

SERPENTINE ENDEMISM IN THE CALIFORNIA FLORA:
A DATABASE OF SERPENTINE AFFINITY

H. D. SAFFORD^{1,2}, J. H. VIERS³, AND S. P. HARRISON²

¹ USDA-Forest Service, Pacific Southwest Region, 1323 Club Drive,
Vallejo, CA 94592

hughsafford@fs.fed.us

² Department of Environmental Science and Policy, University of California,
Davis, CA 95616

³ Information Center for the Environment, DESP, University of California,
Davis, CA 95616

ABSTRACT

We present a summary of a database documenting levels of affinity to ultramafic (“serpentine”) substrates for taxa in the California flora, USA. We constructed our database through an extensive literature search, expert opinion, field observations, and intensive use of accession records at key herbaria. We developed a semi-quantitative methodology for determining levels of serpentine affinity (strictly endemic, broadly endemic, strong “indicator”, etc.) in the California flora. In this contribution, we provide a list of taxa having high affinity to ultramafic/serpentine substrates in California, and present information on rarity, geographic distribution, taxonomy, and lifeform. Of species endemic to California, 12.5% are restricted to ultramafic substrates. Most of these taxa come from a half-dozen plant families, and from only one or two genera within each family. The North Coast and Klamath Ranges support more serpentine endemics than the rest of the State combined. 15% of all plant taxa listed as threatened or endangered in California show some degree of association with ultramafic substrates. Information in our database should prove valuable to efforts in ecology, floristics, biosystematics, conservation, and land management.

Key Words: serpentine, ultramafic, California, endemism, diversity.

INTRODUCTION

Ultramafic rocks, often called “serpentine” by ecologists, botanists and pedologists, underlie more than 6000 km² of the land area of the State of California (Harrison et al. 2000). The edges of continental plates often include bands of these vestiges of oceanic mantle rock, accreted during the geologic process of subduction, and later uplifted and exposed during mountain building and subsequent erosion. Ultramafic rocks and the soils that develop on them are characterized by critically low levels of most principal plant nutrients (N, P, K, Ca), and exceptionally high levels of Mg and Fe and a suite of toxic trace elements including Cr, Ni, and Co. Outcrops of ultramafic rocks support high numbers of edaphic-endemic taxa throughout the world (Brooks 1987). The California serpentine flora is the richest in the temperate zone, and consists of hundreds of species and subspecies that are largely or entirely confined to ultramafic substrates.

Serpentine endemism is a key feature of the diversity of the California flora (Raven and Axelrod 1978; Kruckeberg 2002). Of about 1410 full species endemic to the State (Hickman 1993), Kruckeberg (1984) estimated that about 180 were endemic to serpentine. If these numbers are at least approximately correct, then about 13% of the plant species endemic to California are serpentine endemics. This is a remarkably high number when one considers that only 1.5% of the State is under-

lain by ultramafic rocks (6000 km²/406,280 km²). In addition, because they tend to have small geographic ranges and because many of them occur in the rapidly urbanizing San Francisco Bay Area, serpentine endemics are overrepresented among the state’s rare, sensitive, and listed plant taxa (Skinner and Pavlik 1994). The ecology of California’s serpentine plants has been extensively studied at the University of California’s Sedgwick Ranch Reserve (e.g., Seabloom et al. 2003; Gram et al. 2004) and McLaughlin Reserve (e.g., Harrison et al. 2003; Safford and Harrison 2004) and Stanford University’s Jasper Ridge Reserve (e.g., McNaughton 1968; Huenneke et al. 1990; Hobbs and Mooney 1991).

Botanists have relied for two decades on the monograph by Arthur Kruckeberg (1984) for most of their information on Californian serpentine-endemic plant taxa. Since then, publication of the Jepson Manual (Hickman 1993), and a proliferation of new botanical research and name changes have left this list in need of updating. Our initial aim was to modify Kruckeberg’s (1984) list, primarily using information from Hickman (1993), to use in our research on diversity patterns (Harrison et al. 2000, 2004). However, it soon became clear that we would have to expand and intensify our search for the best available information. Complicating this effort, plants show a continuum in degrees of serpentine restriction, and are sometimes more restrict-

ed in some parts of their geographic ranges than others, thus contributing to inconsistencies among reports from different sources. This led us to adopt a semi-quantitative procedure for scoring plant taxa on their reported degree of serpentine affinity.

In this contribution, we present a summary of our current database of serpentine affinity in the California flora. The database was constructed via an extensive literature search, expert opinion, field observations, web research, and intensive use of accession records at key herbaria. It provides data on levels of serpentine endemism, rarity, geographic distribution, taxonomy, and lifeform.

METHODOLOGY

We began by conducting a database search of the electronic Jepson Manual (Hickman 1993) maintained by the Jepson Herbarium at the University of California-Berkeley (UC-JEPS 2004a). The database was queried for all taxa with “serpentine”, “ultramafic”, or related (e.g., “asbestos soils”) references in the habitat description. Taxa containing “non-serpentine” in the description were removed afterward. We cross-checked the 391 serpentine-related taxa found in the Jepson Manual with Kruckeberg (1984), who listed those taxa he believed to be endemic to ultramafic substrates in California, and those that were either local or regional “serpentine indicators” (i.e., nonendemic taxa whose distributions are nonetheless skewed toward occurrences on ultramafics). Taxonomic updates in the Jepson Manual (Hickman 1993) were applied to the Kruckeberg list (which included 377 taxa after these revisions), and then those taxa not on the Jepson-derived list were added to our database. This resulted in a list of 529 taxa; of these, 287 were not shared between the two sources. We then added to the list a number of taxa that we considered to be likely endemics or indicators but which were not indicated as such by either Kruckeberg (1984) or the Jepson Manual (1993). Finally, published literature (e.g., Meinke and Zika 1992; Nelson and Nelson 2004; Baldwin 1999 and 2001; Barkley 1999; Porter and Johnson 2000; Zika et al. 1998) and the online Jepson Interchange Jepson Flora Project (UC-JEPS 2004b) were consulted for taxonomic revisions and taxa newly described since the publication of the Jepson Manual.

To score the affinity of taxa to ultramafic substrates, we adopted a modification of Kruckeberg’s measures of ultramafic “fidelity”. In his Appendix C, Kruckeberg (1984) used two or three “+”s to signify increasing levels of endemism: three “+”s were attached to taxa with 95–100% of their occurrences found on ultramafics, two “+”s signified taxa with 85–94% fidelity. In his Appendix D, Kruckeberg used one or two exclamation marks (“!”s) to signify increasing levels of fidelity to ultramafic substrates among supposed nonendemic “indicator” taxa. In both appendices, question

marks (“?”) were attached to those taxa for which more information was necessary to confidently assign their status. Some of the “tentative” endemics were included in the indicator appendix as well, thus these taxa occur twice in Kruckeberg’s lists. We combined Kruckeberg’s two scales, and added two levels to yield six levels of ultramafic affinity, where 6 represents a “strict endemic” ($\geq 95\%$ of occurrences on ultramafics), and successively lower values signify lower affinity to the substrate (5 = 85–94% of occurrences; 4 = 75–84%; 3 = 65–74%; 2 = 55–64%; 1 = 45–54%). By this definition, “1” thus represents a species found about half of the time on serpentine. We consider scores between 1 and 2 to indicate “weak indicators”, and a score of about 1 to mean an “indifferent” taxon. The Kruckeberg fidelity scale crosswalks to ours in the following fashion: “+++” = 6; “++” = 5; “!” = 3; one “!” = 2. Those taxa which occurred in both Kruckeberg’s endemic and indicator tables had their two scores averaged: these all fell between “3” and “4” on our scale. For example, *Citrus macnabiana* was rated “+++” in Kruckeberg’s Appendix C (i.e., “6” on our scale), and “!” [i.e., “2” in our scale] in Appendix D; these were averaged to “4” on our scale.

We attached our categorical levels of ultramafic affinity to all of the species in our hybrid Jepson-Kruckeberg database. In the case of the Kruckeberg taxa, we simply cross-walked the Kruckeberg fidelity codes to our scale as described above, making some adjustments based on more recent taxonomic revisions and combinations. In the case of the Jepson Manual taxa, we were forced to interpret the language used in habitat descriptions to determine levels of affinity. We used the following interpretations of description language to assign affinities: a “6” was assigned where the habitat description categorically stated “serpentine” or “ultramafic” (a “5” if there was some indication that this restriction was not absolute); a “4” was assigned where the modifiers “generally” or “usually serpentine” were used; “especially” or “often” equaled “3”; “sometimes” or “occasionally” equaled “1”. In a few cases, affinity levels were assigned based on ancillary information in the habitat and/or range description rather than on explicit statement of serpentine affinity.

We then conducted a broad survey of the literature, regional botanical experts, and herbaria records to obtain as many sources as possible for each taxon in our database, and to add to the database any taxa we might have overlooked. We manually consulted every species description in a variety of regional and local floras (Clifton 2001; Ertter and Bowerman 2004; Howell 1970; McMinn 1939; Oswald 2002; Smith and Wheeler 1992), and guidebooks to rare and sensitive taxa (Hanson 1999; Hoover et al. 1993; Jimerson et al. 1995; McCarten 1988; McCarten and Rogers 1991; Nakamura and Nelson 2001; Trinity SIPS 2001; USFWS 1998).

We also consulted the CalFlora Online Species Database (CalFlora 2004), and the California Native Plant Society Online Inventory of Rare and Endangered Plants (CNPS 2004). We added columns to our database for each source, and gave scores (1–6, as described above) to each taxon for which a habitat description suggested an ultramafic affinity. Information on serpentine affinity in the CalFlora database is limited to taxa from the Sierra Nevada and to rare taxa statewide, and does not include sufficient information to determine degree of affinity (A. Dennis, personal communication). CalFlora was therefore not treated as a typical “source”, and CalFlora serpentine taxa were simply given a score of 0.5 to be added later to the sum of scores when final ultramafic affinities were calculated (see below). The California Natural Diversity Database (CNDDDB) was not searched, as we consulted all of the primary resources originally used to build CNDDDB, and the CNPS Online Inventory (see above) is updated from the same contemporary sources as CNDDDB.

We calculated preliminary mean affinities for taxa in our database by summing the scores across source columns and adding the CalFlora score (if present), then dividing by the number of sources (not including CalFlora) for the taxon in question. We also calculated the number of sources, the median score, and the standard deviation and standard error of the scores for each taxon. We then sent the database to approximately 40 state and regional experts for their review and input, and asked them to score serpentine affinity using the 1–6 scale for taxa with which they were familiar. These individuals included botanists employed by federal and state land management agencies, universities, museums, non-governmental organizations, and private consulting firms. We received 17 substantive replies, and incorporated their input into an updated database.

The next step was to ensure that we had at least three sources of serpentine affinity for each taxon in our database; given the great differences between the Jepson Manual and Kruckeberg’s list, we felt a third opinion was important. We focused on those taxa for which we had less than three sources, as well as those with high variability in scores. We began by consulting the habitat descriptions in Munz and Keck (1968) for every taxon in our database with less than three sources. We then turned to Herbaria accession records. We searched the online “SMASCH” accession databases of the UC and Jepson Herbariums at UC-Berkeley at (UC-JEPS 2004c) for all taxa with one or two sources, and for all taxa with affinity-score standard deviations ≥ 1.0 (a total of 548 taxa). For any Northern California taxa remaining with less than three sources and/or high variability, we then searched the online accession database of the Biological Sciences Herbarium at Chico State University (CSU-BSH 2004; a total of 164 taxa were searched).

In our online accession database research, we followed the following protocol:

1. We began with the most recent accession records and worked backwards, as habitat descriptions before the mid 1970’s usually lack sufficiently detailed information on substrate and location.

2. We consulted the habitat description for each record. If the description included enough information to determine the substrate, we noted whether it was ultramafic or non-ultramafic. We did not count multiple accession records from the same collecting trip and location as different records.

3. On the average, about $\frac{1}{3}$ of the accession records consulted had sufficient information to determine if a collection had been made on ultramafics or not. Not all of these determinations were made simply based on the collector’s habitat description. For example, many California counties do not contain outcrops of ultramafic rocks (e.g., Los Angeles, San Diego, San Bernardino, Modoc). Collections from these counties were coded as “nonserpentine” even where habitat descriptions were missing. Also, collections from well-known collecting locations on ultramafics (e.g., Blue Banks in Glenn County, Red Butte in Siskiyou County, or the mouth of 18-Mile Creek on the Middle Fork Smith River, Del Norte County) were coded as “serpentine” even where habitat descriptions were missing. Finally, where we had trouble getting a sufficient number of records with habitat descriptions, or where it was otherwise critical to get more information, we used location information in the accession record (where it existed) to do further research. We used TOPO! Software (National Geographic Maps 2000) to locate coordinates or named locations and then consulted geological maps (ranging from 1:250,000 to 1:25,000) to determine if the location was on an ultramafic outcrop. Only those occurrences which could be confidently assigned to ultramafics were identified as such.

4. We continued until we had recorded habitat information from at least 10% of the total accession records for the species in question. Our minimum was 10 records, unless there were fewer than 10 records with habitat descriptions and reasonably locatable site information (286/548 taxa had fewer than 10). Our maximum was usually 20, although we went beyond 20 in some cases.

5. We summarized the accession record results for each taxon by dividing the total number of records with sufficient habitat or location information to determine substrate by the number of records recording serpentine/ultramafics, and then multiplied the result by 100 to get a percentage. We then cross-walked the percent value to our scale of ultramafic affinity: 95–100% of records on ultramafics = 6; 85–94% = 5; 75–84% = 4; 65–74% = 3; 55–64% = 2; 45–54% = 1; 35–44% = 0.75; 25–34% = 0.5; 15–24% = 0.25; >0–14% = 0.1; 0 = 0.

Finally, T. Nelson and S. Carothers also used the

Humboldt State University Herbarium to provide information to us on a number of under-documented taxa from Northwestern California.

In our accession records research, we necessarily assumed that: (1) the taxon itself was correctly identified on the accession record; (2) the substrate was correctly identified by the collector; and (3) ultramafic substrates were neither more nor less likely to be identified correctly (or at all) than other substrates. The last assumption is probably flawed, as serpentine and other “charismatic” substrates—given their close connection to plant endemic taxa and their relative ease of identification—are almost certainly more likely to be identified than “normal” substrates. This could theoretically lead to accession records “overstating” the degree of a taxon’s affinity to ultramafic substrates. In practice, however, we found that the accession records were generally somewhat more conservative than our literature sources vis-à-vis the serpentine affinities of the taxa in our database.

Our final database included 18 columns of information sources for serpentine affinity, plus a column for CalFlora. We summed these affinity values and took their mean (not including CalFlora in the denominator). We also calculated the mean without CalFlora, the median, the standard deviation, and the standard error. We identified each taxon by taxonomic category (pteridophyte, gymnosperm, dicot or monocot), and by lifeform (annual forb, perennial forb, annual graminoid, perennial graminoid, shrub, tree). For rare taxa, we added the rarity rating from the California Native Plant Society Online Database of Rare and Endangered Plants (version 6.04d, 11-12-2004). The following information was also added to the complete database: geographic distribution in California for each taxon (by Jepson Manual geographic subdivisions); elevational range (from Hickman 1993); the geographic distribution of, and number of species of the genus of each taxon (from Mabberly 1996); and the common name (from Hickman 1993, and the Natural Resource Conservation Service PLANTS online database [USDA-NRCS 2005]). Aside from a summary of the geographic distribution, this information is not presented in the current paper, but is available on request from the first author, as are the affinity values calculated for each source.

RESULTS

A summary table of the current database is presented in Appendix 1. Appendix 1 includes 669 taxa, ranging in affinity from 6.25 to 1.00 (some values exceed 6 because they were identified as serpentine taxa in the CalFlora Database). Our full database includes 698 taxa, 29 of which have mean serpentine affinities of < 1 ; we did not include these taxa in the current paper. The greatest number of sources we located for any single taxon was nine (four taxa). We found eight sources for eight taxa

and seven sources for 19 taxa; 587 taxa had between three and six sources. Eighty-one taxa had fewer than three sources (77 with two, three with one). Somewhat more than half of the taxa (387) in our original list had standard deviations for serpentine affinities > 1.0 .

Since our serpentine affinities are calculated as the means of multiple sources, our values fall on a continuous scale, rather than in categories. Given this, we recognized taxa with mean affinities > 5.5 as “strict endemics” (analogous to Kruckeberg’s “+++”, or taxa with $> 95\%$ of their occurrences on ultramafics), and taxa with mean affinities > 4.5 and < 5.5 as “broad endemics” (analogous to Kruckeberg’s “++”, taxa with about 85–94% of their occurrences on ultramafics). Using these definitions, 164 taxa are strict endemics, while 82 taxa are broad endemics, for a total of 246 endemic taxa; 176 of these are full species. Among the remaining taxa, 123 are “strong serpentine indicators” (Kruckeberg 1984), with scores ranging from 2.5 to 3.4 (about 65–74% of their occurrences on ultramafics); 150 are “weak indicators”, falling between 1.5 and 2.4 on our scale (± 55 –64% of their occurrences on ultramafics); and 79 fall in a gray area between weak indicators and indifferent taxa (between 1.0 and 1.4 on our scale, or about 50–54% of occurrences. Seventy-one taxa have affinity scores between 3.5 and 4.4 (about 75–84% of their occurrences on ultramafics), and thus represent the transition from strong indicators to broad endemics.

Six families account for more than half of all the endemics: Asteraceae, Liliaceae, Brassicaceae, Polygonaceae, Scrophulariaceae, and Apiaceae (Table 1). The 20 most important plant families among the serpentine endemics are shown in Fig. 1, with the percentage of the serpentine endemic flora that they contribute, as well as the percentage of the total California endemic flora that they contribute. Families that proportionally contribute more to the serpentine endemic flora than to the California endemic flora include Liliaceae, Brassicaceae, Polygonaceae, Linaceae and Caryophyllaceae. Families whose level of endemism is much lower on serpentine than it is statewide include Fabaceae, Poaceae, Boraginaceae, and Rosaceae (Fig. 1).

The most diverse genera in our list of serpentine endemics are *Streptanthus* (Brassicaceae) and *Eriogonum* (Polygonaceae), followed by *Hesperolimon* (Linaceae) and *Arctostaphylos* (Ericaceae) (Table 2). There are 21 genera with at least four taxa among the endemics. These represent 14 plant families, with Asteraceae (four genera among the endemics), Liliaceae (three genera), Scrophulariaceae (two genera) and Brassicaceae (two genera) the only families with multiple genera in the list. Figure 2 compares the contribution of these genera to the serpentine endemic flora with their contribution to the California endemic flora. All but five or six of these genera have a greater level of endemism to serpentine than they have within the State as a

TABLE 1. NUMBERS OF SERPENTINE ENDEMIC AND NEAR ENDEMIC TAXA, BY FAMILY. ¹ Strict endemics. ² Strict endemics plus broad endemics. ³ Strict and broad endemics plus "near endemic" taxa (taxa transitional from strong indicators to broad endemics).

Family	Serpentine affinity score			Total taxa
	≥5.5 ¹	≥4.5 ²	≥3.5 ³	
Asteraceae	26	37	45	106
Liliaceae	15	28	37	85
Brassicaceae	21	26	31	46
Polygonaceae	10	17	19	39
Scrophulariaceae	9	14	18	37
Apiaceae	7	10	13	32
Linaceae	8	9	9	14
Ericaceae	5	8	10	15
Polemoniaceae	6	7	8	18
Caryophyllaceae	5	7	8	18
Fabaceae	4	7	10	24
Lamiaceae	4	6	10	17
Crassulaceae	5	5	7	13
Rhamnaceae	4	5	6	14
Campanulaceae	3	5	8	12
Onagraceae	3	5	7	12
Hydrophyllaceae	4	4	8	15
Rubiaceae	3	4	4	8
Convolvulaceae	1	4	5	6
Cyperaceae	1	4	5	8
Poaceae	1	3	3	19
Portulacaceae	0	3	5	16
Boraginaceae	2	2	3	10
Gentianaceae	2	2	2	3
Iridaceae	2	2	2	4
Malvaceae	2	2	2	5
Salicaceae	2	2	2	3
Garryaceae	1	2	2	2
Rosaceae	1	2	5	10
Cupressaceae	0	2	3	6
Violaceae	0	2	3	7
Asclepiadaceae	1	1	1	1
Berberidaceae	1	1	1	4
Dryopteridaceae	1	1	1	2
Fagaceae	1	1	1	3
Lentibulariaceae	1	1	1	1
Papaveraceae	1	1	1	5
Ranunculaceae	1	1	3	6
Orchidaceae	0	1	1	3
Pteridaceae	0	1	1	4
Verbenaceae	0	1	1	1
Cistaceae	0	0	0	1
Orobanchaceae	0	0	0	1
Pinaceae	0	0	1	6
Plantaginaceae	0	0	0	1
Polygalaceae	0	0	0	1
Primulaceae	0	0	0	1
Sarraceniaceae	0	0	1	1
Saxifragaceae	0	0	1	2
Sterculiaceae	0	0	0	1
Totals	164	246	315	669

whole. These genera include *Streptanthus*, *Hesperolinon*, *Lomatium* and *Minuartia*. Only one genus (*Phacelia*) contributes less to the serpentine endemic flora than it does to the State as a whole; *Ar-*

tostaphylos contributes a similar percentage to both floras (Fig. 2).

Of the taxa in our database, there are 532 dicots (of which 204 are endemic), 119 monocots (38 endemics), 12 gymnosperms (2 endemics) and six pteridophytes (2 endemics). 207 taxa are annual forbs (of which 71 are endemics, including 7 of 14 that can also be perennial/biennial), 383 are perennial forbs (150 endemics, including the 7 "annuals" and 6 taxa which can also be shrubs), 24 are perennial graminoids (7 endemics), 64 are shrubs (23 endemics, including 6 taxa shared with the perennial forbs and 1 which assumes both tree and shrub forms), and 12 are trees (2 endemics) (Appendix 1). Of the endemic perennial forbs, 24 are bulb plants (all Liliaceae), 17 are rhizomatous (from ten different Families), three are hemiparasites (Scrophulariaceae), and one is carnivorous (Lentibulariaceae) (Appendix 1).

Using Kruckeberg's (1984) physiographic provinces of California (which correspond more or less to major geographic subdivisions mapped in the Jepson Manual (Hickman 1993)), we found the following geographic distribution of serpentine endemic taxa (Fig. 3): The North Coast, considered *in toto* (i.e., the Jepson Manual's NCo and NCoR subregions (Hickman 1993)), supports approximately 118 serpentine endemics, with 49 of these restricted to that area. The Klamath Region (Jepson Manual subregion KR), supports 98 endemic taxa, with 54 restricted to that area (including taxa also found in neighboring SW Oregon). The San Francisco Bay Area (Jepson Manual subregion SnFrB plus the sections of NCo and CCo bordering it) supports about 51 endemics, with 24 found only there. The South Coast Ranges, including the Channel Islands and the Santa Ana Mountains (i.e., Jepson Manual subregions CCo, SCoR plus the few ultramafic outcrops that occur in the Jepson SW Region), support 43 total endemics with 24 restricted to that area. The Sierra Nevada (Jepson Manual region SN) support 38 total serpentine endemic taxa, with 21 taxa restricted to the Range (Fig. 3).

Of the 669 taxa in our database, 295 are listed as "rare" or "uncommon" by the California Native Plant Society (CNPS) (Appendix 1). These include 194 of the 246 taxa that we consider to be either strict or broad serpentine endemics. One serpentine endemic taxon, *Arctostaphylos hookeri* subsp. *franciscana*, is extinct in the wild and survives only in cultivation. Of the 295 rare or uncommon taxa, 154 are on CNPS List 1b, which lists plants considered threatened or endangered by either the State or Federal governments, as well as unlisted plants which CNPS considers rare enough to warrant listing; 111 of these List 1b plants are serpentine endemics by our definition. Nine taxa (seven endemics) from Appendix 1 are on CNPS list 2, which contains plant taxa that are rare in California but are not restricted completely to the State; all of these taxa are either State listed and threatened or endangered,

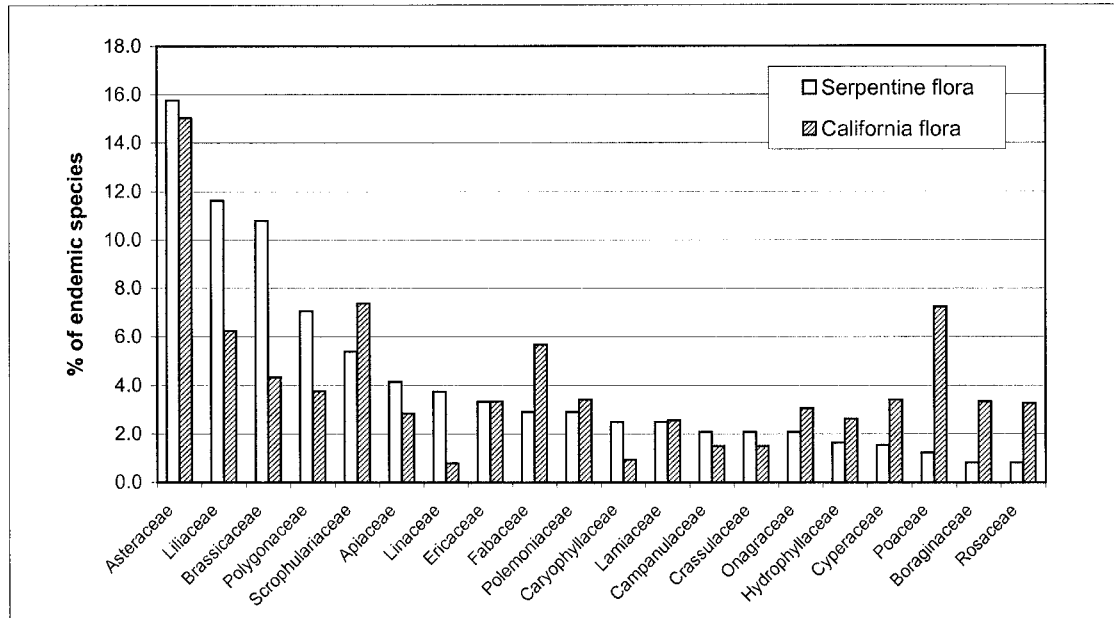


FIG. 1. The twenty most important plant families of serpentine endemic plants (i.e., including strict and broad serpentine endemics), with the percentage of endemic species they contribute to the serpentine endemic flora in California, and to the California endemic flora as a whole.

or are eligible for listing. Eight taxa (four endemics) in Appendix 1 are found on CNPS list 3, which lists uncommon taxa for which more information is required. Of taxa in Appendix 1, 123 (71 endemics) are on CNPS list 4, which contains taxa of "limited distribution or infrequent throughout a broader area in California".

TABLE 2. GENERA WITH MORE THAN THREE TAXA ENDEMIC TO SERPENTINE.

Genus	Family	Endemic taxa
<i>Streptanthus</i>	Brassicaceae	18
<i>Eriogonum</i>	Polygonaceae	14
<i>Hesperolinon</i>	Linaceae	9
<i>Arctostaphylos</i>	Ericaceae	8
<i>Allium</i>	Liliaceae	7
<i>Lomatium</i>	Apiaceae	7
<i>Packera (Senecio)</i>	Asteraceae	6
<i>Calochortus</i>	Liliaceae	5
<i>Cordylanthus</i>	Scrophulariaceae	5
<i>Arabis</i>	Brassicaceae	4
<i>Calystegia</i>	Convolvulaceae	4
<i>Carex</i>	Cyperaceae	4
<i>Castilleja</i>	Scrophulariaceae	4
<i>Cirsium</i>	Asteraceae	4
<i>Erigeron</i>	Asteraceae	4
<i>Fritillaria</i>	Liliaceae	4
<i>Galium</i>	Rubiaceae	4
<i>Lessingia</i>	Asteraceae	4
<i>Minuartia</i>	Caryophyllaceae	4
<i>Monardella</i>	Lamiaceae	4
<i>Phacelia</i>	Hydrophyllaceae	4

DISCUSSION

In 1984, Kruckeberg estimated that the serpentine endemic flora of California numbered approximately 220 taxa (about 180 full species), and that a further 230 taxa were sufficiently associated with ultramafics to be "indicators" of the substrate. Thus, Kruckeberg believed that about 450 taxa were associated with serpentine in California. Although our results suggest that the number of serpentine-associated taxa is closer to 670, they also suggest that Kruckeberg's (1984) estimate of the number of full-species endemics was remarkably accurate (180 vs. 176). As Kruckeberg's numbers also suggested, serpentine endemics therefore comprise approximately 12.5% (176/1410) of the plant species endemic to California. Based on numbers from the Jepson Manual (Hickman 1993; R. Moe personal communication), the percentage of serpentine endemics among California endemic species, subspecies and varieties is about 11.4% (246/2153).

Kruckeberg's (1984) estimates of endemics by California geographic region are somewhat less accurate than his statewide estimate (see Fig. 3), but Kruckeberg's data sources in the 1970's and early 1980's were extremely limited compared to ours. As did Kruckeberg, we found that the North Coast Ranges support more serpentine endemics plants than any other geographic region, but that the Klamath Ranges (and adjoining SW Oregon) support many more restricted endemics than Kruckeberg thought was the case (54 vs. 30). Kruckeberg's estimates for the numbers of restricted endemics in

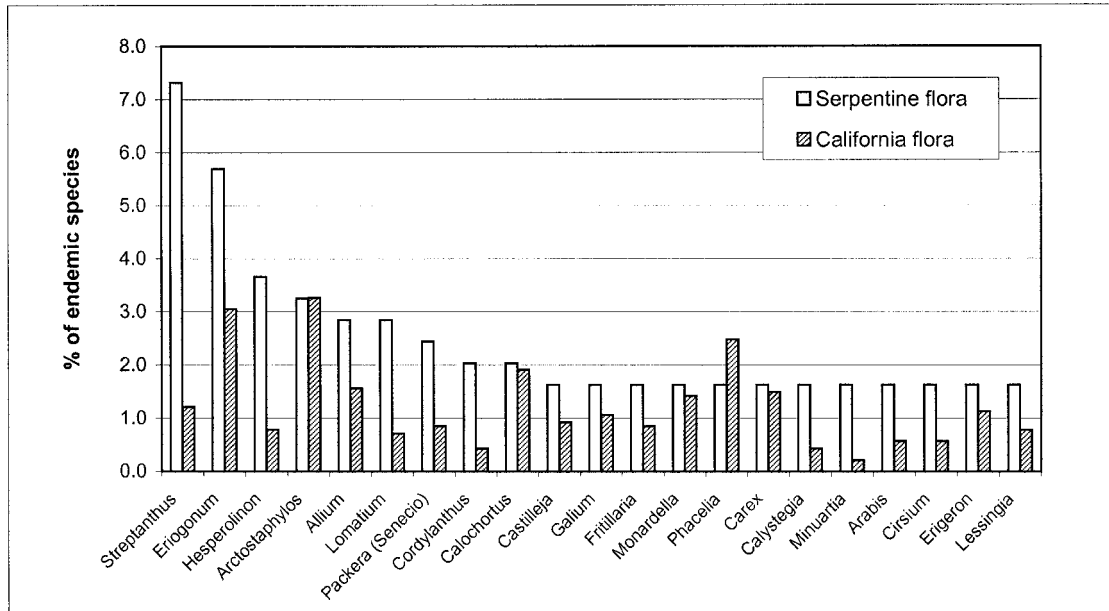


FIG. 2. The twenty-one most important genera of serpentine endemic plants (i.e., including strict and broad serpentine endemics), with the percentage of endemic species they contribute to the serpentine endemic flora in California, and to the California endemic flora as a whole.

the North Coast Ranges and the Bay Area are very similar to our numbers (Fig. 3), but he overestimated the number of endemics in the South Coast Ranges (36 vs. 24). Kruckeberg estimated that either 13 or 16 (depending on whether one goes by the text or the tables in Appendix E) endemic taxa were restricted to the Sierra Nevada; we found 21 taxa thus restricted.

Reasons for differences between our numbers and Kruckeberg's (1984) are many, but belong to two broad categories. The primary reason is quality and quantity of information. In many cases, Kruckeberg's information had to come through his own field experience, or through hard copy herbarium records, which—before the late 1970's—were no-

toriously uninformative when it came to habitat description. In contrast, many data sources we accessed were available electronically and could be queried and retrieved remotely.

The other principal reason for difference is the inevitable discoveries and taxonomic reorganizations that occur over a 20-year period. Kruckeberg's work came before publication of the Jepson Manual (Hickman 1993), which contained many significant changes in California plant taxonomy. A considerable number of serpentine endemic taxa in the Jepson Manual were wholly unknown to Kruckeberg in 1984. Examples include *Calochortus raichei* S. Farwig & V. Girard, *Minuartia stolonifera* T. W. Nelson & J. P. Nelson, *Perideridia bacigalupii* Chuang & Constance, and *Monardella stebbinsii* Hardham & J. Bartel. Since the Manual's publication, there have been further changes (e.g., Barkley 1999; Baldwin 1999; Porter and Johnson 2000). Serpentine endemic taxa named since publication of the Jepson Manual include *Harmonia guggolziorum* B. G. Baldwin, *Carex serpenticola* P. F. Zika, and *Silene serpenticola* T. W. Nelson & J. P. Nelson.

As a null hypothesis, one might expect that the distribution of endemic plant taxa across plant families and genera on California serpentine would more or less mirror the distribution of endemics in the State as a whole. Our data demonstrate that this assumption is incorrect at both taxonomic levels, but the root of this difference seems to be largely at the level of genus. A number of families contribute a much higher proportion of the serpentine

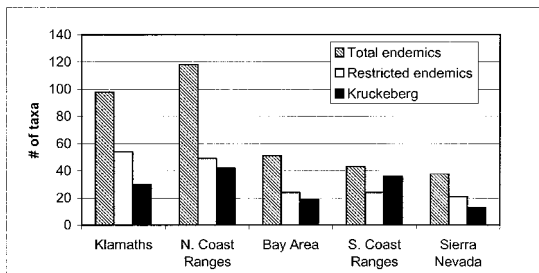


FIG. 3. Geographic distribution of serpentine endemic taxa in California. "Total endemics" includes all California serpentine endemic taxa present in a given region; "restricted endemics" includes only those taxa restricted to a given region; black bars represent Kruckeberg's (1984) estimates of restricted endemics.

TABLE 3. EXAMPLES OF "REGIONAL" SERPENTINE INDICATORS, *SENSU* KRUCKEBERG (1984). ¹ CA = California, KL = Klamath Ranges, NC = North Coast Ranges, BA = San Francisco Bay Area, SC = South Coast Ranges, SN = Sierra Nevada.

Taxon	Distribution ¹	Comments ¹
<i>Allium amplexans</i>	CA	SC—broad endemic; Northern CA—weak indicator at best
<i>Aspidotis densa</i>	CA	Marin County—broad endemic; rest of NC—weak to strong indicator; KL—broad endemic to strong indicator, depending on locality; rest of CA—strong indicator
<i>Festuca californica</i>	CA	Northern SN and KL—strong indicator to broad endemic; NC—primarily weak indicator; rest of CA—indifferent
<i>Lupinus onustus</i>	KL, SN	KL—broad endemic; SN—indifferent (mostly non-ultramafic)
<i>Pinus attenuata</i>	CA	Mendocino County and neighboring NC—broad endemic; rest of NC and SC—strong indicator; KL—weak indicator; SN—weak indicator to indifferent
<i>Pinus jeffreyi</i>	KL, NC, SC, SN	KL and NC—± strict endemic; Westslope of northern SN—strong indicator; rest of CA—indifferent
<i>Quercus vaccinifolia</i>	KL, NC, SN	Mendocino County and neighboring NC—broad endemic; Northern NC and KL—weak indicator; SN—indifferent
<i>Sedum obtusatum</i> ssp. <i>obtusatum</i>	KL, SN	KL and NC—± broad endemic; SN—weak indicator or indifferent
<i>Stachys pycnantha</i>	CA	Marin County—broad endemic to strong indicator; Northern SN—very weak indicator; rest of CA—weak indicator or indifferent
<i>Viola douglasii</i>	CA	Plumas County—endemic; NC—strong indicator; rest of CA—indifferent

endemic flora than they do of the California endemic flora (Fig. 1), but our database shows that most of these "anomalies" are due to one or two genera within those families (see Fig. 2). Examples include *Fritillaria* and *Allium* in Liliaceae, *Minuartia* in Caryophyllaceae, *Streptanthus* and *Arabis* in Brassicaceae, *Hesperolinon* in Linaceae, and *Eriogonum* in Polygonaceae. Many of these genera are well-known as foci of neoendemism (i.e., genera with groups of actively and rapidly speciating taxa) (Raven and Axelrod 1978). It is interesting that such prominent California plant families like Scrophulariaceae, Hydrophyllaceae, Boraginaceae, Onagraceae and Polemoniaceae are underrepresented on serpentine substrates. Certain highly diverse genera in California are also proportionally underrepresented as serpentine endemics (e.g., *Clarkia*, *Phacelia*, *Ceanothus*, *Gilia*, and *Mimulus*).

As we constructed our database, taxa with high variability in serpentine affinity scores were tagged for further research (e.g., through accession records; see Methodology) so that we might be able to discern taxa that truly varied geographically in their affinities from taxa that simply suffered from inadequate or faulty information. The former were called "regional indicators" by Kruckeberg (1984), i.e., taxa that are considered serpentine endemics or indicators in one part of their range but show less or no affinity for ultramafic substrates in other parts of their range. In his Appendix D, Kruckeberg (1984) tried to summarize where the different regional indicators he had identified occurred on ultramafics. We refer the reader to Kruckeberg (1984) for details on these taxa (most of which also occur in our database), but most regional indicators in our database can be recognized by searching for taxa with: (1) relatively wide geographic distributions,

(2) lower mean serpentine affinity scores, and (3) high standard deviations in their affinity scores. Table 3 lists ten examples of regional indicator taxa in our database.

Some of the variability in our serpentine affinity scores is thus due to geographic variation in affinities, but some is also due to inadequate, statistically biased, or even faulty information from our sources. We attempted to offset these sources of variability by including as many sources as possible in our database (and by using accession records), but were not successful in all cases. We consider any taxon with a standard deviation in affinity score > 1.5, or having fewer than three sources, as being in "need of further research"; this includes about a third of the taxa in our database. Examples of such taxa include: *Lupinus lapidicola*—called a strict serpentine endemic by Kruckeberg (1984) and a strong serpentine indicator by CNPS (2004), and with 2/2 accession records in SMASCH with ultramafic habitat descriptions, but stated as occurring only on granites by the Jepson Manual (Hickman 1993) and Munz and Keck (1973); *Phacelia phacelioides*—Kruckeberg (1984) and V. Yadon (personal communication) believe this is a strict endemic, but the Jepson Manual is mute on the subject, and only 1/3 accession records in SMASCH are on ultramafics (but the two nonserpentine locations may have misidentified geology given the location); and *Allium lacunosum* var. *lacunosum*—both the Jepson Manual and Kruckeberg rate this as a strict endemic, Munz and Keck score it a strong indicator, but SMASCH has only 1/6 records on ultramafics.

Some species had surprising levels of ultramafic affinity. For example, our database includes a number of taxa that we personally have only rarely seen

on serpentine (e.g., *Lathyrus vestitus* var. *vestitus*, *Apiastrum angustifolium*, *Emmenanthe penduliflora* var. *penduliflora*). It also includes other taxa which we would have characterized as being clearly indifferent to ultramafic substrates, but which scored higher based on our sources (e.g., *Adenostoma fasciculatum*, *Pinus balfouriana* ssp. *balfouriana*). As noted above, some of these “discrepancies” may be due to inadequate or biased data—the ultramafic affinity of these types of taxa will drop as we collect more information. Many of these surprising affinities are probably real however, and they are simply a sign of our limited knowledge of the relationships between California plant life and ultramafic substrates.

In accession records, and in the literature, botanists and ecologists frequently misidentified basic rock types. For example, in accession records we found a number of examples of peridotite being called “volcanics” or even “sandstones”. We also found multiple examples, in accession records as well as in the literature, of gabbro and other basic intrusive rocks being misidentified as ultramafics. Gabbro and “basic” rocks are “mafic” in composition—that is to say, they usually contain visible feldspars and they are geochemically distinct from ultramafic rocks. For example, the average alkali-gabbro contains 4–5 times as much Na as peridotite, 5–10 times as much P, 3–4 times as much K and Ca, and about 1/3 as much Mg (Ehlers and Blatt 1982). The famous gabbro outcrops of Eldorado County (Pine Hill) or San Diego County are therefore *not* ultramafic, even though the effect of the substrate on plant physiognomy and community composition may appear similar. A number of species in our database appear to be primarily, if not exclusively gabbro endemics, but we lacked sufficient information to remove them from our list. These include *Acanthomintha ilicifolia*, *Fremontodendron californicum* ssp. *decumbens*, and *Calochortus weedii* var. *vestus*.

As has been frequently noted (Mason 1946a, b; Raven and Axelrod 1978; Kruckeberg 1984, 2002; Skinner and Pavlik 1994; McCarten 1997), California’s ultramafic soils support a very high proportion of the State’s rare plants. Based on our database, almost 11% (111/1021) of California’s rare plant taxa are either broadly or strictly restricted to ultramafic substrates; 15% of List 1b taxa (154/1021) show high affinity for ultramafic substrates (i.e., they are endemics or indicators). In northwestern California, 15% of plant taxa managed as “sensitive” by the Forest Service are serpentine endemics, and fully 30% are closely associated with ultramafics (J. K. Nelson and L. Hoover personal communication). In 2002, Kruckeberg wrote that “preservation of serpentine habitats in California is spotty, inadequate, and largely coincidental”. Given the great importance of ultramafic substrates to the richness and distinctiveness of the California flora, the conservation of these unique habitats

should be a high priority for land management agencies and private conservation organizations throughout the State.

Our database of serpentine affinity updates, and expands on the widely-used tables of serpentine endemic and “indicator” taxa published in 1984 by Art Kruckeberg in his classic monograph on California serpentine ecology. Our data are also a quantitative synthesis of the qualitative (and usually incomplete) allusions to serpentine affinity contained in habitat descriptions in California floras and flora databases, including Munz and Keck (1973), Hickman (1993), Oswald (2002), the online CalFlora Database (CalFlora 2004), and the California Native Plant Society Online Inventory of Rare and Endangered Plants (CNPS 2004). Our data on serpentine endemism should prove valuable to efforts in ecology, biosystematics (Baldwin 1995), conservation, and land management. In particular, we hope that our database will help us better understand the nature and degree of serpentine endemism in the California flora, and we hope it will spur the collection of additional, critical information necessary for conserving the rare plants and habitats of ultramafic substrates.

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APPENDIX 1. PLANT TAXA WITH HIGH AFFINITY TO ULTRAMAFIC SUBSTRATES IN CALIFORNIA. Ordered by family and taxon. ¹ Names as in Hickman (1993); names in parentheses are based on more recent revisions (see text for sources). ² Affinity: SE = strict endemic, BE = broad endemic, BE/SI = broad endemic/strong indicator, SI = strong indicator, WI = weak indicator, WI/IN = weak indicator/indifferent. ³ Mean affinity score, including information from CalFlora. ⁴ Sum of all affinity scores, including CalFlora. ⁵ Median of affinity scores. ⁶ Standard deviation of affinity scores. ⁷ Standard error of affinity scores. ⁸ California Native Plant Society rarity codes, from CNPS Inventory of Rare and Endangered Plants of California, 11-2004. ⁹ Geographic distribution: KL = Klamath Ranges, NC = North Coast Ranges, BA = San Francisco Bay Area, SC = South Coast Ranges, SN = Sierra Nevada. ¹⁰ Taxonomic category. ¹¹ carn = carnivorous, cesp = cespitose, hemipar = hemiparasitic, paras = parasitic, rhiz = rhizomatous. See text for more information.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Angelica tomentosa</i>	Apiaceae	SI	2.7	8	3	3.0	1.5	0.9		1	1		1		Dicot	Perennial forb
<i>Apiastrum angustifolium</i>	Apiaceae	WI	1.5	7.6	5	0.1	2.5	1.1		1	1	1	1		Dicot	Annual forb
<i>Ligusticum californicum</i>	Apiaceae	WI/IN	1.4	5.75	4	1.4	1.3	0.7		1	1			1	Dicot	Perennial forb
<i>Lomatium ciliolatum</i>	Apiaceae	SE	6.0	18	3	6.0	0.0	0.0			1	1	1		Dicot	Perennial forb
<i>Lomatium congdonii</i>	Apiaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b					1	Dicot	Perennial forb
<i>Lomatium dasycarpum</i> ssp. <i>dasycarpum</i>	Apiaceae	BE/SI	3.6	21.5	6	3.5	1.9	0.8			1	1	1		Dicot	Perennial forb
<i>Lomatium engelmannii</i>	Apiaceae	SE	5.8	34.5	6	6.0	0.8	0.3	4	1	1				Dicot	Perennial forb
<i>Lomatium hooveri</i>	Apiaceae	SE	5.9	29.5	5	6.0	0.4	0.2	4		1				Dicot	Perennial forb
<i>Lomatium howellii</i>	Apiaceae	SE	6.1	24.5	4	6.0	0.0	0.0	4	1					Dicot	Perennial forb
<i>Lomatium macrocarpum</i>	Apiaceae	SI	2.7	8	3	3.0	0.6	0.3		1	1	1	1	1	Dicot	Perennial forb
<i>Lomatium marginatum</i>	Apiaceae	BE	5.0	25	5	6.0	1.4	0.6		1	1			1	Dicot	Perennial forb
<i>Lomatium observatorium</i>	Apiaceae	WI/IN	1.4	2.75	2	1.4	0.9	0.6				1	1		Dicot	Perennial forb
<i>Lomatium parvifolium</i>	Apiaceae	SI	3.3	13	4	3.0	2.3	1.1	4				1		Dicot	Perennial forb
<i>Lomatium repostum</i>	Apiaceae	SI	3.2	12.6	4	3.0	2.4	1.2	4		1				Dicot	Perennial forb
<i>Lomatium tracyi</i>	Apiaceae	SE	6.1	42.5	7	6.0	0.0	0.0	4	1	1				Dicot	Perennial forb
<i>Lomatium tritermatum</i> var. <i>tritermatum</i>	Apiaceae	SI	2.8	11	4	2.0	2.4	1.2		1	1				Dicot	Perennial forb
<i>Lomatium utriculatum</i>	Apiaceae	WI	1.7	8.5	5	1.0	1.4	0.6		1	1	1	1	1	Dicot	Perennial forb
<i>Perideridia bacigalupii</i>	Apiaceae	BE	4.6	23	5	6.0	2.4	1.1	4					1	Dicot	Perennial forb
<i>Perideridia kelloggii</i>	Apiaceae	WI	2.1	10.6	5	2.0	2.0	0.9			1	1	1	1	Dicot	Perennial forb
<i>Perideridia leptocarpa</i>	Apiaceae	SE	5.6	22.5	4	6.0	1.0	0.5	4	1					Dicot	Perennial forb
<i>Perideridia oregana</i>	Apiaceae	WI	1.7	5	3	1.0	1.2	0.7		1	1	1	1		Dicot	Perennial forb
<i>Perideridia pringlei</i>	Apiaceae	BE/SI	3.7	18.5	5	3.0	2.3	1.0	4				1		Dicot	Perennial forb
<i>Sanicula bipinnatifida</i>	Apiaceae	WI	1.8	7.1	4	2.0	1.5	0.7		1	1	1	1	1	Dicot	Perennial forb
<i>Sanicula hoffmannii</i>	Apiaceae	WI	1.8	3.5	2	1.5	2.1	1.5	4				1		Dicot	Perennial forb
<i>Sanicula maritima</i>	Apiaceae	WI	2.3	4.5	2	2.0	0.0	0.0	1b			1	1		Dicot	Perennial forb
<i>Sanicula peckiana</i>	Apiaceae	BE	5.3	26.5	5	6.0	1.3	0.6	4	1					Dicot	Perennial forb
<i>Sanicula tracyi</i>	Apiaceae	WI	2.1	8.5	4	1.0	2.6	1.3			1				Dicot	Perennial forb
<i>Sanicula tuberosa</i>	Apiaceae	WI/IN	1.3	3.75	3	1.0	0.7	0.4			1		1	1	Dicot	Perennial forb
<i>Tauschia glauca</i>	Apiaceae	BE/SI	3.5	10.5	3	3.0	0.6	0.3	4		1				Dicot	Perennial forb
<i>Tauschia hartwegii</i>	Apiaceae	WI/IN	1.3	4	3	1.0	1.5	0.9				1	1	1	Dicot	Perennial forb
<i>Tauschia howellii</i>	Apiaceae	WI	2.3	7	3	1.0	3.2	1.9		1					Dicot	Perennial forb
<i>Tauschia kelloggii</i>	Apiaceae	SI	2.6	12.75	5	2.0	2.2	1.0			1		1	1	Dicot	Perennial forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Asclepias solanoana</i>	Asclepiadaceae	SE	6.0	42	7	6.0	0.0	0.0	4		1				Dicot	Perennial forb
<i>Agoseris heterophylla</i>	Asteraceae	WI/IN	1.4	4.1	3	1.0	1.5	0.9		1	1	1	1	1	Dicot	Annual forb
<i>Ancistrocarphus filagineus</i>	Asteraceae	SI	3.3	13	4	3.0	0.5	0.3		1	1	1	1	1	Dicot	Annual forb
<i>Antennaria argentea</i>	Asteraceae	WI	1.9	7.75	4	0.8	2.7	1.4		1	1				Dicot	Perennial forb
<i>Antennaria suffrutescens</i>	Asteraceae	SE	5.6	22.5	4	6.0	1.0	0.5	4	1	1				Dicot	Perennial forb
<i>Arnica cernua</i>	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	4	1					Dicot	Perennial forb (rhiz.)
<i>Arnica spathulata</i>	Asteraceae	SE	5.5	16.5	3	6.0	1.2	0.7	4	1					Dicot	Perennial forb (rhiz.)
<i>Aster oregonensis</i>	Asteraceae	WI/IN	1.1	3.25	3	1.0	0.9	0.5		1	1			1	Dicot	Perennial forb
<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	Asteraceae	SI	2.5	15	6	2.0	1.1	0.5	1b			1		1	Dicot	Perennial forb
<i>Balsamorhiza sericea</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Brickellia greenei</i>	Asteraceae	BE/SI	3.7	11	3	4.0	0.6	0.3		1	1			1	Dicot	Perennial forb
<i>Cacaliopsis nardosmia</i>	Asteraceae	WI/IN	1.3	4	3	2.0	1.2	0.7		1	1				Dicot	Perennial forb
<i>Calycadenia multiglandulosa</i>	Asteraceae	SI	3.1	15.5	5	3.0	1.2	0.6			1	1	1	1	Dicot	Annual forb
<i>Calycadenia oppositifolia</i>	Asteraceae	SI	2.6	18	7	2.0	1.6	0.6	1b					1	Dicot	Annual forb
<i>Calycadenia pauciflora</i>	Asteraceae	BE	5.3	21	4	5.5	1.0	0.5			1				Dicot	Annual forb
<i>Calycadenia truncata</i>	Asteraceae	WI	2.1	12.5	6	2.5	1.1	0.5		1	1	1	1	1	Dicot	Annual forb
<i>Chaenactis glabriuscula</i> var. <i>glabriuscula</i>	Asteraceae	WI	1.7	5.1	3	2.0	1.5	0.9				1	1	1	Dicot	Perennial forb
<i>Chaenactis glabriuscula</i> var. <i>heterocarpha</i>	Asteraceae	SI	2.5	10	4	2.5	0.6	0.3			1	1	1	1	Dicot	Annual forb
<i>Chaenactis suffrutescens</i>	Asteraceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Chrysothamnus nauseosus</i> ssp. <i>consimilis</i>	Asteraceae	WI	1.8	8.85	5	2.0	1.5	0.7		1	1			1	Dicot	Shrub
<i>Cirsium andrewsii</i>	Asteraceae	WI	1.7	5	3	2.0	0.9	0.5	1b			1			Dicot	Perennial forb
<i>Cirsium cymosum</i>	Asteraceae	SI	3.0	12	4	2.0	2.0	1.0		1	1	1	1	1	Dicot	Perennial forb
<i>Cirsium douglasii</i> var. <i>breweri</i>	Asteraceae	SI	3.0	12	4	3.0	1.6	0.8		1	1			1	Dicot	Perennial forb
<i>Cirsium fontinale</i> var. <i>campylon</i>	Asteraceae	SE	5.9	29.5	5	6.0	0.4	0.2	1b			1	1		Dicot	Perennial forb
<i>Cirsium fontinale</i> var. <i>fontinale</i>	Asteraceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b			1	1		Dicot	Perennial forb
<i>Cirsium fontinale</i> var. <i>obispoense</i>	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1		1	Dicot	Perennial forb
<i>Cirsium hydrophilum</i> var. <i>vaseyi</i>	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1	1			Dicot	Perennial forb
<i>Cirsium remotifolium</i>	Asteraceae	WI/IN	1.0	3.1	3	1.0	1.0	0.5		1	1	1			Dicot	Perennial forb
<i>Coreopsis stillmanii</i>	Asteraceae	SI	2.7	8	3	3.0	0.6	0.3			1		1	1	Dicot	Annual forb
<i>Crepis pleurocarpa</i>	Asteraceae	WI	2.0	10	5	2.0	0.7	0.3		1	1			1	Dicot	Perennial forb
<i>Ericameria arborescens</i>	Asteraceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1	1		1	1	Dicot	Shrub
<i>Ericameria greenei</i>	Asteraceae	WI	2.0	8.1	4	1.5	2.1	1.1		1	1			1	Dicot	Shrub
<i>Ericameria ophitidis</i>	Asteraceae	SE	5.5	38.5	7	6.0	1.0	0.4	4	1	1				Dicot	Shrub

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Erigeron angustatus</i>	Asteraceae	SE	5.7	28.5	5	6.0	0.9	0.4	1b		1				Dicot	Perennial forb
<i>Erigeron bloomeri</i> var. <i>nudatus</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	2	1					Dicot	Perennial forb
<i>Erigeron cervinus</i>	Asteraceae	SI	3.3	10	3	4.0	3.1	1.8		1					Dicot	Perennial forb (rhiz.)
<i>Erigeron decumbens</i> var. <i>robustior</i>	Asteraceae	WI	1.5	4.5	3	2.0	1.2	0.7	4		1				Dicot	Perennial forb
<i>Erigeron foliosus</i> var. <i>confinis</i>	Asteraceae	BE/SI	3.7	11	3	3.0	1.2	0.7		1					Dicot	Perennial forb
<i>Erigeron lassenianus</i> var. <i>deficiens</i>	Asteraceae	WI	1.7	5	3	2.0	1.5	0.9					1		Dicot	Perennial forb
<i>Erigeron petrophilus</i> var. <i>sierrensis</i>	Asteraceae	BE	4.8	28.5	6	6.0	2.1	0.8	4				1		Dicot	Perennial forb (rhiz.)
<i>Erigeron petrophilus</i> var. <i>viscidulus</i>	Asteraceae	WI	2.4	9.5	4	2.0	0.5	0.3	4	1					Dicot	Perennial forb (rhiz.)
<i>Erigeron reductus</i>	Asteraceae	WI	2.0	8	4	2.0	1.6	0.8		1	1			1	Dicot	Perennial forb
<i>Erigeron serpentinus</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1				Dicot	Perennial forb
<i>Eriophyllum confertiflorum</i> var. <i>tanacetiflorum</i>	Asteraceae	WI	1.9	3.75	2	1.9	1.6	1.1						1	Dicot	Shrub
<i>Eriophyllum jepsonii</i>	Asteraceae	BE/SI	3.5	17.5	5	3.0	1.5	0.7	4			1	1		Dicot	Shrub
<i>Eriophyllum lanatum</i> var. <i>achillaeoides</i>	Asteraceae	WI	2.3	7	3	2.0	0.6	0.3		1	1	1	1	1	Dicot	Shrub
<i>Eriophyllum lanatum</i> var. <i>lanceolatum</i>	Asteraceae	WI	1.7	5	3	2.0	1.5	0.9		1	1				Dicot	Shrub
<i>Eriophyllum latilobum</i>	Asteraceae	SE	5.5	16.5	3	6.0	1.2	0.7	1b			1	1		Dicot	Shrub
<i>Grindelia hirsutula</i> var. <i>davyi</i>	Asteraceae	WI	1.8	5.25	3	2.0	1.4	0.8			1			1	Dicot	Perennial forb
<i>Grindelia hirsutula</i> var. <i>hirsutula</i>	Asteraceae	WI/IN	1.2	3.6	3	1.0	1.0	0.5				1	1		Dicot	Perennial forb
<i>Grindelia hirsutula</i> var. <i>maritima</i>	Asteraceae	WI	1.7	5	3	2.0	0.9	0.5	1b			1			Dicot	Perennial forb
<i>Gutierrezia californica</i>	Asteraceae	WI	1.8	5.25	3	2.0	1.4	0.8			1	1	1		Dicot	Perennial forb, Shrub
<i>Harmonia guggolziorum</i>	Asteraceae	SE	6.0	18	3	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Hazardia stenolepis</i>	Asteraceae	WI	2.0	6.1	3	3.0	1.7	1.0					1		Dicot	Shrub (stem succulent)
<i>Hazardia whitneyi</i> var. <i>discoidea</i>	Asteraceae	WI	1.9	5.75	3	2.0	1.1	0.7			1				Dicot	Perennial forb, Shrub
<i>Hazardia whitneyi</i> var. <i>whitneyi</i>	Asteraceae	WI/IN	1.0	2	2	1.0	1.4	1.0						1	Dicot	Perennial forb, Shrub
<i>Helenium bigelovii</i>	Asteraceae	SI	2.9	11.5	4	2.5	2.3	1.2		1	1		1	1	Dicot	Perennial forb
<i>Helianthus exilis</i>	Asteraceae	SE	5.7	45.5	8	6.0	1.1	0.4	4	1	1		1	1	Dicot	Annual, Perennial forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Hemizonia congesta</i> ssp. <i>calyculata</i>	Asteraceae	WI	1.5	4.5	3	2.0	1.2	0.7	4		1				Dicot	Annual forb
<i>Hemizonia congesta</i> ssp. <i>congesta</i>	Asteraceae	WI/IN	1.3	4	3	2.0	1.2	0.7			1	1	1		Dicot	Annual forb
<i>Hemizonia congesta</i> ssp. <i>tracyi</i>	Asteraceae	WI	1.8	5.25	3	2.0	0.7	0.4	4		1				Dicot	Annual forb
<i>Hemizonia halliana</i>	Asteraceae	SI	3.0	12	4	3.0	2.4	1.2					1		Dicot	Annual forb
<i>Hesperivax sparsiflora</i> var. <i>sparsiflora</i>	Asteraceae	WI	1.8	7.25	4	1.5	1.6	0.8			1	1	1		Dicot	Annual forb
<i>Heterotheca oregona</i> var. <i>oregona</i>	Asteraceae	WI	2.0	6	3	3.0	1.7	1.0			1	1		1	Dicot	Perennial forb
<i>Hieracium bolanderi</i>	Asteraceae	BE/SI	3.8	15	4	4.5	2.6	1.3			1	1			Dicot	Perennial forb
<i>Hieracium greenei</i>	Asteraceae	WI	2.2	6.5	3	3.0	1.4	0.8			1	1			Dicot	Perennial forb
<i>Lagophylla glandulosa</i>	Asteraceae	WI	2.0	6.1	3	3.0	1.7	1.0			1			1	Dicot	Annual forb
<i>Lagophylla minor</i>	Asteraceae	BE	4.7	23.5	5	5.0	1.7	0.7			1			1	Dicot	Annual forb
<i>Layia discoidea</i>	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b				1		Dicot	Annual forb
<i>Layia jonesii</i>	Asteraceae	BE/SI	3.5	10.5	3	3.0	0.6	0.3	1b				1		Dicot	Annual forb
<i>Layia septentrionalis</i>	Asteraceae	SI	3.2	19	6	3.5	1.4	0.6	1b		1				Dicot	Annual forb
<i>Lessingia arachnoidea</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b			1			Dicot	Annual forb
<i>Lessingia filaginifolia</i> var. <i>californica</i>	Asteraceae	WI/IN	1.3	4	3	1.0	1.5	0.9			1	1	1	1	Dicot	Perennial forb, Shrub
<i>Lessingia hololeuca</i>	Asteraceae	SI	2.5	7.5	3	3.0	1.2	0.7	3		1	1			Dicot	Annual forb
<i>Lessingia micradenia</i> var. <i>glabrata</i>	Asteraceae	BE	5.1	30.5	6	5.5	1.3	0.5	1b			1			Dicot	Annual forb
<i>Lessingia micradenia</i> var. <i>micradenia</i>	Asteraceae	BE	5.3	31.5	6	5.5	1.0	0.4	1b			1			Dicot	Annual forb
<i>Lessingia nemaclada</i>	Asteraceae	WI	2.0	6	3	2.0	1.0	0.6			1	1	1	1	Dicot	Annual forb
<i>Lessingia occidentalis</i>	Asteraceae	BE/SI	4.1	16.5	4	4.0	1.8	0.9	4				1		Dicot	Annual forb
<i>Lessingia ramulosa</i>	Asteraceae	BE	5.4	27	5	6.0	1.3	0.6			1			1	Dicot	Annual forb
<i>Luina hypoleuca</i>	Asteraceae	WI/IN	1.4	4.25	3	2.0	1.0	0.6			1	1	1		Dicot	Perennial forb
<i>Madia doris-nilesiae</i> (= <i>Harmonia d.</i>)	Asteraceae	BE	5.4	32.5	6	5.5	0.8	0.3	1b		1				Dicot	Annual forb
<i>Madia exigua</i>	Asteraceae	WI	1.8	7.25	4	2.0	1.4	0.7			1	1	1	1	Dicot	Annual forb
<i>Madia hallii</i> (= <i>Harmonia h.</i>)	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Madia stebbinsii</i> (= <i>Harmonia s.</i>)	Asteraceae	SE	6.1	42.5	7	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Malacothrix clevelandii</i>	Asteraceae	SI	3.0	9.1	3	3.0	3.0	1.7			1	1	1	1	Dicot	Annual forb
<i>Malacothrix floccifera</i>	Asteraceae	WI	2.1	6.25	3	3.0	1.6	0.9			1	1	1	1	Dicot	Annual forb
<i>Micropus amphibolus</i>	Asteraceae	WI	2.4	7.25	3	1.0	3.1	1.8			1	1	1		Dicot	Annual forb
<i>Microseris douglasii</i>	Asteraceae	WI/IN	1.3	4	3	1.0	0.6	0.3			1	1	1	1	Dicot	Annual forb
<i>Monolopia gracilens</i>	Asteraceae	WI	2.4	4.75	2	2.4	2.3	1.6				1	1		Dicot	Annual forb
<i>Pentachaeta bellidiflora</i>	Asteraceae	WI	2.4	7.25	3	3.0	1.3	0.8	1b			1			Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Pyrrocoma racemosa</i> var. <i>congesta</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	2	1					Dicot	Perennial forb
<i>Pyrrocoma racemosa</i> var. <i>pinetorum</i>	Asteraceae	BE/SI	4.0	16	4	4.5	2.4	1.2		1					Dicot	Perennial forb
<i>Pyrrocoma racemosa</i> var. <i>racemosa</i>	Asteraceae	WI	1.7	5	3	1.0	2.1	1.2			1	1	1		Dicot	Perennial forb
<i>Raillardella pringlei</i>	Asteraceae	SE	6.0	30	5	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Rigiopappus leptocladus</i>	Asteraceae	WI	1.9	7.5	4	2.0	1.3	0.7		1	1	1	1	1	Dicot	Annual forb
<i>Rudbeckia californica</i> var. <i>glauca</i>	Asteraceae	BE	5.3	21	4	6.0	1.5	0.8		1	1				Dicot	Perennial forb
<i>Senecio clevelandii</i> var. <i>clevelandii</i> (= <i>Packera c. v. c.</i>)	Asteraceae	SE	5.8	46.5	8	6.0	0.7	0.3	4		1				Dicot	Perennial forb
<i>Senecio clevelandii</i> var. <i>heterophyllus</i> (= <i>Packera c. v. h.</i>)	Asteraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b					1	Dicot	Perennial forb
<i>Senecio eurycephalus</i> var. <i>eurycephalus</i> (= <i>Packera eurycephala</i> var. <i>eurycephala</i>)	Asteraceae	BE/SI	3.8	15	4	3.0	1.5	0.8		1	1				Dicot	Perennial forb
<i>Senecio eurycephalus</i> var. <i>lewisrosei</i> (= <i>Packera eurycephala</i> var. <i>lewisrosei</i>)	Asteraceae	SE	5.8	40.5	7	6.0	0.8	0.3	1b					1	Dicot	Perennial forb
<i>Senecio greenii</i> (= <i>Packera g.</i>)	Asteraceae	BE	5.3	32	6	6.0	1.6	0.7		1	1				Dicot	Perennial forb
<i>Senecio layneae</i> (= <i>Packera l.</i>)	Asteraceae	BE	4.9	29.5	6	5.0	1.3	0.5	1b					1	Dicot	Perennial forb
<i>Senecio macounii</i> (= <i>Packera m.</i>)	Asteraceae	BE	5.1	20.5	4	6.0	2.0	1.0	4	1					Dicot	Perennial forb
<i>Solidago guiradonis</i>	Asteraceae	SE	6.2	18.5	3	6.0	0.0	0.0	4				1		Dicot	Perennial forb
<i>Solidago multiradiata</i>	Asteraceae	WI/IN	1.1	2.1	2	1.1	1.3	1.0		1				1	Dicot	Perennial forb
<i>Stebbinsoseris decipiens</i>	Asteraceae	WI	1.8	5.5	3	2.0	0.6	0.3	1b			1	1		Dicot	Annual forb
<i>Wyethia bolanderi</i>	Asteraceae	WI	1.5	3	2	1.5	0.7	0.5						1	Dicot	Perennial forb
<i>Berberis aquifolium</i> var. <i>aquifolium</i>	Berberidaceae	WI	1.6	4.75	3	1.0	1.2	0.7		1	1			1	Dicot	Shrub
<i>Berberis aquifolium</i> var. <i>repens</i>	Berberidaceae	WI	1.7	5	3	1.0	1.2	0.7		1	1			1	Dicot	Shrub
<i>Vancouveria chrysantha</i>	Berberidaceae	SE	6.2	18.5	3	6.0	0.0	0.0	4	1	1				Dicot	Perennial forb (rhiz.)
<i>Vancouveria planipetala</i>	Berberidaceae	WI	1.7	5	3	1.0	1.2	0.7		1	1	1	1		Dicot	Perennial forb (rhiz.)
<i>Cryptantha clevelandii</i> var. <i>dissita</i>	Boraginaceae	BE/SI	4.4	17.5	4	4.5	2.1	1.0	1b		1				Dicot	Annual forb
<i>Cryptantha excavata</i>	Boraginaceae	WI	1.5	3	2	1.5	2.1	1.5			1				Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Cryptantha flaccida</i>	Boraginaceae	WI	1.6	4.75	3	2.0	0.7	0.4		1	1	1	1	1	Dicot	Annual forb
<i>Cryptantha hispidula</i>	Boraginaceae	SE	6.0	24	4	6.0	0.0	0.0		1	1				Dicot	Annual forb
<i>Cryptantha intermedia</i>	Boraginaceae	WI/IN	1.4	4.1	3	1.0	1.5	0.9		1	1	1	1	1	Dicot	Annual forb
<i>Cryptantha mariposae</i>	Boraginaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b					1	Dicot	Annual forb
<i>Cryptantha milobakeri</i>	Boraginaceae	SI	3.3	9.75	3	3.0	2.6	1.5		1	1			1	Dicot	Annual forb
<i>Cryptantha sobolifera</i>	Boraginaceae	WI/IN	1.4	4.1	3	1.0	1.5	0.9		1				1	Dicot	Perennial forb
<i>Hackelia bella</i>	Boraginaceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1	1				Dicot	Perennial forb
<i>Pectocarya pusilla</i>	Boraginaceae	WI/IN	1.3	2.5	2	1.3	1.1	0.8		1	1	1	1	1	Dicot	Annual forb
<i>Arabis aculeolata</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	2	1					Dicot	Perennial forb
<i>Arabis constancei</i>	Brassicaceae	SE	5.9	41.5	7	6.0	0.4	0.1	1b					1	Dicot	Perennial forb
<i>Arabis koehleri</i> var. <i>stipitata</i>	Brassicaceae	SE	5.5	16.5	3	6.0	1.2	0.7	1b	1					Dicot	Perennial forb
<i>Arabis macdonaldiana</i>	Brassicaceae	BE	5.4	32.5	6	6.0	1.0	0.4	1b	1	1				Dicot	Perennial forb
<i>Arabis oregana</i>	Brassicaceae	BE/SI	3.8	11.5	3	3.0	2.1	1.2	4	1	1				Dicot	Perennial forb
<i>Arabis subpinnatifida</i>	Brassicaceae	SI	3.2	16	5	3.0	1.6	0.7		1	1				Dicot	Perennial forb
<i>Arabis suffrutescens</i> var. <i>horizontalis</i>	Brassicaceae	BE/SI	3.9	27	7	3.0	1.6	0.6			1			1	Dicot	Perennial forb
<i>Arabis suffrutescens</i> var. <i>suffrutescens</i>	Brassicaceae	SI	2.9	17.5	6	2.5	1.9	0.8		1				1	Dicot	Perennial forb
<i>Cardamine californica</i> var. <i>cuneata</i>	Brassicaceae	WI	1.9	3.75	2	1.9	1.6	1.1					1		Dicot	Perennial forb (rhiz.)
<i>Cardamine nuttallii</i> var. <i>gemmata</i>	Brassicaceae	BE	5.2	15.5	3	5.0	1.0	0.6	1b	1					Dicot	Perennial forb (rhiz.)
<i>Cardamine pachystigma</i> var. <i>dissectifolia</i>	Brassicaceae	BE	5.4	48.5	9	6.0	1.0	0.3	3		1			1	Dicot	Perennial forb (rhiz.)
<i>Cardamine pachystigma</i> var. <i>pachystigma</i>	Brassicaceae	WI	2.0	6	3	2.0	1.0	0.6			1			1	Dicot	Perennial forb (rhiz.)
<i>Caulanthus amplexicaulis</i> var. <i>barbarae</i>	Brassicaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b				1		Dicot	Annual forb
<i>Draba aureola</i>	Brassicaceae	SI	2.7	8	3	3.0	0.6	0.3	1b	1					Dicot	Perennial forb
<i>Draba carnosula</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Draba howellii</i>	Brassicaceae	WI/IN	1.4	4.25	3	1.0	1.4	0.8		1					Dicot	Perennial forb
<i>Erysimum franciscanum</i>	Brassicaceae	SI	3.0	9	3	3.0	0.0	0.0	4		1	1	1		Dicot	Perennial forb
<i>Guillenia flavescens</i>	Brassicaceae	WI	2.3	9.25	4	2.5	1.6	0.8			1	1	1		Dicot	Annual forb
<i>Streptanthus albidus</i> ssp. <i>albidus</i>	Brassicaceae	BE	5.3	31.5	6	6.0	1.3	0.5	1b			1	1		Dicot	Annual forb
<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	Brassicaceae	BE/SI	4.3	34.5	8	4.5	1.9	0.7	1b			1	1		Dicot	Annual forb
<i>Streptanthus barbatus</i>	Brassicaceae	SE	5.6	28	5	6.0	0.5	0.2		1					Dicot	Perennial forb
<i>Streptanthus barbiger</i>	Brassicaceae	SE	6.0	24	4	6.0	0.0	0.0	4		1				Dicot	Annual forb
<i>Streptanthus batrachopus</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1	1			Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Streptanthus brachiatus</i> var. <i>brachiatus</i>	Brassicaceae	SE	5.6	22.5	4	6.0	1.0	0.5	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus brachiatus</i> var. <i>hoffmanii</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus breweri</i> var. <i>breweri</i>	Brassicaceae	SE	5.7	40	7	6.0	0.8	0.3		1	1	1	1		Dicot	Annual forb
<i>Streptanthus breweri</i> var. <i>hesperidus</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Streptanthus drepanoides</i>	Brassicaceae	SE	6.1	36.5	6	6.0	0.0	0.0	4	1	1			1	Dicot	Annual forb
<i>Streptanthus glandulosus</i> ssp. <i>glandulosus</i>	Brassicaceae	WI	1.9	5.75	3	2.0	1.1	0.7			1	1	1		Dicot	Annual forb
<i>Streptanthus glandulosus</i> ssp. <i>pulchellus</i>	Brassicaceae	BE	4.9	24.5	5	6.0	1.8	0.8	1b		1	1			Dicot	Annual forb
<i>Streptanthus glandulosus</i> ssp. <i>secundus</i>	Brassicaceae	SI	3.3	20	6	3.0	1.5	0.6			1	1			Dicot	Annual forb
<i>Streptanthus glandulosus</i> ssp. <i>secundus</i> var. <i>hoffmanii</i>	Brassicaceae	SI	3.0	3	1	3.0	—	—	1b		1				Dicot	Annual forb
<i>Streptanthus howellii</i>	Brassicaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Streptanthus insignis</i> ssp. <i>insignis</i>	Brassicaceae	BE/SI	4.0	20	5	4.0	2.4	1.1					1		Dicot	Annual forb
<i>Streptanthus insignis</i> ssp. <i>lyonii</i>	Brassicaceae	SI	3.3	16.5	5	2.0	2.7	1.2	1b				1		Dicot	Annual forb
<i>Streptanthus morrisonii</i> ssp. <i>elatus</i>	Brassicaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus morrisonii</i> ssp. <i>hirtiflorus</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus morrisonii</i> ssp. <i>kruckebergii</i>	Brassicaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus morrisonii</i> ssp. <i>morrisonii</i>	Brassicaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1				Dicot	Annual, Perennial forb
<i>Streptanthus niger</i>	Brassicaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1	1			Dicot	Annual forb
<i>Streptanthus polygaloides</i>	Brassicaceae	SE	5.7	28.5	5	6.0	0.9	0.4					1		Dicot	Annual forb
<i>Streptanthus tortuosus</i> var. <i>suffrutescens</i>	Brassicaceae	WI	1.6	8.2	5	2.0	1.6	0.7			1		1	1	Dicot	Annual, Perennial forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Streptanthus tortuosus</i> var. <i>tortuosus</i>	Brassicaceae	WI/IN	1.4	4.25	3	2.0	1.0	0.6			1	1		1	Dicot	Annual, Perennial forb
<i>Thelypodium brachycarpum</i>	Brassicaceae	SI	3.3	10	3	3.0	0.6	0.3	4	1	1				Dicot	Annual, Perennial forb
<i>Thlaspi californicum</i>	Brassicaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1				Dicot	Perennial forb
<i>Thlaspi montanum</i> var. <i>montanum</i>	Brassicaceae	BE/SI	4.4	22	5	4.0	1.5	0.7		1	1				Dicot	Perennial forb
<i>Campanula angustiflora</i>	Campanulaceae	BE/SI	3.9	19.25	5	4.0	2.4	1.1			1	1			Dicot	Annual forb
<i>Campanula exigua</i>	Campanulaceae	BE/SI	3.9	19.5	5	4.0	1.5	0.7	1b			1	1		Dicot	Annual forb
<i>Campanula griffinii</i>	Campanulaceae	SE	6.0	18	3	6.0	0.0	0.0			1	1	1		Dicot	Annual forb
<i>Campanula rotundifolia</i>	Campanulaceae	BE	5.0	15	3	6.0	1.7	1.0		1					Dicot	Perennial forb
<i>Campanula scabrella</i>	Campanulaceae	SI	2.5	10	4	2.5	1.3	0.6	4	1					Dicot	Perennial forb (rhiz.)
<i>Campanula sharsmithiae</i>	Campanulaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b			1	1		Dicot	Annual forb
<i>Campanula wilkinsiana</i>	Campanulaceae	WI/IN	1.0	5	5	0.0	1.7	0.8		1					Dicot	Perennial forb (rhiz.)
<i>Githopsis diffusa</i> ssp. <i>candida</i>	Campanulaceae	WI/IN	1.0	2	2	1.0	1.4	1.0						1	Dicot	Annual forb
<i>Githopsis pulchella</i> ssp. <i>campestris</i>	Campanulaceae	WI	1.6	3.25	2	1.6	1.9	1.4						1	Dicot	Annual forb
<i>Githopsis pulchella</i> ssp. <i>pulchella</i> var. <i>glabra</i>	Campanulaceae	BE/SI	3.8	19	5	3.0	2.0	0.9						1	Dicot	Annual forb
<i>Githopsis pulchella</i> ssp. <i>serpentinicola</i>	Campanulaceae	BE	5.3	21	4	5.5	1.0	0.5	4					1	Dicot	Annual forb
<i>Nemacladus montanus</i>	Campanulaceae	SE	6.0	18	3	6.0	0.0	0.0			1	1	1		Dicot	Annual forb
<i>Arenaria kingii</i> var. <i>glabrescens</i>	Caryophyllaceae	WI/IN	1.4	4.1	3	2.0	1.1	0.6						1	Dicot	Perennial forb
<i>Cerastium arvense</i>	Caryophyllaceae	WI	2.1	8.5	4	0.9	2.6	1.3		1	1	1	1	1	Dicot	Perennial forb
<i>Minuartia californica</i>	Caryophyllaceae	WI	1.7	5	3	2.0	1.5	0.9		1	1	1	1	1	Dicot	Annual forb
<i>Minuartia cismontana</i> (new taxon)	Caryophyllaceae	WI	1.8	3.5	2	1.8	1.8	1.3		1	1	1	1	1	Dicot	Annual, Perennial forb
<i>Minuartia decumbens</i>	Caryophyllaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b	1	1				Dicot	Perennial forb
<i>Minuartia douglasii</i>	Caryophyllaceae	SI	3.0	15	5	3.0	0.7	0.3		1	1	1	1	1	Dicot	Annual forb
<i>Minuartia howellii</i>	Caryophyllaceae	SE	5.7	28.5	5	6.0	0.9	0.4	1b	1					Dicot	Perennial forb
<i>Minuartia nuttallii</i> ssp. <i>gregaria</i>	Caryophyllaceae	SI	3.2	16	5	3.0	1.9	0.9		1	1				Dicot	Perennial forb
<i>Minuartia rosei</i>	Caryophyllaceae	SE	6.1	30.5	5	6.0	0.0	0.0	4	1	1				Dicot	Perennial forb
<i>Minuartia stolonifera</i>	Caryophyllaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Moehringia macrophylla</i>	Caryophyllaceae	SI	2.7	8	3	3.0	0.6	0.3		1	1	1	1	1	Dicot	Perennial forb
<i>Silene antirrhina</i>	Caryophyllaceae	WI/IN	1.1	3.25	3	1.0	0.9	0.5		1	1	1	1	1	Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Silene campanulata</i> ssp. <i>campanulata</i>	Caryophyllaceae	BE	5.3	31.5	6	5.5	1.0	0.4	4	1	1				Dicot	Perennial forb
<i>Silene campanulata</i> ssp. <i>glandulosa</i>	Caryophyllaceae	BE/SI	3.8	19	5	3.0	1.3	0.6		1	1				Dicot	Perennial forb
<i>Silene grayi</i>	Caryophyllaceae	WI	1.8	5.5	3	2.0	1.3	0.7		1					Dicot	Perennial forb
<i>Silene hookeri</i> ssp. <i>bolanderi</i>	Caryophyllaceae	BE	4.5	18	4	4.5	1.7	0.9		1	1				Dicot	Perennial forb
<i>Silene hookeri</i> ssp. <i>hookeri</i>	Caryophyllaceae	SI	3.0	12	4	2.5	2.2	1.1		1	1				Dicot	Perennial forb
<i>Silene serpentinicola</i> (new taxon)	Caryophyllaceae	SE	6.0	6	1	6.0	—	—		1					Dicot	Perennial forb (rhiz.)
<i>Helianthemum suffrutescens</i> (in <i>H. scoparium</i> in Jepson)	Cistaceae	WI/IN	1.0	2	2	1.0	1.4	1.0	3					1	Dicot	Shrub
<i>Calystegia collina</i> ssp. <i>collina</i>	Convolvulaceae	BE	4.7	33	7	6.0	1.6	0.6			1	1			Dicot	Perennial forb
<i>Calystegia collina</i> ssp. <i>oxyphylla</i>	Convolvulaceae	SE	5.6	33.5	6	6.0	1.2	0.5	4		1				Dicot	Perennial forb
<i>Calystegia collina</i> ssp. <i>tridactylosa</i>	Convolvulaceae	BE	4.5	18	4	4.5	1.7	0.9			1				Dicot	Perennial forb
<i>Calystegia collina</i> ssp. <i>venusta</i>	Convolvulaceae	BE	4.9	24.5	5	5.0	1.3	0.6	4				1		Dicot	Perennial forb
<i>Calystegia malacophylla</i>	Convolvulaceae	WI	1.5	4.5	3	1.0	1.3	0.8				1	1	1	Dicot	Perennial forb
<i>Convolvulus simulans</i>	Convolvulaceae	BE/SI	3.7	14.75	4	4.0	2.4	1.2	4			1	1		Dicot	Annual forb
<i>Dudleya abramsii</i> ssp. <i>bettinae</i>	Crassulaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b				1		Dicot	Perennial forb
<i>Dudleya abramsii</i> ssp. <i>murina</i>	Crassulaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b				1		Dicot	Perennial forb
<i>Dudleya blochmaniae</i> ssp. <i>blochmaniae</i>	Crassulaceae	SI	3.2	9.5	3	3.0	0.0	0.0	1b				1		Dicot	Perennial forb
<i>Dudleya setchellii</i>	Crassulaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1	1		Dicot	Perennial forb
<i>Parvisedum pentandrum</i>	Crassulaceae	WI	2.0	8.1	4	1.5	2.1	1.1			1	1	1		Dicot	Annual forb
<i>Parvisedum pumilum</i>	Crassulaceae	WI	1.7	5.1	3	2.0	1.5	0.9			1			1	Dicot	Annual forb
<i>Sedum albomarginatum</i>	Crassulaceae	SE	6.1	42.5	7	6.0	0.0	0.0	1b					1	Dicot	Perennial forb
<i>Sedum eastwoodiae</i>	Crassulaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1			Dicot	Perennial forb
<i>Sedum laxum</i> ssp. <i>flavidum</i>	Crassulaceae	SI	3.1	18.5	6	3.0	0.6	0.3	4	1	1				Dicot	Perennial forb
<i>Sedum laxum</i> ssp. <i>heckneri</i>	Crassulaceae	BE/SI	3.5	10.5	3	3.0	0.6	0.3	4	1	1				Dicot	Perennial forb
<i>Sedum laxum</i> ssp. <i>laxum</i>	Crassulaceae	BE/SI	4.0	16	4	3.5	1.4	0.7		1	1				Dicot	Perennial forb
<i>Sedum obtusatum</i> ssp. <i>obtusatum</i>	Crassulaceae	SI	3.2	16	5	3.0	2.2	1.0		1				1	Dicot	Perennial forb (rhiz.)
<i>Sedum radiatum</i>	Crassulaceae	WI	2.0	6	3	2.0	2.0	1.2		1	1	1	1	1	Dicot	Annual forb
<i>Calocedrus decurrens</i>	Cupressaceae	SI	3.0	9	3	3.0	0.0	0.0		1	1	1	1	1	Gymnosp.	Tree
<i>Cupressus bakeri</i>	Cupressaceae	SI	2.6	13	5	3.0	0.5	0.2	4	1				1	Gymnosp.	Tree
<i>Cupressus lawsoniana</i>	Cupressaceae	SI	3.0	15	5	3.0	0.7	0.3		1	1				Gymnosp.	Tree
<i>Cupressus macnabiana</i>	Cupressaceae	BE	4.7	28	6	4.5	1.2	0.5			1			1	Gymnosp.	Tree
<i>Cupressus sargentii</i>	Cupressaceae	BE	4.9	34	7	5.0	1.2	0.5			1	1	1		Gymnosp.	Tree
<i>Juniperus communis</i> var. <i>jackii</i>	Cupressaceae	BE/SI	4.0	8	2	4.0	2.8	2.0		1					Gymnosp.	Shrub

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Carex amplexans</i>	Cyperaceae	SI	2.6	10.5	4	2.3	2.9	1.4						1	Monocot	Perennial gram. (cesp.)
<i>Carex brainerdii</i>	Cyperaceae	WI/IN	1.4	4.25	3	2.0	1.0	0.6		1	1		1	1	Monocot	Perennial gram. (rhiz.)
<i>Carex gigas</i>	Cyperaceae	BE	4.5	22.5	5	4.0	1.7	0.7	4	1				1	Monocot	Perennial gram. (rhiz.)
<i>Carex mendocinensis</i>	Cyperaceae	BE/SI	3.8	23	6	3.5	1.2	0.5		1	1			1	Monocot	Perennial gram. (cesp.)
<i>Carex obispoensis</i>	Cyperaceae	BE	4.9	24.5	5	6.0	1.6	0.7	1b					1	Monocot	Perennial gram. (cesp.)
<i>Carex serpentinicola</i> (new taxon)	Cyperaceae	SE	5.5	11	2	5.5	0.7	0.5	2	1					Monocot	Perennial gram. (rhiz.)
<i>Carex serratodens</i>	Cyperaceae	BE	4.9	39	8	5.0	1.1	0.4			1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Carex spissa</i>	Cyperaceae	SI	2.8	8.25	3	2.0	2.9	1.7						1	Monocot	Perennial gram. (rhiz.)
<i>Polystichum lemmonii</i>	Dryopteridaceae	SE	6.0	24	4	6.0	0.0	0.0		1	1			1	Pteridoph.	Perennial forb (rhiz.)
<i>Polystichum scopulinum</i>	Dryopteridaceae	WI	1.7	5.1	3	2.0	1.5	0.9		1	1			1	Pteridoph.	Perennial forb (rhiz.)
<i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	Ericaceae	SE	5.5	27.5	5	6.0	1.3	0.6	1b		1				Dicot	Shrub
<i>Arctostaphylos bakeri</i> ssp. <i>sublaevis</i>	Ericaceae	SE	6.3	12.5	2	6.0	0.0	0.0	1b		1				Dicot	Shrub
<i>Arctostaphylos canescens</i> ssp. <i>sonomensis</i>	Ericaceae	SI	2.5	12.5	5	3.0	1.5	0.7	1b	1	1				Dicot	Shrub
<i>Arctostaphylos hispidula</i>	Ericaceae	BE	4.5	22.5	5	4.0	1.1	0.5	4	1	1				Dicot	Shrub
<i>Arctostaphylos hookeri</i> ssp. <i>franciscana</i>	Ericaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1a			1	1		Dicot	Shrub
<i>Arctostaphylos hookeri</i> ssp. <i>montana</i>	Ericaceae	BE	4.9	19.5	4	4.5	1.0	0.5	1b			1	1		Dicot	Shrub
<i>Arctostaphylos hookeri</i> ssp. <i>ravenii</i>	Ericaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b			1	1		Dicot	Shrub

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Arctostaphylos klamathensis</i>	Ericaceae	BE/SI	3.9	19.5	5	4.0	1.8	0.8	1b	1					Dicot	Shrub
<i>Arctostaphylos nortensis</i>	Ericaceae	SI	2.8	5.5	2	2.5	0.7	0.5	4	1					Dicot	Shrub
<i>Arctostaphylos obispoensis</i>	Ericaceae	SE	5.7	28.5	5	6.0	0.9	0.4	4				1	Dicot	Shrub	
<i>Arctostaphylos stanfordiana</i> <i>ssp. raichei</i>	Ericaceae	SI	2.6	10.5	4	3.0	1.7	0.9	1b		1			Dicot	Shrub	
<i>Arctostaphylos viscida</i> ssp. <i>pulchella</i>	Ericaceae	BE	5.0	25	5	5.0	1.0	0.4		1	1			Dicot	Shrub	
<i>Arctostaphylos viscida</i> ssp. <i>viscida</i>	Ericaceae	WI	2.2	10.75	5	3.0	1.2	0.5		1			1	Dicot	Shrub	
<i>Pyrola picta</i> ssp. <i>dentata</i>	Ericaceae	WI	2.0	6	3	3.0	1.7	1.0		1	1			Dicot	Perennial forb (rhiz.)	
<i>Vaccinium coccineum</i>	Ericaceae	BE/SI	3.5	3.5	1	3.0	—	—	3	1				Dicot	Shrub	
<i>Astragalus breweri</i>	Fabaceae	SI	3.2	15.75	5	3.0	2.0	0.9	4		1	1		Dicot	Annual forb	
<i>Astragalus clarianus</i> (<i>claranus</i>)	Fabaceae	SI	3.0	6	2	3.0	0.0	0.0	1b		1			Dicot	Annual forb	
<i>Astragalus clevelandii</i>	Fabaceae	SE	6.1	24.5	4	6.0	0.0	0.0	4		1		1	Dicot	Perennial forb	
<i>Astragalus curtipes</i>	Fabaceae	WI	1.8	3.5	2	1.8	1.8	1.3					1	Dicot	Perennial forb	
<i>Astragalus macrodon</i>	Fabaceae	WI/IN	1.3	3.75	3	1.0	0.7	0.4	4				1	Dicot	Perennial forb	
<i>Astragalus rattanii</i> var. <i>jepsonianus</i>	Fabaceae	BE/SI	4.3	25.5	6	4.0	1.2	0.5	1b		1			Dicot	Annual forb	
<i>Astragalus whitneyi</i> var. <i>siskiyouensis</i>	Fabaceae	BE	4.6	23	5	5.0	1.1	0.5		1	1			Dicot	Perennial forb	
<i>Hoita strobilina</i>	Fabaceae	SI	2.5	5	2	2.5	2.1	1.5	1b			1		Dicot	Perennial forb	
<i>Lathyrus biflorus</i>	Fabaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1			Dicot	Perennial forb	
<i>Lathyrus delnorticus</i>	Fabaceae	BE	5.3	10.5	2	5.0	1.4	1.0	4	1				Dicot	Perennial forb	
<i>Lathyrus vestitus</i> var. <i>vestitus</i>	Fabaceae	WI	1.8	7.2	4	0.6	2.8	1.4			1	1	1	Dicot	Perennial forb	
<i>Lotus junceus</i> var. <i>junceus</i>	Fabaceae	WI	1.5	3	2	1.5	0.7	0.5					1	Dicot	Perennial forb	
<i>Lupinus constancei</i>	Fabaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1			Dicot	Perennial forb	
<i>Lupinus lapidicola</i>	Fabaceae	SI	3.0	15	5	3.0	3.0	1.3	4	1	1			Dicot	Perennial forb	
<i>Lupinus onustus</i>	Fabaceae	SI	3.1	15.25	5	3.0	2.9	1.3		1			1	Dicot	Perennial forb	
<i>Lupinus spectabilis</i>	Fabaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b				1	Dicot	Annual forb	
<i>Pediomelum californicum</i>	Fabaceae	BE/SI	4.4	21.75	5	6.0	2.4	1.1			1	1	1	Dicot	Perennial forb	
<i>Trifolium amoenum</i>	Fabaceae	WI/IN	1.3	2.5	2	1.0	1.4	1.0	1b		1	1		Dicot	Annual forb	
<i>Trifolium fucatum</i>	Fabaceae	WI/IN	1.3	4	3	1.0	0.6	0.3			1		1	Dicot	Annual forb	
<i>Trifolium gracilentum</i> var. <i>gracilentum</i>	Fabaceae	WI/IN	1.0	3.1	3	1.0	1.0	0.5		1	1	1	1	Dicot	Annual forb	
<i>Trifolium longipes</i> var. <i>elmeri</i>	Fabaceae	BE	5.3	21	4	6.0	1.5	0.8		1	1			Dicot	Perennial forb	
<i>Trifolium longipes</i> var. <i>oreganum</i>	Fabaceae	BE/SI	4.0	12	3	4.0	2.0	1.2		1	1			Dicot	Perennial forb	
<i>Trifolium microcephalum</i>	Fabaceae	WI/IN	1.4	7	5	1.0	1.1	0.5		1	1		1	Dicot	Annual forb	
<i>Trifolium willdenovii</i>	Fabaceae	WI/IN	1.3	4	3	1.0	0.6	0.3		1	1	1	1	Dicot	Annual forb	

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Lithocarpus densiflorus</i> var. <i>echinoides</i>	Fagaceae	SI	2.5	12.25	5	1.0	2.5	1.1		1				1	Dicot	Shrub
<i>Quercus durata</i> var. <i>durata</i>	Fagaceae	SE	5.8	40.5	7	6.0	0.8	0.3			1	1	1	1	Dicot	Shrub
<i>Quercus vaccinifolia</i>	Fagaceae	SI	2.5	12.25	5	2.0	2.2	1.0		1	1			1	Dicot	Shrub
<i>Garrya buxifolia</i>	Garryaceae	SE	5.8	29	5	6.0	0.4	0.2		1	1				Dicot	Shrub
<i>Garrya congdonii</i>	Garryaceae	BE	5.0	30	6	5.5	1.3	0.5		1	1	1		1	Dicot	Shrub
<i>Centaurium tricanthum</i>	Gentianaceae	SE	5.5	11	2	5.5	0.7	0.5			1	1			Dicot	Annual forb
<i>Gentiana setigera</i>	Gentianaceae	SE	5.8	17.5	3	6.0	0.3	0.2		1	1				Dicot	Perennial forb
<i>Swertia fastigiata</i>	Gentianaceae	WI	1.5	3	2	1.5	2.1	1.5		1					Dicot	Perennial forb
<i>Emmenanthe penduliflora</i> var. <i>penduliflora</i>	Hydrophyllaceae	WI	1.8	7	4	2.0	0.5	0.3			1	1	1	1	Dicot	Annual forb
<i>Emmenanthe penduliflora</i> var. <i>rosea</i>	Hydrophyllaceae	BE/SI	4.3	17	4	4.5	1.7	0.9				1	1		Dicot	Annual forb
<i>Phacelia breweri</i>	Hydrophyllaceae	SE	5.5	11	2	5.5	0.7	0.5				1	1		Dicot	Annual forb
<i>Phacelia californica</i>	Hydrophyllaceae	WI/IN	1.4	4.25	3	1.0	1.4	0.8			1	1	1		Dicot	Perennial forb
<i>Phacelia corymbosa</i>	Hydrophyllaceae	SE	5.5	33	6	6.0	0.8	0.3		1	1				Dicot	Perennial forb
<i>Phacelia dalesiana</i>	Hydrophyllaceae	SE	6.1	30.5	5	6.0	0.0	0.0	4	1					Dicot	Perennial forb
<i>Phacelia distans</i>	Hydrophyllaceae	WI/IN	1.1	2.1	2	1.1	1.3	1.0			1	1	1		Dicot	Annual forb
<i>Phacelia divaricata</i>	Hydrophyllaceae	WI	2.3	7	3	3.0	1.2	0.7			1	1	1		Dicot	Annual forb
<i>Phacelia egena</i>	Hydrophyllaceae	WI	2.1	6.25	3	3.0	1.6	0.9		1	1	1	1	1	Dicot	Perennial forb
<i>Phacelia greenei</i>	Hydrophyllaceae	SE	6.1	36.5	6	6.0	0.0	0.0	1b	1					Dicot	Annual forb
<i>Phacelia imbricata</i> ssp. <i>imbricata</i>	Hydrophyllaceae	WI	1.7	5	3	1.0	1.2	0.7			1	1	1	1	Dicot	Perennial forb
<i>Phacelia leonis</i>	Hydrophyllaceae	BE/SI	3.9	27.5	7	4.0	1.1	0.4	1b	1					Dicot	Annual forb
<i>Phacelia phacelioides</i>	Hydrophyllaceae	BE/SI	4.2	12.5	3	6.0	3.2	1.8				1	1		Dicot	Annual forb
<i>Phacelia pringlei</i>	Hydrophyllaceae	BE/SI	4.0	12	3	4.0	1.0	0.6		1					Dicot	Annual forb
<i>Phacelia purpusii</i>	Hydrophyllaceae	WI/IN	1.1	2.1	2	1.1	1.3	1.0						1	Dicot	Annual forb
<i>Iris bracteata</i>	Iridaceae	SE	5.8	11.5	2	5.5	0.7	0.5	3	1					Monocot	Perennial forb (rhiz.)
<i>Iris innominata</i>	Iridaceae	SE	5.8	11.5	2	5.5	0.7	0.5	4	1	1				Monocot	Perennial forb (rhiz.)
<i>Iris macrosiphon</i>	Iridaceae	WI/IN	1.1	3.25	3	1.0	0.9	0.5			1	1		1	Monocot	Perennial forb (rhiz.)
<i>Iris tenuissima</i> ssp. <i>purdyiformis</i>	Iridaceae	WI	1.5	3	2	1.5	2.1	1.5		1				1	Monocot	Perennial forb (rhiz.)
<i>Acanthomintha duttonii</i>	Lamiaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b			1	1		Dicot	Annual forb
<i>Acanthomintha ilicifolia</i>	Lamiaceae	WI/IN	1.3	3	3	0.0	1.7	1.0					1		Dicot	Annual forb
<i>Acanthomintha lanceolata</i>	Lamiaceae	SI	3.4	16.75	5	3.0	2.1	0.9	4			1	1		Dicot	Annual forb
<i>Acanthomintha obovata</i> ssp. <i>obovata</i>	Lamiaceae	BE/SI	3.5	10.5	3	3.0	2.5	1.5	4				1		Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Monardella antonina</i> ssp. <i>benitensis</i>	Lamiaceae	SE	6.1	24.5	4	6.0	0.0	0.0	4				1		Dicot	Perennial forb (rhiz.)
<i>Monardella douglasii</i> ssp. <i>douglasii</i>	Lamiaceae	SI	3.0	6	2	3.0	1.4	1.0			1	1	1		Dicot	Annual forb
<i>Monardella follettii</i>	Lamiaceae	SE	5.8	34.5	6	6.0	0.8	0.3	1b					1	Dicot	Shrub
<i>Monardella palmeri</i>	Lamiaceae	BE	4.8	28.5	6	6.0	2.2	0.9	1b				1		Dicot	Perennial forb (rhiz.)
<i>Monardella purpurea</i>	Lamiaceae	BE/SI	4.4	22	5	6.0	2.3	1.0		1	1	1	1		Dicot	Perennial forb
<i>Monardella sheltonii</i>	Lamiaceae	SI	3.0	18	6	3.0	1.7	0.7		1	1			1	Dicot	Perennial forb
<i>Monardella stebbinsii</i>	Lamiaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b					1	Dicot	Perennial forb (rhiz.)
<i>Monardella viridis</i> ssp. <i>viridis</i>	Lamiaceae	BE/SI	4.3	17	4	4.5	2.1	1.0			1				Dicot	Perennial forb
<i>Salvia sonomensis</i>	Lamiaceae	WI	1.6	9.5	6	1.5	1.3	0.5		1	1	1	1	1	Dicot	Shrub
<i>Scutellaria antirrhinoides</i>	Lamiaceae	WI	2.3	11.5	5	3.0	1.5	0.7		1	1			1	Dicot	Perennial forb
<i>Stachys pycnantha</i>	Lamiaceae	WI	2.2	11	5	1.0	2.4	1.1		1	1	1	1	1	Dicot	Perennial forb
<i>Trichostema laxum</i>	Lamiaceae	BE/SI	4.0	16	4	4.5	2.4	1.2		1	1				Dicot	Annual forb
<i>Trichostema rubisepalum</i>	Lamiaceae	BE	5.4	21.5	4	6.0	1.5	0.8	4		1		1	1	Dicot	Annual forb
<i>Pinguicula vulgaris</i> ssp. <i>macroceras</i>	Lentibulariaceae	SE	6.2	18.5	3	6.0	0.0	0.0	2	1					Dicot	Perennial forb (carn.)
<i>Allium acuminatum</i>	Liliaceae	WI	1.5	4.5	3	2.0	0.9	0.5		1	1	1			Monocot	Perennial forb (bulb)
<i>Allium amplexens</i>	Liliaceae	WI	2.3	11.25	5	2.0	2.2	1.0		1	1	1	1	1	Monocot	Perennial forb (bulb)
<i>Allium bolanderi</i> var. <i>bolanderi</i>	Liliaceae	WI/IN	1.1	4.5	4	1.0	0.6	0.3		1	1	1			Monocot	Perennial forb (bulb)
<i>Allium bolanderi</i> var. <i>mirabile</i>	Liliaceae	WI	2.0	4	2	2.0	0.0	0.0		1	1				Monocot	Perennial forb (bulb)
<i>Allium cratericola</i>	Liliaceae	SI	2.6	15.75	6	2.5	1.9	0.8		1	1			1	Monocot	Perennial forb (bulb)
<i>Allium crispum</i>	Liliaceae	WI/IN	1.3	3.75	3	1.0	0.7	0.4				1	1		Monocot	Perennial forb (bulb)
<i>Allium diabloense</i>	Liliaceae	SE	6.0	18	3	6.0	0.0	0.0					1		Monocot	Perennial forb (bulb)
<i>Allium falcifolium</i>	Liliaceae	BE/SI	4.2	38	9	4.0	1.6	0.5		1	1	1			Monocot	Perennial forb (bulb)
<i>Allium fimbriatum</i> var. <i>purdyi</i>	Liliaceae	BE	5.4	21.5	4	6.0	1.5	0.8	4		1				Monocot	Perennial forb (bulb)
<i>Allium hoffmanii</i>	Liliaceae	SE	6.1	30.5	5	6.0	0.0	0.0	4	1	1				Monocot	Perennial forb (bulb)
<i>Allium howellii</i> var. <i>sanbenitense</i>	Liliaceae	BE/SI	4.0	12	3	4.0	1.0	0.6					1		Monocot	Perennial forb (bulb)

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Allium jepsonii</i>	Liliaceae	BE	5.4	37.5	7	6.0	1.0	0.4	1b					1	Monocot	Perennial forb (bulb)
<i>Allium lacunosum</i> var. <i>lacunosum</i>	Liliaceae	BE/SI	3.8	15.25	4	4.5	2.8	1.4				1	1		Monocot	Perennial forb (bulb)
<i>Allium lacunosum</i> var. <i>micranthum</i>	Liliaceae	BE/SI	4.3	13	3	6.0	2.9	1.7					1		Monocot	Perennial forb (bulb)
<i>Allium membranaceum</i>	Liliaceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1				1	Monocot	Perennial forb (bulb)
<i>Allium obtusum</i> var. <i>conspicuum</i>	Liliaceae	WI/IN	1.0	2	2	1.0	1.4	1.0						1	Monocot	Perennial forb (bulb)
<i>Allium peninsulare</i> var. <i>franciscanum</i>	Liliaceae	WI	1.8	3.5	2	1.8	1.8	1.3	1b			1	1		Monocot	Perennial forb (bulb)
<i>Allium sanbornii</i> var. <i>congdonii</i>	Liliaceae	SE	5.6	22.5	4	6.0	1.0	0.5	4					1	Monocot	Perennial forb (bulb)
<i>Allium sanbornii</i> var. <i>sanbornii</i>	Liliaceae	SI	3.4	27	8	3.5	2.2	0.8	4					1	Monocot	Perennial forb (bulb)
<i>Allium serra</i>	Liliaceae	SI	2.6	10.5	4	3.0	1.5	0.7			1	1	1		Monocot	Perennial forb (bulb)
<i>Allium sharsmithiae</i>	Liliaceae	BE	5.1	20.5	4	6.0	2.0	1.0	1b			1	1		Monocot	Perennial forb (bulb)
<i>Allium siskiyouense</i>	Liliaceae	SI	2.8	14	5	2.0	1.8	0.8	4	1	1				Monocot	Perennial forb (bulb)
<i>Allium tuolumnense</i>	Liliaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b					1	Monocot	Perennial forb (bulb)
<i>Allium unifolium</i>	Liliaceae	WI/IN	1.0	3	3	1.0	1.0	0.6			1	1	1		Monocot	Perennial forb (bulb)
<i>Brodiaea californica</i> var. <i>californica</i>	Liliaceae	WI/IN	1.1	4.5	4	1.3	1.0	0.5			1			1	Monocot	Perennial forb
<i>Brodiaea californica</i> var. <i>leptandra</i>	Liliaceae	WI	2.0	4	2	2.0	1.4	1.0			1				Monocot	Perennial forb
<i>Brodiaea coronaria</i> ssp. <i>coronaria</i>	Liliaceae	WI/IN	1.0	2	2	1.0	1.4	1.0		1	1			1	Monocot	Perennial forb
<i>Brodiaea coronaria</i> ssp. <i>rosea</i>	Liliaceae	SE	5.5	27.5	5	6.0	1.3	0.6	1b		1				Monocot	Perennial forb
<i>Brodiaea pallida</i>	Liliaceae	BE	4.9	19.5	4	5.0	1.5	0.8	1b					1	Monocot	Perennial forb
<i>Brodiaea purdyi</i>	Liliaceae	WI	2.2	11	5	2.0	0.8	0.4						1	Monocot	Perennial forb
<i>Brodiaea stellaris</i>	Liliaceae	SE	6.0	18	3	6.0	0.0	0.0			1				Monocot	Perennial forb
<i>Calochortus clavatus</i> var. <i>clavatus</i>	Liliaceae	BE	4.5	13.5	3	4.0	0.6	0.3	4				1		Monocot	Perennial forb (bulb)
<i>Calochortus coeruleus</i> var. <i>fimbriatus</i>	Liliaceae	WI	1.5	4.5	3	1.0	1.3	0.8		1	1			1	Monocot	Perennial forb (bulb)
<i>Calochortus elegans</i> var. <i>nanus</i>	Liliaceae	WI	2.0	4	2	2.0	1.4	1.0		1					Monocot	Perennial forb (bulb)

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Calochortus greenii</i>	Liliaceae	SE	6.0	12	2	6.0	0.0	0.0		1					Monocot	Perennial forb (bulb)
<i>Calochortus nudus</i>	Liliaceae	WI	2.1	8.5	4	2.5	1.2	0.6		1				1	Monocot	Perennial forb (bulb)
<i>Calochortus obispoensis</i>	Liliaceae	BE	5.4	21.5	4	6.0	1.5	0.8	1b				1		Monocot	Perennial forb (bulb)
<i>Calochortus raichei</i>	Liliaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1				Monocot	Perennial forb (bulb)
<i>Calochortus tiburonensis</i>	Liliaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1	1			Monocot	Perennial forb (bulb)
<i>Calochortus umbellatus</i>	Liliaceae	SI	2.9	14.5	5	3.0	1.1	0.5	4		1	1			Monocot	Perennial forb (bulb)
<i>Calochortus uniflorus</i>	Liliaceae	WI	1.7	5	3	1.0	1.2	0.7		1	1	1	1		Monocot	Perennial forb (bulb)
<i>Calochortus vestae</i>	Liliaceae	WI	2.0	6	3	2.0	1.0	0.6		1	1				Monocot	Perennial forb (bulb)
<i>Calochortus weedii</i> var. <i>vestus</i>	Liliaceae	WI/IN	1.0	3	3	0.0	1.7	1.0	1b				1		Monocot	Perennial forb (bulb)
<i>Chlorogalum angustifolium</i>	Liliaceae	WI	2.4	9.5	4	1.8	2.8	1.4			1			1	Monocot	Perennial forb (bulb)
<i>Chlorogalum grandiflorum</i>	Liliaceae	BE	5.2	26	5	6.0	1.1	0.5	1b					1	Monocot	Perennial forb (bulb)
<i>Chlorogalum pomeridianum</i> var. <i>minus</i>	Liliaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1	1	1		Monocot	Perennial forb (bulb)
<i>Chlorogalum purpureum</i> var. <i>reductum</i>	Liliaceae	SE	5.5	16.5	3	6.0	1.2	0.7	1b				1		Monocot	Perennial forb (bulb)
<i>Erythronium californicum</i>	Liliaceae	SI	2.7	8	3	2.0	2.1	1.2		1	1				Monocot	Perennial forb (bulb)
<i>Erythronium citrinum</i> var. <i>citrinum</i>	Liliaceae	BE/SI	4.3	21.5	5	4.0	0.4	0.2	4	1					Monocot	Perennial forb (bulb)
<i>Erythronium citrinum</i> var. <i>roderickii</i>	Liliaceae	BE	4.7	37.5	8	4.5	1.4	0.5	1b	1					Monocot	Perennial forb (bulb)
<i>Erythronium helenae</i>	Liliaceae	BE	4.5	18	4	4.5	1.7	0.9	4		1				Monocot	Perennial forb (bulb)
<i>Erythronium hendersonii</i>	Liliaceae	SI	2.5	5	2	2.5	3.5	2.5		1					Monocot	Perennial forb (bulb)
<i>Erythronium howellii</i>	Liliaceae	WI	2.3	7	3	2.0	2.5	1.5	1b	1					Monocot	Perennial forb (bulb)
<i>Erythronium multiscapoideum</i>	Liliaceae	SI	3.0	15	5	2.0	1.7	0.8						1	Monocot	Perennial forb (bulb)
<i>Erythronium purpurascens</i>	Liliaceae	WI/IN	1.0	2	2	1.0	1.4	1.0						1	Monocot	Perennial forb (bulb)

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Erythronium tuolumnense</i>	Liliaceae	SI	2.5	5	2	2.5	3.5	2.5						1	Monocot	Perennial forb (bulb)
<i>Fritillaria affinis</i> var. <i>affinis</i>	Liliaceae	WI	2.0	6	3	2.0	0.0	0.0		1	1	1		1	Monocot	Perennial forb (bulb)
<i>Fritillaria agrestis</i>	Liliaceae	SI	2.7	13.25	5	2.0	1.6	0.7	4		1	1	1	1	Monocot	Perennial forb (bulb)
<i>Fritillaria biflora</i> var. <i>biflora</i>	Liliaceae	WI	2.3	9	4	2.5	1.7	0.9			1	1	1		Monocot	Perennial forb (bulb)
<i>Fritillaria biflora</i> var. <i>ineziana</i>	Liliaceae	BE	5.4	21.5	4	6.0	1.5	0.8	1b			1			Monocot	Perennial forb (bulb)
<i>Fritillaria eastwoodiae</i>	Liliaceae	WI	2.3	13.5	6	2.0	0.4	0.2	3					1	Monocot	Perennial forb (bulb)
<i>Fritillaria falcata</i>	Liliaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1	1		Monocot	Perennial forb (bulb)
<i>Fritillaria glauca</i>	Liliaceae	BE/SI	4.3	17.25	4	5.5	2.7	1.4		1	1				Monocot	Perennial forb (bulb)
<i>Fritillaria liliacea</i>	Liliaceae	WI	1.8	7	4	1.5	1.1	0.6	1b			1	1		Monocot	Perennial forb (bulb)
<i>Fritillaria pluriflora</i>	Liliaceae	WI	2.4	9.5	4	2.5	1.5	0.7			1			1	Monocot	Perennial forb (bulb)
<i>Fritillaria purdyi</i>	Liliaceae	BE	4.5	31.5	7	4.0	1.8	0.7	4	1	1				Monocot	Perennial forb (bulb)
<i>Fritillaria recurva</i> var. <i>coccinea</i>	Liliaceae	SI	2.7	8	3	2.0	3.1	1.8			1				Monocot	Perennial forb (bulb)
<i>Fritillaria recurva</i> var. <i>recurva</i>	Liliaceae	SI	2.7	8	3	3.0	0.6	0.3		1	1			1	Monocot	Perennial forb (bulb)
<i>Fritillaria viridea</i>	Liliaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b				1		Monocot	Perennial forb (bulb)
<i>Hastingsia alba</i>	Liliaceae	SI	3.4	17	5	3.0	1.5	0.7		1	1			1	Monocot	Perennial forb (bulb)
<i>Hastingsia serpentinicola</i>	Liliaceae	SE	6.0	18	3	6.0	0.0	0.0		1	1				Monocot	Perennial forb (bulb)
<i>Lilium bolanderi</i>	Liliaceae	SE	6.2	18.5	3	6.0	0.0	0.0	4	1					Monocot	Perennial forb (bulb)
<i>Lilium kelloggii</i>	Liliaceae	SI	2.5	10	4	2.0	1.9	1.0		1	1				Monocot	Perennial forb (bulb)
<i>Lilium rubescens</i>	Liliaceae	WI	2.0	9.75	5	2.0	1.4	0.6	4	1	1	1			Monocot	Perennial forb (bulb)
<i>Lilium washingtonianum</i> ssp. <i>purpurascens</i>	Liliaceae	BE/SI	3.5	10.5	3	3.0	2.5	1.5	4	1					Monocot	Perennial forb (bulb)
<i>Muilla maritima</i>	Liliaceae	WI	2.0	6	3	2.0	1.0	0.6			1	1	1	1	Monocot	Perennial forb (bulb)
<i>Odontostomum hartwegii</i>	Liliaceae	SI	2.7	8	3	3.0	0.6	0.3			1			1	Monocot	Perennial forb (bulb)
<i>Triteleia bridgesii</i>	Liliaceae	SI	3.3	13	4	3.5	1.7	0.9		1	1			1	Monocot	Perennial forb (bulb)

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Triteleia crocea</i> var. <i>crocea</i>	Liliaceae	SI	3.3	10	3	3.0	2.5	1.5	4	1					Monocot	Perennial forb
<i>Triteleia crocea</i> var. <i>modesta</i>	Liliaceae	BE	4.5	22.5	5	4.0	1.5	0.7	4	1					Monocot	Perennial forb
<i>Triteleia ixioides</i> ssp. <i>cookii</i>	Liliaceae	BE	4.5	13.5	3	6.0	2.9	1.7	1b				1		Monocot	Perennial forb
<i>Triteleia peduncularis</i>	Liliaceae	BE/SI	3.8	19	5	3.0	2.2	1.0		1	1	1	1		Monocot	Perennial forb
<i>Xerophyllum tenax</i>	Liliaceae	WI	1.6	8	5	1.0	0.9	0.4		1	1	1	1	1	Monocot	Perennial forb (rhiz.)
<i>Zigadenus micranthus</i> var. <i>fontanus</i>	Liliaceae	BE/SI	3.8	23	6	4.0	0.8	0.3	4		1	1	1		Monocot	Perennial forb (bulb)
<i>Zigadenus paniculatus</i>	Liliaceae	WI	1.6	4.75	3	2.0	0.7	0.4		1	1			1	Monocot	Perennial forb (bulb)
<i>Hesperolinon adenophyllum</i>	Linaceae	SE	5.7	28.5	5	6.0	0.9	0.4	1b		1				Dicot	Annual forb
<i>Hesperolinon bicarpellatum</i>	Linaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Hesperolinon breweri</i>	Linaceae	SI	2.5	10	4	2.5	1.5	0.7	1b		1	1			Dicot	Annual forb
<i>Hesperolinon californicum</i>	Linaceae	SI	2.8	8.5	3	3.0	0.6	0.3			1	1	1	1	Dicot	Annual forb
<i>Hesperolinon clevelandii</i>	Linaceae	WI	2.0	8	4	2.0	1.8	0.9			1	1			Dicot	Annual forb
<i>Hesperolinon congestum</i>	Linaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1	1			Dicot	Annual forb
<i>Hesperolinon didymocarpum</i>	Linaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Hesperolinon disjunctum</i>	Linaceae	SE	6.0	18	3	6.0	0.0	0.0			1	1	1		Dicot	Annual forb
<i>Hesperolinon drymarioides</i>	Linaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Hesperolinon micranthum</i>	Linaceae	WI	2.4	11.75	5	3.0	1.0	0.4		1	1	1	1	1	Dicot	Annual forb
<i>Hesperolinon serpentinum</i>	Linaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1				Dicot	Annual forb
<i>Hesperolinon spergulinum</i>	Linaceae	BE	4.7	14	3	6.0	2.3	1.3			1	1			Dicot	Annual forb
<i>Hesperolinon tehamense</i>	Linaceae	SE	5.8	34.5	6	6.0	0.8	0.3	1b		1				Dicot	Annual forb
<i>Linum lewisii</i>	Linaceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1	1	1	1	1	Dicot	Perennial forb
<i>Sidalcea diploscypha</i>	Malvaceae	SI	2.6	13	5	3.0	2.3	1.0			1	1	1	1	Dicot	Annual forb
<i>Sidalcea hartwegii</i>	Malvaceae	WI	1.6	4.75	3	2.0	0.7	0.4			1			1	Dicot	Annual forb
<i>Sidalcea hickmanii</i> ssp. <i>anomala</i>	Malvaceae	SE	5.6	22.5	4	6.0	1.0	0.5	1b				1		Dicot	Perennial forb
<i>Sidalcea hickmanii</i> ssp. <i>viridis</i>	Malvaceae	SE	6.3	12.5	2	6.0	0.0	0.0	1b		1	1			Dicot	Perennial forb
<i>Sidalcea keckii</i>	Malvaceae	SI	3.0	6	2	3.0	2.8	2.0	1b					1	Dicot	Annual forb
<i>Camissonia benitensis</i>	Onagraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b				1		Dicot	Annual forb
<i>Camissonia lacustris</i>	Onagraceae	SI	3.0	9	3	3.0	3.0	1.7			1			1	Dicot	Annual forb
<i>Clarkia arcuata</i>	Onagraceae	WI	2.3	7	3	2.0	0.6	0.3						1	Dicot	Annual forb
<i>Clarkia biloba</i> ssp. <i>biloba</i>	Onagraceae	WI/IN	1.4	2.75	2	1.4	0.9	0.6					1		Dicot	Annual forb
<i>Clarkia breweri</i>	Onagraceae	BE/SI	3.8	11.5	3	3.0	2.1	1.2	4			1	1		Dicot	Annual forb
<i>Clarkia franciscana</i>	Onagraceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1	1		Dicot	Annual forb
<i>Clarkia gracilis</i> ssp. <i>albicaulis</i>	Onagraceae	WI	2.2	6.5	3	2.0	1.0	0.6	1b					1	Dicot	Annual forb
<i>Clarkia gracilis</i> ssp. <i>tracyi</i>	Onagraceae	BE	5.0	25	5	5.0	1.0	0.4	4			1			Dicot	Annual forb
<i>Epilobium minutum</i>	Onagraceae	WI	2.0	6	3	2.0	1.0	0.6			1	1	1	1	Dicot	Annual forb
<i>Epilobium oreganum</i>	Onagraceae	BE/SI	3.8	23	6	4.0	2.2	0.9			1	1			Dicot	Perennial forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Epilobium rigidum</i>	Onagraceae	BE	5.1	20.5	4	6.0	2.0	1.0	4	1					Dicot	Perennial forb
<i>Epilobium siskiyouense</i>	Onagraceae	SE	5.5	38.5	7	6.0	1.0	0.4	1b	1					Dicot	Perennial forb
<i>Cypripedium californicum</i>	Orchidaceae	BE	4.5	40.5	9	4.0	1.3	0.4	4	1	1	1		1	Monocot	Perennial forb (bulb)
<i>Cypripedium fasciculatum</i>	Orchidaceae	SI	2.5	12.25	5	2.0	1.6	0.7	4	1	1	1		1	Monocot	Perennial forb (bulb)
<i>Piperia candida</i>	Orchidaceae	WI/IN	1.2	3.5	3	1.0	1.0	0.6	4	1	1	1			Monocot	Perennial forb (bulb)
<i>Orobanche valida</i> ssp. <i>howellii</i>	Orobanchaceae	SI	3.4	13.5	4	3.0	1.3	0.6	4		1				Dicot	Perennial forb (paras.)
<i>Dicentra chrysantha</i>	Papaveraceae	WI/IN	1.1	3.25	3	1.0	0.9	0.5		1	1	1	1	1	Dicot	Perennial forb
<i>Dicentra formosa</i> ssp. <i>oregana</i>	Papaveraceae	SE	5.6	22.5	4	6.0	1.0	0.5	4	1					Dicot	Perennial forb
<i>Dicentra pauciflora</i>	Papaveraceae	WI	2.2	6.5	3	3.0	1.4	0.8		1				1	Dicot	Perennial forb
<i>Eschscholzia hypaeoides</i>	Papaveraceae	SI	2.6	7.75	3	1.0	3.1	1.8	4				1		Dicot	Annual forb
<i>Platystemon californicus</i>	Papaveraceae	WI	1.7	5	3	2.0	0.6	0.3		1	1	1	1	1	Dicot	Annual forb
<i>Picea breweriana</i>	Pinaceae	WI	2.2	6.5	3	3.0	1.4	0.8		1					Gymnosp.	Tree
<i>Pinus attenuata</i>	Pinaceae	SI	2.5	12.6	5	3.0	2.4	1.1		1	1	1	1	1	Gymnosp.	Tree
<i>Pinus balfouriana</i> ssp. <i>balfouriana</i>	Pinaceae	BE/SI	4.3	26	6	4.0	1.5	0.6		1					Gymnosp.	Tree
<i>Pinus coulteri</i>	Pinaceae	WI/IN	1.3	4	3	1.0	1.5	0.9				1	1		Gymnosp.	Tree
<i>Pinus jeffreyi</i>	Pinaceae	SI	2.7	8	3	3.0	0.6	0.3		1	1		1	1	Gymnosp.	Tree
<i>Pinus sabiniana</i>	Pinaceae	WI/IN	1.4	4.25	3	1.0	1.4	0.8		1	1	1	1	1	Gymnosp.	Tree
<i>Plantago erecta</i>	Plantaginaceae	WI/IN	1.0	3	3	1.0	1.0	0.6		1	1	1	1	1	Dicot	Annual forb
<i>Achnatherum lemmonii</i> var. <i>pubescens</i>	Poaceae	BE	4.8	14.5	3	6.0	2.3	1.3	3	1	1				Monocot	Perennial gram. (cesp.)
<i>Achnatherum nelsonii</i> var. <i>dorei</i>	Poaceae	WI/IN	1.0	2	2	1.0	1.4	1.0						1	Monocot	Perennial gram. (cesp.)
<i>Achnatherum stillmanii</i>	Poaceae	WI/IN	1.1	2.1	2	1.1	1.3	1.0						1	Monocot	Perennial gram. (cesp.)
<i>Agrostis microphylla</i>	Poaceae	WI/IN	1.1	4.25	4	1.1	1.1	0.5			1	1	1		Monocot	Annual gram.
<i>Bromus laevipes</i>	Poaceae	WI	1.7	65	3	2.0	0.6	0.3		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Calamagrostis foliosa</i>	Poaceae	WI	1.7	5	3	2.0	1.5	0.9			1				Monocot	Perennial gram. (rhiz.)
<i>Calamagrostis ophitidis</i>	Poaceae	SE	6.1	24.5	4	6.0	0.0	0.0	4		1	1			Monocot	Perennial gram. (rhiz.)

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	Poaceae	WI	1.5	3	2	1.5	2.1	1.5		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Danthonia californica</i> var. <i>californica</i>	Poaceae	SI	3.3	13	4	3.0	2.2	1.1		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	Poaceae	WI	1.6	3.1	2	1.6	2.1	1.5		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Festuca californica</i>	Poaceae	WI	2.4	11.75	5	2.0	1.6	0.7		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Festuca idahoensis</i>	Poaceae	WI/IN	1.3	5.25	4	1.0	1.2	0.6		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Hordeum brachyantherum</i> ssp. <i>californicum</i>	Poaceae	SI	3.1	9.25	3	3.0	2.9	1.7		1	1	1	1	1	Monocot	Perennial gram. (cesp.)
<i>Melica geyeri</i>	Poaceae	WI/IN	1.2	6	5	1.0	0.4	0.2		1	1		1	1	Monocot	Perennial gram. (cesp.)
<i>Poa piperi</i>	Poaceae	BE	5.4	21.5	4	5.5	1.0	0.5	4	1					Monocot	Perennial gram. (rhiz.)
<i>Poa rhizomata</i>	Poaceae	WI	1.8	3.5	2	1.5	2.1	1.5	4	1					Monocot	Perennial gram. (rhiz.)
<i>Poa tenerrima</i>	Poaceae	SI	3.3	13	4	3.0	1.3	0.6				1	1	1	Monocot	Perennial gram. (cesp.)
<i>Scribneria bolanderi</i>	Poaceae	WI	1.7	5.1	3	1.0	2.0	1.2		1	1	1	1	1	Monocot	Annual gram.
<i>Vulpia microstachys</i> var. <i>microstachys</i>	Poaceae	WI	2.3	9.1	4	2.0	2.0	1.0		1	1	1	1	1	Monocot	Annual gram.
<i>Collomia diversifolia</i>	Polemoniaceae	SE	5.6	33.5	6	6.0	1.2	0.5	4		1	1			Dicot	Annual forb
<i>Collomia tinctoria</i>	Polemoniaceae	WI	1.8	7.1	4	2.0	1.5	0.7		1	1		1		Dicot	Annual forb
<i>Gilia capitata</i> ssp. <i>capitata</i>	Polemoniaceae	WI	1.6	4.75	3	1.0	1.2	0.7		1	1				Dicot	Annual, Perennial forb
<i>Gilia sinistra</i> ssp. <i>pinnatisecta</i>	Polemoniaceae	BE/SI	3.8	19	5	3.0	2.2	1.0	4		1				Dicot	Annual, Perennial forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Gilia sinistra</i> ssp. <i>sinistra</i>	Polemoniaceae	SI	2.5	7.5	3	3.0	1.8	1.0		1	1			1	Dicot	Annual forb
<i>Linanthus ambiguus</i>	Polemoniaceae	SE	5.8	17.5	3	6.0	0.6	0.3	4			1	1		Dicot	Annual forb
<i>Linanthus bolanderi</i>	Polemoniaceae	WI/IN	1.3	2.5	2	1.3	1.1	0.8			1	1		1	Dicot	Annual forb
<i>Linanthus dichotomus</i>	Polemoniaceae	SI	2.5	12.35	5	3.0	2.4	1.1		1	1	1	1	1	Dicot	Annual forb
<i>Linanthus latisectus</i> (= <i>Leptosiphon</i> la.)	Polemoniaceae	WI	2.0	6	3	2.0	0.0	0.0			1				Dicot	Annual forb
<i>Linanthus liniflorus</i> (= <i>Leptosiphon</i> li.)	Polemoniaceae	WI	1.6	6.25	4	1.5	1.2	0.6		1	1	1	1	1	Dicot	Annual forb
<i>Linanthus nuttallii</i> ssp. <i>howellii</i> (= <i>Leptosiphon</i> n. s. h.)	Polemoniaceae	BE	5.3	31.5	6	6.0	1.3	0.5	1b		1				Dicot	Perennial forb
<i>Navarretia heterodoxa</i>	Polemoniaceae	SI	2.8	14	5	3.0	2.4	1.1				1			Dicot	Annual forb
<i>Navarretia jaredii</i>	Polemoniaceae	SE	5.9	23.5	4	6.0	0.5	0.3	4				1		Dicot	Annual forb
<i>Navarretia jepsonii</i>	Polemoniaceae	SE	5.6	22.5	4	5.5	0.6	0.3	4		1				Dicot	Annual forb
<i>Navarretia pubescens</i>	Polemoniaceae	WI	2.0	6	3	2.0	1.0	0.6			1	1	1	1	Dicot	Annual forb
<i>Navarretia rosulata</i>	Polemoniaceae	SE	6.0	18	3	6.0	0.0	0.0	1b		1	1			Dicot	Annual forb
<i>Phlox hirsuta</i>	Polemoniaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Polemonium chartaceum</i>	Polemoniaceae	WI	1.6	8.1	5	2.0	1.5	0.7	1b	1				1	Dicot	Perennial forb
<i>Polygala cornuta</i> var. <i>cornuta</i>	Polygalaceae	WI	2.3	9	4	2.0	1.3	0.6		1				1	Dicot	Perennial forb, Shrub
<i>Chorizanthe breweri</i>	Polygonaceae	BE	5.4	21.5	4	5.5	1.0	0.5	1b				1		Dicot	Annual forb
<i>Chorizanthe palmeri</i>	Polygonaceae	BE	4.9	24.5	5	6.0	1.6	0.7	4				1		Dicot	Annual forb
<i>Chorizanthe uniaristata</i>	Polygonaceae	SI	2.7	10.75	4	2.5	2.0	1.0					1	1	Dicot	Annual, Perennial forb
<i>Chorizanthe ventricosa</i>	Polygonaceae	BE	5.3	16	3	6.0	1.2	0.7	4				1		Dicot	Annual forb
<i>Eriogonum alpinum</i>	Polygonaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Eriogonum argillosum</i>	Polygonaceae	SI	3.1	12.5	4	3.0	2.6	1.3	4			1	1		Dicot	Annual forb
<i>Eriogonum compositum</i> var. <i>compositum</i>	Polygonaceae	WI	1.7	5.1	3	2.0	1.5	0.9		1	1				Dicot	Perennial forb
<i>Eriogonum congdonii</i>	Polygonaceae	BE	5.1	35.5	7	6.0	1.7	0.7	4	1					Dicot	Shrub
<i>Eriogonum covilleanum</i>	Polygonaceae	SI	3.0	12	4	3.0	1.6	0.8					1		Dicot	Annual forb
<i>Eriogonum dasyanthemum</i>	Polygonaceae	SI	3.0	6	2	3.0	1.4	1.0			1				Dicot	Annual forb
<i>Eriogonum diclinum</i>	Polygonaceae	SI	3.2	9.5	3	3.0	3.0	1.7	4	1					Dicot	Perennial forb
<i>Eriogonum elatum</i> var. <i>villosum</i>	Polygonaceae	SI	3.3	13	4	3.5	3.2	1.6		1				1	Dicot	Perennial forb
<i>Eriogonum hirtellum</i>	Polygonaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b	1					Dicot	Perennial forb (rhiz.)
<i>Eriogonum hirtiflorum</i>	Polygonaceae	SI	3.3	13	4	3.5	3.2	1.6		1	1	1	1	1	Dicot	Annual forb
<i>Eriogonum kelloggii</i>	Polygonaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Perennial forb
<i>Eriogonum libertini</i>	Polygonaceae	SE	6.1	36.5	6	6.0	0.0	0.0	4	1	1				Dicot	Perennial forb
<i>Eriogonum luteolum</i> var. <i>caninum</i>	Polygonaceae	SE	5.5	27.5	5	6.0	0.9	0.4	3		1	1	1		Dicot	Annual forb

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Eriogonum luteolum</i> var. <i>luteolum</i>	Polygonaceae	BE/SI	3.8	15	4	3.0	1.5	0.8		1	1	1	1	Dicot	Annual forb	
<i>Eriogonum nervulosum</i>	Polygonaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b		1			Dicot	Perennial forb (rhiz.)	
<i>Eriogonum nudum</i> var. <i>indictum</i>	Polygonaceae	WI	1.5	4.5	3	1.0	0.6	0.3	4			1		Dicot	Perennial forb	
<i>Eriogonum nudum</i> var. <i>oblongifolium</i>	Polygonaceae	WI	2.0	6	3	2.0	0.0	0.0		1	1		1	Dicot	Perennial forb	
<i>Eriogonum pendulum</i>	Polygonaceae	SE	6.2	18.5	3	6.0	0.0	0.0	2	1				Dicot	Perennial forb	
<i>Eriogonum pyrolifolium</i>	Polygonaceae	WI/IN	1.0	3	3	0.0	1.7	1.0		1			1	Dicot	Perennial forb	
<i>Eriogonum siskiyouense</i>	Polygonaceae	BE	5.4	32.5	6	6.0	1.2	0.5	4	1				Dicot	Perennial forb	
<i>Eriogonum strictum</i> var. <i>greenii</i>	Polygonaceae	SE	5.9	29.5	5	6.0	0.4	0.2	4	1	1			Dicot	Perennial forb	
<i>Eriogonum strictum</i> var. <i>proliferum</i>	Polygonaceae	SE	6.0	24	4	6.0	0.0	0.0		1	1		1	Dicot	Perennial forb	
<i>Eriogonum ternatum</i>	Polygonaceae	SE	6.2	18.5	3	6.0	0.0	0.0	4	1	1			Dicot	Perennial forb	
<i>Eriogonum trichopes</i> var. <i>hooveri</i>	Polygonaceae	SI	3.3	10	3	3.0	2.5	1.5				1		Dicot	Annual forb	
<i>Eriogonum tripodum</i>	Polygonaceae	BE	5.3	26.5	5	6.0	1.3	0.6	4		1		1	Dicot	Shrub	
<i>Eriogonum umbellatum</i> var. <i>argus</i>	Polygonaceae	SI	3.0	12	4	3.5	1.4	0.7		1	1			Dicot	Perennial forb	
<i>Eriogonum umbellatum</i> var. <i>bahiiforme</i>	Polygonaceae	BE/SI	3.5	21	6	3.0	1.2	0.5	4		1	1	1	Dicot	Perennial forb	
<i>Eriogonum umbellatum</i> var. <i>goodmanii</i>	Polygonaceae	SI	3.3	10	3	3.0	2.5	1.5		1				Dicot	Perennial forb	
<i>Eriogonum umbellatum</i> var. <i>humistratum</i>	Polygonaceae	BE	4.5	27.25	6	5.0	2.1	0.8	4	1	1			Dicot	Perennial forb	
<i>Eriogonum umbellatum</i> var. <i>speciosum</i>	Polygonaceae	BE/SI	4.2	21	5	4.0	1.3	0.6		1			1	Dicot	Perennial forb	
<i>Eriogonum ursinum</i>	Polygonaceae	WI/IN	1.1	2.25	2	1.1	1.2	0.9		1			1	Dicot	Perennial forb	
<i>Eriogonum vimineum</i>	Polygonaceae	WI/IN	1.0	3	3	1.0	0.0	0.0		1			1	Dicot	Annual forb	
<i>Polygonum douglasii</i> ssp. <i>majus</i>	Polygonaceae	WI	1.5	4.5	3	2.0	0.9	0.5		1			1	Dicot	Annual forb	
<i>Polygonum douglasii</i> ssp. <i>spergulariiforme</i>	Polygonaceae	SI	3.0	18.25	6	2.5	2.1	0.9		1	1	1	1	Dicot	Annual forb	
<i>Systemotheca vortriedei</i>	Polygonaceae	SI	3.1	12.25	4	2.5	2.2	1.1	4			1		Dicot	Annual forb	
<i>Calyptridium quadripetalum</i>	Portulacaceae	BE	4.6	27.5	6	4.0	1.2	0.5	4		1			Dicot	Annual forb	
<i>Calyptridium umbellatum</i>	Portulacaceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1	1	1	1	Dicot	Perennial forb	
<i>Claytonia exigua</i> ssp. <i>exigua</i>	Portulacaceae	SI	3.4	24	7	3.0	1.1	0.4		1	1	1	1	Dicot	Annual forb	
<i>Claytonia exigua</i> ssp. <i>glauca</i>	Portulacaceae	BE/SI	3.6	18	5	3.0	1.3	0.6		1	1	1	1	Dicot	Annual forb	
<i>Claytonia gypsophiloides</i>	Portulacaceae	SI	3.1	15.5	5	3.0	0.2	0.1			1	1	1	Dicot	Annual forb	

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Claytonia saxosa</i>	Portulacaceae	BE/SI	4.4	21.75	5	5.0	2.2	1.0		1	1				Dicot	Annual forb
<i>Lewisia cantelovii</i>	Portulacaceae	WI/IN	1.0	6	6	1.0	1.1	0.4	1b	1				1	Dicot	Perennial forb
<i>Lewisia cotyledon</i> var. <i>cotyledon</i>	Portulacaceae	WI	2.0	6	3	3.0	1.7	1.0		1					Dicot	Perennial forb
<i>Lewisia cotyledon</i> var. <i>heckneri</i>	Portulacaceae	WI/IN	1.0	4	4	0.5	1.4	0.7		1					Dicot	Perennial forb
<i>Lewisia cotyledon</i> var. <i>howellii</i>	Portulacaceae	WI/IN	1.3	4	3	1.0	1.5	0.9		1					Dicot	Perennial forb
<i>Lewisia leana</i>	Portulacaceae	SI	3.0	6	2	3.0	0.0	0.0		1	1			1	Dicot	Perennial forb
<i>Lewisia nevadensis</i>	Portulacaceae	WI	1.7	5	3	2.0	1.5	0.9		1	1			1	Dicot	Perennial forb
<i>Lewisia oppositifolia</i>	Portulacaceae	BE	5.3	21	4	6.0	1.5	0.8		1					Dicot	Perennial forb
<i>Lewisia rediviva</i>	Portulacaceae	WI/IN	1.4	7	5	1.0	1.1	0.5		1	1	1	1	1	Dicot	Perennial forb
<i>Lewisia stebbinsii</i>	Portulacaceae	BE	4.7	14	3	6.0	2.3	1.3	1b		1				Dicot	Perennial forb
<i>Lewisia triphylla</i>	Portulacaceae	WI	1.7	5	3	2.0	1.5	0.9		1	1			1	Dicot	Perennial forb
<i>Dodecatheon clevelandii</i> ssp. <i>patulum</i>	Primulaceae	SI	3.0	9	3	3.0	0.0	0.0				1	1	1	Dicot	Perennial forb
<i>Adiantum aleuticum</i>	Pteridaceae	WI	2.4	11.75	5	2.0	1.2	0.5		1	1	1	1	1	Pteridoph.	Perennial forb
<i>Aspidotis carlotta-halliae</i>	Pteridaceae	BE	5.3	26.5	5	6.0	1.1	0.5	4			1	1		Pteridoph.	Perennial forb (rhiz.)
<i>Aspidotis densa</i>	Pteridaceae	SI	3.4	31	9	3.0	1.2	0.4		1	1	1	1	1	Pteridoph.	Perennial forb
<i>Pellaea brachyptera</i>	Pteridaceae	WI	1.5	4.5	3	2.0	0.9	0.5		1	1			1	Pteridoph.	Perennial forb
<i>Anemone drummondii</i>	Ranunculaceae	WI	2.3	6.75	3	2.0	1.6	0.9		1				1	Dicot	Perennial forb
<i>Aquilegia eximia</i>	Ranunculaceae	BE/SI	4.2	25	6	3.5	1.5	0.6			1	1	1		Dicot	Perennial forb
<i>Delphinium hesperium</i> ssp. <i>hesperium</i>	Ranunculaceae	SI	2.7	8	3	3.0	0.6	0.3		1	1	1			Dicot	Perennial forb
<i>Delphinium nuttallianum</i>	Ranunculaceae	WI/IN	1.4	4.1	3	1.0	1.5	0.9		1				1	Dicot	Perennial forb
<i>Delphinium parryi</i> ssp. <i>eastwoodiae</i>	Ranunculaceae	BE/SI	3.7	11	3	4.0	2.5	1.5					1		Dicot	Perennial forb
<i>Delphinium uliginosum</i>	Ranunculaceae	SE	5.7	28.5	5	6.0	0.9	0.4	4		1				Dicot	Perennial forb
<i>Ceanothus confusus</i>	Rhamnaceae	WI/IN	1.3	2.5	2	1.3	1.1	0.8	1b		1				Dicot	Shrub
<i>Ceanothus cuneatus</i> var. <i>cuneatus</i>	Rhamnaceae	WI	1.5	6.1	4	1.5	1.3	0.6		1	1	1	1	1	Dicot	Shrub
<i>Ceanothus divergens</i>	Rhamnaceae	WI	2.0	4	2	2.0	1.4	1.0	1b		1				Dicot	Shrub
<i>Ceanothus ferrisae</i>	Rhamnaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b			1			Dicot	Shrub
<i>Ceanothus foliosus</i> var. <i>medius</i>	Rhamnaceae	BE/SI	4.0	12	3	3.0	1.7	1.0				1	1		Dicot	Shrub
<i>Ceanothus jepsonii</i>	Rhamnaceae	SE	6.0	18	3	6.0	0.0	0.0			1	1			Dicot	Shrub
<i>Ceanothus masonii</i>	Rhamnaceae	SI	3.3	6.5	2	3.0	4.2	3.0	1b			1			Dicot	Shrub
<i>Ceanothus papillosus</i> var. <i>roweanus</i>	Rhamnaceae	WI	1.5	3	2	1.5	2.1	1.5					1		Dicot	Shrub
<i>Ceanothus pumilus</i>	Rhamnaceae	SE	5.7	28.5	5	6.0	0.9	0.4		1	1				Dicot	Shrub
<i>Ceanothus roderickii</i>	Rhamnaceae	WI	1.7	5	3	2.0	1.5	0.9	1b					1	Dicot	Shrub
<i>Ceanothus sonomensis</i>	Rhamnaceae	WI/IN	1.3	4	3	2.0	1.2	0.7	1b			1			Dicot	Shrub

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Rhamnus californica</i> ssp. <i>occidentalis</i>	Rhamnaceae	SE	6.0	24	4	6.0	0.0	0.0		1	1			1	Dicot	Shrub
<i>Rhamnus tomentella</i> ssp. <i>crassifolia</i>	Rhamnaceae	BE	4.8	19	4	6.0	2.5	1.3		1	1				Dicot	Shrub
<i>Rhamnus tomentella</i> ssp. <i>tomentella</i>	Rhamnaceae	WI	1.5	6	4	0.8	1.7	0.8		1	1	1	1	1	Dicot	Shrub
<i>Adenostoma fasciculatum</i>	Rosaceae	WI/IN	1.3	5.2	4	1.1	1.4	0.7			1	1	1	1	Dicot	Shrub
<i>Holodiscus discolor</i>	Rosaceae	WI/IN	1.0	3	3	1.0	1.0	0.6		1	1	1	1	1	Dicot	Shrub
<i>Horkelia congesta</i> ssp. <i>nemorosa</i>	Rosaceae	BE/SI	3.8	7.5	2	3.5	0.7	0.5	2	1					Dicot	Perennial forb
<i>Horkelia daucifolia</i>	Rosaceae	BE/SI	3.8	15	4	3.0	1.5	0.8		1	1				Dicot	Perennial forb
<i>Horkelia sericata</i>	Rosaceae	SE	5.6	22.5	4	6.0	1.0	0.5	4	1					Dicot	Perennial forb
<i>Horkelia tridentata</i> ssp. <i>flavescens</i>	Rosaceae	SI	3.0	9	3	2.0	1.7	1.0		1	1			1	Dicot	Perennial forb
<i>Ivesia gordonii</i>	Rosaceae	WI	1.6	3.25	2	1.6	1.9	1.4		1	1			1	Dicot	Perennial forb
<i>Ivesia pickeringii</i>	Rosaceae	BE	5.4	32.5	6	6.0	1.0	0.4	1b	1					Dicot	Perennial forb
<i>Potentilla cristae</i>	Rosaceae	SI	3.1	12.5	4	3.0	0.0	0.0	1b	1					Dicot	Perennial forb
<i>Sanguisorba officinalis</i>	Rosaceae	BE/SI	4.2	12.5	3	3.0	1.7	1.0	2	1	1				Dicot	Perennial forb (rhiz.)
<i>Galium ambiguum</i> var. <i>ambiguum</i>	Rubiaceae	SI	3.3	10	3	3.0	2.5	1.5			1			1	Dicot	Perennial forb
<i>Galium ambiguum</i> var. <i>siskiyouense</i>	Rubiaceae	SE	5.5	27.5	5	6.0	0.9	0.4		1	1				Dicot	Perennial forb
<i>Galium andrewsii</i> ssp. <i>andrewsii</i>	Rubiaceae	SI	3.2	16	5	3.0	1.9	0.9			1	1	1		Dicot	Perennial forb
<i>Galium andrewsii</i> ssp. <i>gatense</i>	Rubiaceae	BE	5.1	20.5	4	5.0	0.8	0.4	4			1	1		Dicot	Perennial forb
<i>Galium andrewsii</i> ssp. <i>intermedium</i>	Rubiaceae	WI/IN	1.4	2.75	2	1.4	0.9	0.6					1		Dicot	Perennial forb
<i>Galium clementis</i>	Rubiaceae	WI/IN	1.0	2	2	1.0	1.4	1.0	1b				1		Dicot	Perennial forb
<i>Galium hardhamiae</i>	Rubiaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b				1		Dicot	Perennial forb
<i>Galium serpenticum</i> ssp. <i>scotticum</i>	Rubiaceae	SE	5.9	29.5	5	6.0	0.4	0.2	1b	1					Dicot	Perennial forb
<i>Salix breweri</i>	Salicaceae	SE	6.0	30	5	6.0	0.0	0.0			1	1	1		Dicot	Shrub
<i>Salix delnortensis</i>	Salicaceae	SE	6.2	18.5	3	6.0	0.0	0.0	4	1					Dicot	Shrub
<i>Salix sitchensis</i>	Salicaceae	WI	1.6	4.75	3	1.0	1.2	0.7		1	1	1	1		Dicot	Tree, shrub
<i>Darlingtonia californica</i>	Sarraceniaceae	BE/SI	4.1	32.5	8	4.0	1.4	0.5	4	1				1	Dicot	Perennial forb (carn.)
<i>Parnassia californica</i>	Saxifragaceae	WI	2.0	6	3	2.0	0.0	0.0		1	1		1	1	Dicot	Perennial forb
<i>Saxifraga howellii</i>	Saxifragaceae	BE/SI	3.8	7.5	2	3.5	2.1	1.5	4	1					Dicot	Perennial forb
<i>Antirrhinum cornutum</i>	Scrophulariaceae	WI	2.2	11	5	2.0	0.8	0.4			1				Dicot	Annual forb
<i>Antirrhinum leptaleum</i>	Scrophulariaceae	WI	1.6	3.1	2	1.6	2.1	1.5						1	Dicot	Annual forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Antirrhinum subcordatum</i>	Scrophulariaceae	BE/SI	4.3	21.5	5	4.0	1.8	0.8	4		1				Dicot	Annual forb
<i>Antirrhinum vexillo-calyculatum</i>	Scrophulariaceae	SI	2.5	20	8	2.5	1.3	0.5		1	1	1	1	1	Dicot	Annual forb
<i>Antirrhinum virga</i>	Scrophulariaceae	SI	2.8	8.5	3	3.0	0.6	0.3	4		1				Dicot	Perennial forb
<i>Castilleja affinis</i> ssp. <i>neglecta</i>	Scrophulariaceae	SE	6.1	30.5	5	6.0	0.0	0.0	1b		1	1			Dicot	Perennial forb (hemipar.)
<i>Castilleja foliolosa</i>	Scrophulariaceae	WI	2.3	9	4	2.5	1.0	0.5			1	1	1	1	Dicot	Perennial forb, Shrub
<i>Castilleja hispida</i> ssp. <i>brevilobata</i>	Scrophulariaceae	SE	6.2	18.5	3	6.0	0.0	0.0	4	1					Dicot	Perennial forb (hemipar.)
<i>Castilleja miniata</i> ssp. <i>elata</i>	Scrophulariaceae	BE	4.6	27.5	6	4.5	1.4	0.6	2	1					Dicot	Perennial forb (hemipar.)
<i>Castilleja minor</i> ssp. <i>spiralis</i>	Scrophulariaceae	SI	3.3	16.5	5	3.0	2.6	1.2			1	1	1	1	Dicot	Annual forb (hemipar.)
<i>Castilleja pruinosa</i>	Scrophulariaceae	SI	3.2	15.75	5	3.0	1.9	0.8		1	1			1	Dicot	Perennial forb (hemipar.)
<i>Castilleja rubicundula</i> ssp. <i>lithospermoides</i>	Scrophulariaceae	WI	2.4	9.75	4	2.0	1.8	0.9			1				Dicot	Annual forb (hemipar.)
<i>Castilleja rubicundula</i> ssp. <i>rubicundula</i>	Scrophulariaceae	SE	5.6	28	5	6.0	0.9	0.4	1b		1				Dicot	Annual forb (hemipar.)
<i>Collinsia greenii</i>	Scrophulariaceae	BE	5.2	31	6	6.0	1.3	0.5		1	1				Dicot	Annual forb
<i>Collinsia multicolor</i>	Scrophulariaceae	WI/IN	1.1	2.25	2	1.1	1.2	0.9	1b		1	1			Dicot	Annual forb
<i>Collinsia sparsiflora</i>	Scrophulariaceae	WI	1.7	5	3	1.0	1.2	0.7		1	1	1	1	1	Dicot	Annual forb
<i>Cordylanthus nidularius</i>	Scrophulariaceae	SE	6.2	18.5	3	6.0	0.0	0.0	1b			1	1		Dicot	Annual forb (hemipar.)
<i>Cordylanthus pilosus</i> var. <i>pilosus</i>	Scrophulariaceae	SI	2.5	10	4	2.5	0.6	0.3			1	1			Dicot	Annual forb (hemipar.)
<i>Cordylanthus pringlei</i>	Scrophulariaceae	SE	5.6	28	5	6.0	0.9	0.4			1				Dicot	Annual forb (hemipar.)
<i>Cordylanthus tenuis</i> ssp. <i>brunneus</i>	Scrophulariaceae	BE	5.1	25.5	5	5.0	1.0	0.4	4		1				Dicot	Annual forb (hemipar.)
<i>Cordylanthus tenuis</i> ssp. <i>capillaris</i>	Scrophulariaceae	SE	6.1	24.5	4	6.0	0.0	0.0	1b		1				Dicot	Annual forb (hemipar.)
<i>Cordylanthus tenuis</i> ssp. <i>tenuis</i>	Scrophulariaceae	WI	2.3	9	4	2.0	0.5	0.3						1	Dicot	Annual forb (hemipar.)
<i>Cordylanthus tenuis</i> ssp. <i>viscidus</i>	Scrophulariaceae	BE	4.5	27	6	4.5	1.4	0.6		1	1			1	Dicot	Annual forb (hemipar.)
<i>Keckiella lemmonii</i>	Scrophulariaceae	WI/IN	1.1	3.25	3	1.0	0.9	0.5		1	1			1	Dicot	Shrub
<i>Mimulus douglasii</i>	Scrophulariaceae	SI	2.7	13.5	5	3.0	0.5	0.2		1	1	1	1	1	Dicot	Annual forb
<i>Mimulus glaucescens</i>	Scrophulariaceae	BE/SI	3.8	18.75	5	4.0	2.1	0.9	4					1	Dicot	Annual forb
<i>Mimulus layneae</i> (including <i>M. brachiatus</i>)	Scrophulariaceae	SI	2.9	14.25	5	3.0	1.2	0.5		1	1			1	Dicot	Annual forb

APPENDIX 1. CONTINUED.

Taxon ¹	Family	Aff ²	Mean ³	Sum ⁴	Sources	Med. ⁵	SD ⁶	SE ⁷	Rarity ⁸	Geog. Dist. ⁹					Tax. Cat. ¹⁰	Lifeform ¹¹
										KL	NC	BA	SC	SN		
<i>Mimulus nudatus</i>	Scrophulariaceae	SE	5.6	33.5	6	6.0	1.2	0.5	4		1				Dicot	Annual forb
<i>Mimulus primuloides</i> ssp. <i>linearifolius</i>	Scrophulariaceae	BE/SI	4.0	16	4	4.5	2.4	1.2		1					Dicot	Perennial forb (rhiz.)
<i>Orthocarpus pachystachyus</i>	Scrophulariaceae	SE	6.0	18	3	6.0	0.0	0.0			1				Dicot	Annual forb (hemipar.)
<i>Pedicularis howellii</i>	Scrophulariaceae	SI	2.5	7.5	3	3.0	1.2	0.7	4		1				Dicot	Perennial forb (hemipar.)
<i>Penstemon azureus</i> var. <i>azureus</i>	Scrophulariaceae	SI	2.7	8	3	3.0	0.6	0.3			1	1		1	Dicot	Perennial forb
<i>Penstemon filiformis</i>	Scrophulariaceae	BE	5.0	30	6	5.5	1.3	0.5			1				Dicot	Perennial forb
<i>Penstemon parvulus</i>	Scrophulariaceae	BE/SI	3.7	11	3	4.0	0.6	0.3			1			1	Dicot	Perennial forb
<i>Penstemon purpusii</i>	Scrophulariaceae	SI	2.8	11	4	2.0	2.4	1.2			1	1			Dicot	Perennial forb
<i>Triphysaria floribunda</i>	Scrophulariaceae	WI	2.3	6.75	3	2.0	1.9	1.1	1b			1	1	1	Dicot	Annual forb
<i>Veronica copelandii</i>	Scrophulariaceae	SE	6.1	24.5	4	6.0	0.0	0.0	4		1				Dicot	Perennial forb
<i>Fremontodendron californicum</i> ssp. <i>decumbens</i>	Sterculiaceae	BE/SI	2.0	8	4	1.5	2.4	1.2	1b					1	Dicot	Shrub
<i>Verbena californica</i>	Verbenaceae	BE	4.8	14.5	3	4.0	1.2	0.7	1b					1	Dicot	Perennial forb
<i>Viola cuneata</i>	Violaceae	BE	5.2	31	6	6.0	1.3	0.5			1	1			Dicot	Perennial forb
<i>Viola douglasii</i>	Violaceae	SI	2.8	13.75	5	2.0	2.0	0.9			1	1	1	1	Dicot	Perennial forb
<i>Viola hallii</i>	Violaceae	BE/SI	4.0	16	4	4.0	2.3	1.2			1	1			Dicot	Perennial forb
<i>Viola lobata</i> ssp. <i>lobata</i>	Violaceae	WI	2.3	11.35	5	2.0	2.4	1.1			1	1		1	Dicot	Perennial forb (rhiz.)
<i>Viola ocellata</i>	Violaceae	SI	2.5	12.5	5	3.0	0.9	0.4			1	1	1	1	Dicot	Perennial forb
<i>Viola primulifolia</i> ssp. <i>occidentalis</i>	Violaceae	BE	5.1	25.5	5	6.0	1.4	0.6	1b		1				Dicot	Perennial forb (rhiz.)
<i>Viola purpurea</i> ssp. <i>integrifolia</i>	Violaceae	WI/IN	1.3	4	3	2.0	1.2	0.7			1	1		1	Dicot	Perennial forb