

## Appendix B. Framework for developing and maintaining lists and assigning state ranks to special plant species of concern in Wyoming

*The following information is taken from Heidel (2007), and is the basis for global and state ranks that appear with the target list and the floristic list in this report.*

### Wyoming Plant Species of Concern

The primary species of concern list contains all vascular plant species/varieties considered to be of conservation concern in the state of Wyoming. This includes almost all species having state ranks of S1, most species ranked as S2, and select species with ranks of S3 if they have a high Wyoming Contribution Rank and other possible concerns like threats. There are 468 species on this list.

In addition, there is a second list of species of *potential* concern. Species on this other list have limited distribution as regional or state endemics, and appear to be secure at present. However, they could become vulnerable under large-scale changes. Their status warrants periodic checks. There are 32 species on this list.

These lists are prepared by Wyoming Natural Diversity Database (WYNDD) in peer review and ongoing updates that compile and build upon available collection and survey data. They are not addressed by any state legislation but are sometimes cited in policies and in development of sensitive species lists by federal land-managing agencies. Federal sensitive species list criteria may use narrower criteria and are specific to a given land area than the Wyoming species of concern list. The list contents and s-rank values depend on five factors (next page).

### Codes Used in the List

**Heritage Ranks:** WYNDD uses a standardized ranking system originally developed by the Nature Conservancy and its network of natural heritage programs (now called NatureServe) to assess the global and statewide abundance and the probability of extinction of each plant species, subspecies, and variety. 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: status of the taxon in Wyoming. State ranks differ between states.

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

- 1 Critically imperiled because of extreme rarity
- 2 Imperiled because of rarity
- 3 Rare or local throughout its range or found locally in a restricted range
- 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.
- H Known only from historical records (pre-1970)
- X Believed to be extinct.
- U Possibly in peril, but status uncertain; more information is needed.
- Q Questions exist regarding the taxonomic validity of a species, subspecies, or variety.
- NA Not appropriate to assign a conservation rank, for one or more reasons: not native, not regularly occurring, or not confident in validity of report for state.

## State Ranking Factors

Ranking information for species of concern (elements) is presented in abbreviated form as part of the Wyoming species of concern list. The structure of the ranking information reflects a standardized system in the NatureServe network. Maintaining element occurrence data and element ranking data are essential in keeping the list current. Narrative that explains the rationale for ranking values for each species is provided in state species abstracts and maintained in WYNDD databases.

### 1. State Estimated Number of Occurrences

The element occurrence records represent working approximations of populations. The number of element occurrences is the single greatest factor in assigning s-rank.

- A. **Very Low** = 1-5 extant occurrences
- B. **Low** = 6-20 extant occurrences
- C. **Moderate** = 21-80 extant occurrences
- D. **High** = over 80 extant occurrences
- E. **Unknown** = no basis for tallying or estimating

Each element occurrence is represented by one or more points, lines or polygons (source features), separated from other occurrences by 1.5-6 miles (2-10 km) depending on the setting, nature of the habitat, species' biology (dispersal, pollination), extent of surveys, and mapping accuracy. The level of accuracy or uncertainty around each shape is represented as a buffer. For example, a collection within a quarter-quarter section would be represented as a point having a 1/8 mile buffer. It is important to remember that 20 collections or 20 surveys do not necessarily equate to 20 occurrences, but could represent repeated visits to one occurrence, expansions of the boundaries for a large, complex occurrence (either in semi-contiguous areas or in a close series of settings), or any other intermediate number short of 20 discrete occurrences.

Historic occurrences (those prior to 1970) are not included in the tally for state ranking purposes. The assumption that all records are extant since 1970 is a working assumption only, and unsuccessful efforts to relocate any occurrence convert the record to "historic." If concerted surveys document that the species or its habitat are no longer present and likely to have been destroyed, then the record is regarded as "extirpated."

### 2. State Abundance

This category is an estimate of the approximate abundance of the element in Wyoming. It is based on the area of occupied habitat, or else miles of stream length for riparian species. The numbers of individuals may be used to round up or down those values that are at cut-off thresholds. State ranks for species with very low abundance are ranked more conservatively, particularly if they are concentrated in a single area of the state (see next page).

A = **Very Rare**, which means at least one of the following apply:

Fewer than 2,000 acres (i.e., about 3 sections of occupied habitat)

Fewer than 10 miles of stream length.

Fewer than 1,000 individuals

(Includes blowout penstemon, desert yellowhead, Hyattville milkvetch, red manzanita)

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B = **Rare**, which means at least one of the following apply:

2,000 - 10,000 acres (i.e., 3 - 15 sections of occupied habitat)

10 - 50 miles of stream length

1,000 - 3,000 individuals

(Includes Absaroka beardtongue, Laramie columbine, Porter's sagebrush, shoshonea)

C = **Uncommon**, which means at least one of the following apply:

10,000 - 50,000 acres (i.e., 15 - 78 sections, or 0.5 - 2 townships)

50 - 250 miles of stream length

3,000 - 10,000 individuals

(Includes Barr's milkvetch, clustered lady's-slipper, persistent-sepal yellowcress; species that may or may not be tracked depending on trends and threats)

D = **Common**, which means at least one of the following apply

over 50,000 acres (i.e., over 80 sections, or 2.2 townships of occupied habitat)

over 250 miles of stream length

over 10,000 individuals

(Includes locally dominant or abundant species; not tracked)

E = **Abundant**, which means at least one of the following apply:

over 250,000 acres (i.e., over about 390 sections, or 10 townships of occupied habitat)

over 1,000 miles of stream length

over 50,000 individuals

(Includes dominant species like Ponderosa pine, quaking aspen, Wyoming big sagebrush, and habitat-generalist species like yarrow)

### 3. State Trend

This category is a measure of the trends in populations within Wyoming and has two sub-categories: Historical Trend and Recent Trend. Usually, Historical Trends are not known and quantitative information for recent trend is not available apart from anecdotal information or inference. For that reason, Recent Trend categories are working approximations and Historical Trend categories are not presented in the 2007 list, while they are added factors for those few species with historical trend evidence. State ranks for species with large recent (or historical) declines are ranked more conservatively.

Recent trend is a measure of the decline or increase in numbers of occurrences or extent over recent decades (starting about 1970 unless otherwise stated). Current numbers and occupied habitat are not known for most species, and pre-1970 values are wanting, so trend rank is based largely on current distribution pattern and inferred habitat change over this area. Short-term cyclic population fluxes should not be included in this ranking, but rather might be included under the intrinsic vulnerability rank. Potential and projected trends are addressed under threats.

A = **Large decline**: Decrease of over the majority of total numbers or in total occupied area.

B = **Moderate decline**: Decrease of less than the majority of total numbers or in total occupied area.

C = **Stable**: Species has likely not declined in total numbers or occupied range.

D = **Increase**: Species has increased in total numbers or occupied range.

U = **Unknown**: There is insufficient data to estimate a trend in either direction.

#### 4. State Vulnerability

Vulnerability is a function of species' life history, community ecology, and habitat specificity. State ranks for species with high vulnerability are ranked more conservatively. Essentially, vulnerability is an attempt to bracket the range of potential constraints on species' viability in the natural world. In the absence of information on e.g., pollination biology and life history, inferences are drawn elsewhere in the genus or family. The significance of life history attributes (including stages, longevity, dormancy phases) and of community ecology (herbivory, competition, succession) are conditioned by habitat specificity, symbiosis, and by one another, and are not represented in abbreviated description of the categories.

A = **High Vulnerability** Narrow habitat specificity, or narrowly-specialized symbiosis

B = **Moderate Vulnerability** Moderate habitat specificity, or moderately-specialized symbiosis

C = **Low Vulnerability** Low habitat specificity, or unspecialized symbiosis

D = **No Vulnerability** No habitat specificity, and no specialized symbiosis

U = **Unknown Vulnerability**

#### 5. Threats

Threats are factors generally associated with human activities that are likely to result in habitat loss or degradation, and eventual population loss or decline. State ranks for species with high threats are ranked more conservatively. Threat ranks are particularly difficult to assign to plants in Wyoming due to large-scale developments and limited basis for inference and extrapolation. Threat ranks are not presented in the current species of concern list.

Any extremes in the preceding five state ranking factors increase the thresholds set in assigning state ranks by the number of occurrences. For example, if a species is known from eight extant occurrences, but all recent surveys indicate large declines, then it would remain with an s-rank of S1. If five more stable occurrences were documented for it, it would be re-ranked S2. However, if decline or high vulnerability was also documented among the five new occurrences, it would still remain with an s-rank of S1.

#### State Ranks in Context

The state ranks are usually presented with other ranking information for context. In addition to global rank, Walter Fertig and colleagues developed and implemented a range context value and Wyoming contribution rank (Fertig and Heidel 2002, Keinath et al. 2003, Keinath and Beauvais 2004).

##### 1. Global Ranks

It is widespread practice to present state ranks side-by-side with global ranks. Global ranks are assigned by lead states within the NatureServe network, in a manner similar to state ranks. When a global rank of a Wyoming species has the identical value as a state rank, in the G1-G3 range, this indicates that much of a species' distribution lies within the state. When the two values differ, as they do for most Wyoming plant species of special concern, this indicates that much of a species' distribution lies outside the state. To put these many cases in biogeographic context and in terms of Wyoming significance, two additional values are presented.

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### 2. Range Context Framework

The extent and position of a species' continental range relative to Wyoming is presented in the two-part range context. The first part is a characterization of species' distribution pattern, using set standards regardless of political boundaries. The second part is a characterization of where Wyoming falls in the overall distribution. State ranks for local and regional endemics that have their core distribution in Wyoming are ranked more conservatively.

There are three continental distribution patterns.

- **Local endemic:** Continental range is no larger than an average county, e.g., Natrona County, Wyoming (72 X 72 miles; less than 500 mi<sup>2</sup>)
- **Regional endemic:** Continental distribution is no larger than an average western state, e.g., Wyoming (270 x 357 miles; less than 100,000 mi<sup>2</sup>).
- **Widespread:** Continental range is much larger than the state of Wyoming (may or may not be restricted to North America).

There are three Wyoming context categories.

- **Core:** Wyoming encompasses >25% of the continental range
- **Edge:** Wyoming encompasses < 25% of the continental range
- **Disjunct:** Wyoming populations are widely isolated (by about 300 miles or more) from the main, contiguous portion of the continental range.

In keeping with these definitions, there are seven main range context outcomes (Local endemic/ core or edge; Regional endemic/ core or edge; and Widespread/ core, edge or disjunct). These values provide narrative context for the following Wyoming contribution rank, and a biogeographic standard that can be used for making comparisons within Wyoming or across state boundaries. Most species fall into these categories, though a few endemic species have disjunct occurrences.

### 3. Wyoming Contribution Rank

This rank is a measure of Wyoming's contribution to the rangewide persistence of each species. It reflects how much of a species' range occurs in Wyoming relative to its entire distribution.

- A = **Very High:** Wyoming populations contribute greatly to the species' rangewide persistence, generally assigned for all local endemics or for regional endemics with almost all of its numbers in Wyoming.
- B = **High:** Wyoming and adjoining states contribute substantially to the species' rangewide persistence, the Wyoming populations generally corresponding with much of the species' continental range (also applied to extreme disjuncts).

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C = **Medium**: Wyoming populations contribute to the species' rangewide persistence, but are apparently no more critical than populations in other states; representing some significant fraction of the species' continental range. Disjunct species are assigned this rank as species separated by distances over 300 miles from core of distribution and represent special cases regardless of the size of their Wyoming range. They do not fit a biogeographic continuum, and the genetic significance of disjuncts may be higher than their extent would indicate.

D = **Low**: Wyoming populations contribute minimally to the species' rangewide persistence. Typically applies to species that are prevalent and secure in other states, and occur only peripherally in Wyoming.

U = **Unknown**: The species is known only from historic records in Wyoming or there are unresolved questions in determining the species' North American range or its Wyoming range.

The Wyoming Contribution Rank results (A-D) are a product of range context factors:

Wyoming context category/ Continental distribution pattern	Core	Edge	Disjunct
Local Endemic	A	A	--
Regional Endemic	B	C	--
Widespread	--	D	C

Wyoming Contribution Ranks are moved up one score for those species of high global rank, i.e., widespread species with G2-G3 global rank. These are sometimes placed in a separate range context category as "sparse".