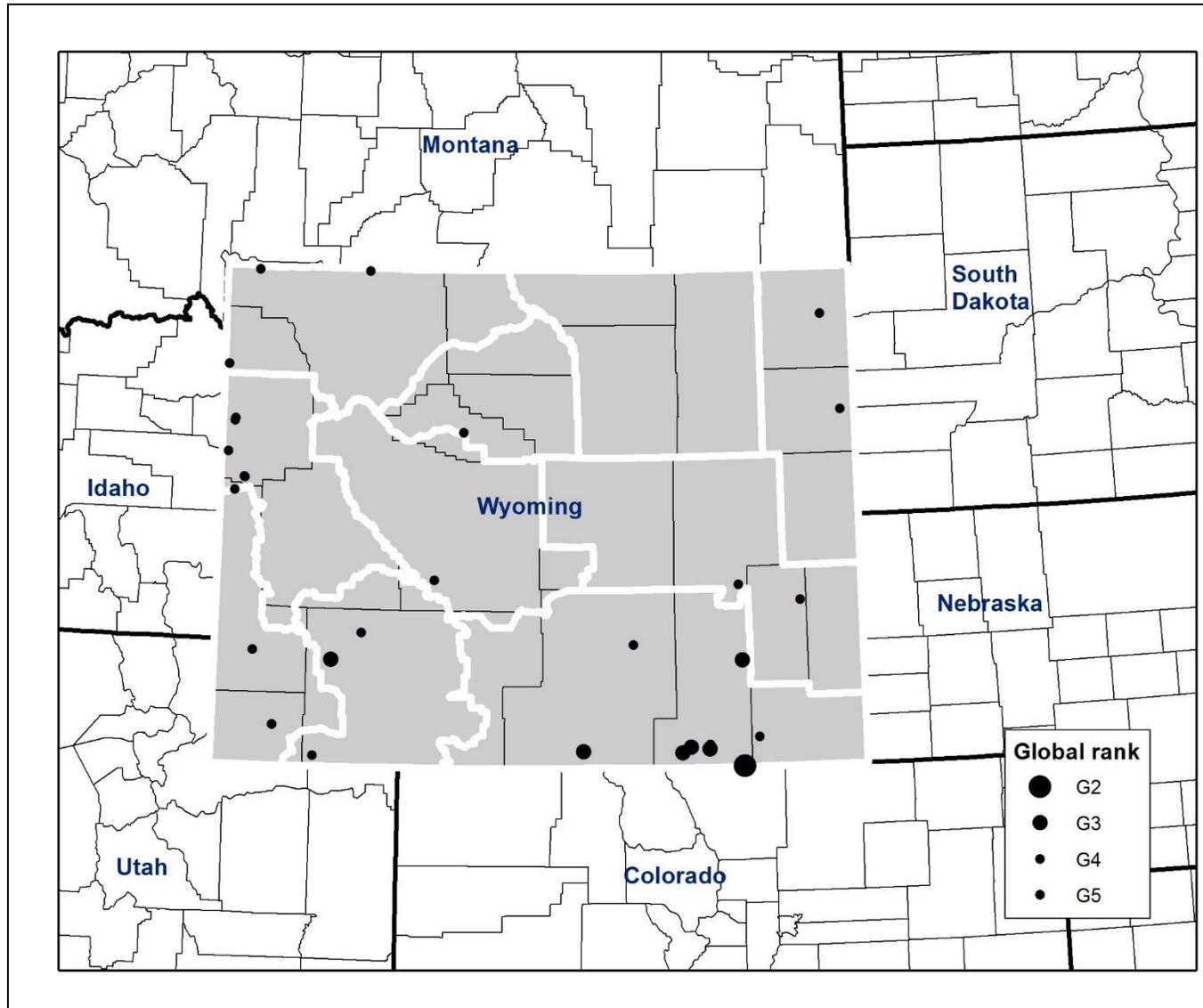
A compilation of out-of-state plant occurrences from adjoining counties resulted in a tally of 4767 records for 648 different species (Table 2). A total of 1132 records for 330 different species are known within 10 km. Included among the 330 species are 17 rare species that are not known from Wyoming (Figure 2), 11 of which are globally rare (Table 3). Colorado has the highest number of records from adjoining counties, Montana has the highest number of records within 10 km of the state line, and South Dakota has far more plant records bordering Wyoming than all other adjoining states if scaled to the extent of shared border. Nebraska has the highest net number of species in adjoining counties and within 10 km of the state line. Collectively, there are 17 species within 10 km of Wyoming that are not known in Wyoming, and the highest number adjoin the Rock Springs FO followed by Rawlins FO (Table 3).

Table 2. Out-of-state plant species occurrence data as compiled from counties adjoining Wyoming³

State	All records in adjoining counties	Records within 10 km of WY	All unique taxa in adjoining counties	Taxa within 10 km of WY	Taxa within 10 km of WY that are not in WY
CO	1398	201	138	41	5
ID	140	60	43	19	1
MT	908	398	141	73	2
NE	939	217	203	111	2
SD	1105	195	149	64	2
UT	277	61	58	22	5
TOTAL	4767	1132	648	330	17

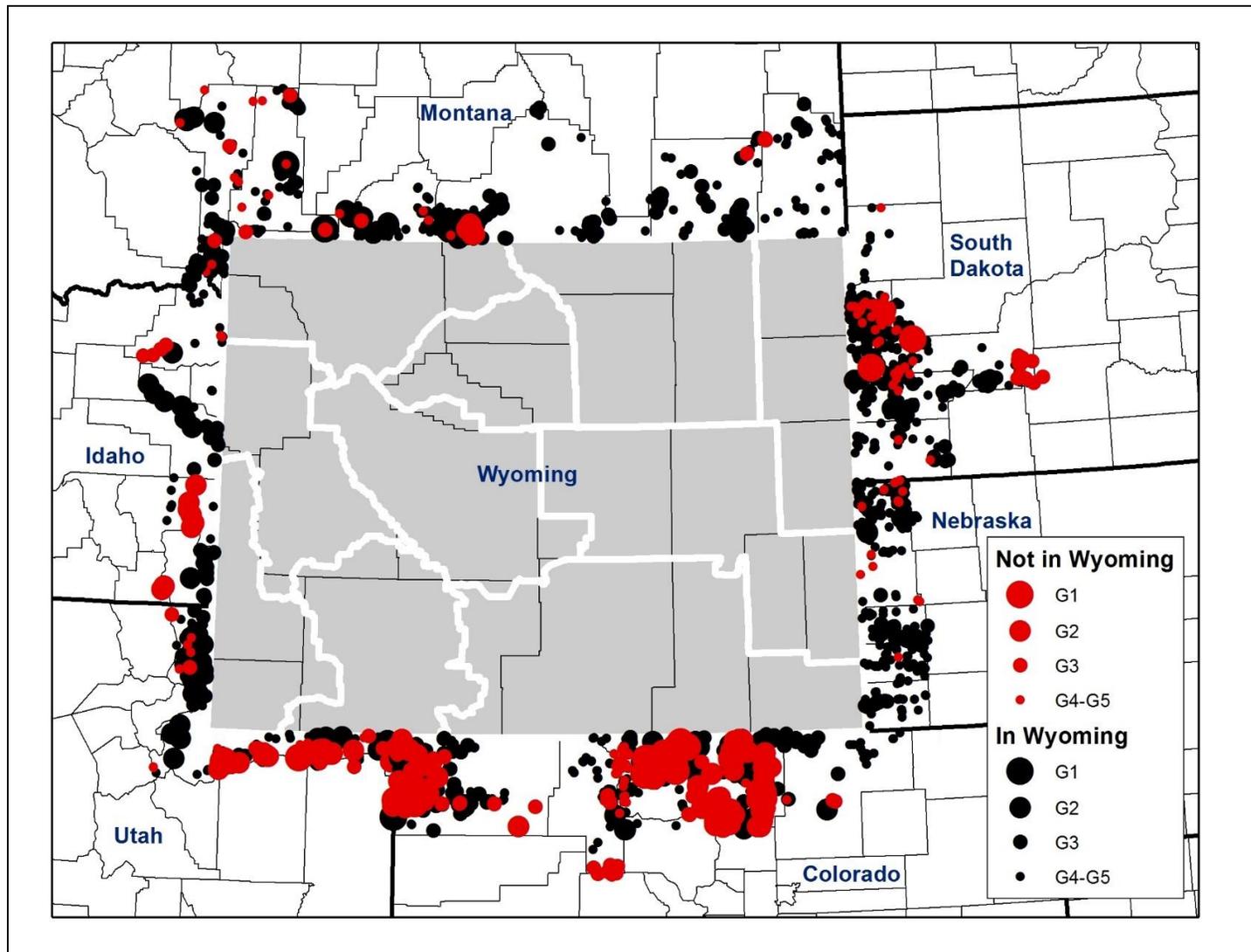
³ The highest values are highlighted in red font.

Figure 2. Records for Wyoming plant SOC known only from historical records⁴



⁴ Black lines represent state and county borders. White lines represent BLM FO borders in Wyoming.

Figure 3. Records for plant SOC in the six states bordering Wyoming⁵



⁵ All out-of-state data is visually-represented and tabulated without presenting precise species' locations. This is in deference to data sensitivity and data propriety, and at the request of state counterparts. Data reflect the current plant species of concern lists and from each state and accompanying global ranks (refer to Bibliography). Black lines represent state and county borders. White lines represent BLM FO borders in Wyoming.

Table 3. Out-of-state plant records within 10 km of Wyoming but not known from Wyoming flora⁶

Scientific name	Common name	Global rank	State where tracked	ESA status	Sensitive designation	Nearest BLM FO in Wyoming
<i>Artemisia campestris</i> var. <i>petiolata</i>	Field sagewort	G5T1?	UT		R4	Rock Springs
<i>Astragalus duchesnensis</i>	Duchesne milkvetch	G3	UT		BLM-CO	Rock Springs
<i>Botrychium echo</i>	Reflexed grapefern	G3	CO			Rawlins
<i>Carex pedunculata</i>	Longstalk sedge	G5	SD			Newcastle
<i>Chrysothamnus nauseosus</i> var. <i>uintahensis</i> (<i>Ericameria</i> x <i>uintahensis</i>)	(Possibly a hybrid of Rubber rabbitbrush x Parry's rabbitbrush)	G5T3?Q	UT			Rock Springs
<i>Corallorhiza odontorhiza</i>	Autumn coralroot	G5	SD			Newcastle
<i>Delphinium glaucescens</i>	Smooth larkspur	G3G4	MT			Cody
<i>Drosera rotundifolia</i>	Round-leaved sundew	G5	CO		R2	Rawlins
<i>Dryopteris carthusiana</i>	Spinulose woodfern	G5	NE			Newcastle
<i>Lycopodiella inundata</i>	Inundated clubmoss	G5	ID			Cody
<i>Mirabilis glabra</i>	Smooth four o'clock	GNR	NE		R1, R6	Casper
<i>Oenothera acutissima</i>	Flaming Gorge evening primrose	G2	CO	Threatened		Rock Springs
<i>Oxytropis deflexa</i> var. <i>pulcherrima</i>	Nodding locoweed	G5T2T3	UT			Rock Springs
<i>Penstemon angustifolius</i> var. <i>vernalensis</i>	Broadbeard beardtongue	G5T3	UT			Rock Springs
<i>Phacelia formosula</i>	Northpark phacelia	G1	CO	Threatened		Rawlins
<i>Physaria lesicii</i>	Lesica's twinpod	G2	MT		BLM-MT	Cody
<i>Potentilla rupincola</i>	Rock cinquefoil	G2	CO		R2	Rawlins

⁶ The globally ranks of species that are globally rare are highlighted in red font.

DISCUSSION

The value of recognizing historical species, as presented in Table 1 and Figure 2, is stated by Snyder (1993):

“The concept of historical species allows us to tackle head-on the limitations of our methods and abilities to document a plant’s existence. It acknowledges the uncertainties and gaps in our knowledge without sidestepping common sense by employing convenience short cuts that only work on paper or are valid only in theory. The need for an historical rank becomes apparent when we try to sort out the extant species from the less than extant – not as lists on paper, but as living organisms, each presenting a unique set of problems.”

The 24 Wyoming plant SOC known only from historical records may represent species that have truly become extirpated, or that have simply been overlooked in more recent years. Among them are some historical records with location information that are so vague as to never be sure that the historical record location has been completely surveyed. Little over 10 years ago, the list of historical SOC in Wyoming had 41 species (Heidel 2003). Since that time, nine of the 41 SOC presented as historical in the state have subsequently been relocated, one historical specimen has been redetermined, and other species have subsequently been interpreted as accidental rather than part of the native flora. The nine re-discoveries were a result of floristic surveys, intensive research into difficult groups (*Potamogeton* spp. in Yellowstone National Park), and WYNDD surveys.

The modest list of SOC known only from historic records reflects the robust documentation of the state flora over time, including critical interpretation of taxonomic validity. In other words, all taxa on this list are valid and accepted in the state flora (Dorn 2001) and the review of species on this list benefited greatly from the rigorous work that went into the flora, including the work of Rocky Mountain Herbarium.

The value of highlighting species known within 10 km of state boundaries that are not known in Wyoming, as represented in Table 2 and Figure 3, is that this information fills a gap in proximal data as is routinely used to make initial inferences about distribution. It does not substitute for floristic surveys and species surveys, but helps even the disparities in SOC list development and promotes information exchange between states and between agencies, e.g., between BLM offices of adjoining states. ESA designation and the NatureServe global rank criteria are the only national, semi-uniform standards that transcend state lines, in contrast to state list criteria and federal agency criteria.

As a result of this analysis, there have been 11 species flagged as present in close proximity to state borders that are globally rare and not known from Wyoming. The next step is to compare their out-of-state habitat information with in-state conditions and determine if they warrant consideration in environmental reviews and general botanical surveys that take place near the state border (highlighted in Table 3).

There is immediate value in historical and out-of-state information to promote proactive baseline surveys in Wyoming. This has already been recognized for some species, such as *Spiranthes diluvialis* (Ute ladies’-tresses), which occurs in three different watersheds directly downstream of Wyoming and not known in those same watersheds upstream within state borders. Now that approximate locations are

known to within 10 km, habitat characteristics out-of-state can be compared with in-state conditions to enable Wyoming botanists to gauge the likelihood and design the survey accordingly.

Results reveal two Threatened species within 10 km of Wyoming state lines that are not known in the state, *Oenothera acutissima* (Flaming Gorge primrose) and *Phacelia formulosa* (Northpark phacelia). The proximity of the two listed species to Wyoming is no reason to promote conjecture, but it justifies information compilation to further evaluate the merit of pilot fieldwork comparing the occupied out-of-state habitat with in-state habitat conditions.

In general, out-of-state information has many potential applications:

1. It provides a broader perspective on distribution patterns of any one species shared in common between states, e.g., in categorizing species as regional endemic, disjunct or peripheral, and considering the continuity of distribution.
2. The broader distribution perspective may suggest additional areas of potential habitat to survey within state boundaries.
3. Out-of-state data provides spatially-explicit information on species not known from the Wyoming flora. Habitat information on such species may be used in concerted surveys to evaluate the likelihood of their distribution extending into Wyoming.
4. Out-of-state data expands the set of search targets to be included in any surveys conducted along state lines.
5. Out-of-state data stratifies the state SOC lists of adjoining states by proximity to Wyoming in order to facilitate collaboration.

On the other hand, state SOC lists represent different conventions for developing lists in different states, the histories of list updates, the histories of documentation, and the unique realms of biogeography for each state. The South Dakota SOC list has many Black Hills species with Rocky Mountain affinity, whereas the Wyoming SOC list has many Black Hills species with Eastern Deciduous Forest and Great Plains affinities. This focus on rare species data from out-of-state counterparts is both an asset and a limitation. It does not represent all cases of species' distributions that apparently stop at state lines. For example, there are a number of cases in which species that are not tracked in South Dakota, including two ferns (*Dryopteris carthusiana*, *Matteuccia struthiopteris*), that are close to the state line but absent from the Wyoming flora. Since they are not considered rare in South Dakota, such cases are not brought to light in this project.

There has been a history of dialogue within and between state botanists on global ranking information. This data compilation is a potential framework for expanded discussion of species and lists, in addition to ranking updates. The same datasets collected from adjoining states by Wyoming will be offered to each state collaborator, broadening the realm of shared information and broadening species' geographic resources in-state as gleaned from proximal out-of-state distribution.

BIBLIOGRAPHY

- Bailey, R. G., P. E. Avers, T. King, and W. H. McNab, editors. 1994. Ecoregions and subregions of the United States (map). U.S. Geological Survey, Washington, DC. Scale 1:7,500,000 colored. Accompanied by a supplementary table of map unit descriptions compiled and edited by W. H. McNab and R. G. Bailey. Prepared for the USDA Forest Service.
- Colorado Natural Heritage Program. 2013. CNHP tracked vascular plant species. Posted on-line at: <http://www.cnhp.colostate.edu/download/list/vascular.asp>
- Dorn, R. D. 2001. Vascular Plants of Wyoming, third ed. Mountain West Publishing, Cheyenne, WY.
- Heidel, B. 2003. Alive and well. *Castilleja* 22(4): 1, 7-9.
- Heidel, B. 2012. Wyoming plant species of concern. Wyoming Natural Diversity Database, Laramie, WY. Includes list, methods and background.
- Heidel, B. 2013. The Endangered Species Act at 40: a hundred reasons to celebrate. *Castilleja* 32(4): 1, 5-7.
- Kinter, L. 2014. Idaho vascular plant species of concern. Posted at: https://fishandgame.idaho.gov/ifwis/portal/sites/ifwis/files/user/idfg-jstrickland/INHP_Tracked_Plant_Species--2014.pdf
- Mincemoyer, S. 2013. Montana plant species of concern. Montana Natural Heritage Program, Helena, MT.
- Nelson, B.E. and R. Hartman. 1997. Checklist of the vascular plants of Wyoming. Rocky Mountain Herbarium. Posted on-line at: <http://www.rmh.uwyo.edu/>.
- Ode, D. 2009. Rare, Threatened or Endangered plants tracked by the South Dakota Natural Heritage Program. Pierre, SD. Posted on-line at: <http://gfp.sd.gov/wildlife/threatened-endangered/rare-plant.aspx>
- Porter, C.L. 1962. A Flora of Wyoming, Part I. Bulletin 402. Agricultural Experiment Station, University of Wyoming, Laramie, WY.
- Schneider, R., K. Stoner, G. Steinauer, M. Panella, and M. Humpert. 2011. The Nebraska Natural Legacy Project: State Wildlife Action Plan. 2nd ed. The Nebraska Game and Parks Commission, Lincoln, NE.
- Snyder, D.S. 1993. Extinct, extant, extirpated, or historical? Or in defense of historical species. *Bartonia* 57, Suppl.: 50-57.
- Utah Native Plant Society. 2010. Utah Rare Plant Guide. 2010. Posted on-line at: <http://www.utahrareplants.org/rpg.html>.