

**THE BEES OF THE COLUMBIA BASIN**

**V. J. Tepedino & T. L. Griswold**

**USDA-ARS Bee Biology & Systematics Laboratory  
Utah State University  
Logan, Utah 84322-53 10**

## Introduction

Axelrod (1960) estimated that about 67% of all flowering plant species benefit from insects visiting their flowers. In the absence of insect visitors, these flowers produce either no fruits or seeds, or fewer and/or more genetically uniform seeds. The primary insect pollinators of plants in the Columbia River Basin are native bees. Bees are the only organisms, with a few minor exceptions, that depend exclusively on the rewards supplied by flowers, i.e., pollen and nectar, for food throughout their life cycle. Many species have become specialized in extracting the pollen and nectar from plants of particular families or genera, although the converse, i.e., the strict dependency of plant taxa on particular bee taxa for pollination services is rare.

Many other groups of insects visit flowers, mostly for nectar, sometimes for pollen. The most obvious are butterflies and moths (Lepidoptera), flies (Diptera) and some beetles (Coleoptera). Although many of these taxa may sometimes be valuable pollinators, they are generally less reliable as flower visitors, and less efficient at transferring pollen from flower-to-flower than are bees. Flies and beetles, for example, tend to be more poorly adapted and less finely-tuned to flower phenology and structure and reward extraction than are bees. They tend to visit open flowers with easily accessible rewards, flowers that are readily pollinated by any insect that visits them.

For the Columbia Basin, the most obvious exception to the rule that bees are always the preeminent pollinators is at higher elevations where flies assume increased importance (del Moral & Standley 1979). Except for bumble bees, bee abundance and diversity is inversely related to altitude: The vacancy created by the decline in bee diversity with altitude is filled by flies, apparently because of their greater ability to cope with high altitudes and cold temperatures. Flies mostly visit open, shallow flowers. Flowers with restricted accessibility are visited by bumble bees at higher elevations.

Butterflies and moths tend to visit a wide variety of flowering species for nectar and occasionally for pollen. Unlike bees, they collect flower rewards only to fuel them in their search for acceptable egg-laying sites. Lepidopterans exhibit little parental care, e.g., they do not build nests and are not central-place foragers (Orians and Pearson 1979) as are bees. Therefore they tend to move longer distances than do bees. This long-distance searching behavior has led some to suggest that butterflies and moths are more important as long-distance dispersers of pollen (Courtney et al. 1982, Courtney and Hill 1983) but evidence for this assertion is scant (Tepedino 1983).

Because lepidopterans are the subjects of several other reports on this project, and because both they and flies are of secondary import as pollinators, we have chosen to focus this report on bees.

The generalizations which follow are only as good as the

data base which prompts them. We have drawn from our own extensive collection of native bees (one of the largest in the United States) and from published and unpublished systematic studies of bee taxa. In many cases these records are less detailed than we would wish and we have had to make the best of it. There are several problems with these records. First, there is frequently no flower association included with the specimen, so for many species it is impossible to say anything about their foraging preferences. Second, in most cases where flower records exist, the purpose of the visit, i.e., collecting nectar, resting, etc., is not. Although we have assumed throughout that a flower record attests to an individual extracting resources and pollinating the flower, this is not always the case.

The third problem we have had to deal with, and perhaps the most insidious one, is trying to associate bees with vegetation types. Although most of the 58 genera of Columbia Basin bees have been revised, detailed locality records have been published for only roughly half of the species present. It is also rare to find insect labels that state "9.2 miles SSE Oridwa OR", or that give latitude and longitude of the collection site. More frequently one finds "Oridwa OR" and then struggles to translate this to a vegetation type. There is no question but that the vegetation type associations we have assigned to some of these records (we know not what percentage) are wrong. With the data currently available we can see no way to clarify the issue.

## Bee Diversity

### General

Based on 8350 specimen records, there are 647 species of bees presently known to occur in the Columbia River Basin, an area of about 75 million hectares. This is almost certainly a substantial underestimate because there are relatively few specimen records from the Basin, i.e., there has been little collecting effort. It is our feeling that the actual number of bee species in the Basin is much closer to 1,000.

There are three ways to illustrate the paucity of sampling effort in the Basin. First, Curlew Valley, a thoroughly sampled area in Idaho and Utah just outside the southeastern edge of the Basin (but in Bailey's Subsection 342B), has 324 species of bees, just under half of the Columbia Basin estimate but in only 375,000 hectares (0.5% of the area of the Basin). Second, the state of Wyoming, itself an undercollected area, has about the same number of species (Lavigne & Tepedino 1975) as the Columbia Basin in an area one-third the size (25+ million hectares). Third, a graph of a rough estimate of sampling effort (number of individuals recorded) versus the number of species for each of the Bailey's Subsections fails to show any sign of the expected plateau in species richness with increasing collecting effort (Figure 1).

Roughly thirty percent of the bee taxa recorded from the Basin must currently be regarded as rare or uncommon. In Appendix I we have supplied Panel Species Information for the 24 non-

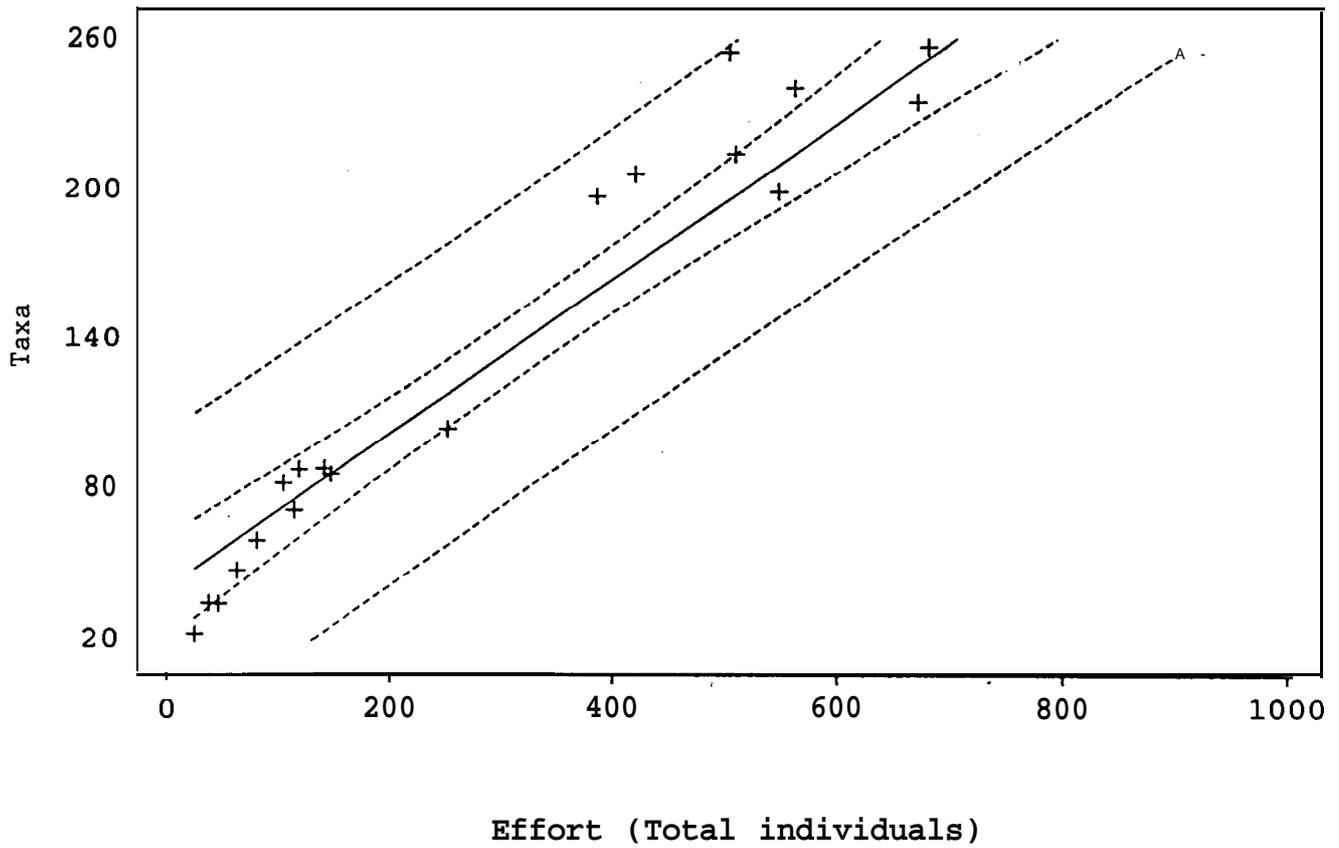


Figure 1. Number of species and subspecies versus sampling effort for each Bailey's Subsection.  
 ( $y = 0.31x + 40.3$ ,  $R^2 = 0.90$ ,  $P < 0.0001$ )

parasitic taxa (16 species, 8 subspecies) that are endemic to the Basin. Eleven of these taxa are extremely rare (indeed, some may be extinct), having been recorded at only a single site. Some have been recorded only once, many years ago (e.g., Macropis steironema opaca (1882), Synhalonia douglasiana (1902), others). Others appear to be specialists of uncommon and/or heavily utilized habitats such as sand dunes (Mesachile umatillensis, Nomadopsis barri) or lava beds (Hylaeus lunicraterius). While most (14 species) are, or are likely to be, somewhat specialized foragers (e.g., Perdita crassihirta, Hesperapis kavella) none is likely to be so important to its plant as to threaten that plant's existence if the bee is absent.

We have also included two other Appendices, one to highlight other species that may be rare, and the other to represent some characteristics of more common species. Appendix II lists an additional 168 bee taxa, and the Bailey's Subsections in which they occur, that are present uncommonly both in the Basin and in one or two neighboring states (Appendix II). Some of these species are almost as rare as the rarest of Columbia Basin endemics (e.g., Andrena luteihirta, Perdita tacita). Appendix III supplies detailed information on individual taxa or, sometimes, groups of taxa that may be taken to represent a particular Bailey's Subsection.

### Bailey's Subsections

The number of taxa recorded by Bailey's Subsection and by vegetation type are shown in Table 1. Half of the 20 Subsections have more than 100 species of bees; 8 have >200 species. The number of species recorded for a Subsection is largely related to the area of that Subsection (Fig. 2).

Although the Subsections have roughly been sampled in proportion to their area (Fig. 3), eight Subsections fall to the undersampled side, between the 95% confidence interval and the 95% predicted interval: M332A,B, E, F; M333A,B,C,D. These Subsections comprise the north and east of the Basin: they should be given priority for future sampling.

### Vegetation Types

Vegetation types differ widely in the number of species they support. Fourteen of the 29 types support about 100 or more species of bees. Again, the number of species is partially explained by the size of the area covered by a particular vegetation type (Fig. 4).

As with the Bailey's Subsections, the vegetation types have also been sampled approximately in proportion to the area they cover (Fig. 5). Undersampled vegetation types which should be given priority for future surveys are Salt Desert Shrub (SRM 414), Wyoming Big Sagebrush (SRM 403), Lodgepole Pine (SAF 218), Engelmann Spruce-Subalpine Fir (SAF 206), Interior Douglas Fir (SAF 210), Mixed grass-ag-shrub (CRB 002).

There are some glaring anomalies in the vegetation data. What, for example; do we do with the 171 species of bees that

Table 1. Number of species of bees in the Columbia River Basin by Bailey's Subsection and by vegetation type.

Bailey's Subsection	# Species	Vegetation		# Species
		Number	Type	
M332A	104	1	none	171
M332B	59	2	CRB001	420
M332E	47	3	CRB002	183
M332F	34	4	CRB003	21
M332G	258	5	CRB004	155
M333A	86	6	CRB005	11
M333B	22	7	CRB006	13
M333C	34	8	SAF206	101
M333D	71	9	SAF208	28
331A	257	10	SAF210	124
342B	198	12	SAF212	3
342C	2 0 0	13	SAF213	116
342D	235	14	SAF215	46
342H	88	15	SAF217	99
342I	241	16	SAF218	95
M242C	215	18	SAF226	4
M261D	88	20	SAF229	19
M261G	207	21	SAF230	30
M331A	82	25	SAF237	244
M331D	255	30	SRM101	48
		32	SRM104	15
		33	SRM107	a
		34	SRM109	50
		35	SRM110	176
		39	SRM304	32
		40	SRM306	97
		41	SRM402	117
		42	SRM403	217
		43	SRM412	54
		44	SRM414	25

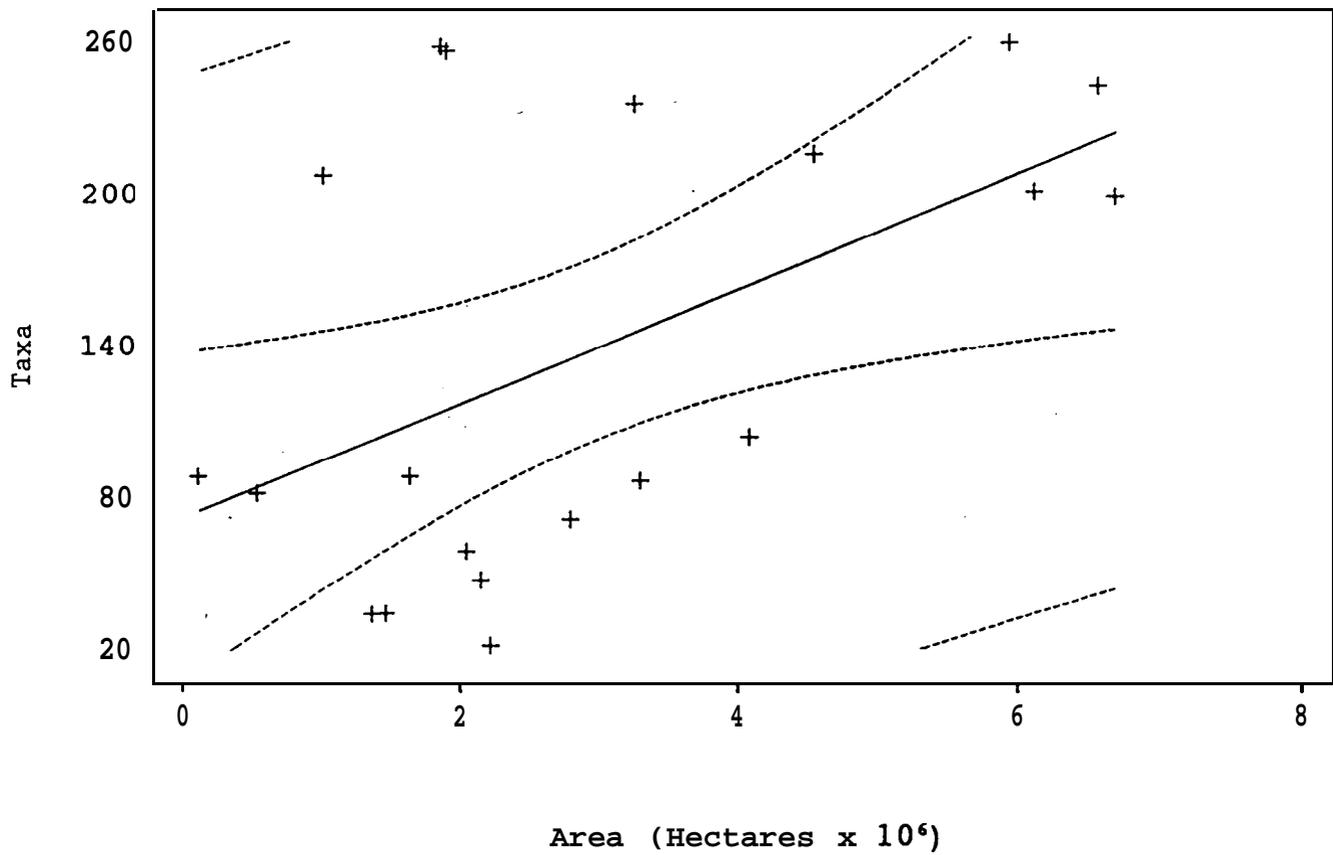


Figure 2. Number of species and subspecies versus area for each Bailey's Subsection. Includes only the area of subsections actually within the Columbia River Basin.  
 $(y = 22.4x + 72.7, R^2 = 0.27, P < 0.02)$

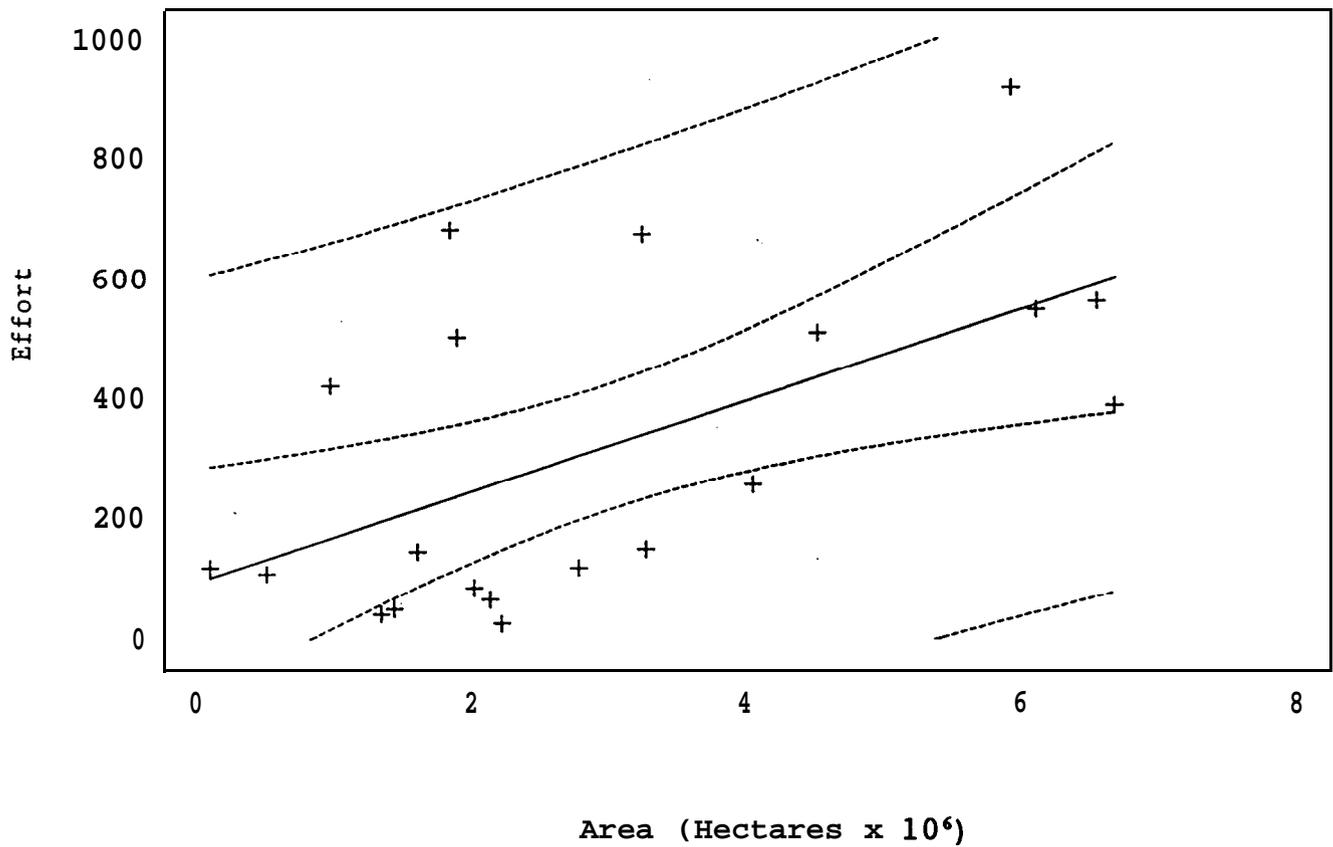


Figure 3. Sampling effort (number of individuals captured) versus area for each Bailey's Subsection.  
 ( $y = 92.1x + 75.7$ ,  $R^2 = 0.33$ ,  $P = 0.008$ )

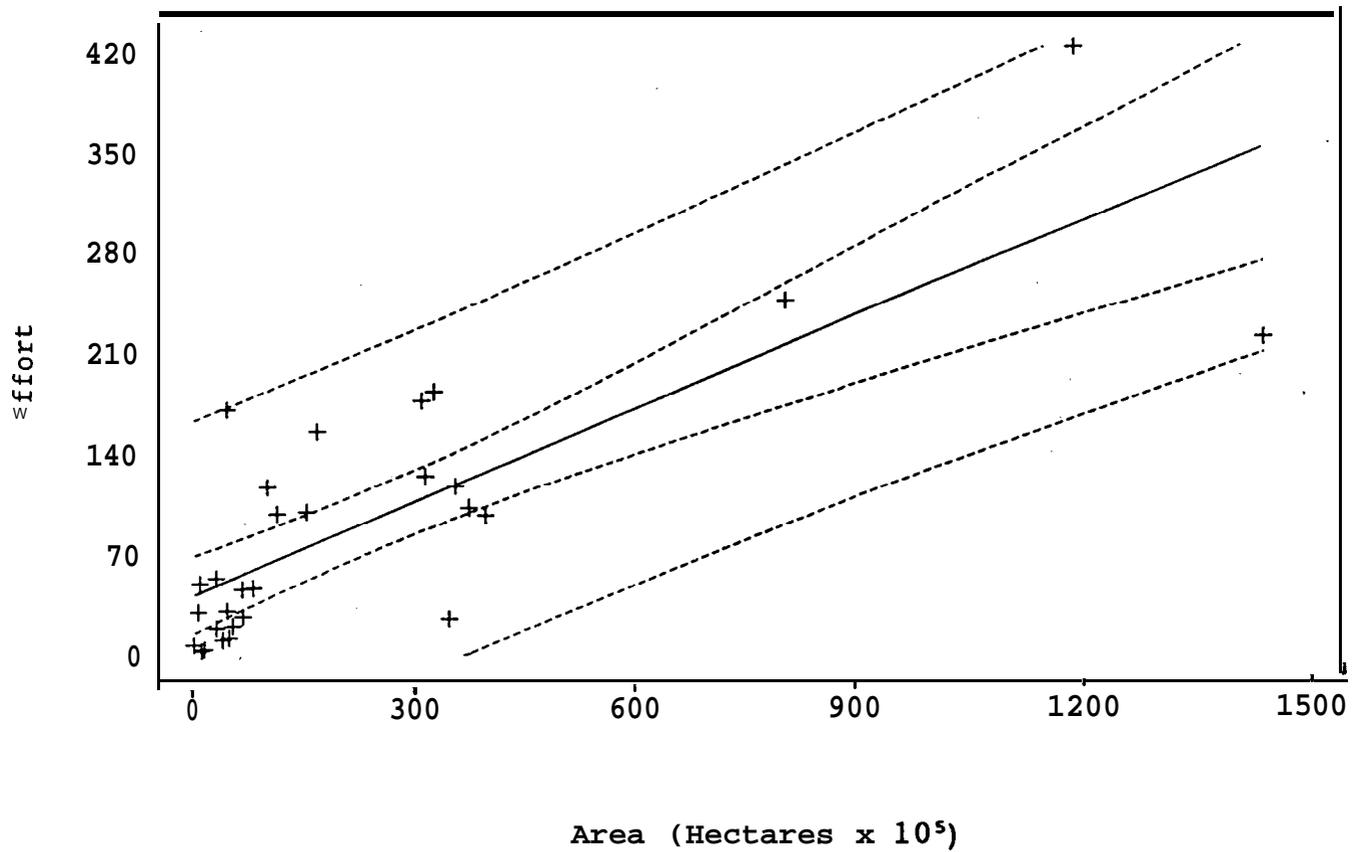


Figure 4. Number of species and subspecies versus area for 29 vegetation types.  
 ( $y = 0.21x + 40.9$ ,  $R^2 = 0.64$ ,  $P < 0.0001$ )

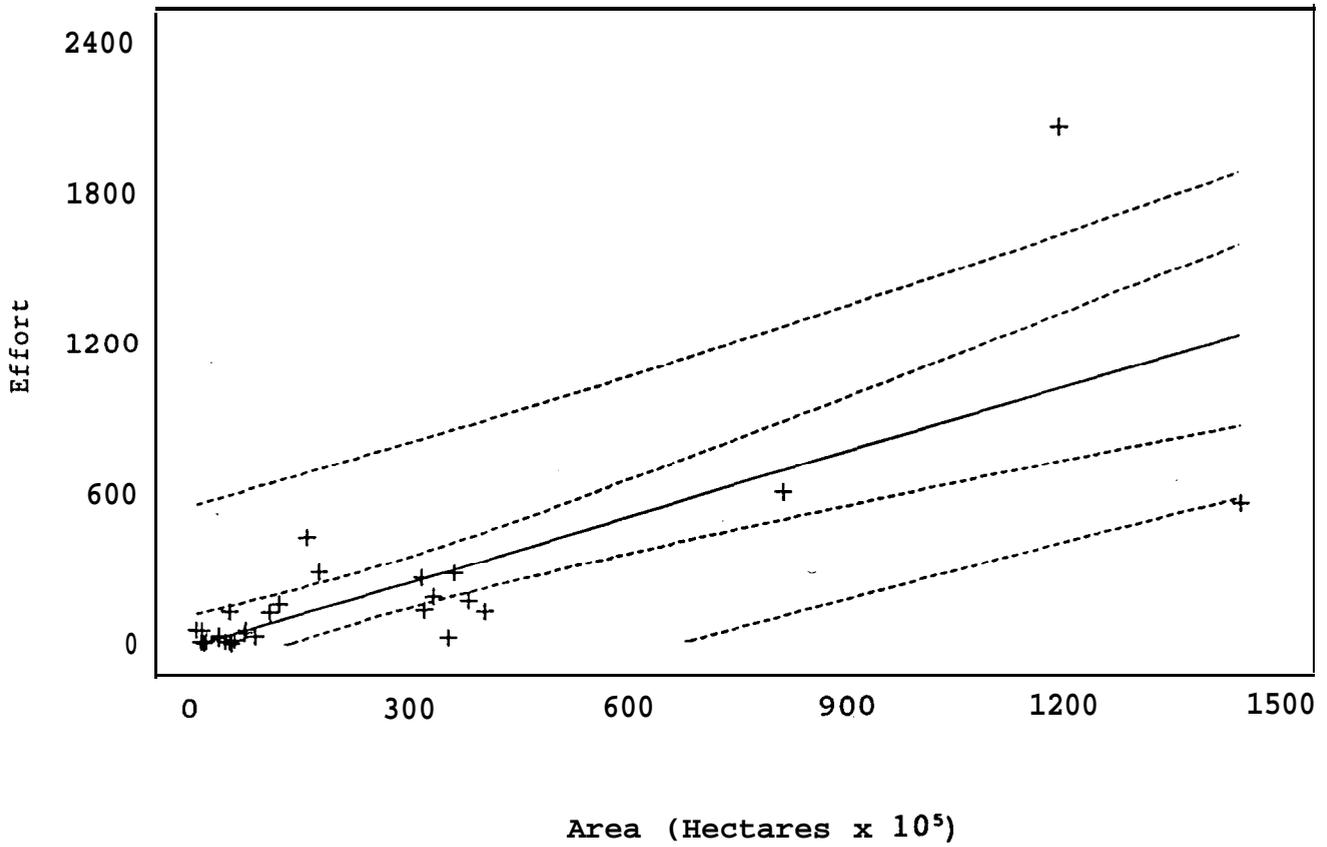


Figure 5. Sampling effort (number of individuals captured) versus area for 29 vegetation types.  
 $(y = 0.83x - 1.81, R^2 = 0.56, P < 0.0001)$

have been assigned to the "water" type of vegetation? Aquatic bees have previously been unknown, and the discovery of a few in the Columbia Basin would have been cause for rejoicing for bee enthusiasts but one does suspect the existence of so many species.

The second unsettling datum is the very large number of species recorded on "Agricultural Land Use". We are unsure what this reflects. Is it the ease of access and the facility of collecting in such areas that makes the species count high? Or, were many of these specimens collected from the vegetation type that existed in these areas before they were much used for agriculture? Although we have not had time to examine the data in detail, it is our subjective impression that many of these records are from a time when the land was either under less intense cultivation or no cultivation at all. If these 420 species (fully two-thirds of those present in the Basin) indeed remain in these areas today it is doubtful they are subsisting on, or pollinating, the plants they foraged upon years ago. Without surveys and studies it is impossible to vouch for their continued existence in these areas or to speculate about their role in the agroecosystem.

#### Key Environmental Factors

The resources necessary to support bee occurrence, and which help to determine their abundance can be broadly categorized into food and shelter or acceptable nesting habitats (For greater detail consult Linsley 1958; Stephen, Bohart & Torchio 1969; Michener 1974; Alford 1975; Heinrich 1979; Eickwort & Ginsberg 1980; Schemske 1983; Batra 1984; Roubik 1989; O'Toole & Raw 1991; Neff & Simpson 1993).

Shelter. Unlike most insects, bees exhibit a fairly sophisticated level of parental care. In contrast to popular impression, most species are solitary rather than social: in solitary species individual females search for sites where they can construct nests. Once constructed, their nests will be provisioned with pollen and nectar as food for their progeny. Females usually construct individual cells containing a pollen/nectar "loaf" on which an egg is laid. Each nest contains several cells which are usually separated from each other by partitions made of extraneous material.

For convenience we can divide nest sites into three broad categories: soil, wood, other. The other category contains a variety of unrelated nesting substrates that are used by a few non-burrowing species and are thus of minimal importance. We merely mention them here for purposes of completeness. Thus, some species build mud nests either on or below rocks, or in crevices in rocks. Obviously, such species require rocks as foundations for their nests, and a soil type which will readily harden when collected and water and/or diluted nectar are added. Also in the "other" category are species that nest in pine cones

and snail shells. Examples of such species are included in the Panel Species Information Sheets in Appendices I & III.

Most soil-nesting species are also burrowers: a few taxa, e.g., ground-nesting bumblebees, use abandoned rodent burrows rather than excavating their own nests. Soil nest sites can range from vertical clay embankments to alkali flats to agricultural fields; they may be compacted and barren or uncompacted and vegetated.

With some important exceptions, the preferred or even acceptable type of soil for nesting is unknown for most species. First, they are difficult to find, particularly for species whose nests are dispersed rather than aggregated. Second, we have no idea how representative existing descriptions of nesting sites are. This is because it is unusual to find the nesting site of a species described more than once. Thus we have little idea whether existing descriptions represent the nest-site norm or are simply areas that are acceptable under certain circumstances, but are not preferred. Third, the descriptions that exist rarely include such important details as soil type, texture, etc.: melittologists are rarely soil scientists.

The nest-sites of ground-nesting bees may be subject to a variety of disturbances. Sites in vertical or near-vertical embankments are subject to erosion, and to destruction from climbers, dirt-bikers, and cattle. Such activity can damage maturing progeny in the soil, and/or disrupt current nesting activity. Sites in more level ground are also vulnerable to compaction from heavy traffic, be it pedestrian, vehicular, or due to domestic animals such as cattle or sheep. Heavy traffic can also obliterate or change the subtle landmarks adjacent to nest-holes that bees use to relocate their nests when returning from foraging trips. Such alterations in the landscape will either slow bees in their daily business or cause them to abandon the nest.

Except for carpenter bees, which excavate their own burrows, and perhaps a few other taxa, bees that nest in wood are non-burrowing. They depend primarily upon holes, mostly in dead snags, stumps, logs, twigs, stems, etc., that have been excavated and vacated by members of the 177 genera of boring beetles in the Columbia Basin (Arnett 1968). Their natural nesting habits are poorly understood because they are rarely reported in numbers large enough to support generalizations. Most of our information on these bees comes from the use of artificial nests, "trap-nests", fashioned of wood or twigs whose soft pith has been removed (Krombein 1967). Thus, in general, we are unable to say if certain kinds, or ages, or diameters, etc. of wood are preferred.

The single greatest threat to wood-nesting species of bees is obvious: removal of their nesting material, dead wood. Some of the highest abundances of such bees have been obtained using trap-nests in areas where dead wood is not removed: Grand Teton National Park (Parker & Tepedino 1980). When the Grand Teton data is compared with an area with very similar bee fauna but

where much dead wood is removed, i.e., Logan Canyon, Cache and Rich Cos., Utah, the Grand Teton wood-nesting bee abundances are 50-75% greater.

Food. All bees of the Columbia Basin depend upon the pollen and nectar of flowers for their sustenance throughout their life cycle. Some species have become so specialized as to collect the pollen of a restricted group of plants. The genus Peponapis, for example, collects pollen only from plants of the genus Cucurbita although individuals may collect nectar from other flowers after squash flowers have closed.

The specialization of Peponapis can be contrasted with the generalization of many other groups. For example, many members of the subfamily Halictinae, which includes numerous species of primitively social bees, are notorious for the plasticity of their pollen and nectar collecting habits. Individual females commonly visit the flowers of a variety of species on individual foraging trips and may frequently visit them in the order in which they are encountered (Tepedino, unpub. obs.).

Such foraging behavior is bound to decrease the efficiency of pollination for all flowers, but particularly for specialized plant species. Flowers with deep corolla tubes, bilateral symmetry, and/or various other contrivances that attempt to reserve their rewards for those highly adapted species that pollinate them are less well-served by generalists that collect their pollen (Strickler 1979). Pollen may be placed in inappropriate spots on the generalist's body. Further, frequent movements by generalists between flower species are bound to result in some pollen loss from the bee's body, and other pollen being misplaced on unreceptive stigmas (Waser 1978). Thus, a much lower proportion of the pollen picked up by generalists from all flowers, but particularly from specialist flowers, can expect to find its way to receptive stigmas. Nevertheless, generalists serve an important pollination role, and are occasionally valuable even to specialized flowers when their specialist pollinators are absent.

Obviously, generalist bees, because of their "willingness" to use a wide range of floral resources, are more immune to disturbance, and, in general, to changes in the flowering plant composition, than are more specialized species (Tepedino 1979). Although they may be important occasional supplemental pollinators, generalists can also act to exacerbate a decline in the numbers of specialized plants and bees. If generalists are forced to play an increasing role in pollinating specialist plants because of permanent or long-term specialist bee declines, then those plant species will be more poorly pollinated than their generalist neighbors, and may eventually spiral to extinction because of insufficient reproduction, or change their method of reproduction. Ample examples of generalists and specialists are included in Appendices I and III.

Although there is no equation to describe the increase of bee diversity with flower diversity; it is a truism that the diversity of one enables and supports the diversity of the other

(Neff and Simpson 1993). Every flower species eliminated removes a unique suite of floral characters that favors a particular suite of pollinator characteristics over all others. The easiest and most straightforward way to manage for bee diversity is to maintain or augment flowering plant species diversity.

### Functional Roles

Bees function in four capacities in Columbia Basin ecosystems. As mentioned previously, they are the most important pollinators of flowering plants. In their absence most plants would reproduce only marginally.

In their capacity as pollinators, bees influence, to some extent, the genetic variability of the seeds produced by the plants they visit. They can do this in two ways. First, because of their movement patterns within and between plants they can influence the rate of inbreeding in plants with self-compatible flowers, i.e., those that are receptive to their own pollen. More flower-to-flower visits on the same plant increases the chances that self-pollination will occur. Conversely, more between-plant flower visits increases the likelihood of outcrossing and of producing more variable progeny. Because bees are generally thought to forage so as to exploit their resources efficiently (forage optimally) (Pyke 1984), they should visit as many flowers as possible on each plant, except when discouraged from doing so by the plant's flower display strategy. Such foraging behavior, which is not well-documented in non-social bees, would increase the likelihood of inbreeding in self-compatible plants and reduce the genetic variability, and perhaps adaptability, of plant populations.

The second way bees may influence genetic variability of plant populations is by their tendency, or lack of it, to fly between populations during foraging trips. Such trips would result in gene flow between populations and would tend to make populations more uniform genetically by counteracting genetic drift and natural selection for site-specific traits. While there is little doubt that insect pollinators do influence the genetic characteristics of the plants they service (see above) it is not possible at present to reach any conclusions about the details of these influences or even whether interpopulation gene flow is desirable (Waser 1993).

The products of pollination, fruits and seeds, are important not only to the plants that produce them, but to the numerous birds, mammals and insects that utilize them as food for all or part of the year. An idea of the diversity of organisms that eat fruits and seeds and the amount eaten can be gained from Janzen's (1971) review of seed predation.

Finally, ground-nesting bees, particularly those that nest in large aggregations of thousands of nests, move large amounts of soil in digging their main burrows and side branches. In so doing, they contribute to the recycling of the soil layers, and of nutrients in the soil. We know of no study that has examined

this the magnitude of this effect but suspect that it could occasionally be substantial.

Vulnerable Habitats. Despite their often bleak appearance, sand dunes and similar vegetated sandy areas are habitats with rich and distinctive bee faunas. Bees find the sandy substrate favorable for nesting. Sand dunes thus often serve as pollinator reservoirs important to floral maintenance on adjacent lands. Some bees (Mesachile umatillensis, Nomadopsis barri, Hesperapis kavella) are restricted to sand dune environments while other predominantly southern species (Lithurse anicalis) persist in the Columbia Basin only in these specialized habitats. Many of the dune areas in the Columbia Basin remain unsampled, while other have been collected only sporadically. Based on the limited available data, dunes appear to act as islands, with bee faunas differing markedly between dunes.

Sampling of sandy environments should be given priority for two reasons. First, they are areas of species richness with high degrees of endemism. Second, these unique faunas face significant threats from recreational vehicle use. Off-road-vehicle activity not only reduces floral resources necessary for reproduction but destroys nests and potential nest sites.

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**APPENDIX I**

**Endemic Bee Species of the Columbia Basin**

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**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**


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Date: 1-31 -95 \_\_\_\_\_

Panelist Name: TEPEDINO &amp; GRISWOLD (optional)

Species or Species Group: Hylaemus lunicraterius

Geographic Area and/or Habitat Type: M332Fa Craters of the Moon Nat. Mon.

Representative Species:

"I did not complete this form because: "

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**Key Environmental Correlates**

1. Presence of flowering plants of one of several families: known to visit  
 flowers of Phacelia, Eriogonum and members of Compositae.

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Categorical  \_\_\_\_\_C o n t i n u o u sSuitable Categories:  
Adult reproductive plants

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? July-August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (snags, stumps, etc.) or stems with abandoned beetle burrows.

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Categorical  \_\_\_\_\_C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No 

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental Correlates**

3. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
 Which seasons? \_\_\_\_\_  
 Theme name: \_\_\_\_\_  
 Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
 Which seasons? \_\_\_\_\_  
 Theme name: \_\_\_\_\_  
 Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flower species visited for pollen and nectar including Phacelia, Eriogonum, and members of the Compositae.

• \_\_\_\_\_ ne flow within and between populations of flower species visited for pollen and nectar including Phacelia, Eriogonum, and members of the Compositae.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants, and other seed-eating insects.

4. \_\_\_\_\_  
 \_\_\_\_\_

b. \_\_\_\_\_  
 \_\_\_\_\_

### Key Assumptions

That Hylaeus lunicraterius is a generalist, i.e., that it visits numerous taxa of flowering plants.

That H. lunicraterius is an important pollinator of those plants it visits for pollen and nectar.

That H. lunicraterius nests in beetle burrows in dead wood and in hollow stems, holes, and cavities as do all its known congeners.

### Key Unknowns and Monitoring or Research Needs

Because so little collecting has been done in the Columbia Basin, little is known of the distribution, plant host range, or nesting habitat of this species.

Because of its occurrence in Craters of the Moon, it is possible that lava pockets are used as nesting sites. This should be investigated both in the Monument and in other areas with lava deposits.

### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants.

Presence of appropriate nesting habitat.

### Degree of Confidence in Knowledge of Species

High     

Medium   

Low     x

### Comments

This rare endemic species has been recorded only from Craters of the Moon National Monument. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Heterosarus subdilaptes n. sp.

Geographic Area and/or Habitat Type: M331 D Grand Teton National Park

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of unknown flowering plant species probably in the family Compositae.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes x No

Maximum:

Which seasons? June-July

Theme name:

Attribute:

2. Presence of appropriate (unknown) soil substrate for nesting.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonally? Yes No x

Maximum:

Which seasons?

Theme name:

Attribute:

*Key Environmental Correlates*

\_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

1. Pollination of various flower species presumably in the Compositae.

2. Gene flow within and between populations of various flowers, presumably in the Compositae.

3. Recycle soil layers and nutrients.

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants, and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *H. subdilatus* is a visitor to flowers of the Compositae.  
That *H. subdilatus* is an important pollinator of flowers of the Compositae.  
That *H. subdilatus* nests in the ground as do all its known conspecifics.  
 \_\_\_\_\_  
 \_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

Because so little collecting has been done in the Columbia Basin, little is known of the distribution, plant host range, or specific nesting requirements of this species.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight  
Requirements for dispersal: Presence of flowering plants in the family Compositae.  
Presence of appropriate nesting habitat.  
 \_\_\_\_\_  
 \_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

High \_\_\_\_\_  
 Medium   d    
 Low   x  

**Comments**

This rare endemic species has been recorded only from Grand Teton National Park, High research priority.  
 \_\_\_\_\_  
 \_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Nomadoosis barri

Geographic Area and/or Habitat Type: 342 Db Idaho Fescue - Bluebunch Wheatgrass, M242 Cc Interior Ponderosa Pine

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of sand dunes (stabilized?) as nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes \_\_\_ No X

Maximum:

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of unknown flowerina plants, Dossibly including Melilotus or other small-flowered legumes from which it has been taken.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No \_\_\_

Maximum:

Which seasons? July

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental Correlates**

3. \_\_\_\_\_  
 \_\_\_\_\_

***C a t e g o r i c a l***

***C o n t i n u o u s***

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Minimum: \_\_\_\_\_

*Applies seasonally?* Yes \_\_\_ No \_\_\_  
*Which seasons?* \_\_\_\_\_  
*Theme name:* \_\_\_\_\_  
*Attribute:* \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
 \_\_\_\_\_

***C a t e g o r i c a l***

***C o n t i n u o u s***

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Minimum: \_\_\_\_\_

*Applies seasonally?* Yes \_\_\_ No \_\_\_  
*Which seasons?* \_\_\_\_\_  
*Theme name:* \_\_\_\_\_  
*Attribute:* \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

**1. Pollination of unknown species of flowering plants, including, and possibly restricted to, small-flowered legumes such as Melilotus.**

**2. Gene flow within and between populations of various flowers, including small-flowered legumes such as Melilotus.**

**3. Recycle soil layers and nutrients.**

**4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants, and other fruit- and seed-eating insects.**

5. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Key Assumptions**

That *Nomadoosis barri* visits the flowers of *Melilotus* and other small-flowered legumes.

That *N. barri* is an important pollinator of the flowers that it visits.

That *N. barri* is restricted to sand dune habitats.

**Key Unknowns and Monitoring or Research Needs**

Survey dunes in Columbia Basin, many of which have not been sampled, to determine the distribution of this species.

Determine the flower preferences of this species.

Determine whether this species is an effective pollinator of the flowers it visits.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of sand dunes.

Presence of appropriate flowering plants.

**Degree of Confidence in Knowledge of Species**

H i g h

Med.

L o w

**Comments**

This rare endemic has been recorded only from Rexburg, Idaho, and Sisters, Oregon. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Hesperapis kavella n. sp.

Geographic Area and/or Habitat Type: 342 Ce Agricultural

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of plants of aenus Tiavilia.

Categorical X

Continuous

Suitable Categories: Adult reproductive plants.

Unit of Measure:

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? June

Theme name:

Attribute:

2. Presence of sandy, river-bottom soil for nestina.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonal/v? Yes No

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

1. Pollination of Tiavilia flowers. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between Tiavilia flowers. \_\_\_\_\_  
\_\_\_\_\_

3. Recycle soil layers and nutrients. \_\_\_\_\_  
\_\_\_\_\_

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants,  
and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That *Hesperapis kavella* is a specialist visitor of *Tiquilia*.  
That *H. kavella* is an important pollinator of *Tiquilia* flowers.  
That *H. kavella* nests preferentially in sandy substrates.

**Key Unknowns and Monitoring or Research Needs**

Because so little collecting has been done in the Columbia Basin, little is known of the distribution or plant host range of this species.  
Survey sand dunes and other sandy habitats to determine the overall distribution of this species.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants of the genus *Tiquilia*.

Presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

High     

Med.  X

Low     

**Comments**

This rare endemic has been recorded only from a single locality in Owyhee County, Idaho and from three sites in Washoe County, Nevada. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Macroois steironema ooaca

Geographic Area and/or Habitat Type: 3421 Columbia Basin/SRM 110

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of bloomina plants of the aenus Steironema.

Categorical X

Continuous

Suitable Categories: Adult reproductive plants.

Unit of Measure:

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? summer

Theme name:

Attribute:

2. Nest site cover

Categorical

Continuous X

Suitable Categories: Partial shade

Unit of Measure:

Minimum:

Applies seasonally, res x No

Maximum:

Which seasons? summer

Theme name:

Attribute:

Key Environmental Correlates

3. Nest site slope

C a t e g o r i c a l

C o n t i n u o u s X

Suitable Categories:

U n i t o f M e a s u r e : d e g r e e s

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: 5%

Applies seasonal/y? Yes \_\_\_ No X  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: 40%

4. Nest site soil type

C a t e g o r i c a l X

C o n t i n u o u s

Suitable Categories: not clay

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

7. Pollination of plants in the genus Steironema

2. Gene flow within and between populations of Steironema.

3. Recycle soil layers and nutrients.

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants, and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

- That Steironema is alloamorous (requires a pollinator).
- That Macrodis is oligolectic (specialized on Steironema).
- That MacroDis is an effective pollinator of Steironema.
- That MacroDis steironema.opaca utilizes nest sites similar to those of other Macrodis species.

**Key Unknowns and Monitoring or Research Needs**

- Whether MacroDis steironema.opaca still exists (only known record is from 1882) - This sub-species probably should be listed under the Endangered Species Act if it still exists.
- Whether MacroDis steironema.opaca is the only, or the most important, pollinator of Steironema.
- Insect collecting from the flowers of Steironema should be immediately undertaken to determine the distribution of this bee species throughout the Columbia Basin.

**Dispersal**

- Dispersal mode: Independent flight
- Requirements for dispersal: Presence of host plant (Steironema)
- Presence of appropriate soil type.

**Degree of Confidence in Knowledge of Species**

High \_\_\_\_\_  
 Mod. \_\_\_\_x  
 Low o\_\_\_\_w

**Comments**

This rare endemic has been recorded only from Morgan's Ferry, Washington, along the Yakima River. Very high research priority.

COL UMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Ashmeadiella sculleni

Geographic Area and/or Habitat Type: M332G Blue Mtns; 3428 NW Basin and Range

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of blooming plants in the genus Penstemon.

Categorical X

Continuous

Suitable Categories: Adult reproductive plants.

Unit of Measure:

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? June-mid July

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) with abandoned beetle burrows

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

***C a t e g o r i c a l***

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Applies seasonally?* Yes \_\_\_ No \_\_\_  
*Which seasons?* \_\_\_\_\_  
*Theme name:* \_\_\_\_\_  
*Attribute:* \_\_\_\_\_

***C o n t i n u o u s***

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

***C a t e g o r i c a l***

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Applies seasonally?* Yes \_\_\_ No \_\_\_  
*Which seasons?* \_\_\_\_\_  
*Theme name:* \_\_\_\_\_  
*Attribute:* \_\_\_\_\_

***C o n t i n u o u s***

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

1. Pollination of plants of the aenus Penstemon

2. Gene flow within and between populations of plants of the aenus Penstemon

~~4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.~~

5. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Key Assumptions**

That Ashmeadiella sculleni is a specialist visitor of Penstemon.

That Ashmeadiella sculleni is an important pollinator of Penstemon.

That it nests in beetle burrows in dead wood as do all its known consubgeners.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

Because so little collecting has been done in the Columbia Basin, little is known of the distribution or plant host range of this species. Monitoring studies are warranted.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants of the genus Penstemon

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

H i g h

Med. X

L o w

**Comments**

This rare endemic has been recorded only from single localities in Baker and Harney counties, Oregon, and one locality just outside the basin in northern Humboldt County, Nevada. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Hoplitis producta subaracilis

Geographic Area and/or Habitat Type: M333Ae - Interior Ponderosa Pine; M242Cc - Agricultural; M242Ce - Engelmann Spruce - subalpine fir; 331Ac - Agricultural; M332G1 - Idaho fescue/slender wheat-grass; 33 1 Ab - Agriculture.

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants of one of several aenera (Penstemon, Phacelia, Astraaalus, etc.) or families (Leguminosae, Rosaceae, Scrophulariaceae, etc.1

Categorical

C o n t i n u o u s

Suitable Categories: Adult reproductive plants.

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? July-August

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.1 with abandoned beetle burrows for use as nestina sites.

Categorical

C o n t i n u o u s

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of various flowering plant species visited for pollen and nectar.

2. Gene flow within and between populations of various flowering plant species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

**Key Assumptions**

That *Hoolitis producta subaracilis* is a generalist flower visitor as are other members of its species group.

That *H. producta subaracilis* is an important pollinator of the species it visits.

That *H. producta subaracilis* nests in beetle burrows in dead wood as do all known members of its species group.

**Key Unknowns and Monitoring or Research Needs**

Because so little collecting has been done in the Columbia Basin, little is known of the distribution or plant host range of this species.

We know nothing of its host plant selection or of its effectiveness as a pollinator of those plants it visits.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable flowering plants; presence of acceptable nesting habitat.

**Degree of Confidence in Knowledge of Species**

H i g h

Med. x

L o w

**Comments**

This endemic taxa has been recorded from several habitat types in the Columbia Basin. For this reason and because its taxonomic status is somewhat problematic, it is not a top priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Osmia ashmeadii

Geographic Area and/or Habitat Type: 3421a Ponderosa Pine - Shrubland

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowering plants in the family Leguminosae.

Categorical x

Continuous

Suitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes x No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? Unknown

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of appropriate resting substrate (unknown).

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No x

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowering plants in the leaume family.

2. Gene flow within and between populations of various flowering species in the leaume family.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

~~4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.~~

5. \_\_\_\_\_

6. \_\_\_\_\_

### Key Assumptions

That *Osmia ashmeadii*, like most other members of the subgenus *Acanthosmiodes*, prefers to visit flowers of the legume family.

That *O. ashmeadii* is an important pollinator of the plants it visits.

### Key Unknowns and Monitoring or Research Needs

Because so little collecting has been done in the Columbia Basin, little is known of the phenology, distribution, plant host range, or nesting requirements of this species. It is essential that information be gathered on this very rare species.

### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants of the legume family.

Presence of acceptable nesting habitat.

### Degree of Confidence in Knowledge of Species

High

Medium

Low

### Comments

This rare endemic has been recorded only from The Dalles, Oregon. A high priority should be assigned to research on this species.

## COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95Panelist Name: TEPEDINO & GRISWOLD (optional)Species or Species Group: Osmyia cascadica n. sp.Geographic Area and/or Habitat Type: M242Ce - Engelmann Spruce - subalpine fir;M261Dh - Mountain Bie Saaebush; M242Cg - Interior Ponderosa Pine.

Representative Species:

"I did not complete this form because: "

## Key Environmental Correlates

1. Presence of flowering plants in the family Scrophulariaceae.C a t e g o r i c a l xC o n t i n u o u sSuitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes x No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? July-August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (snags, stumps, etc.) or stems with abandoned beetle burrows for use as nesting sites.C a t e g o r i c a l XC o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No x

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowering plants in the family Scrophulariaceae.

2. Gene flow within and between populations of flowering plant species in the family Scrophulariaceae.

• laborators in the production of native fruits and seeds used as food by mammals, birds, ants  
and other fruit- and seed-eating insects.

4. \_\_\_\_\_

• \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That *Osmia cascadica* is a specialized flower visitor of flowers in the Scrophulariaceae.

That *O. cascadica* is an important pollinator of plants in the Scrophulariaceae.

That *O. cascadica*, like most other members of the subgenus *Chenosmia*, nests in abandoned beetle burrows in wood and stems.

*Key Unknowns and Monitoring or Research Needs*

Because so little collecting has been done in the Columbia Basin, little is known with surety of the distribution, plant host range, or nesting requirements of this species.

We should assess the host plant selection of this species and whether it is an effective pollinator of the plants it visits.

We should confirm that *O. cascadica* is a species that builds nests in abandoned beetle burrows in dead wood.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants of the family Scrophulariaceae.

Presence of acceptable nesting habitat.

*Degree of Confidence in Knowledge of Species*

High \_\_\_\_\_

Med. \_\_\_\_\_

Low \_\_\_\_\_

*Comments*

This endemic species of the Columbia Basin is apparently restricted to the high Cascades. It is fairly common in the Basin and for this reason can be assigned lower research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Proteriades n. sp. near plaiiostoma

Geographic Area and/or Habitat Type: M332Ga mixed grass-ag-shrub

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of bloomina host olants in the genus Crvotantha

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive olants

Minimum:

Applies seasonally Yes X No

Maximum:

Which seasons? Sprina (April, May)

Theme name:

Attribute:

2. Presence of dead wood with abandoned beetle burrows.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonal/v? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers in the genus Cryptantha \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of Cryptantha \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

That this species, like its sister species P. plagiostoma and other members of the genus, is a specialized visitor of the flowers of Crvotantha.

That this species is an important pollinator of Crvotantha.

That, like all known congeners, it nests in holes made by other insects in dead wood.

*Key Unknowns and Monitoring or Research Needs*

The information supplied above is based upon educated guesses: nothing is known of this species except that it exists. Because so little collecting has been done in the Columbia Basin, we know nothing with certainty of this species' distribution or host range.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming populations of Crvotantha:

Presence of appropriate nesting habitat.

*Degree of Confidence in Knowledge of Species*

*H i g h*

*M a d*

*Low*    x

*Comments*

This rare endemic has been collected from only one site in Asotin County, Washington. High research priority.

**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species, or Species Group: Proteriades orthoanathus

Geographic Area and/or Habitat Type: M332Arr Interior Ponderosa Pine  
M332Ga Idaho Fescue-Slender Wheatgrass  
M332Ga Ponderosa Pine-arassiand

Representative Species:

*"I did not complete this form because: "*

**Key Environmental Correlates**

7. Presence of blooming populations of unknown species of flowering plants.

*C a t e g o r i c a l*   x  

*C o n t i n u o u s*

Suitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies *seasonally*? Yes   x   No     
Which seasons? Summer (June-July)  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

2. Presence of dead wood with abandoned beetle burrows.

*C a t e g o r i c a l*   x  

*C o n t i n u o u s* \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies *seasonal/v*? Yes \_\_\_\_\_ No   x    
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Environmental Correlates**

~ \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s** \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollinator of flowering plants visited for pollen and nectar.

2. Gene flow within and between populations of plants visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That this species is an important pollinator of the flowers it visits.

That, like all others of its genus, it nests in abandoned insect burrows excavated in dead wood.

*Key Unknowns and Monitoring or Research Needs*

What little information is supplied above is based upon educated guesses: nothing is known of this species except that it exists. Because so little collecting has been done in the Columbia Basin, we know nothing, with surety, of this species distribution, flower preferences or nesting behavior.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of flowering plants of unknown identity:

Presence of appropriate nesting substrate.

*Degree of Confidence in Knowledge of Species*

*H i g h*

*M e d .*

*Low*   x

*Comments*

This endemic species is known from only three locations (Baker County, Oregon; Idaho County, Idaho; Asotin County, Washington) and is potentially rare. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Synhalonia frater lata

Geographic Area and/or Habitat Type: M261 Ga Water (?); M332Gk Enalemann Spruce-subalpine fir; M332Ga Idaho fescue-Slender wheatgrass; M332Ga Interior Ponderosa Pine; 331 Ab, 331 Ac Agricultural Land use; 331Af Mixed grass-ag-shrub.

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of bloomina plants in the aenus Astraaalus and perhaps other aenera.

Categorical [X]

Continuous

Suitable Categories:

Unit of Measure:

[Blank lines for suitable categories]

Minimum:

Applies seasonally? Yes [X] No [ ]
Which seasons? April-August
Theme name:
Attribute:

Maximum:

2. Presence of appropriate soil habitat for this around-nestina species.

Categorical [X]

Continuous

Suitable Categories:

Unit of Measure:

[Blank lines for suitable categories]

Minimum:

Applies seasonally? Yes [ ] No [X]
Which seasons?
Theme name:
Attribute:

Maximum:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

*Key Ecological Functions*

7. Pollination of Astragalus flowers and possibly those of other species.

2. Gene flow within and between populations of Astragalus flowers and possibly those of other species.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That this species prefers to visit the flowers of Astragalus plants. Other subspecies appear to be quite generalized in their flower-visiting habits.

That this species, like all others of its genus whose nesting habits have been observed, nests in the ground.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

We need to have more information on the flower-visiting and pollinating behavior of this apparently wide-spread (in the Columbia Basin) species. Phenological records (flight period from April to August) suggest that there is more than one generation per year.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants of the genus Astragalus and perhaps other species as well.

Presence of appropriate soil nest sites.

\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

H i g h

M a d. X

L o w

**Comments**

This endemic of the Columbia Basin occurs in several habitats and is fairly common. Lower research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Meachile umatillensis

Geographic Area and/or Habitat Type: 3421 Columbia Basin
M333Ar Interior Ponderosa Pine

Representative Species:

I did not complete this form because:

Key Environmental Correlates

1. Presence of blooming populations of Oenothera (Onagraceae)

Categorical x

Continuous

Suitable Categories:
Adult reproductive plants

Unit of Measure:

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? June-July

Theme name:

Attribute:

2. Presence of stabilized sand dunes for nesting sites.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

*Continuous* \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

*C o n t i n u o u s*

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

*Key Ecological Functions*

7. Pollination of Oenothera flowers.

2. Gene flow within and between populations of Oenothera.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That this species is restricted in its foraging options to flowers of the genus Oenothera.

That this species is restricted in its nesting options to stabilized sand dune habitats.

*Key Unknowns and Monitoring or Research Needs*

Other sand dune habitats in the Columbia Basin should be censused to uncover the total distribution pattern of this species and to determine whether it is restricted to certain species of Oenothera as host plants or if it accepts other species as well.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of stabilized sand dunes:  
presence of blooming populations of Oenothera.

*Degree of Confidence in Knowledge of Species*

H i g h

M e d . X

L o w

*Comments*

This rare species is known from only two locations in Washington and three populations in Utah and Colorado. It has likely been extirpated from the Utah population due to urbanization and intensive agricultural land use, and has not been collected in the Columbia Basin since 1882. High research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Synhalonia douglasiana

Geographic Area and/or Habitat Type: 342ld Water (?)

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of blooming plants of unknown identity.

Categorical   x  

Continuous

Suitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes   x   No     

Maximum: \_\_\_\_\_

Which seasons?   June-July  

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of appropriate soil habitat of unknown characteristics for nesting.

Categorical   x  

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonal/v? Yes      No   x  

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

### Key Environmental Correlates

3. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

### **Key Ecological Functions**

7. Pollination of flowers visited for pollen and nectar.  
 \_\_\_\_\_  
 \_\_\_\_\_

2. Gene flow within and between populations of flowers visited for pollen and nectar.  
 \_\_\_\_\_  
 \_\_\_\_\_

3. Recycle soil layers and nutrients.  
 \_\_\_\_\_  
 \_\_\_\_\_

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.  
 \_\_\_\_\_  
 \_\_\_\_\_

5. \_\_\_\_\_  
 \_\_\_\_\_

b. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Key Assumptions**

Because so little is known of this species no assumptions have been made.

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**Key Unknowns and Monitoring or Research Needs**

Only one specimen (a female) of this species has ever been collected. The site of collection was Steamboat Rock, Grand Coulee. There is no information available other than that the species existed in 1902! A monitoring program is desperately needed.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable host plants (unknown) in bloom;

Presence of acceptable nest-sites (unknown).

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**Degree of Confidence in Knowledge of Species**

H i g h

M a d .

Low(est)

**Comments**

This rare endemic has been collected only once, from Grant County, Washington, in 1902. Very High research priority.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: I-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or *Species* Group: Andrena aculeata

Geographic Area and/or Habitat Type: M332Gk Englemann Spruce-subalpine fir  
331Af Agricultural land use

Representative *Species*:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants of unknown identity.

*C a t e g o r i c a l*  x

*C o n t i n u o u s*

Suitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  X No

Maximum: \_\_\_\_\_

Which seasons? May-August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nesting habitat.

*C a t e g o r i c a l*  X

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes   No  X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**Continuous** \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

\_\_\_\_\_

**Key Assumptions**

None.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

There is no information on the flower preferences of this species.

There is no information on the specifics of nest-site selection by this species.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of preferred species of flowering plants;

Presence of appropriate soil-nesting sites.

\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

High \_\_\_\_\_

M a d

Low x

**Comments**

Few species of *Andrena* have more than one generation per year. The phenology of this species (in flight from May-August) suggests that it is more widespread in its occurrence in the Columbia Basin than the few collection records might suggest. It is likely to occur at a range of altitudes and to be active from May at the lowest sites into August at the highest sites. Such a range of flight times and altitudes also suggests that the species will likely be found on different plant species at different sites. Moderate research priority.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Andrena winnemuccana

Geographic Area and/or Habitat Type: 342Cg Wyoming Big Sagebrush

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of acceptable flowering plants (unknown but may be a specialist visitor of crucifer flowers).

Categorical

Continuous

Suitable Categories: Adult reproductive plants

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? May-June

Theme name:

Attribute:

2. Presence of appropriate soil habitat for nesting.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s \_\_\_\_\_

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers of unknown identity (perhaps crucifers). \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of flowers of unknown identity (perhaps crucifers). \_\_\_\_\_  
\_\_\_\_\_

3. Recycle soil layers and nutrients. \_\_\_\_\_  
\_\_\_\_\_

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

None.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

Neither the host plants nor the details of nest-site selection are known for this species. Other  
closely related members of this genus tend to specialize on the flowers of crucifers and that may also be  
true for this species but it remains to be confirmed. We also need information on the type of nest-site used by this  
species.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Dispersal*

*Dispersal mode:* Independent flight  
*Requirements for dispersal:* Presence of acceptable flowering plants:  
Presence of appropriate nesting substrate.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Degree of Confidence in Knowledge of Species*

H i g h  
M e d .  
Low x \_\_\_\_\_

*Comments*

This rare endemic of the northern Great Basin and Owyhee Uplands has been collected only once  
in the Columbia Basin, at Owyhee Dam in Malheur County, Oregon. High research priority.  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita accepta

Geographic Area and/or Habitat Type: 342Hc Pondersa Pine - Grassland

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowering plants in the family Compositae.

Categorical

Continuous

Suitable Categories: Adult reproductive plants

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? July-August

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

*Key Environmental Correlates*

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

*Key Ecological Functions*

1. Pollination of flowers of the family Compositae.

2. Gene flow within and between populations of flowers of the family Compositae.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That like all other species in the zonalis taxonomic group, P. accepta is a specialist visitor Of composite flowers.

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**Key Unknowns and Monitoring or Research Needs**

We do not know which, if any, composite species are Dpreferred by P. accepta.

We have no information on the type of soil substrate that will be used for nestina.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants in acceptable aenera of composites.

Presence of acceptable soil nestina substrate.

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**Degree of Confidence in Knowledge of Species**

High     

M e d    X

L o    w

**Comments**

This rare endemic has been collected onlv once, in 1939, at Tumalo in Deschutes County, Oregon. Very high research priority.

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**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**

Date: 1-31 -95 \_\_\_\_\_

Panelist Name: TEPEDINO &amp; GRISWOLD (optional)

Species or Species Group: Perdita crassihirta

Geographic Area and/or Habitat Type: 342ld Agricultural Land Use

Representative Species:

"I did not complete this form because: "

**Key Environmental Correlates**

**1. Presence of flowering plants in the family Compositae.**

**Categorical** **Continuous**Suitable Categories:  
Adult reproductive plants.

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No 

Maximum: \_\_\_\_\_

Which seasons? July-August \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**2. Presence of acceptable around-nesting habitat.**

**Categorical** **Continuous**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No 

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers of the family Comuositae.

2. Gene flow within and between populations of flowers of the family Comoositae.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That like all other species in the zonalis taxonomic group, P. crassihirta is a specialist visitor of composite flowers.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

We do not know which, if any, composite species are Preferred by P. crassihirta.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Dispersal*

Dispersal mode: Independent flight  
Requirements for dispersal: Presence of blooming plants in acceptable genera of composites.  
Presence of acceptable soil-nesting substrate.  
\_\_\_\_\_  
\_\_\_\_\_

*Degree of Confidence in Knowledge of Species*

H i g h \_\_\_\_\_  
Med.   X    
Low \_\_\_\_\_

*Comments*

This rare endemic has been collected only once, in 1941, at Wenatchee in Clallam County, Washington. Very high research priority.  
\_\_\_\_\_  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita similis pascoensis

Geographic Area and/or Habitat Type: 3421a Pinyon - Juniper Woodland

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants in the family Compositae.

Categorical x

Continuous

Suitable Categories: Adult reproductive plants

Unit of Measure:

Minimum:

Maximum:

Applies seasonally? Yes X No

Which seasons? August-September

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Maximum:

Applies seasonal/v? Yes No X

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

*Continuous* \_\_\_\_\_

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

*C o n t i n u o u s*

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers of the family Comoositae.

2. Gene flow within and between populations of flowers of the familv Comoositae.

3. Recycle soil lavers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That like all other species in the zonal taxonomic group, P. similis oascoensis is a specialist visitor of composite flowers.

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**Key Unknowns and Monitoring or Research Needs**

We do not know which, if any, composite species are preferred by P. similis oascoensis.

We have no information on the type of soil substrate that will be used for nesting.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants in acceptable genera of composites.

Presence of acceptable soil nesting substrate.

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**Degree of Confidence in Knowledge of Species**

High     

Med.   X  

Low     

**Comments**

This rare endemic has been collected only once, in 1904, in Pasco, Franklin County, Washington. Very high research priority.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita barri

Geographic Area and/or Habitat Type: 342Ce Agricultural Land Use

Representative Species:

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants, perhaps in the genus Phacelia.

Categorical X

Continuous

Suitable Categories:  
Adult reproductive plants

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? June-July

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

*Key Ecological Functions*

1. Pollination of flowers, perhaps of the genus Phacelia.

2. Gene flow within and between populations of flowers, perhaps of the genus Phacelia.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

That P. barri is a specialist visitor of Phacelia flowers.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

We do not know with surety if this species is a specialist visitor of Phacelia flowers: this must be confirmed by additional observation.  
We have no information on the type of soil substrate that will be used for nesting.  
We have no idea of the overall distribution of this species.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Dispersal*

Dispersal mode: Independent flight  
Requirements for dispersal: Presence of blooming plants in acceptable areas.  
Presence of acceptable soil-nesting substrate.  
\_\_\_\_\_  
\_\_\_\_\_

*Degree of Confidence in Knowledge of Species*

High \_\_\_\_\_  
Medium \_\_\_\_\_  
Low x\_\_\_\_\_

*Comments*

This rare endemic has been collected only once, in 1952, near Midvale, Washington County, Idaho. Very high research priority.  
\_\_\_\_\_  
\_\_\_\_\_

**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita salicis euxantha

Geographic Area and/or Habitat Type: M331 Ag Ponderosa Pine-Grassland; M332Gd Mixed Grass-ag-shrub

Representative Species:

"I did not complete this form because: "

**Key Environmental Correlates**

7. Presence of flowering plants in the genus Salix.

**C a t e g o r i c a l** X

**C o n t i n u o u s**

Suitable Categories:  
Adult reproductive plants

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? June-July

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nesting habitat

**C a t e g o r i c a l** X

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**Categorical** \_\_\_\_\_

**Continuous** \_\_\_\_\_

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers of the aenus Salix.

2. Gene flow within and between populations of flowers of the aenus Salix.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eatina insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That like other subspecies in the salicis species complex, P. s. euxantina is a specialist visitor of willow flowers.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

We do not know which, if any, other species are visited for nectar and/or pollen.  
\_\_\_\_\_  
We have no information on the type of soil substrate that is be used for nesting.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight  
\_\_\_\_\_  
Requirements for dispersal: Presence of blooming plants in the genus Salix.  
\_\_\_\_\_  
Presence of acceptable soil-nesting substrate.  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

H i g h  
M a d. X  
L o w

**Comments**

This rare endemic has been collected only from Kiaer Island, Orean and two sites in Idaho (Idaho & Nez Perce counties). High research priority.  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: I-31 -95 \_\_\_\_\_

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita salicis sublaeta

Geographic Area and/or Habitat Type: M242Cc, 342lc Agricultural Use Land

Representative Species: \_\_\_\_\_

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of flowering plants in the genus Salix.

Categorical X

Continuous

Suitable Categories:  
Adult reproductive plants

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_

Which seasons? June-July

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
A ttribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers of the aenus Salix.  
\_\_\_\_\_

2. Gene flow within and between oooulations of flwoers of the aenus Salix.  
\_\_\_\_\_

3. Recycle soil layers and nutrients  
\_\_\_\_\_

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.  
\_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

### *Key Assumptions*

That like other subspecies in the salicis species complex, P. s. sublaeta is a specialist visitor of willow flowers.

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### *Key Unknowns and Monitoring or Research Needs*

We do not know which, if any, other species are visited for nectar and/or pollen.

We have no information on the type or soil substrate that is used for nesting.

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### *Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants in the genus Salix.

Presence of acceptable soil-nesting substrate.

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### *Degree of Confidence in Knowledge of Species*

H i g h

Med.

L o w

### *Comments*

This rare endemic has been collected from only two sites in Oregon: Hood River and the Dalles. High research priority.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita wyvomiensis sculleni

Geographic Area and/or Habitat Type: M332G1, 331 Ac, 3421b, 3421c, 331 Ab Agricultural Use Land
M332Gg Interior Ponderosa Pine
M332Go Ponderosa Pine-Grassland

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of flowering plants in unknown genera, perhaps Calochortus.

Categorical [X]

Continuous

Suitable Categories:
Adult reproductive plants

Unit of Measure:

Minimum:

Applies seasonally? Yes [X] No
Which seasons? June-July
Theme name:
Attribute:

Maximum:

2. Presence of acceptable around-nestina habitat.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No [X]
Which seasons?
Theme name:
Attribute:

Maximum:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

Categorical

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Continuous

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

Categorical

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Continuous

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers of undetermined genera, perhaps including Calochortus.

2. Gene flow within and between populations of undetermined genera, perhaps including Calochortus.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That, like one other subspecies in the wvovinaensis species complex, P. w. sculleni is a specialist visitor of Calochortus flowers.

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*Key Unknowns and Monitoring or Research Needs*

We are not sure which flowers are used to supply pollen and nectar to this subspecies.

We have no information on the type of soil substrate that will be used for nesting.

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*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants in undetermined genera. Possibly including Calochortus.

Presence of acceptable soil-nesting substrate.

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*Degree of Confidence in Knowledge of Species*

H i g h

M e d

Low x

*Comments*

This is a fairly widespread and common endemic of the Columbia Basin. Lower research Priority.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: Perdita wvominaensis wvominaensis

Geographic Area and/or Habitat Type: M331 Dp Idaho Fescue - Slender Wheatgrass

Representative Species:

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of flowering plants in unknown genera, perhaps Calochortus.

Categorical X

Continuous

Suitable Categories: Adult reproductive plants

Unit of Measure:

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? June-July

Theme name:

Attribute:

2. Presence of acceptable around-nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers of undetermined aenera, perhaps includina Calochortus.

2. Gene flow within and between populations of undetermined aenera, perhaps includina Calochortus.

3. Recycle soil layers and nutrients

4. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That, like one other subspecies in the *wyomingensis* species complex, *P. w. wyomingensis* is a specialist visitor of *Calochortus* flowers.

**Key Unknowns and Monitoring or Research Needs**

We are not sure which flowers are used to supply pollen and nectar to this subspecies.

We have no information on the type of soil substrate that will be used for nesting.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of blooming plants in undetermined genera, possibly including *Calochortus*; presence of acceptable soil-nesting substrate.

**Degree of Confidence in Knowledge of Species**

*H* i g h

*M* e d

*Low* x

**Comments**

This rare endemic has been collected only from Jackson, Wyoming, in 1920. High research priority.

**APPENDIX II**

**Rare Bee Species That Occur in the Columbia Basin and  
Surrounding Areas**

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Colletes ciliatoides</i>	ID	UT
<i>Colletes paniscus mertensi</i>	M242C	CA, NV
<i>Colletes lutzi interior</i>	M261G, M252C, 342H, 3421, 331A	CA, NV
<i>Hylaeus nevadensis</i>	M242C, M332G, M333A, 342C, 331A	CA, NV
<i>Dialictus actinosus</i>	342D, M332F	WY, GP
<i>Dufourea afasciata</i>	M261D	CA
<i>Dufourea calochorti</i>	M242C	CA
<i>Dufourea holocyanea</i>	M242C, M332G, M332A, M33A, M333C,	CA
<i>Dufourea orovada</i>	M331D	CA, NV
<i>Dufourea scabricornis</i>	M261G, M331D,	CA, NV
<i>Dufourea versatilis rubriventris</i>	M242C, M332F, M342B	CA
<i>Dufourea versatilis versatilis</i>	M332F	CA
<i>Lasioglossum mellipes</i>	M261D, M242C, M332A, 3420, 342H	CA
<i>Lasioglossum olympiae</i>	M261G, M242C, M332G, M333A, M333D, 3421, 331A	CA, BC
<i>Sphecodes patruelis</i>	M331D	
<i>Sohecodes sulcatulus</i>	M331D	AZ
<i>Andrena prolixa</i>	M261D, M261G, 342B, 3421	CA, NV
<i>Andrena levipes</i>	M332G	CA
<i>Andrena bocensis</i>	M261G, 342B	CA
<i>Andrena citrinihirta</i>	M332G	CA, UT
<i>Andrena sulcata</i>	342C, 3421	UT, GP
<i>Andrena anisochlora</i>	3421	CA
<i>Andrena caliginosa</i>	342B	CA
<i>Andrena chalybiodes</i>	WA, OR	CA
<i>Andrena latifrons</i>	M261G, M332G	CA, NV
<i>Andrena vandykei</i>	M261D	CA
<i>Andrena cuneilabris</i>	M242C	CA
<i>Andrena penemisella</i>	331A	CA
<i>Andrena ribblei</i>	M242C, M332G	CA
<i>Andrena suavis</i>	M261D	CA
<i>Andrena flocculosa</i>	3421, 331A	CA, NV

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Andrena concinnula</i>	M242C, 342H	UT, AZ
<i>Andrena atypica</i>	M261G	CA
<i>Andrena gordonii</i>	M261G, M331D, 342I, 331A	CA
<i>Andrena luteihirta</i>	OR	CA
<i>Andrena plana</i>	M242C,	CA
<i>Andrena sladeni</i>	M331A, M331D, 342B, 342C, 342I, 331A	NV, BC
<i>Andrena orthocarpi</i>	M261G, M242C, 342I	CA
<i>Andrena pensilis</i>	M261G	CA
<i>Nomadopsis anthidia lutea</i>	M261G, 342C, 342H	CA, NV
<i>Nomadopsis personata</i>	M332G, M331D, 342C, 342I	NV, UT
<i>Nomadopsis edwardsii</i>	M261G, M242C, M332G	C A
<i>Nomadopsis xenus</i>	M242C	CA
<i>Panurginus atriceps</i>	M332G, M331D, 331A	CA
<i>Panurginus cressoniellus</i>	M331D	AZ, TX
<i>Panurginus ineptus</i>	M332G	UT, CO
<i>Panurginus quadratus</i>	M331D	CA
<i>Perdita idahoensis</i>	342D	CA
<i>Perdita adjuncta</i>	342B, 342D, 342C	CA, NV
<i>Perdita aemula</i>	M332G, 342H	UT
<i>Perdita ciliata</i>	M261G, 342C	CA
<i>Perdita claypolei limatula</i>	M242C, M332G	CA, NV
<i>Perdita distincta</i>	M332G	CA
<i>Perdita lepidosparti lepidosparti</i>	342C, 342D	ID, NV, CA
<i>Perdita salicis subtristis</i>	M242C, 342I	
<i>Perdita tacita</i>	342C	
<i>Perdita tessellata</i>	342C	NV, UT
<i>Perdita zonalis aequalis</i>	M242C, M332G, M332B, M332E, 342H, 342I	CA, NV
<i>Perdita zonalis zonalis</i>	M242C, 331A	CA
<i>Perdita wyomingensis segona</i>	M331D	UT
<i>Hesperapis carinata</i>	M332G, 342D, 342C	CA, NV
<i>Anthidium edwardsii</i>	342C	CA, NV
<i>Anthidium rodecki</i>	342D	NV, UT
<i>Dianthidium dubium dubium</i>	M261D	CA

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Dianthidium plenum</i>	M261G	CA, NV
<i>Stelis cockerelli</i>	M332G, M331D	CA
<i>Stelis wanonae</i>	M242C	
<i>Stelis callura</i>	M261G, M331D, 342B	UT, CO
<i>Stelis carnifex</i>	M261G	UT, AZ
<i>Stelis incisa</i>	3420	CA
<i>Stelis monticola</i>	M242C, M332G, M332A, M331D, 331A	CA
<i>Stelis holocyanea</i>	M261G, M332G, M332A, M331D, 342B, 342C, 331A	CA
<i>Stelis rusti</i>	M332A	CA, NV
<i>Stelis phaceliae</i>	M261G, M332G, 342B, 342C, 3421	CA, NV
<i>Trachusa timberlakei</i>	M242C	CA, NV
<i>Ashmeadiella foxiella</i>	M261G, M332G, 342D, 3421, 331A	CA
<i>Ashmeadiella leachi</i>	M261G	CA
<i>Ashmeadiella pronitens</i>	M242C	WY, CO
<i>Ashmeadiella timberlakei</i>	M261D, M261G, 342B	CA, NV
<i>Ashmeadiella aridula astrigali</i>	M261G, M331D, 342D	CA, NV
<i>Ashmeadiella californica florissantensis</i>	M331D, 331A	CO, NM
<i>Ashmeadiella cubiceps cubiceps</i>	M261D, M332G	CA, NV
<i>Ashmeadiella rufitarsis</i>	M261G	CA, AZ
<i>Atoposmia abjecta abjecta</i>	M261D, M242C, M332G, M332A, M332F, 342B, 342C, 3421, 331A	UT, CO
<i>Atoposmia oregona</i>	M261D, M242C, M332F	CA
<i>Atoposmia triodonta shastens</i>	M242C, M332G, 342D	CA, NV
<i>Hoplitis producta gracilis</i>	342H	CA, NV
<i>Hoplitis uvulalis</i>	M332G	CA, UT
<i>Hoplitis albifrons maura</i>	M261D	CA
<i>Hoplitis fulgida platyura</i>	M261D, M261G, M242C, 342B	CA, UT
<i>Hoplitis viridimicans</i>	M242C	CA
<i>Osmia hurdi</i>	M261D, M332A, 342D, 342H	CA, BC
<i>Osmia odontogaster</i>	M261G, M242C, 342H	CA, BC
<i>Osmia bakeri</i>	342B, 342I, 331A	CA, NV
<i>Osmia thyanisca</i>	M331D, 342B	CA, UT

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Osmia vandykei</i>	M242C, M332G, 342B, 342D, 331A	CA, UT
<i>Osmia montana quadrice</i>	M261D, M261G, M242C, M332A, M333A, 342B, 342C	CA, UT
<i>Osmia cyanopoda</i>	342D, 342C	CA, NV
<i>Osmia exigua</i>	M261D, M261G, M242C, M332G, M332B, 3428, 3421	CA, NV
<i>Osmia granulosa</i>	3421	CA
<i>Osmia hirsuta</i>	M332B	CO
<i>Osmia indepressa</i>	M332G, M331D, 331A	CA, NV
<i>Osmia laeta</i>	M242C	C A
<i>Osmia malina</i>	M242C, M333A	CA, UT
<i>Osmia pagosa</i>	3428	CA, CO
<i>Osmia regulina</i>	M261G, M332G, 3428, 342C	CA, NV
<i>Osmia torchioi</i>	M261D, M261G, M332G, 342B, 342D, 342C, 342H, 3421, 331A	CA, NV
<i>Osmia trevoris</i>	M261G, M332A, M332F, M331D	UT, AZ
<i>Osmia nigriventris</i>	M242C, M332E, M331A	CO, AT
<i>Osmia hesperos</i>	M242C, M332G	CA
<i>Osmia lacus</i>	M242C	CA
<i>Osmia rawlini</i>	342B	CA
<i>Osmia sanrafaelae</i>	342B	UT
<i>Megachile laurita</i>	342C, 342I	UT
<i>Coelioxys salinaria</i>	M261G, M331D, 342B, 342D, 342C, 342I, 331A	UT
<i>Coelioxys serricauda</i>	M332G	CA
<i>Neolarra penicula</i>	M332E, M331D	CA, UT
<i>Oreopasites scituli</i>	342C	UT
<i>Epeolus scopulus</i>	M332G, 342C	CA, NV
<i>Triepeolus eldredi</i>	M332G, 342C	CA, NV
<i>Triepeolus heterurus</i>	M331D, 342D	CA, UT
<i>Triepeolus lestes</i>	M332G, 342C	CA, CO
<i>Triepeolus paenepectoralis</i>	342D	CO, BC
<i>Triepeolus timberlakei</i>	M332G, M331D, 342B, 342C, 3421, 331A	CA, UT
<i>Nomada scita</i>	3421	CO, GP
<i>Nomada grayi grayi</i>	M261D	CA, UT

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Nomada maculata</i>	M332A	EA
<i>Nomada physura</i>	M331D	NV
<i>Nomada rhodomelas</i>	M261G, M242C, M332G, 342B	CA, BC
<i>Nomada rubi</i>	M331D, 342B	GP
<i>Nomada hemphilli</i>	342I, 331A	CA, NV
<i>Nomada accepta</i>	M332G, 342H	CO, EA
<i>Nomada citrina citrina</i>	M242C	CA, UT
<i>Nomada citrina rufula</i>	M331D	CA, UT
<i>Nomada collinsiana</i>	M332A, 342C, 342I, 331A	UT, CO
<i>Nomada cressonii cressoni</i>	M332G, M331D, 331A	UT, EA
<i>Nomada elegantula</i>	342B, 342H, 331A	CA, UT
<i>Nomada malonina</i>	342B	
<i>Nomada vicinalis vicinalis</i>	M331D, 342I	CA, UT
<i>Nomada verecunda</i>	M242C, M331D, 342D, 342C, 331A	CA, NV
<i>Exomalopsis albicans</i>	M261G,	CA
<i>Diadasia nitidifrons</i>	342I	CA, UT
<i>Melissodes metenua</i>	M261G, M332G, M331A, 342I, 331A	CA, UT
<i>Melissodes plumosa</i>	M261G, M332G, 342I	CA, GP
<i>Melissodes stearnsi</i>	M242C	CA
<i>Melissodes paulula</i>	342I	CA
<i>Melissodes saponellus</i>	342H, 342I	UT, CO
<i>Synhalonia amsinckiae</i>	M242C, 331A	CA
<i>Synhalonia chrysophila</i>	331A	CO, NM
<i>Synhalonia delphinii</i>	M242C, M332G, 331A	CA, NV
<i>Synhalonia frater lata</i>	M261D, M261G, M332G, 331A	BC
<i>Synhalonia hurdi</i>	M261G, 331A	CA
<i>Synhalonia monozona</i>	M261G, 342I	CA
<i>Synhalonia stretchii</i>	M242C	CA
<i>Synhalonia virgata</i>	M261D	CA
<i>Anthophora arthuri</i>	342D	CO
<i>Anthophora crotchii</i>	342I	BC
<i>Habropoda dammersi</i>	M261G	CA
<i>Habropoda morrisoni</i>	342D, 342C, 342I	NV, UT
<i>Habropoda tristissima</i>	M261G	CA
<i>Melecta pacifica pacifica</i>	342H	CA

SPECIES	COLUMBIA BASIN SITES	OTHER STATES
<i>Ceratina segoioae</i>	M261G, M332G, M332A, 331A	CA
<i>Ceratina tejonensis</i>	M242C	CA
<i>Xylocopa tabaniformis orpifex</i>	M261G, M242C	CA
<i>Xylocopa californica californica</i>	M261G	CA
<i>Bombus edwardsii</i>	M261G, M242C	CA, NV
<i>Bombus vandykei</i>	M261D, M261G, M242C, 3428	CA

LEGEND: AZ = Arizona, BC = British Columbia, CA = California, CO = Colorado, EA = East, GP = Great Plains, NM = New Mexico, NV = Nevada, OR = Oregon, TX = Texas, UT = Utah, WY = Wyoming.

**APPENDIX III**

**Representative Bee Species of the Columbia Basin by  
Bailey's Subsections**

**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 59 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332B; Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province; Bitterroot Valley Section; > 70% coniferous forest

Representative Species: Bumblebees; Bombus ~~appositus~~, B. bifarius, B. californicus, B. fervidus, B. flavifrons, B. mixtus, B. occidentalis (Apidae)

"I did not complete this form because: "

**Key Environmental Correlates**

**1. Presence of a diverse array of flowering plants for the entire growing season (March - October** influenced by altitude). The seven species fall into two broad categories according to length of mouth-parts (short v. long) which, in turn, partially influences their choice of flowers

**Categorical** X

**Continuous** X

Suitable Categories: \_\_\_\_\_

Unit of Measure: mm

Minimum: ca. 2

Applies seasonally? Yes X No \_\_\_\_\_

Maximum: ca. 15

**Which seasons?** Entire growing season (March-October, influenced by altitude)

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**2. Presence of suitable nesting sites: abandoned rodent burrows for subterranean nesters (primarily** B. bifarius, B. californicus, B. fervidus, B. flavifrons, B. occidentalis); abandoned nests of hole-nesting birds (primarily B. ~~appositus~~, B. mixtus); depressions in the soil surface covered with dead vegetation (primarily B. ~~appositus~~, B. californicus, B. mixtus).

**Categorical** X

**Continuous**

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

abandoned bird (tree-hole) and rodent nests.

Minimum: \_\_\_\_\_

Applies seasonal/v? Yes \_\_\_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers

2. Gene flow within and between populations of diverse flowering plants.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

none  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

Although a great deal remains to be learned about the habitat, nest-site and flower preferences  
of bumble bees, their ecology is better understood than any other group of native bees. Therefore,  
research on bumble bees is of lower priority than that needed for other pollinators in the Columbia  
Basin.  
\_\_\_\_\_

*Dispersal*

*Dispersal mode:* Independent flight  
\_\_\_\_\_

*Requirements for dispersal:* Presence of a diverse array of flowering plants for the entire growing  
season (March - October, influenced by altitude) presence of suitable nesting sites.  
\_\_\_\_\_  
\_\_\_\_\_

*Degree of Confidence in Knowledge of Species*

High   X    
M e   d    
L o   w  

*Comments*

Most of these seven species of bumblebees are at home in forests or prairie although their  
foraging will typically be done in open habitats (prairie, clearings and meadows) where flowering  
plants abound. Only B. mixtus can be regarded as a habitat specialist (forests); B. californicus  
and B. fervidus prefer, but are not restricted to, prairie habitats.  
\_\_\_\_\_

87.7% of the area of this section has bees collected from it. Important sections which remain to be collected  
from are Grand Fir and Idaho Fescue - Slender Wheatgrass.  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: > 215 species Pollinating Bees

Geographic Area and/or Habitat Type: Bailey's M242C Cascade Mixed Forest-Coniferous Forest-Alpine Meadow Province; Eastern Cascade Section; > 90% coniferous forests

Representative Species: Hoplitis fulaia (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants.

Categorical x

Continuous

Suitable Categories: Adult reproductive plants

Unit of Measure:

Minimum:

Maximum:

Applies seasonally? Yes X No \_\_\_  
Which seasons? late May-early August, depending on altitude

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) or stems with abandoned beetle (and other insect) burrows.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Maximum:

Applies seasonally? Yes \_\_\_ No X

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

Categorical \_\_\_\_\_

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of visited flowers. \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That *Hoplitis fulvida* is an important pollinator of the flowers it visits.

That *Hoplitis fulvida* visits a variety of flowering plants for pollen and nectar.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

While this species is a generalized visitor of the flowers of a variety of plant species, its preferences and pollinating ability of those species is less well-understood.

Although we know that this species nests in acorn weevil burrows, we do not know if species-specific, or size-specific nest site preferences exist.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants: presence of appropriate nesting habitat.

\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

H i g h

Med. Medium-High

L o w

**Comments**

This is a fairly widespread species common to many vegetation types in the Columbia Basin and throughout the West. In the Basin it is present mostly at higher (> 5000 ft) elevations.

This section has been well-collected compared to some others: 95% of the total area has seen some collecting effort.

\_\_\_\_\_



Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of diverse flowering plants. \_\_\_\_\_  
\_\_\_\_\_

• \_\_\_\_\_laborators in the production of native fruits and seeds used as food by mammals, birds, ants  
and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

None

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**Key Unknowns and Monitoring or Research Needs**

Although a great deal remains to be learned about the habitat, nest-site and flower preferences of  
bumble bees, their ecology is better understood than any other group of native bees. Therefore, research on  
bumble bees is of lower priority than that needed for other pollinators in the Columbia Basin.

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**Dispersal**

**Dispersal mode:** Independent flight

**Requirements for dispersal:** Presence of a diverse array of flowering plants for the entire growing season (March -  
October, influenced by altitude) presence of suitable nesting sites.

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**Degree of Confidence in Knowledge of Species**

High   X  

Medium   .  

Low   w  

**Comments**

Most of these 18 species of bumblebees are at home in forests or prairie although their foraging  
will typically be done in open habitats (prairie, clearings and meadows) where flowering plants  
abound. Only *B. mixtus* can be regarded as a habitat specialist (forests): *B. californicus*, *B. fervidus*, *B. ariseocollis*  
and *B. morrisoni* prefer, but are not restricted to, prairie habitats.  
This section has been well-collected compared to some others; 95% of the total area has seen some collecting  
effort.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: ≥ 59 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332B; Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province; Bitterroot Valley Section; > 70% coniferous forest

Representative Species: Osmia bruneri (Megachilidae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowering plants in the families Leguminosae, Hydrophyllaceae, Scrophulariaceae

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? April to September; most May to July (according to altitude)

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) or stems with abandoned beetle burrows.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes \_\_\_ No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
A ttribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
A ttribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of various flower species in the Leguminosae. Hydrochylaceae. Scrophulariaceae. others

\_\_\_\_\_

2. Gene flow within and between populations of various flowers visited, for pollen and nectar.

\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

\_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

\_\_\_\_\_

*Key Assumptions*

That *Osmia bruneri* is an important pollinator of plants in the Leguminosae, Hydrophyllaceae, Scrophulariaceae, others.

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*Key Unknowns and Monitoring or Research Needs*

While this species is a visitor of the flowers of a wide range of species, its pollination ability is less well-understood.

We do not know the species specific nest-site preferences.

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*Dispersal*

*Dispersal mode:* Independent flight

*Requirements for dispersal:* Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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*Degree of Confidence in Knowledge of Species*

*H i g h*

*Med. Medium-high*

*Low* \_\_\_\_\_

*Comments*

It is a widespread species common to many vegetation types in the Columbia Basin and throughout the West. On the Basin it is known from altitudes of 2300-7000 feet. On some areas (e.g., Madras, Oregon) it may have more than one generation per year.

87.7% of the area of this section has had bees collected from it. Important sections which remain to be collected from are Grand Fir and Idaho Fescue - Slender Wheatgrass.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: ≥ 88 Species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M261 D; Sierran Steppe-Mixed Forest-coniferous forest-Alpine Meadow Province; ~ 70% coniferous forests

Representative Species: Osmia lianaria (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Prefers flowers of plants in the Hydrochloaceae or Rosaceae but will forage from a wide variety of other species if necessary

Categorical

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? Spring (April-May, June at highest elevations)

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows.

Categorical

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

1. Pollination of flowers in the Hydrophyllaceae, Rosaceae, and other families.

• the flow within and between populations or species in the Hydrophyllaceae, Rosaceae,  
and other families.

• laborators in the production of native fruits and seeds used as food by mammals, birds, ants  
and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

None

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*Key Unknowns and Monitoring or Research Needs*

Although a great deal remains to be learned about the natural nesting habitat and flower preferences  
of this species, its ecology is better understood than probably any other species of its genus. Therefore, research  
on *O. lignaria* is of lower priority than that required for other pollinators in the Columbia Basin.

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*Dispersal*

*Dispersal mode:* Independent flight

*Requirements for dispersal:* Presence of acceptable species of flowering plants; presence of  
appropriate nesting habitat.

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*Degree of Confidence in Knowledge of Species*

High   X  

M a   d  

Low       

*Comments*

This is a widespread and abundant species that occurs throughout the United States in  
two subspecies. It is currently being developed as a commercial pollinator of orchard crops.  
This section is poorly represented in collections: Less than half its area has been recorded  
from it. Important vegetation types which remain unrepresented are Pacific Ponderosa Pine (10.6% area),  
Blue Oak-Digger Pine (6.3%), Ponderosa Pine Grassland (6.0%), White Fir (5.5%), etc.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: ≥ 88 Species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M261 D; Sierran Steppe-Mixed Forest-coniferous forest-Alpine Meadow Province; ~ 70% forested

Representative Species: Andrena orunorum (Andrenidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowerina plants in bloom.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? April-September, dependina upon altitude

Theme name:

Attribute:

2. Presence of acceptable soil-nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_

**C a t e g o r i c a l** \_\_\_\_\_

**C o n t i n u o u s** \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowering plants visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. cycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That *Andrena orunorum* is an effective pollinator of the flowering plants that it visits.

That this species, like all other known *Andrena* nests in the ground.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

We have no information on the nesting habitat and substrate preferences of this species.

We do not know if, as the data suggests, *A. orunorum* has more than one generation per year at some locations.

We do not know if this species prefers certain species of flowering plants to others, or if it is more efficient as a pollinator of some than others.

\_\_\_\_\_  
\_\_\_\_\_

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

*Degree of Confidence in Knowledge of Species*

High \_\_\_\_\_

Medium  X

Low \_\_\_\_\_

*Comments*

*Andrena orunorum* is an abundant and widespread species that visits a wide variety of flowers for pollen and nectar. It has been recorded from a range of habitats in the Basin, and from an altitude of 475-7200 feet.

This section is poorly represented in collections: Less than half its area has been recorded from it. Important vegetation types which remain unrepresented are Pacific Ponderosa Pine (10.6% area), Blue Oak-Digger Pine (6.3%), Ponderosa Pine Grassland (6.0%), White Fir (5.5%), etc.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group:  $\geq$  207 Species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M261 G; Sierran Steppe-Mixed Forest-coniferous forest-Alpine Meadow Province; ~ 45% forested

Representative Species: Halictus farinosus, H. rubicundis, H. tripartitus (Halictidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants in a range of plant taxa.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? March-September

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of flat, alkaline, silty loam soil that is sparsely vegetated and partially compacted.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

*Key Ecological b-unctions*

1. Pollination of flowers of a variety of species visited for pollen and nectar.

2. Gene flow within and between populations of flowering plants visited for pollen and nectar.

3. Collaborators in the production of fruits and seeds of native plant species which are used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That these Halictus soecies are effective oollinators of the plants they visit for pollen and nectar.

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*Key Unknowns and Monitoring or Research Needs*

We have limited information on the natural nestina habitat and nestina preferences of these soecies.

We do not know if these soecies of Halictus prefer certain species of flowerina plants to others, or if they are more efficient at pollinating some than others.

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*Dispersal*

Dispersal mode: Indeoendent fliabt

Requirements for dispersal: Presence of acceptable species of flowerina plants; presence of aoorooriate nestina habitat.

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*Degree of Confidence in Knowledge of Species*

H i g h

Med. X

Low     

*Comments*

These soecies of Halictus are distributed widelv and are freauntlv important members Of the pollinator community. They are generalized in their foraging habits, a necessity forced upon them by their primitive social behavior and the fact that they are in flight for much of the growing season.

Bee collections have been made from 71.7% of the total area of this section. An important vegetation type which is unrepresented is Wyoming Big Sagebrush.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 2 207 Species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M261 G; Sierran Steppe-Mixed Forest-coniferous forest-Alpine Meadow Province; ~ 45% forested

Representative Species: Ceratina acanthq, C. nanula, C. neomexicana, C. pacifica (Anthophoridae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowerina plants in bloom.

Categorical x

C o n t i n u o u s

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? April-September

Theme name:

Attribute:

2. Presence of broken, usually dead, stems and twias with soft excavatable pith exposed, usually in the genera-Rubus, Sambucus, Rhus, etc.

C a t e g o r i c a l X

C o n t i n u o u s

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

C a \_\_\_\_\_tegorical

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a \_\_\_\_\_tegorical

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of a variety of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowering plants visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That these Ceratina species are effective pollinators of the flowering plants that they visit.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Key Unknowns and Monitoring or Research Needs*

We have limited information on the natural nesting habitat and nesting preferences of these species.  
\_\_\_\_\_  
We do not know if these species prefer certain species of flowering plants to others, or if they are more efficient at pollinating some than others.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Dispersal*

Dispersal mode: Independent flight  
\_\_\_\_\_  
Requirements for dispersal: presence of acceptable species of flowering plants; presence of appropriate nesting habitat.  
\_\_\_\_\_  
\_\_\_\_\_

*Degree of Confidence in Knowledge of Species*

H i g h  
Med. X  
L o w

*Comments*

These species differ from bees in the Megachilidae that nest in twigs and stems in that they excavate their own tunnels in soft pith. Thus, they are not dependent upon the abandoned holes of others for nest-sites. In general, they are long-lived for non-social bees (they may live for several months as adults), and are apparently quite generalized in their foraging habits.  
bee collections have been made from 71.7% of the total area of this section. An important vegetation type which is unrepresented is Wyoming Big Sagebrush.  
\_\_\_\_\_  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 82 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M331 A Southern Rocky Mtn Steppe - open woodland - Coniferous forest - Alpine Meadow Province; Yellowstone Highlands Section; ~ 58% coniferous forest

Representative Species: Andrena amphibola (Andrenidae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of flowering plants in bloom.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X NO, Which seasons? April-August

Maximum:

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers visited for pollen and nectar.  
\_\_\_\_\_

2. Gene flow within and between populations of flowers visited for pollen and nectar.  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.  
\_\_\_\_\_

4. Recycle soil layers and nutrients.  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

### Key Assumptions

That *A. amohibola* is an important pollinator of those flowers it visits.

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### Key Unknowns and Monitoring or Research Needs

We know that *A. amohibola* has been recorded visiting the flowers of many plant species but we know very little about its flower preferences, which plants it visits for pollen and which plants it visits for nectar, and how effective a pollinator it is.

We know nothing about the nesting habitat and soil characteristics required by this species.

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### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants: presence of appropriate nesting habitat.

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### Degree of Confidence in Knowledge of Species

High \_\_\_\_\_

Medium     

Low \_\_\_\_\_x

### Comments

This is a fairly widespread, though never abundant, species of the Pacific Northwest. It appears to be very generalized in its foraging habits.

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We have collection records from sections representing only 60% of the total area of this section. Important vegetation types which have not been collected from include alpine tundra, white-bark pine and lodgepole pine.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 82 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M331 A Southern Rocky Mtn Steppe - open woodland - Coniferous forest - Alpine Meadow Province; Yellowstone Highlands Section; ~ 58% coniferous forest

Representative Species: Meachile inermis (Megachilidae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowering plants in the Comoositae and/or the Leauminosae.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? July-September

Theme name:

Attribute:

2. Presence of dead wood (snags, stumos, etc.) with larvae-diameter beetle burrows.

Categorical X

Continuous X

Suitable Categories:

Unit of Measure: mm

Applies seasonally? Yes No X

Minimum: 7

Which seasons?

Theme name:

Attribute:

Maximum: 11

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
A ttribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers of plants in the families Comoositae and Leauminosae.

2. Gene flow within and between populations of plants in the families Comoositae and Leauminosae.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That *M. inermis* is an effective pollinator of taxa in the Compositae and Leguminosae.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

We know that *M. inermis* has been recorded visiting the flowers of plant species in the Leguminosae and the Compositae but we know very little about its specific flower preferences, which plants it visits for pollen and which plants it visits for nectar, and how effective a pollinator it is.  
\_\_\_\_\_

We know relatively little about the nesting habitat of this species.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight  
\_\_\_\_\_

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

*H i g h* \_\_\_\_\_  
*Med.* X \_\_\_\_\_  
*Low* \_\_\_\_\_

**Comments**

This species is one of the largest species of its genus. It is widespread in occurrence (coast-to-coast) though nowhere does it seem to be abundant. It was considered for a time as a potential crop pollinator (alfalfa).

We have collection records from sections representing only 60% of the total area of this section. Important vegetation types which have not been collected from include alpine tundra, white-bark pine and lodgepole pine.  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 255 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M331 D, Southern Rocky Mountain Steppe- Open Woodland - Coniferous Forest - Alpine Meadow Province; Overthrust Mountain Section; -46% Coniferous Forest

Representative Species: Megachile melanophaea (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of flowering plants in bloom.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No
Which seasons? late May - August
Theme name:
Attribute:

Maximum:

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X
Which seasons?
Theme name:
Attribute:

Maximum:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*Continuous* \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_

*C a t e g o r i c a l* \_\_\_\_\_

*Continuous* \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

*Key Ecological Functions*

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients

5. \_\_\_\_\_

6. \_\_\_\_\_

### *Key Assumptions*

That *M. melanophaea* is an important pollinator of those plants it visits.

That this species nests exclusively in the ground: Other members of the subgenus *Delomea* nest, at least partially, in abandoned holes in wood.

### *Key Unknowns and Monitoring or Research Needs*

*M. melanophaea* has been recorded visiting the flowers of many plant species but we know very little about its flower preferences, which plants it visits for pollen and which plants it visits for nectar, and how effective a pollinator it is.

We know little about the nesting habitat and soil characteristics required by this species, or if it will accept vacant borings in wood as will some of its subgenera.

### *Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

### *Degree of Confidence in Knowledge of Species*

H i g h

M e Medium-Low

L o w

### *Comments*

This species appears to be a generalized forager of mid-elevations (5,000 - 8,000 ft). It occurs throughout much of the United States although it appears never to attain great abundance.

This Bailey's section is fairly well-collected compared to most others: we have some representation from vegetation types comprising 93% of the total section area.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 255 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M331 D, Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province; Overthrust Mountain Section; -46% Coniferous Forest

Representative Species: Svnhalonia frater (Anthophoridae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of flowering plants in bloom: There is some indication that this species may prefer plants in the Leguminosae.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No --

Maximum:

Which seasons? May - August

Theme name:

Attribute:

2. Presence of acceptable around-nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonally? Yes \_\_\_ No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_

L - a \_ t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key **Ecological Functions**

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

~~4. Recycle soil layers and nutrients.~~

6. \_\_\_\_\_

### Key Assumptions

That *S. frater* is an important pollinator of those plants it visits.

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That *S. frater* is probably a specialist forager of legume flowers.

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### Key Unknowns and Monitoring or Research Needs

*S. frater* has been recorded visiting the flowers of many plant species although it appears to prefer legumes.

Its flower preferences, which plants it visits for pollen and which plants it visits for nectar, and how effective a pollinator it is, should be studied more closely to determine if the above assumptions are correct.

We know little about the nesting habitat and soil characteristics required by this species.

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### Dispersal

Dispersal mode: Independent flight

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Requirements for dispersal: Presence of acceptable species of flowering plants: presence of appropriate nesting habitat.

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### Degree of Confidence in Knowledge of Species

H i g h

M a d.

Low —x

### Comments

This is a widespread species in the western United States that occurs in several subspecies. It has been recorded from between 550 and 7200 ft. elevation.

This Bailey's section is fairly well-collected compared to most others; we have some representation from vegetation types comprising 93% of the total section area.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 104 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332A, Middle Rocky Mt. Steppe - Coniferous Forest - Alpine Meadow Province, Idaho Batholith Section; -72% Coniferous Forest

Representative Species: Colletes niarifrons (Colletidae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of flowering plants in bloom.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? May - August

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonal/v? Yes No

Maximum:

Which seasons?

Theme name:

Attribute:

*Key Environmental Correlates*

3. \_\_\_\_\_  
\_\_\_\_\_

***C a t e g o r i c a l***

***C o n t i n u o u s*** \_\_\_\_\_

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

***C a t e g o r i c a l***

***C o n t i n u o u s***

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

***Key Ecological Functions***

1. Pollination of flowers in species visited for pollen and nectar.  
\_\_\_\_\_

2. Gene flow within and between populations of species visited for pollen and nectar.  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.  
\_\_\_\_\_

4. cycle soil layers and nutrients.  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

at C. niarifrns is an effective pollinator of flowers of the species it visits for pollen and nectar.

That like most members of its oenus it is restricted to nesting habitat in the around.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

C. niarifrns has been recorded visiting the flowers of many plant soecies but we know very little about its flower preferences, which plants it visits for pollen and which plants it visits for nectar, and how effective a pollinator it is.

We know little about the nestina habitat and soil characteristics reauired by this soecies, or if it will accent vacant borings in wood as will a minority of its congeners.

\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: **Indeependent** flight

Requirements for dispersal: **Presence of acceptable soecies of flowerina olants: presence of aoarooriate nestina habitat.**

\_\_\_\_\_

**Degree of Confidence in Know/edge of Species**

H i g h

M e d .

Low x \_\_\_\_\_

**Comments**

This is a Pan-Canadian soecies which also occurs in the northwestern United States at elevations of 7,000-9,000 feet (and perhaps above). It appears to be a generalist flower forager.

This Bailey's section is fairly well-collected comoared to most others: we have some reoresentation from vegetation types comprising 92% of the total section area.

\_\_\_\_\_  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 104 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332A, Middle Rocky Mt Steppe - Coniferous Forest - Alpine Meadow Province, Idaho Batholith Section; ~ 72% Coniferous Forest

Representative Species: Osmia pentstemonis (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants, probably in the genus Penstemon and the family Leucosyntherisma.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? June - July

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows to nest in.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

A ttribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key **Ecological Functions**

1. Pollination of flowers probably of species in the genus Penstemon and the family Leuminosae.

2. Gene flow within and between populations of species in the genus Penstemon and the family Leuminosae.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

### Key Assumptions

~~That *O. Denstemonis* is an important pollinator of the flowers of the plants that it visits.~~

~~That *O. Denstemonis* is likely to be a specialized visitor of flowers in the genus *Penstemon* and the family Leguminosae.~~

### Key Unknowns and Monitoring or Research Needs

~~We need to corroborate that this species is a specialized visitor of flowers in the genus *Penstemon* and the family Leguminosae, and that it is an important pollinator of these plants.~~

~~We need information on the preferred nest habitat and substrate.~~

### Dispersal

~~Dispersal mode: independent flight~~

~~Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.~~

### Degree of Confidence in Knowledge of Species

High   

Medium   

Low   x

### Comments

~~*O. Denstemonis* is a species of the western United States; it is found at 5,000-9,000 feet elevation, but not commonly.~~

~~This Bailey's section is fairly well-collected compared to most others; we have some representation from vegetation types comprising 92% of the total section area.~~

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 47 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332A, Middle Rocky Mt Steppe - Coniferous Forest - Alpine Meadow Province, Beaverhead Mountain Section; ~ 34% Coniferous Forest

Representative Species: Hoolitis albifrons (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants in bloom.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? May-August

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows to nest in.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No x

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No, \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers probably of species visited for pollen and nectar.

2. Gene flow within and between populations of species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That H. albifrons is an important pollinator of the flowers of plants that it visits.

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**Key Unknowns and Monitoring or Research Needs**

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.  
We need information on the preferred nest habitat and substrate.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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**Degree of Confidence in Knowledge of Species**

H i g h

Med. Medium-Low

Low \_\_\_\_\_

**Comments**

H. albifrons is an apparently generalized flower visitor of the western United States; it is found at 6,000-8,500 feet elevation and is sometimes fairly common.

This Bailey's section has been moderately collected compared to other; we have some representation from vegetation types comprising 70% of the total section area. Important vegetation types from which we have no records are: Aspen, Lodgepole pine, Ponderosa Pine Grassland, and Idaho Fescue-Bluebunch Wheatgrass.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 47 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332E, Middle Rocky Mt. Steppe - Coniferous Forest - Alpine Meadow Province, Beaverhead Mountain Section; ~ 34% coniferous forest

Representative Species: Bombus balteatus, B. centralis, B. fervidus, B. huntii, B. morrisoni, B. occidentalis, B. rufocinctus. (Apidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of a diverse array of flowering plants for the entire growing season (March - October, influenced by altitude). The seven species fall into two broad categories according to length of mouth-parts (short v. long) which, in turn, partially influences their choice of flowers.

Categorical [X] Continuous [X]

Suitable Categories: Unit of Measure: mm

Adult reproductive plants

Minimum: ca. 2

Applies seasonally? Yes [X] NO [ ] Maximum: ca. 15

Which seasons? Entire growing season (March - October, influenced by altitude)

Theme name:

Attribute:

2. Presence of suitable nesting sites: Abandoned rodent burrows for subterranean nesters; abandoned nests of hole-nesting birds; depressions in the soil surface covered with dead vegetation.

Categorical [X] Continuous [ ]

Suitable Categories: Unit of Measure:

Abandoned bird (tree-hole) and rodent nests.

Minimum:

Applies seasonally? Yes [ ] NO [X] Maximum:

Which seasons?

Theme name:

Attribute:

126

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers

2. Gene flow within and between populations of diverse flowering plants.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

None

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*Key Unknowns and Monitoring or Research Needs*

Although a great deal remains to be learned about the habitat, nest-site and flower preferences of bumble bees, their ecology is better understood than any other group of native bees. Therefore, research on bumble bees is of lower priority than that needed for other pollinators in the Columbia Basin.

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*Dispersal*

*Dispersal mode:* Independent flight

*Requirements for dispersal:* Presence of a diverse array of flowering plants for the entire growing season (March - October, influenced by altitude); presence of suitable nesting sites.

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*Degree of Confidence in Knowledge of Species*

High x

Medium .

Low w

*Comments*

Most of these seven species of bumblebees are at home in forests or prairie although their foraging will typically be done in open habitats (prairie, clearings and meadows) where flowering plants abound.

This Bailey's section has been moderately collected compared to others: we have some representation from vegetation types comprising 70% of the total section area. Important vegetation types from which we have no records are: Aspen, Lodgepole pine, Ponderosa Pine Grassland, and Idaho Fescue-Bluebunch Wheatgrass.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 34 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332F, Middle Rocky Mt Steppe - Coniferous Forest-Alpine Meadow Province, Challis Volcanic Section; ~ 42 % Coniferous Forest

Representative Species: Anthoohora bomboides (Anthophoridae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowering plants in bloom.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? April-August

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes \_\_\_ No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers of species visited for pollen and nectar.

2. Gene flow within and between populations of species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

**Key Assumptions**

That *A. bomboides* is an important pollinator of the flowers of plants that it visits.

**Key Unknowns and Monitoring or Research Needs**

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.

We need information on the preferred nest habitat and its occurrence.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

H i g h

M e Medium-Low

L o w

**Comments**

*A. bomboides* is an apparently generalized flower-visitor that occurs, in its several subspecies, throughout the United States.

This Bailey's section has been fairly well-collected compared to others; we have some representation from vegetation types comprising 82% of the total section area. Important vegetation types from which we have no records are: Lodgepole pine and Ponderosa Pine Grassland.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 34 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332F, Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province, Challis Volcanic Section; ~ 42% Coniferous Forest

Representative Species: Osmia kincaidii (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of flowering plants in bloom.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? April-August

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows to nest in.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers probably of species visited for pollen and nectar.

~~Gene flow within and between populations or species visited for pollen and nectar~~

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *O. kincaidii* is an important pollinator of the flowers of plants that it visits.

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**Key Unknowns and Monitoring or Research Needs**

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.

We need information on the preferred nest habitat and substrate.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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**Degree of Confidence in Knowledge of Species**

H i g h

Med. X

Low     

**Comments**

*O. kincaidii* is an apparently generalized flower-visitor of the western United States: it is found at 550-6,500 ft. elevation, and is sometimes fairly common.

This Bailey's section has been fairly well-collected compared to others: we have some representation from vegetation types comprising 82% of the total section area. Important vegetation types from which we have no records are: Lodgepole pine and Ponderosa Pine Grassland.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 258 species of pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332G, Middle Rocky Mt Steppe-Coniferous Forest-Alpine Meadow Province, Blue Mountain Section; ~47% Coniferous Forest

Representative Species: Melissodes rivalis (Anthophoridae)

"I did not complete this form because:

Key Environmental Correlates

1. Presence of flowering plants in the composite tribe Cynareae, as a pollen source, as well as other diverse species used for nectar.

Categorical

Continuous

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Adult reproductive plants \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? July-August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of sand banks in which to nest.

Categorical

Continuous

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

135

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
A ttribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

7. Pollination of flowers in the composite tribe Cynareae as well as those of species visited for nectar.

2. Gene flow within and between populations of species visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That *M. rivalis* is an important pollinator of the flowers that it visits for pollen and nectar.

That *M. rivalis* nests exclusively in sand banks.

*Key Unknowns and Monitoring or Research Needs*

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.

We need additional information on the preferred nest habitat and substrate to determine if this species is a sand bank specialist.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

*Degree of Confidence in Knowledge of Species*

H i g h

M a d . X

L o w

*Comments*

*M. rivalis* is a specialized flower-visitor of composites in the western United States; it is sometimes fairly common.

This Bailey's section has been well-collected compared to others; we have some representation from vegetation types comprising 99.8% of the total section area.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 258 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M332G, Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province, Blue Mountain Section; -47% Coniferous Forest

Representative Species: Bombus appositus, B. bifarius, B. californicus, B. centralis, B. fervidus, B. flavifrons, B. griseocollis, B. huntii, B. melanopygus, B. mixtus, B. morrisoni, B. nevadensis, B. occidentalis, B. rufocinctus, B. sitkensis, B. sylvicola (Apidae)

"I did not complete this form because: "

Key to Environmental Correlates

7. Presence of a diverse array of flowering plants for the entire growing season (March - October, influenced by altitude). The 16 species fall into two broad categories according to length of mouth-parts (short v. long) which, in turn, partially influences their choice of flowers.

Category: Ca teorical x

Continuous x

Suitable Categories:

Unit of Measure: mm

Adult reproductive plants

Minimum: ca. 2

Applies seasonally? Yes x No

Maximum: ca. 15

Which seasons? entire growing season (March - October, influenced by altitude)

Theme name:

Attribute:

2. Presence of suitable nesting sites: abandoned rodent burrows for subterranean nesters; abandoned nests of hole-nesting birds; depressions in the soil surface covered with dead vegetation.

Category: Ca teorical X

Continuous

Suitable Categories:

Unit of Measure:

Abandoned bird (tree-hole) and rodent nests.

Minimum:

Applies seasonally? Yes \_\_\_ No X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers

2. Gene flow within and between populations of diverse flowering plants.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

~~4.~~ \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

None

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*Key Unknowns and Monitoring or Research Needs*

Although a great deal remains to be learned about the habitat, nest-site and flower preferences of bumble bees,  
their ecology is better understood than any other group of native bees. Therefore, research on bumble bees is of  
lower priority than that needed for other pollinators in the Columbia Basin.  
or plant host range of this species.

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*Dispersal*

*Dispersal mode:* Independent flight

*Requirements for dispersal:* Presence of a diverse array of flowering plants for the entire growing season (March -  
October, influenced by altitude); presence of suitable nesting sites.

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*Degree of Confidence in Knowledge of Species*

High   X  

M e d   

L o   w  

*Comments*

Most of these 16 species of bumblebees are at home in forests or prairie although their foraging will typically be  
done in open habitats (prairie, clearings and meadows) where flowering plants abound.

This Bailey's section has been well-collected compared to others: we have some representation  
from vegetation types comprising 99.8% of the total section area.

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COL UMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 86 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333A, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; ? Section; -70% Coniferous Forest

Representative Species: Lasioalossium eareaium (Halictidae)

I did not complete this form because:

Key Environmental Correlates

1. Presence of flowering plant species in bloom

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? April - September

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes NO

Maximum:

Which seasons?

Theme name:

Attribute:

141

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key **Ecological Functions**

7. Pollination of flowers of plants visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of plants visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

~~4. Recycle soil layers and nutrients.~~ \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

172

### Key Assumptions

That *L. eoreoium* is an effective pollinator of the plants that it visits.

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### Key Unknowns and Monitoring or Research Needs

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.

We need to know if this species is a true generalist or if it requires (prefers) certain taxa of flowering plants for pollen or nectar.

We need information on the preferred nest habitat and substrate.

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### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nest habitat.

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### Degree of Confidence in Knowledge of Species

High \_\_\_\_\_

Medium \_\_\_\_\_

Low  \_\_\_\_\_

### Comments

This species is apparently a generalized flower visitor like most North American halictid bees. It is widespread in North America west of the 104th Meridian.

This Bailey's section has been fairly well-collected compared to most others; we have some representation from vegetation types comprising 91.5% of the total section area. Collections are needed from the Western Pine vegetation types.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 86 species pollinating bees

Geographic Area and/or Habitat Type: Baiiev's M333A, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; ? Section; -70% Coniferous Forest

Representative Species: Andrena cuoreotincta (Andrenidae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of flowerina plant species in bloom

Categorical   x  

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive Dlants \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes   x   No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? April - June \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nestina habitat.

Categorical   x  

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No   x  

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

144

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Key **Ecological Functions**

7. Pollination of flowers visited for pollen and nectar.

. ne flow within and between populations of flowers visited for pollen and nectar.

~~3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.~~

. cycle soil layers and nutrients.

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

^^ \_\_\_\_\_

*Key Assumptions*

That *A. cuoreotincta* is an effective pollinator of the plants that it visits.

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*Key Unknowns and Monitoring or Research Needs*

We need to learn if this species is an effective pollinator of flowers of the plants that it visits for pollen and nectar.

We need to know if this species is a true generalist or if it requires (prefers) certain taxa of flowering plants for pollen or nectar.

We need information on the preferred nest habitat and substrate.

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*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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*Degree of Confidence in Knowledge of Species*

*H i g h*

*M e d*

*Low x*

*Comments*

*Andrena cuoreotincta* is a moderately common species found throughout the western United States. It appears to be a non-specialized flower-forager.

This Bailey's section has been fairly well-collected compared to most others: we have some representation from vegetation types comprising 91.5% of the total section area. Collections are needed from the Western White Pine vegetation type.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 22 Species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333B, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; Flathead Valley Section; ~ 77% Coniferous Forest

Representative Species: Synhalonia acerba (Anthophoridae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of blooming plants of species in the genus Arctostaphylos (Ericaceae)

Categorical

Continuous

Suitable Categories:

Unit of Measure:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum:

Applies seasonal/y? Yes  No

Maximum:

Which seasons? May - June

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key *Environmen tal* Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers of Arctostahvlos and any others that are visited for oollen and nectar.

2. Gene flow within and between oooulations of Arctostahvlos and anv other species that are visited for oollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil lavers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That *S. acerba* is restricted in its foraging preferences to flowers of *Arctostaphylos*.

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*Key Unknowns and Monitoring or Research Needs*

We need to know whether *S. acerba* is restricted in its foraging choices to flowers of *Arctostaphylos*.

We need to know if this species is an effective pollinator of *Arctostaphylos* species.

We need information on the acceptable nesting habitat of *Synhalonia*.

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*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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*Degree of Confidence in Knowledge of Species*

*H i g h*

*M e d .*

*Low x*

*Comments*

*Synhalonia acerba* is an uncommon species of around-nesting bee that is restricted in distribution to the Pacific Northwest. Its foraging choices are also apparently restricted to species of *Arctostaphylos*.

This Bailey's section has been moderately collected compared to most others; we have some representation from vegetation types comprising 75% of the total section area. Collections are needed from the following vegetation types: Interior Douglas Fir; Seral Shrub Regen.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 22 Species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333B, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; Flathead Valley Section; ~ 77% coniferous forest

Representative Species: Heliades carinarus (Megachilidae)

"I did not complete this form because: "

**Key Environmental Correlates**

1. Presence of flowering plant species in bloom.

Categorical x

Continuous \_\_\_\_\_

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? June - August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (stumps, snags, twigs) with abandoned beetle burrows, or pine cones in which to nest.

Categorical \_\_\_\_\_ x

Continuous \_\_\_\_\_

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Applies seasonal/v Yes \_\_\_\_\_ No x

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. Presence of pitch/resin that can be gathered and used in cell and nest modification and construction.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_

Categorical

Continuous \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers of those species visited for pollen and nectar.

2. Gene flow within and between populations of those species visited for pollen and nectar

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *H. carinatus* is an important pollinator of the flowers that it visits.

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**Key Unknowns and Monitoring or Research Needs**

We need to know if *H. carinatus* is an important pollinator of the flowers that it visits.

We need to know if *H. carinatus* is a generalized flower forager or if it has more restricted flower-visiting habits.

We need to know if, as its nesting habits suggest, *H. carinatus* is restricted in its distribution to sites in or near coniferous forests.

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**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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**Degree of Confidence in Knowledge of Species**

H i g h

Med. X

L o w

**Comments**

*H. carinatus* is found throughout the United States although it is rarely common. Apparently, it is a generalized flower-forager.

This Bailey's section has been moderately collected compared to most others; we have some representation from vegetation types comprising 75% of the total section area. Collections are needed from the following vegetation types: Interior Douglas Fir, Seral Shrub Regen.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 34 Species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333C, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; Northern Rockies Section; ~ 86% coniferous forest

Representative Species: Anthidium tenuiflorae (Megachilidae)

"I did not complete this form because:"

*Key Environmental Correlates*

7. Presence of acceptable species of flowering plants in bloom.

Categorical

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? June - August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable nesting sites: Species is known to build nests in crevices in rocks.

Categorical

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Applies seasonally? Yes  No

Minimum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Maximum: \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental Correlates**

3. Presence of a resin source (wood of Gvmnosoerms. olants of Grindelia. etc.) which is used for cell and nest construction and modification.

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers that are visited for oollen and nectar.

2. Gene flow within and between oopulations of flowers that are visited for oollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals. birds. ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

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***Key Assumptions***

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That *A. tenuiflorae* is an effective pollinator of those plants it visits for pollen and nectar.

That *A. tenuiflorae* is a generalized flower forager capable of obtaining resources from a range of plant species.

That *A. tenuiflorae* is restricted in its nesting habitat to areas with large rocks.

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***Key Unknowns and Monitoring or Research Needs***

We need to know if *A. tenuiflorae* is an effective pollinator of those plants it visits for pollen and nectar.

We need to know if *A. tenuiflorae* is a generalized flower forager capable of obtaining resources from a range of plant species.

We need to know if *A. tenuiflorae* is restricted in its nesting habitat to areas with large rocks.

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***Dispersal***

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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***Degree of Confidence in Knowledge of Species***

H i g h

M e d .

Low    x

***C o m m e n t s***

*Anthidium tenuiflorae* is a species distributed throughout much of the western United States in its northern half. It is uncommon in the Columbia Basin.

This Bailey's section has been moderately collected compared to most others; we have some representation from vegetation types comprising 76.4% of the total section area. Collections are needed from the following vegetation types: Western Larch, Grand Fir, Seral Shrub Regen.

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COLUMBIA RIVER BASIN - PANEL SPECJES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 34 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333C, Northern Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; Northern Rockies Section; ~ 70% coniferous forest

Representative Species: Andrena crataegi (Andrenidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of blooming species of flowering plants, especially in the Rosaceae.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes X No

Maximum:

Which seasons? May - July

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes \_\_\_ No X

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *A. crataegi* prefers species in the Rosaceae.

That *A. crataegi* is an effective pollinator of plants in the Rosaceae as well as any other plant species it visits for pollen and nectar.

**Key Unknowns and Monitoring or Research Needs**

We should obtain additional information on the flower-visiting habits and pollination efficiency of this species.

We need information on the acceptable nesting habitat used by this species.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

High     

Medium   d  

Low     x  

**Comments**

*Andrena crataegi* occurs through much of northern North America including the Columbia Basin.

This Bailey's section has been moderately collected compared to most others: we have some representation from vegetation types comprising 76.4% of the total section area. Collections are needed from the following vegetation types: Western Larch, Grand Fir, Seral Shrub Regen.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 71 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333D, Norther Rocky Mountain Steppe-Coniferous Forest - Alpine Meadow Province; Bitterroot Mountains Section; ~ 82% coniferous forest

Representative Species: Osmia tristella (Megachilidae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of blooming plants in the genus Penstemon and/or the family Leuminosae, and oossibly others as well.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? June - July

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, twigs, etc.) with abandoned insect burrows that can be used for nesting.

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonally? Yes  No

Minimum:

Which seasons?

Theme name:

Attribute:

Maximum:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

Categorical \_\_\_\_\_

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production or native fruits and seeds used as food by mammals, birds, ants  
and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

That *O. tristella* is an effective pollinator of plants of the genus *Penstemon* and/or family *Leguminosae*.

That *O. tristella* is an effective pollinator of plants in the genus *Penstemon* and/or family *Leguminosae*.

That *O. tristella* nests only in abandoned holes in dead wood.

**Key Unknowns and Monitoring or Research Needs**

Whether *O. tristella* prefers to forage on plants of the genus *Penstemon* and/or family *Leguminosae*.

Whether *O. tristella* is an effective pollinator of plants in the genus *Penstemon* and/or family *Leguminosae*.

Whether *O. tristella* nests only in abandoned holes in dead wood.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

H i g h

M e d

Low x

**Comments**

*Osmia tristella* is an uncommon species of the Pacific northwest.

This section has been very well-collected compared to others: Fully 99% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 71 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M333D, Northern Rocky Mountain Steppe-coniferous forest - Alpine Meadow Province; Bitterroot Mountains Section; ~ 82% coniferous forest

Representative Species: Andrena w-scripta (Andrenidae)

"I did not complete this form because: "

*Key Environmental Correlates*

7. Presence of bloomina species of plants.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes X No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? April - June

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

142

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

A ttribute: \_\_\_\_\_

Key *Ecological Functions*

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of plants visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

*Key Assumptions*

That *A. w-scripta* is an effective pollinator of those plants it visits for pollen and nectar.

That *A. w-scripta* is a generalized flower forager capable of obtaining resources from a range of plant species.

*Key Unknowns and Monitoring or Research Needs*

Whether *A. w-scripta* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *A. w-scripta* is a generalized flower forager capable of obtaining resources from a range of plant species.

What constitutes acceptable around-nesting habitat for this species.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

*Degree of Confidence in Knowledge of Species*

H i g h

M e d .

Low x

*Comments*

*Andrena w-scripta* is a fairly common species of the western United States in its northern half, and in the Columbia Basin.

This section has been very well-collected compared to others: Fully 99% of the total section area has been the subject of some sampling.

**COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION**

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Date: I-3 I-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 198 species pollinating bees

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Geographic Area and/or Habitat Type: Bailey's M342B, Intermountain Semi-Desert Province; Northwestern Basin and Range; 1% coniferous forest

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Representative Species: Qsmia calla (Megachilidae)

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"I did not complete this form because: "

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**Key Environmental Correlates**

7. Presence of blooming plants.

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Categorical  x

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

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Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? May - August

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (snags, stumps, branches, etc.) with abandoned insect burrows to nest in.

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Categorical  X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_

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Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

165

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s* \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

*Key Ecological Functions*

7. Pollination of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

3. Colony production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

### Key Assumptions

That *O. calla* is an effective pollinator of those plants it visits for pollen and nectar.

That *O. calla* is a generalized flower forager capable of obtaining resources from a range of plant species.

That *O. calla*, like all its known conspecifics, nests in abandoned insect burrows in dead wood.

### Key Unknowns and Monitoring or Research Needs

Whether *O. calla* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *O. calla* is a generalized flower forager capable of obtaining resources from a range of plant species.

Whether *O. calla*, like all its known conspecifics, nests in abandoned insect burrows in dead wood.

### Dispersal

Dispersal mode: independent flight

Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

### Degree of Confidence in Knowledge Of Species

H i g h

M e d

Low x

### Comments

*Osmia calla* is a species of the northwestern United States common in the Columbia Basin between 2,000 and 8,000 feet. It is found in a variety of habitats and is thought to be a generalized flower forager.

This section has been very well-collected compared to others: Fully 99.7% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 198 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342B, Intermountain Semi-Desert Province; Northwestern Basin & Range; 1% coniferous forest

Representative Species: Andrena andustitarsata (Andrenidae)

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of blooming plants

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? April - August

Theme name:

Attribute:

2. Presence of acceptable around-nesting habitat

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

*Categorical* \_\_\_\_\_

*C o n t i n u o u s*

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

*C a t e g o r i c a l*

*C o n t i n u o u s*

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *A. anaustitarsata* is an effective pollinator of those plants it visits for pollen and nectar.

That *A. anaustitarsata* is a generalized flower forager capable of obtaining resources from a range of plant species.

**Key Unknowns and Monitoring or Research Needs**

Whether *A. anaustitarsata* is an effective pollinator of those plants it visits for pollen and nectar, or plant host range of this species.

Whether *A. angustitarsata* is a generalized flower forager capable of obtaining resources from a range of plant species.

Information on the ground-nesting habitat preferred by this species.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

H i g h

M e d

Low x

**Comments**

*Andrena anaustitarsata* is a species of the northwestern United States common in the Columbia Basin between 200 and 5,400 feet. It is found in a variety of habitats and is thought to be a generalized flower forager.

This section has been very well-collected compared to others: Fully 99.7% Of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 200 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342C, Intermountain Semi-Desert Province; Owyhee Uplands Section; 1% coniferous forest

Representative Species: Melissodes agilis (Anthophoridae)

I did not complete this form because:

Key Environmental Correlates

7. Presence of blooming plants in the family Compositae, especially of the genus Helianthus

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No  ,  
Which seasons? July - September

Maximum:

Theme name:

Attribute:

2. Presence of acceptable flat, silt loam, around-nesting habitat

Categorical

Continuous

Suitable Categories:

Unit of Measure:

\_\_\_\_\_

Minimum:

\_\_\_\_\_

Applies seasonally? Yes  No

Maximum:

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of composite flowers. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of composite flowers. \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production of native fruits and seeds used as food native plant species which is used as food by mammals, birds, ants and other fruit- and seed-eating insects. \_\_\_\_\_  
\_\_\_\_\_

4. Recycle soil layers and nutrients. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

**Key Assumptions**

None  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

Information on the range of ground-nesting habitats acceptable to this species.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

High X

Medium    

Low    

**Comments**

Melissodes aolis is distributed throughout much of the United States and is common in the Columbia Basin in a variety of habitats.

This section has been very well-collected compared to others: Fully 95.2% of the total Section area has been the subject of some sampling.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 200 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342C, Intermountain Semi-Desert Province; Owyhee Uplands Section; 0% coniferous forest

Representative Species: Nomia melanderi (Halictidae)

~~I did not complete this form because:~~  
\_\_\_\_\_  
\_\_\_\_\_

Key Environmental Correlates

7. Presence of blooming plants, especially species in the Leguminosae, which it prefers.

C o n t i n u o u s

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

2. Presence of flat, moist alkali flats as around-nesting habitat.

Categorical X \_\_\_\_\_

C o n t i n u o u s

Suitable Categories:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No X

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

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Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

\_\_\_\_\_ laborators in the production of native fruit and seed of native plant species which is used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

### Key Assumptions

That N. melanderi is an effective pollinator of those plants it visits for pollen and nectar.

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### Key Unknowns and Monitoring or Research Needs

Whether N. melanderi is an effective pollinator of those plants it visits for pollen and nectar.

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### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

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### Degree of Confidence in Knowledge of Species

High  X

M e  d

L o  w

### Comments

Nomia melanderi occurs throughout much of the western United States and is fairly common in the Columbia Basin between 300 and 5,000 feet. It is found in a variety of habitats and is thought to prefer flowers of the Leguminosae although it is capable of obtaining pollen and nectar from a range of other flower species. The species is sometimes used as a pollinator of alfalfa.

This section has been very well-collected compared to others: Fully 95.2% of the total section area has been the subject of some sampling.

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COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 I-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 235 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342D, Intermountain Semi-Desert Province; Snake River Basalt Section; 1 % coniferous forest

Representative Species: Lithuroe aoicalis (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of blooming plants in the genus Opuntia (Cactaceae).

C a t e g o r i c a l  x

C o n t i n u o u s

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  X  No

Maximum:

Which seasons? June - July

Theme name:

Attributer

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows for making nests in.

C a t e g o r i c a l  X

C o n t i n u o u s

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes   No  X

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of Opuntia flowers.

2. Gene flow within and between populations of Opuntia flowers.

3. Collaborators in the production of native fruits and seeds used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

None

**Key Unknowns and Monitoring or Research Needs**

We have little information on the distribution of this species in the Columbia Basin.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

High   h

Medium   .

Low   x

**Comments**

Lithurge apicalis is distributed throughout much of the western United States but is rarely common anywhere. It is a specialist visitor of Oenothera flowers.

This section has been very well-collected compared to others: Fully 97.5% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 235 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342D, Intermountain Semi-Desert Province; Snake River Basalt Section; 1% Coniferous Forest

Representative Species: Nomadoosis scitula (Andrenidae)

"I did not complete this form because:"

Key Environmental Correlates

1. Presence of blooming plants; may prefer to forage on species of the genus Cleome and Potentilla

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons? June - July

Theme name:

Contributor

2. Presence of flat, sparsely-vegetated, around-nestina habitat

Categorical

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes  No

Maximum:

Which seasons?

Theme name:

Attribute:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *N. scitula* is an effective pollinator of those plants it visits for pollen and nectar.

That *N. scitula* is a generalized flower forager capable of obtaining resources from a range of plant species.

That *N. scitula* prefers to visit the flowers of *Cleome* and *Potentilla*

**Key Unknowns and Monitoring or Research Needs**

Whether *N. scitula* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *N. scitula* is a generalized flower forager capable of obtaining resources from a range of plant species.

Information on the range of ground-nesting habitats acceptable to this species.

**Dispersal**

*Dispersal mode:* Independent flight

*Requirements for dispersal:* Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

High \_\_\_\_\_

Med. X \_\_\_\_\_

Low \_\_\_\_\_

**Comments**

*Nomadoosis scitula* is distributed throughout much of the western United States but is uncommon in the Columbia Basin and is restricted to the Intermountain Semi-desert Province.

This section has been very well-collected compared to others: Fully 97.5% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: I-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 88 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342H, Intermountain Semi-Desert Province; High Lava Plains Section; 11% Coniferous Forest

Representative Species: Dianthidium ulkei ((Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of bloomina plants in the familv Compositae.

Categorical  x

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? July - Auaust

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of dead wood (snaas, stumos, etc.) with abandoned insect'burrows to make nests in.

Categorical  X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_

Minimum: \_\_\_\_\_

\_\_\_\_\_

Applies seasonally? Yes  No

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental Correlates**

3. Presence of a source of resin (coniferous trees, resinous herbs such as Grindelia) to use to construct cell partitions and closing plug for the nest.

**Categorical** X

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_

**Categorical** \_\_\_\_\_

**C o n t i n u o u s**

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**Key Ecological Functions**

1. Pollination of comoosite flowers.

2. Gene flow within and between populations of comoosite flowers.

laborators in the production of native fruit and seed ov native plant species which IS used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

**Key Assumptions**

That *D. ulkei* is an effective pollinator of those composite species it visits for pollen and nectar.

That *N. scitula* is capable of obtaining resources from a range of composite species.

**Key Unknowns and Monitoring or Research Needs**

The range of composite species acceptable as food plants is not known.

Information on the range of nesting habitats acceptable to this species. There is some indication that crevices in rocks and short tunnels in the ground are also occasionally used for nests.

**Dispersal**

Dispersal mode: independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

High   X  

Medium   

Low   W  

**Comments**

*Dianthidium ulkei* is distributed throughout much of the western United States but is rarely common: in the Columbia Basin it occurs in a variety of habitats.

This section has been very well-collected compared to others: Fully 97.3% of the total section area has been the subject of some sampling.

## COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95 \_\_\_\_\_

Panelist Name: TEPEDINO &amp; GRISWOLD (optional)

Species or Species Group: 88 species pollinating bees  
\_\_\_\_\_Geographic Area and/or Habitat Type: Bailey's M342H, Intermountain Semi-Desert Province; High Lava Plains Section; 11% coniferous forest  
\_\_\_\_\_Representative Species: Colletes lutzi (Colletidae)  
\_\_\_\_\_"I did not complete this form because:"  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Key Environmental Correlates

7. Presence of bloomina olants suoolvina extractable pollen and nectar  
\_\_\_\_\_C a t e g o r i c a l  x 

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Adult reproductive plants  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes  x  No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? July - September \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of acceptable around-nestina habitat  
\_\_\_\_\_C a t e g o r i c a l  x 

C o n t i n u o u s

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No  x 

Maximum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

**Key Environmental correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Applies seasonally? Yes \_\_\_ NO \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of flowers visited for pollen and nectar

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Key Assumptions**

That *C. lutzii* is an effective pollinator of those plants it visits for pollen and nectar.

That *C. lutzii* is a generalized flower forager capable of obtaining resources from a range of plant species.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

Whether *C. lutzii* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *C. lutzii* is a generalized flower forager capable of obtaining resources from a range of plant species.

Information on the range of around-nesting habitats acceptable to this species.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

H i g h

M e d

Low x

**Comments**

*Colletes lutzii* is distributed throughout much of the western United States and occurs in two subspecies in the Columbia Basin in a variety of habitats. It appears to be a generalized flower forager from the little available information.

This section has been very well-collected compared to others: Fully 97.3% of the total section area has been the subject of some sampling.

\_\_\_\_\_  
\_\_\_\_\_

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-3 1-95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 241 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M3421, Intermountain Semi-Desert Province; Columbia Basin Section; 3% coniferous forest

Representative Species: Atoposmia abiecta (Megachilidae)

"I did not complete this form because: "

*Key Environmental Correlates*

1. Presence of blooming plants in the genus Penstemon

*Categorical* x

*Continuous*

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive plants

Minimum: \_\_\_\_\_

Applies seasonally? Yes x No \_\_\_\_\_

Maximum: \_\_\_\_\_

Which seasons? June - October

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

2. Presence of stones and crevices in rocks which are used for nesting

*Categorical* x

*Continuous* \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Applies seasonal/v? Yes \_\_\_\_\_ No x

Minimum: \_\_\_\_\_

Which seasons? \_\_\_\_\_

Maximum: \_\_\_\_\_

Theme name: \_\_\_\_\_

Attribute: \_\_\_\_\_

Key Environmental correlates

3: \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s \_\_\_\_\_

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key Ecological Functions

1. Pollination of Penstemon flowers.

2. Gene flow within and between populations of Penstemon flowers.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

### Key Assumptions

That *A. abiecta* is an effective pollinator of Penstemon flowers.

That *A. abiecta* is restricted in its foraging selections to flowers of Penstemon.

That we are aware of the whole spectrum of potential nest sites used by this species.

### Key Unknowns and Monitoring or Research Needs

Whether *A. abiecta* is an effective pollinator of Penstemon flowers.

Whether *A. abiecta* is restricted in its foraging selections to flowers of Penstemon.

Whether stones and rock crevices constitute the entire spectrum of potential nest sites used by this species.

### Dispersal

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

### Degree of Confidence in Knowledge of Species

High \_\_\_\_\_

Med. \_\_\_\_\_x

Low \_\_\_\_\_

### Comments

*Atoposmia abiecta* is found throughout much of the northwestern United States from 3,000 to 9,000 feet elevation in a variety of habitats. It appears to be a specialized forager on Penstemon flowers and is rarely common.

This section has been very well-collected compared to others: Fully 98.4% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species, or Species Group: 24 1 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's M342I, Intermountain Semi-Desert Province; Columbia Basin Section; 3% coniferous forest

Representative Species: Chelostoma cockerelli (Megachilidae)

"I did not complete this form because: "

Key Environmental Correlates

1. Presence of blooming plants in the genus Eriodictyon.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes x No

Maximum:

Which seasons? June

Theme name:

Attribute:

2. Presence of dead wood (snags, stumps, etc.) with abandoned insect burrows in which to nest.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Applies seasonally? Yes No x

Maximum:

Which seasons?

Theme name:

Attribute:

**Key Environmental Correlates**

3. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
 Which seasons? \_\_\_\_\_  
 Theme name: \_\_\_\_\_  
 Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
 \_\_\_\_\_

**C a t e g o r i c a l**

Suitable Categories:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
 Which seasons? \_\_\_\_\_  
 Theme name: \_\_\_\_\_  
 Attribute: \_\_\_\_\_

**C o n t i n u o u s**

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Ecological Functions**

7. Pollination of Eriodictyon flowers.

2. Gene flow within and between populations of (Eriodictyon) flowers.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other seed-eating insects.

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *C. cockerelli* is an effective pollinator of *Eriodictyon* flowers.

That *C. cockerelli* is restricted in its foraging selection to flowers of the genus *Eriodictyon*.

**Key Unknowns and Monitoring or Research Needs**

This species has been recorded only once in the Columbia Basin (it is also uncommon surrounding the Basin).

Surveys are badly needed.

Whether *C. cockerelli* is an effective pollinator of *Eriodictyon* flowers.

Whether *C. cockerelli* is restricted in its foraging selection to flowers of the genus *Eriodictyon*.

Information on the range of acceptable nest substrates and types.

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

**Degree of Confidence in Knowledge of Species**

H i g h

M a d

Low x

**Comments**

*Chelostoma cockerelli* is an endemic of the Pacific Northwest which is not quite restricted to the Columbia Basin. It has been recorded only from the Tygh Valley in Wasco Co., Oregon. There is little available information on this species.

This section has been very well-collected compared to others: Fully 98.4% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 257 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's 331A, Great Plains - Palouse Dry Steppe Province; Palouse Prairie Section; 11.6% coniferous forest

~~Representative Species:~~ Agapostemon femoratus (Halictidae)

"I did not complete this form because:"

Key Environmental Correlates

7. Presence of bloomina plants supplying extractable pollen and nectar.

Categorical x

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

Adult reproductive olants

Minimum: \_\_\_\_\_

Applies seasonally? Yes x No \_\_\_  
Which seasons? May - July  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

2. Presence of acceptable around-nestina habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_\_\_ No x  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

**Key Environmental Correlates**

3. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

**C a t e g o r i c a l**

**C o n t i n u o u s**

Suitable Categories: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unit of Measure: \_\_\_\_\_

Minimum: \_\_\_\_\_

Maximum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

***Key Ecological Functions***

7. Pollination of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

2. Gene flow within and between populations of flowers visited for pollen and nectar. \_\_\_\_\_  
\_\_\_\_\_

3. Collaborators in the production of native fruit and seed by native plant species which is used as food  
by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients. \_\_\_\_\_  
\_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_

*Key Assumptions*

That *A. femoratus* is an effective pollinator of those plants it visits for pollen and nectar.

That *A. femoratus* is a generalized flower forager capable of obtaining resources from a range of plant species.

*Key Unknowns and Monitoring or Research Needs*

Whether *A. femoratus* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *A. femoratus* is a generalized flower forager capable of obtaining resources from a range of plant species.

Information on the range of around-nesting habitats acceptable to this species.

*Dispersal*

Dispersal mode: Independent flight

Requirements for dispersal: Presence of acceptable species of flowering plants; presence of appropriate nesting habitat.

*Degree of Confidence in Knowledge of Species*

High \_\_\_\_\_

Med. x\_\_\_\_\_

Low \_\_\_\_\_

*Comments*

*Agapostemon femoratus* is distributed throughout much of the western United States and the Columbia Basin up to 10,000 feet elevation in a variety of habitats. It appears to be a generalized flower forager.

This section has been very well-collected compared to others: Fully 98.7% of the total section area has been the subject of some sampling.

COLUMBIA RIVER BASIN - PANEL SPECIES INFORMATION

Date: 1-31 -95

Panelist Name: TEPEDINO & GRISWOLD (optional)

Species or Species Group: 257 species pollinating bees

Geographic Area and/or Habitat Type: Bailey's 33 1 A, Great Plains - Palouse Dry Steppe Province; Palouse Prairie Section; 11.6% coniferous forest

Representative Species: Andrena buckelli (Andrenidae)

"I did not complete this form because: "

Key Environmental Correlates

7. Presence of blooming plants supplying extractable pollen and nectar.

Categorical x

Continuous

Suitable Categories:

Unit of Measure:

Adult reproductive plants

Minimum:

Applies seasonally? Yes x No
Which seasons? July - September
Theme name:
Attribute:

Maximum:

2. Presence of acceptable around-nesting habitat.

Categorical X

Continuous

Suitable Categories:

Unit of Measure:

Minimum:

Applies seasonally? Yes No x
Which seasons?
Theme name:
Attribute:

Maximum:

Key Environmental Correlates

3. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

4. \_\_\_\_\_  
\_\_\_\_\_

C a t e g o r i c a l

C o n t i n u o u s

Suitable Categories:

Unit of Measure: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Minimum: \_\_\_\_\_

Applies seasonally? Yes \_\_\_ No \_\_\_  
Which seasons? \_\_\_\_\_  
Theme name: \_\_\_\_\_  
Attribute: \_\_\_\_\_

Maximum: \_\_\_\_\_

Key *Ecological Functions*

7. Pollination of flowers visited for pollen and nectar.

2. Gene flow within and between populations of flowers visited for pollen and nectar.

3. Collaborators in the production of native fruit and seed by native plant species which is used as food by mammals, birds, ants and other fruit- and seed-eating insects.

4. Recycle soil layers and nutrients.

5. \_\_\_\_\_

6. \_\_\_\_\_

**Key Assumptions**

That *A. buckelli* is an effective pollinator of those plants it visits for pollen and nectar.

That *A. buckelli* is a generalized flower forager capable of obtaining resources from a range of plant species.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Key Unknowns and Monitoring or Research Needs**

There is no available information on the foraging choices of this species.

Whether *A. buckelli* is an effective pollinator of those plants it visits for pollen and nectar.

Whether *A. buckelli* is a generalized flower forager capable of obtaining resources from a range of plant species.

Information on the range of ground-nesting habitats acceptable to this species.

\_\_\_\_\_  
\_\_\_\_\_

**Dispersal**

Dispersal mode: Independent flight

Requirements for dispersal: Present of acceptable species of flowering plants: presence of appropriate nesting habitat.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Degree of Confidence in Knowledge of Species**

High \_\_\_\_\_

Medium \_\_\_\_\_

Low \_\_\_\_\_

**Comments**

*Andrena buckelli* is an endemic of the Pacific northwest whose distribution overflows the Columbia Basin. Although it appears to be common and occurs in a variety of habitats we have no information on its choice of flowers nor its nesting habitat.

This section has been very well-collected compared to others: Fully 99.7% of the total section area has been the subject of some sampling.

\_\_\_\_\_  
\_\_\_\_\_

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# Curriculum Vitae Vincent J. Tepedino

## EDUCATIONAL BACKGROUND.

B. S., 1971, Brooklyn College of the City University of New York  
Ph.D., 1980, University of Wyoming; Zoology

## EMPLOYMENT

**1978-PRESENT** Research Entomologist, USDA-ARS  
**1982- 1988** Adjunct Assistant Professor, Department of Biology and the Ecology Center, Utah State University  
**1988-PRESENT** Adjunct Associate Professor, Department of Biology and the Ecology Center, Utah State University

## FUNDING

Recipient of grants totaling \$500,000 from USDA-APHIS, USDA-Forest Service, **DOI-USFWS**, **DOI-BLM**, Nature Conservancy to study the reproductive biology of rare plants in the western United States, **1988-present**.

## ADVISORY ACTIVITIES

Reviewer of research proposals to NSF, USDA Competitive Grants Program; and of manuscripts to numerous scientific journals including Ecology, Evolution, Journal of Economic Entomology, Ecological Entomology, Annals of the American Entomological Society, and many others.

## MENTORING

Major professor or committee member for four Ph.D and nine M.S. degrees.

## PUBLICATIONS

Sole author or co-author of 69 refereed publications in scientific journals, 11 abstracts and 15 technical reports, all on the ecology and behavior of native bees and the plants they pollinate.

## Curriculum Vitae

### PERSONAL DATA.

Name : Terry Lane Griswold  
Place of Birth: Los Angeles, California  
Date of Birth: 24 June 1950  
Marital Status: Married  
Address: USDA-ARS Bee Biology & Systematics Lab  
Utah State University, Logan UT 84322-5310  
Phone: (801) 750-2524  
FAX: (801) 750-1575  
E-Mail: Tgris@cc.usu.edu

### EDUCATION.

1986: Ph.D. Utah State University; biology.  
1974: M.A. Pacific Union College; major, teaching of biology.  
1972: B.A. Pacific Union College; major, biophysics.

### GRANTS, FELLOWSHIPS, CONTRACTS, AND AWARDS.

1992-1995: USFWS, Biology and Floral Fidelity of Perdita meconis, a Pollinator of a Rare Plant  
1988-1995: USDA, APHIS, Pollination Biology of Threatened and Endangered Plants  
1984: National Science Foundation, Doctoral Dissertation Improvement Grant for three months study of types in European museums.  
1979-1980: University Research Fellowship, Utah State University  
1977-1978: Survey of aculeate Hymenoptera of California Desert Conservation Area, contract, BLM, Riverside, California  
1974-1974: California State Graduate Fellowship  
1968: National Merit Scholarship Finalist

### RESEARCH AND TEACHING EXPERIENCE.

1983- : Entomologist and curator of George E. Bohart collection, USDA, ARS, Bee Biology and Systematics Lab, Logan, Utah  
1980-1982: Lab-field research aide, USDA, ARS, Bee Biology and Systematics Lab, Logan, Utah  
1977-1979: Junior high school teacher, science/math/physical education, Ukiah, California  
1974-1977: Junior high school teacher, science/math/physical education, Yucaipa, California  
1968-1974: Curator of insect collection, Pacific Union College, Angwin, California

### PROFESSIONAL ORGANIZATIONS.

Pacific Coast Entomological Society  
Kansas Entomological Society

### FIELD EXPERIENCE.

U.S.A., Canada, Mexico, Jamaica, Cyprus, India, Pakistan, South Africa, Zimbabwe, Zambia, Malawi, Tanzania, Kenya.

### PUBLICATIONS.

Author or co-author of 29 refereed journal articles, five technical reports, and three abstracts on bee biology and systematics and pollination biology.