

**Potential Habitat for Sensitive Plant Species
in Noxious Weed Treatment Areas,
Helena National Forest**

prepared for:

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by

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Introduction

This analysis was conducted to identify areas of potential habitat for Sensitive Plant Species within weed areas targeted for treatment on Helena National Forest (HNF). The results will be used to design field surveys that are as effective and efficient as possible.

At the outset of the analysis, Bonnie Heidel (former Program Botanist), Susan Crispin (Program Director and botanist), and Lois Olsen (HNF) reviewed the Region 1 Sensitive Species list, and information on Species of Concern in the Montana Natural Heritage Program (MTNHP) databases. We identified five species with a significant likelihood of occurring in or near mapped weed polygons on the Forest: *Cirsium longistylum*, *Grindelia howellii*, *Phlox kelseyi* var *missoulensis*, and *Polygonum douglasii* ssp *austinae*. *Lesquerella klausii* was also selected for the analysis, as it has been associated with many of the locations of *Phlox kelseyi* var *missoulensis*, and *Polygonum douglasii* ssp *austinae* and was formerly a Species of Concern. *Botrychium paradoxum* and *Botrychium crenulatum* were subsequently added to the list after they were found in appropriate habitat on the Forest just this summer (2001) by Lois Olsen. Several other species were excluded from further consideration. All species considered are summarized in Table 1.

We then assembled data from MTNHP and HNF files documenting the distribution and habitat characteristics of known populations of these species. Occurrence records were assembled from the Montana Natural Heritage Program databases (current as of July 2001) and 30 meter Digital Elevation Models (DEMs) were used to determine the range of aspect, elevation, and slope values for locations of those species. Soil types were determined using the "Landtype" variable within the "Landwaters" GIS coverage provided by the Helena National Forest Service. Likewise, characteristic vegetation types for each species were derived using the "Best stratum" field within individual forest unit vegetation coverages.

Based on the data layers assembled, we used five variables -- aspect, elevation, slope, soil type, and vegetation type -- to predict potential habitat for each species within the Helena National Forest. (*Botrychium crenulatum* was not included in this modeling exercise, due to lack of occurrence records as a basis for determining habitat parameters.) The potential habitat was further screened to within 50 feet of the proposed weed treatment areas, provided by the USFS. This exercise was completed using ArcView 3.2, unless otherwise noted, and is described below.

TABLE 1: Selection of USFS Sensitive species for Helena NF weed treatment analysis.

SPECIES	HABITAT	KNOWN OCCURRENCE AREAS	PROBABILITY IN WEED TREATMENT AREAS
Moderate to high potential for occurring in HNF weed treatment areas:			
<i>Botrychium crenulatum</i>	wetlands; recently reported from fescue grassland	no occurrences in Helena NF (recently reported there)	moderate??
<i>Botrychium paradoxum</i>	mesic montane meadows	Lincoln District	moderate
<i>Cirsium longistylum</i>	montane grassland	Duck Creek Pass and Avalanche Creeks are the only known occurrences in high quality natural habitat	moderate
<i>Grindellia howellii</i>	along roads	easily surveyed by car	moderate
<i>Phlox kelseyi</i> var. <i>missoulensis</i>	exposed limestone ridges and slopes	Helena and Lincoln Districts	high, but probably not in burn areas
<i>Polygonum douglasii</i> ssp. <i>austinae</i>	shale slopes	Helena and Townsend Districts	high - potentially in burn areas
Low potential for occurring in HNF weed treatment areas:			
<i>Amerorchis rotundifolia</i>	low - wetland	Lincoln District	low
<i>Aquilegia brevistyla</i>	open woods, streambanks	known from Lewis & Clark only; Little Belt Mountains	low
<i>Carex livida</i>	wetland	Lincoln District	low
<i>Carex paupercula</i>	wetland	no occurrences in the Helena NF	low
<i>Cypripedium parviflorum</i>	wetland	Lincoln District	low
<i>Cypripedium passerinum</i>	moist forest	known from Lewis & Clark only; Rocky Mountain Front	low
<i>Drosera anglica</i>	wetland	Lincoln District	low
<i>Drosera linearis</i>	wetland	Lincoln District	low
<i>Epipactis gigantea</i>	wetlands	no occurrences in the Helena NF	low
<i>Goodyera repens</i>	north-facing forest slopes	no occurrences in the Helena NF	low
<i>Juncus hallii</i>	moist to wet meadows	Helena & Townsend Ranger Districts	low-moderate?
<i>Oxytropis podocarpa</i>	alpine zone	known only from the Lewis & Clark, Front Range	low
<i>Salix wolfii</i> var. <i>wolfii</i>	wetlands	not tracked by MTNHP	low
<i>Saxifraga tempestiva</i>	wetland, alpine	no occurrences in the Helena NF	low
<i>Scirpus subterminalis</i>	wetland	Lincoln District	low
<i>Thalictrum alpinum</i>	wet meadows	no occurrences in the Helena NF	low
<i>Veratrum californicum</i>	wetlands	no occurrences in the Helena NF	low
<i>Viola renifolia</i>	swampy woods	no occurrences in the Helena NF	low
Formerly tracked species included as frequent associate and possible "indicator" of <i>Phlox</i> and <i>Polygonum</i> habitat:			
<i>Lesquerella klausii</i> (not a FS Sensitive species)	dry slopes and exposed areas	overlaps with <i>Polygonum</i> in Big Belts, and with with <i>Phlox</i> in Lincoln District	high; may indicate potential habitat for other species

Methods

The following outlines in greater detail the steps taken and methods used in this analysis:

- a. The MTNHP database was queried for occurrences (EOPoints) of each species. Individual ArcView shapefiles (e.g., cirs_eopoints) were created containing the occurrences of each species.
- b. Using the ArcView Spatial Analyst extension, the aspect and slope were calculated from the Digital Elevation Model (DEM).
- c. Features of the DEM, "Landwaters" coverage and vegetation coverages, which intersected the individual shapefiles (cirs_eopoints), were selected to determine the aspect, elevation, and slope, as well as soil and vegetation types in which the species were found. Shape files were created from the selected records.
- d. A map query was performed on the aspect, elevation, and slope of each species (cirs_demdata) to derive areas meeting the terrain requirements.
- e. All vegetation layers were queried using the appropriate "Best_stratum" values determined in the "Select By Theme" procedure. The selected records were converted to grid files.
- f. To eliminate additional steps, the individual vegetation grids were merged into a single vegetation grid (cirs_vegmerge).
- g. Likewise, the "Landwaters" coverage was queried using the appropriate "landtype" values, determined in the "Select By Theme" procedure, and the selected records were converted to grid files.
- h. A map query (cirs_dem&lw) was performed to determine areas that contained compatible aspect, elevation, and slope (cirs_demdata) as well as compatible soil type.
- i. Another map query (cirs_compatbl) determined areas that were compatible with both the vegetation (cirs_vegmerge) and aspect, elevation, slope, and soil (cirs_dem&lw). The map query was converted to a shapefile (cirs_compatbl.shp) and the shapefile was buffered to 50 feet.
- j. The weed polygon, line, and point files, provided by the USFS, were clipped with the 50 foot buffer of "cirs_compatbl.shp".
- k. The area of each polygon and length of each line were calculated using the Xtools extension.
- l. Centroids of the polygon and line files were created using the Xtools extension and projected to NAD 83, decimal degrees, to derive latitude and longitude.

Results

The following models were developed based on very low sample sizes. To improve the models, any additional occurrences that are found in the course of this or future studies could be added to the MTNHP database and incorporated into the analysis.

Botrychium paradoxum

- Elevation (2083-2299 m) and slope (2.13 – 10.29°) were derived from 7 known locations of *Botrychium paradoxum* within the DEM range. Aspect was not considered in this analysis upon the recommendation of Lois Olsen, USFS.
- Using the Landwaters and vegetation coverages provided by the USFS, and 4 known locations of *Botrychium*, vegetation and soil types were derived. *Botrychium* was located in open parks on soil type 77A. Upon the recommendations of Lois Olsen, USFS, soil type was eliminated from the final model.
- From the planned weed treatment areas, 9 lines of the original 180, 1 point of 225, and 14 polygons of 790, were found to contain potentially compatible habitat for *Botrychium paradoxum*. Latitude and longitude for points are given in the attached tables. Polygonal areas and line lengths are listed in the tables, as well as latitude and longitude of their respective centroids.
- The maps for *Botrychium paradoxum* in Appendix B display areas in which potential habitat and proposed weed treatment areas intersect. These intersects are widespread distribution within the Forest but show discernable clusters. To increase visibility of the locations, all point, line and polygon locations are displayed as red points – some larger than the actual area of potential habitat. Larger scale maps could show the exact shape and size of the small areas.
- The total acreage of potential habitat, which intersects with proposed weed treatment areas, is 29.70 acres and the total linear distance is 1.06 miles. Detailed data for *Botrychium paradoxum* begins on Appendix A, Page 1.

Cirsium longistylum

- Aspect (42.14 – 341.57°), elevation (1423 – 2357 m), and slope (0.76 – 25.62°) were derived from 19 known locations of *Cirsium longistylum* within the DEM range.
- Using the Landwaters and vegetation coverages provided by the USFS, and 10 known locations of *Cirsium*, vegetation and soil types were derived. *Cirsium* was located in closed canopy mature timber (n = 2), open parks (n = 7), and rock (n = 1). Known locations of *Cirsium* were located on the following soil types: 100 (n = 1), 34- (n = 1), 360 (n = 1), 44- (n = 1), 49-(n = 1), 51- (n = 1), 54- (n = 1), 77A (n = 1), 79B (n = 1), and 87- (n = 1).

Cirsium longistylum (continued)

- From the planned weed treatment areas, 58 lines of the original 180, 7 points of 225, and 278 polygons of 790, were found to contain potentially compatible habitat for *Cirsium longistylum*. Latitude and longitude for points are given in the attached tables. Polygonal areas and line lengths are listed in the tables, as well as latitude and longitude of their respective centroids.
- The maps for *Cirsium longistylum* in Appendix B display areas in which potential habitat and proposed weed treatment areas intersect. These intersects are widespread within the Forest but form discernable clusters. To increase visibility of plant locations, all point, line and polygon locations are displayed as red points. Larger scale maps could reveal the exact shape and size of the small areas.
- The total acreage of potential habitat, which intersects with proposed weed treatment areas, is 717.13 acres and the total linear distance is 8.81 miles. Detailed data for *Cirsium longistylum* begins on Appendix A, Page 2.

Grindelia howellii

- Aspect (22.38 – 326.31°), elevation (1228 – 1693 m), and slope (0.955 – 27.02°) were derived from 21 known locations of *Grindelia howellii* within the DEM range. No known locations of *Grindelia howellii* fell within the Landwaters and vegetation coverages provided by the USFS; therefore, we were unable to further analyze potential habitat for this species. *Grindelia* is known to grow along roadsides, and would most effectively be surveyed in this fashion. Alternatively, if Forest Service staff could identify the vegetation and soil types corresponding to general descriptions of known occurrences outside the forest, it may be possible to construct a model that would narrow the potential habitat areas to be surveyed.

Phlox kelseyi* var. *missoulensis

- Aspect (30.96 – 307.57°), elevation (1286 – 2349 m), and slope (1.07 – 7.78°) were derived from 7 known locations of *Phlox kelseyi* var. *missoulensis* within the DEM range.
- Using the Landwaters and vegetation coverages provided by the USFS, and 3 known locations of *Phlox*, vegetation and soil types were derived. *Phlox* was located in open parks (n = 2), and rock (n = 1). Known locations of *Phlox* were located on the following soil types: 54- (n = 1), 77A (n = 1), and 210 (n = 1).
- From the planned weed treatment areas, 19 lines of the original 180, 1 point of 225, and 43 polygons of 790, were found to contain potentially compatible habitat for *Phlox kelseyi* var. *missoulensis*. Latitude and longitude for points are given in the attached tables. Polygonal areas and line lengths are listed in the tables, as well as latitude and longitude of their respective centroids.

Phlox kelseyi* var. *missoulensis (continued)

- The maps for *Phlox kelseyi* var. *missoulensis* in Appendix B display areas in which potential habitat and proposed weed treatment areas intersect. These intersects show clusters of potential habitat to the east of Canyon Ferry Reservoir and to the west in the Austin—Marysville vicinity. Please note that in order to make all of the locations visible, all point, line and polygon locations are displayed as red points. Larger scale maps could reveal the exact shape and size of the small areas.
- The total acreage of potential habitat, which intersects with proposed weed treatment areas, is 118.27 acres and the total linear distance is 3.58 miles. The detailed data begins on Appendix A, Page 24.

Polygonum douglasii* ssp. *austinae

- Aspect (67.52 – 241.82°), elevation (1329 – 1810 m), and slope (11.63 – 27.90°) were derived from 5 known locations of *Polygonum douglasii* ssp. *austinae* within the DEM range.
- Using the Landwaters and vegetation coverages provided by the USFS, and 3 known locations of *Polygonum*, vegetation and soil types were derived. *Polygonum* was located in open grown mature timber (n = 1), open parks (n = 1), and unstocked timber stands (n = 1). Known locations of *Polygonum* were located on the following soil types: 29- (n = 1), 39-(n = 2), 390 (n = 1), and 39B (n = 1).
- From the planned weed treatment areas, 6 lines of the original 180, 7 points of 225, and 203 polygons of 790, were found to contain potentially compatible habitat for *Polygonum douglasii* ssp. *austinae*. Latitude and longitude for points are given in the attached tables. Polygonal areas and line lengths are listed in the tables, as well as latitude and longitude of their respective centroids.
- The maps for *Polygonum douglasii* ssp. *austinae* in Appendix B display areas in which potential habitat and proposed weed treatment areas intersect. These intersects are clustered to the east of Canyon Ferry Reservoir, including the area of the Cave Gulch Fire, to the south east of Canyon Ferry in the Deep Creek area, and are scattered throughout the continental divide area to the west. Please note that in order to make all of the locations visible, all point, line and polygon locations are displayed as red points. Larger scale maps could reveal the exact shape and size of the small areas.
- The total acreage of potential habitat, which intersects with proposed weed treatment areas, is 986.02 acres and the total linear distance is 0.52 miles. The detailed data begins on Appendix A, Page 26.

Lesquerella klausii

- Aspect (75.47 – 307.48°), elevation (1203 – 2356 m), and slope (5.876 – 35.08°) were derived from 33 known locations of *Lesquerella klausii* within the DEM range. Using the Landwaters and vegetation coverages provided by the USFS, and 26 known locations of *Lesquerella*, vegetation and soil types were derived. *Lesquerella* was located in pole timber (n = 2), open grown mature timber (n = 8), open parks (n = 11), and rock (n = 5). Known locations of *Lesquerella* were located on the following soil types: 100 (n = 2), 29- (n = 2), 32A (n = 1), 32B (n = 2), 39-(n = 5), 392 (n = 1), 39A (n = 1), 39B (n = 1), 49- (n = 2), 51- (n = 1), 54 (n = 2), 91- (n = 1), 94- (n = 3), and 95- (n = 1).
- From the planned weed treatment areas, 63 lines of the original 180, 30 points of 225, and 448 polygons of 790, were found to contain potentially compatible habitat for *Lesquerella klausii*. Latitude and longitude for points are given in the attached tables. Polygonal areas and line lengths are listed in the tables, as well as latitude and longitude of their respective centroids.
- Correlating these locations with predicted habitat for *Polygonum* and *Phlox* might be used as an indicator of increased potential for those species to occur, to be tested through field surveys. However, because the potential habitat predicted is so extensive, this information may not be especially helpful in focusing surveys for those other species.
- The detailed acreage and mileage data for *Lesquerella klausii* begins on Appendix A, Page 11.

SUMMARY AND RECOMMENDATIONS

By using data from known locations to model potential habitat for sensitive species judged likely to occur in weed treatment areas, this approach can focus survey work on a small portion of the weed treatment areas. The table below shows the areas identified for sensitive species survey as a percentage of the total mapped weed points (225 total), linear miles (198 total) and polygons (18,318 acres).

<u>Species</u>	<u>Percent of mapped weed:</u>	<u>Points</u>	<u>Linear Miles¹</u>	<u>Polygon Acreage</u>
<i>Botrychium paradoxum</i>		0.4%	0.6%	0.16%
<i>Cirsium longistylum</i>		3.1%	5.2%	3.9%
<i>Grindelia howellii</i>		na	na	na
<i>Phlox kelseyi</i> var. <i>missouriensis</i>		0.4%	2.1%	0.6%
<i>Polygonum douglassii</i> var. <i>austinae</i>		3.1%	0.3%	5.4%

¹ The mileage totals do not include linear weed features in the Belt area, as we did not receive line data from the Forest for that area. Points and polygons for the Belt area were received and included.

Habitat models are only as good as the data used to create them. Most of our models were based on relatively few occurrences -- ranging from 19 for *Cirsium longistylum* to only 3 each for the *Phlox* and *Polygonum*. Models based on only three records are unlikely to represent the full range of elevation, slope, etc. over which a species occurs. The fact both the *Phlox* and *Polygonum* are inconspicuous and/or may easily be mistaken for more common species also suggests that they could easily be more widely distributed in the Forest than current records reflect. Since survey work for such small, inconspicuous species is fairly labor-intensive, it will be productive to first search areas that fit the existing -- if limited -- habitat model. If a number of new occurrences are found, it may then be worth expanding searches to include, e.g., a broader range of elevation or slope. However, if few or no new populations are found in the modeled habitats, then expanding the parameters of the search is less likely to be productive.

For *Cirsium* and *Polygonum*, our model identified many areas of potential habitat in the Divide and Lincoln Districts, where no populations are currently known to exist. We chose to apply the model to the entire Forest, rather than restricting it to areas of known locations. That said, however, we would expect the likelihood of occurrence to be much greater in the eastern units where the species have been documented. The lack of known locations in the western units may indicate habitat unsuitability due to parameters not captured by our measures (especially for *Cirsium longistylum* which is large and easily recognized). Often, plants, by their distribution, are "telling us something" about habitat requirements that we may not be able to discern, much less quantify. Given this, we would suggest a sampling approach to surveying for these species in districts where they have not been documented to date. For greater efficiency, this sampling could focus on weed treatment areas where our models show predicted habitat for more than one sensitive species. If any new populations are found in those areas, the searches could be expanded to address all identified intersects of weed treatment areas with potential habitat in that unit. If the sampling results were negative, a complete survey of those predicted habitat areas may not be necessary or very productive.

We would also suggest that where surveys identify new populations of sensitive species, the search be extended beyond the mapped weed area to determine the extent of the population. This will help determine the extent to which the entire population may be affected by current or future weed treatments, and will generate valuable information on the species' abundance and habitat. In some areas, it may even be worthwhile for botanists, at their discretion, to survey high quality potential habitat in the vicinity of mapped weed treatment areas where sensitive plants are not found.

Finally, the GIS layers assembled and created can be reproduced in various combinations, scales and formats to help botanists conduct survey work more easily and efficiently. For example, maps could be generated that show the full extent of identified potential habitat (beyond simply the intersects with mapped weed areas) to assist in conducting more extensive opportunistic searches.

DATA SOURCES & ANALYSIS TOOLS

Montana Natural Heritage Program, Biological and Conservation Database, July 2001

U.S. Geological Survey, 7 ½' Digital Elevation Model data

U.S. Forest Service, Helena National Forest, Weed Treatment Areas (points, lines & polygons) for Clancy, Belts, Blackfoot, Divide, Elkhorn, Magpie (point and polygon only)

U.S. Forest Service, Helena National Forest, "Landwaters" database

ESRI's ArcView 3.2a with Spatial Analyst extension, version 1.0a

X-Tools ArcView extension, version 6-2001

APPENDIX A.

**Detailed data on Intersections of
Potential Habitat for Sensitive Species
and Mapped Weed Areas**

Appendix A

Botrychium paradoxum

Acres	Polygon		Length (m)	Length (miles)	Line		Y	Point	
	X	Y			X	Y		X	Y
4.58	-112.4911	46.8809	103.73	0.06	-111.5691	46.8767	-111.7421	46.3416	
2.77	-112.4816	46.8760	131.08	0.08	-111.5762	46.8795			
0.14	-112.4838	46.8652	837.87	0.52	-111.5830	46.8803			
0.11	-112.4798	46.8646	159.05	0.10	-111.5943	46.8770			
0.50	-112.4783	46.8642	356.02	0.22	-111.8085	46.2487			
0.58	-111.5671	46.8729	33.48	0.02	-112.4023	46.4750			
0.12	-111.4523	46.6845	6.08	0.00	-112.3786	46.4528			
0.15	-111.4483	46.6811	8.84	0.01	-112.3785	46.4528			
10.08	-111.2219	46.5180	62.62	0.04	-112.3773	46.4222			
2.77	-112.1749	46.4259	1,698.76	1.06					
0.72	-111.8049	46.2570							
6.85	-111.7939	46.2554							
0.00	-111.8078	46.2506	31.192	0.02	-112.4014	46.4751			
0.34	-111.8086	46.2504							
29.70	Total Acres								

This is the figure prior to removing the landtype variable in Landwaters from the model.

Appendix A

Cirsium longistylum

Polygon		Line		Point		
Acres	X	Y	Length (m)	Length (miles)	X	Y
5.32	-112.4601	47.1347	221.52	0.14	-111.6017	46.8170
2.02	-112.4671	47.1307	17.34	0.01	-111.6026	46.8161
5.26	-112.4645	47.1305	38.61	0.02	-111.6084	46.8193
0.86	-112.4663	47.1280	166.59	0.10	-111.5982	46.8141
0.81	-112.4725	47.1190	8.15	0.01	-111.6593	46.8482
0.23	-112.4739	47.1159	253.49	0.16	-111.5763	46.8795
0.48	-112.4741	47.1150	68.59	0.04	-111.5784	46.8799
1.36	-112.4805	47.1009	446.42	0.28	-111.5817	46.8803
0.12	-112.4757	47.1104	389.06	0.24	-111.5872	46.8825
2.03	-112.4871	47.0941	114.50	0.07	-112.5266	46.4402
0.93	-112.6176	47.0846	87.12	0.05	-112.5347	46.4721
0.64	-112.6163	47.0798	58.81	0.04	-112.5330	46.4714
0.50	-112.3664	47.0623	102.82	0.06	-112.5339	46.4724
1.06	-112.8493	47.0450	166.77	0.10	-112.5229	46.4499
0.83	-112.8399	47.0439	506.88	0.31	-112.4022	46.4731
5.97	-112.6227	47.0322	766.82	0.48	-112.4076	46.4769
0.01	-112.6240	47.0330	331.78	0.21	-112.4103	46.4754
2.06	-112.6211	47.0287	88.90	0.06	-112.4213	46.4665
0.41	-112.6138	47.0214	107.89	0.07	-112.4207	46.4657
0.23	-112.6224	47.0301	118.82	0.07	-112.4196	46.4641
1.14	-112.6236	47.0318	79.75	0.05	-112.4266	46.4907
0.20	-112.6251	47.0327	127.20	0.08	-112.2485	46.5349
0.07	-112.6238	47.0328	91.53	0.06	-112.2437	46.5538
0.45	-112.7494	47.0202	25.15	0.02	-112.2501	46.5325
0.28	-112.7575	46.9777	682.10	0.42	-112.1970	46.5308
0.60	-112.7674	46.9679	58.94	0.04	-112.4397	46.5158
3.15	-112.7687	46.9663	172.13	0.11	-112.4852	46.5318
0.17	-112.7853	46.9587	134.69	0.08	-112.4882	46.8191
1.00	-112.7802	46.9765	379.07	0.24	-112.4340	46.8017
12.29	-112.7896	46.9600	149.67	0.09	-112.4361	46.8066
4.57	-112.7681	46.9544	68.22	0.04	-112.4292	46.8036
25.36	-112.7712	46.9526	121.79	0.08	-112.4263	46.8122
1.49	-112.8936	46.9185	45.57	0.03	-112.3308	46.6563

Appendix A

Acres	Polygon		936.74	0.58	-112.3189	46.6525
	X	Y				
1.49	-112.8935	46.9182	1029.01	0.64	-112.3147	46.6440
3.40	-112.8978	46.9172	289.67	0.18	-112.3277	46.6568
2.99	-112.8419	46.9186	265.67	0.17	-112.3247	46.6555
0.05	-112.8396	46.9186	104.26	0.06	-112.3005	46.6702
4.54	-112.8323	46.9170	280.84	0.17	-112.3032	46.6707
6.26	-112.8282	46.9155	45.02	0.03	-112.3077	46.6714
2.51	-112.8252	46.9138	6.61	0.00	-112.3230	46.6552
0.50	-112.8242	46.9133	400.12	0.25	-112.3299	46.6777
14.27	-112.8711	46.9120	1155.47	0.72	-112.3253	46.6769
2.85	-112.8786	46.9094	266.53	0.17	-112.3075	46.5569
0.31	-112.8922	46.9118	549.17	0.34	-112.3105	46.5577
0.92	-112.8899	46.9108	679.21	0.42	-112.3111	46.5606
0.61	-112.8855	46.9064	70.21	0.04	-112.3268	46.5565
0.04	-112.8872	46.9057	118.09	0.07	-112.3729	46.5038
0.36	-112.8827	46.9058	355.86	0.22	-112.1379	46.4093
0.14	-112.8816	46.9058	364.17	0.23	-112.1437	46.4106
0.40	-112.8839	46.9057	445.93	0.28	-111.6528	46.8135
1.00	-112.5981	46.8992	97.82	0.06	-111.6314	46.8075
4.96	-112.5896	46.8958	90.54	0.06	-111.6319	46.8073
0.02	-112.6566	46.8941	66.66	0.04	-111.7345	46.7593
1.43	-112.6551	46.8953	157.69	0.10	-111.7415	46.7565
0.15	-112.7370	46.8784	148.00	0.09	-111.4630	46.6240
1.75	-112.4306	46.8906	24.77	0.02	-111.6033	46.7217
0.02	-112.4322	46.8806	30.32	0.02	-111.6051	46.7201
0.38	-112.4464	46.8775	14,175.05	8.81		
0.47	-112.5949	46.8914				
0.53	-112.5980	46.8772				
0.92	-112.5926	46.8776				
3.31	-112.5902	46.8776				
0.14	-112.6633	46.8873				
1.50	-112.6640	46.8816				
1.41	-112.7584	46.8839				
0.17	-112.7580	46.8827				
0.21	-112.8718	46.8761				
1.17	-112.8744	46.8759				

Appendix A

Acres	Polygon	
	X	Y
0.03	-112.5885	46.8837
2.61	-112.6641	46.8786
3.10	-112.6149	46.8781
0.14	-112.6174	46.8787
2.99	-112.7250	46.8378
0.11	-112.7235	46.8326
0.21	-112.4786	46.8634
0.06	-112.8380	46.8399
0.54	-112.8500	46.8386
1.13	-112.8517	46.8378
1.51	-112.8471	46.8373
0.00	-112.8476	46.8378
17.74	-112.8021	46.8451
2.48	-112.7587	46.8472
1.93	-112.7518	46.8488
0.35	-112.7658	46.8469
0.18	-112.7679	46.8473
2.27	-112.6999	46.8437
0.78	-112.7076	46.8327
0.34	-112.7096	46.8468
1.16	-112.8242	46.8414
5.41	-111.5664	46.8722
6.43	-112.8168	46.8406
0.39	-112.8210	46.8347
1.84	-112.8077	46.8405
0.65	-112.8214	46.8353
3.69	-112.7727	46.8295
0.60	-112.7787	46.8368
2.15	-112.7775	46.8318
28.92	-112.7723	46.8337
1.14	-111.7157	46.8535
22.22	-111.7072	46.8583
0.10	-111.7126	46.8537
0.05	-111.7163	46.8529
0.06	-112.5007	46.8213

Appendix A

Acres	Polygon	
	X	Y
0.07	-112.4888	46.8189
0.01	-112.4753	46.8116
0.91	-112.4260	46.8122
0.45	-112.4362	46.8067
0.47	-112.4294	46.8036
0.02	-112.4321	46.8180
7.44	-112.4570	46.8134
1.03	-111.6630	46.8203
1.23	-112.5880	46.7892
0.06	-112.5933	46.7864
0.05	-112.5929	46.7867
0.17	-112.5922	46.7870
0.08	-112.5908	46.7877
0.02	-112.5893	46.7885
0.29	-112.5900	46.7887
0.41	-112.5911	46.7883
9.15	-112.6030	46.7797
0.52	-112.5781	46.8026
1.21	-112.5765	46.8045
0.10	-112.5773	46.8034
0.19	-112.5787	46.8018
0.11	-112.5799	46.7998
0.16	-112.5794	46.8005
0.38	-112.5814	46.7972
1.00	-112.5806	46.7985
0.04	-112.5858	46.7906
0.32	-112.6047	46.7885
1.28	-112.6016	46.7883
0.69	-112.6066	46.7854
0.00	-112.6073	46.7859
0.01	-112.6162	46.7924
8.80	-112.6134	46.7881
1.84	-112.6150	46.7920
1.28	-111.6626	46.8122
0.28	-111.6278	46.8041

Appendix A

Acres	Polygon	
	X	Y
0.68	-112.6065	46.7773
2.02	-111.4216	46.7630
0.07	-111.5936	46.7580
9.81	-111.5952	46.7570
0.24	-111.5939	46.7569
0.05	-111.5943	46.7565
0.06	-111.5957	46.7565
0.05	-111.5964	46.7560
0.00	-111.5760	46.7378
0.56	-111.5774	46.7381
0.42	-111.5698	46.7358
1.70	-111.5036	46.7350
5.24	-111.5733	46.7334
0.88	-111.6845	46.7265
0.01	-111.6862	46.7268
0.52	-111.7056	46.7175
8.87	-111.4993	46.7281
0.91	-111.4885	46.7157
1.52	-111.4911	46.7098
0.02	-111.4922	46.7084
0.13	-111.4838	46.7272
0.06	-111.4862	46.7249
0.08	-111.4858	46.7252
0.44	-111.6059	46.7197
0.05	-111.5332	46.7078
1.32	-111.6129	46.7118
0.01	-111.6114	46.7113
0.62	-111.6119	46.7109
1.91	-111.4896	46.7113
2.99	-111.4932	46.7075
0.04	-111.5007	46.6986
1.19	-111.5014	46.6985
0.52	-111.5050	46.6954
0.89	-111.4921	46.6882
0.36	-111.3515	46.6850

Appendix A

Acres	Polygon	
	X	Y
4.46	-111.4525	46.6838
0.02	-111.4491	46.6814
0.81	-111.4476	46.6813
0.17	-111.4490	46.6810
4.59	-111.4387	46.6807
14.61	-111.5057	46.6704
1.54	-111.5329	46.6770
1.45	-111.5815	46.6735
2.76	-111.4151	46.6725
1.10	-111.3094	46.6697
1.27	-111.4214	46.6661
4.87	-111.4098	46.6616
0.82	-111.4235	46.6580
1.23	-111.4241	46.6570
0.31	-111.3801	46.6579
0.63	-111.3771	46.6570
0.00	-111.4256	46.6497
1.24	-111.4260	46.6492
3.89	-111.4283	46.6445
3.49	-111.4297	46.6435
5.81	-111.4359	46.6409
0.32	-111.4328	46.6421
0.50	-111.4366	46.6385
0.47	-111.4381	46.6385
1.01	-111.4344	46.6422
1.17	-111.3966	46.6360
0.25	-111.4572	46.6274
2.33	-111.3880	46.6271
3.54	-111.4639	46.6243
2.16	-111.4648	46.6216
1.31	-111.4624	46.6174
1.52	-111.4618	46.6165
0.74	-111.3815	46.6139
6.39	-111.3809	46.6148
0.28	-111.3855	46.6105

Appendix A

Acres	Polygon	
	X	Y
0.01	-111.4158	46.6020
0.75	-111.4180	46.5996
0.70	-111.4224	46.6025
1.62	-111.4205	46.6008
6.76	-111.4254	46.5983
0.36	-111.4202	46.5986
5.80	-111.4222	46.5985
1.59	-112.2100	46.5525
0.35	-111.4253	46.5585
4.10	-111.4269	46.5576
0.54	-111.4231	46.5553
3.04	-112.5122	46.5269
1.84	-111.4289	46.5531
0.86	-111.4230	46.5536
4.16	-111.4235	46.5526
1.53	-112.5054	46.5253
0.43	-112.3234	46.5311
4.15	-111.4175	46.5481
2.99	-111.4240	46.5478
13.99	-112.2581	46.5228
0.01	-112.2570	46.5255
10.99	-112.2547	46.5270
0.10	-112.2527	46.5290
1.21	-111.4145	46.5452
3.02	-112.4287	46.5151
7.42	-112.4304	46.5134
50.40	-112.4365	46.5126
7.81	-112.5324	46.5098
0.48	-111.2194	46.5318
2.04	-111.2153	46.5174
0.20	-112.0961	46.4896
0.00	-111.2148	46.5027
1.55	-111.2381	46.5036
1.58	-112.5308	46.4745
5.39	-112.4063	46.4767

Appendix A

Acres	Polygon	
	X	Y
0.22	-112.5332	46.4710
1.34	-112.5345	46.4667
3.65	-112.1880	46.4744
2.49	-112.5340	46.4649
27.15	-112.5292	46.4570
2.03	-112.1436	46.4519
1.54	-111.7271	46.4417
7.54	-112.1874	46.4284
1.62	-112.1619	46.4267
3.36	-112.1756	46.4252
13.61	-112.1571	46.4252
4.08	-112.1307	46.4160
18.38	-111.6644	46.4178
0.11	-112.1876	46.4092
1.78	-112.1480	46.4115
0.21	-112.1537	46.4088
0.04	-111.1973	46.3922
0.87	-111.2196	46.3871
1.90	-111.2173	46.3837
7.68	-111.1725	46.3769
2.95	-111.1723	46.3734
0.47	-111.1851	46.3556
1.37	-111.1003	46.3539
0.46	-111.1709	46.3458
0.32	-111.1464	46.3460
0.71	-111.1534	46.3439
0.74	-111.1550	46.3436
0.70	-111.2214	46.3343
0.49	-111.1758	46.3329
0.86	-111.1772	46.3323
1.81	-111.1805	46.3305
2.41	-111.2089	46.3315
1.34	-111.2073	46.3306
33.51	-111.1973	46.3278
3.96	-111.1655	46.3166

717.13 Total Acres

Appendix A

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Acres	Polygon		Line				Point	
	X	Y	Length (m)	Length (miles)	X	Y	X	Y
1.29	-112.4581	47.1371	49.83	0.03	-111.7461	46.7545	-111.6899	46.7094
0.00	-112.4590	47.1355	137.06	0.09	-111.7971	46.8202	-111.7232	46.6679
0.02	-112.4627	47.1326	445.67	0.28	-111.8031	46.8191	-111.6939	46.6613
7.86	-112.4666	47.1315	15.89	0.01	-111.8089	46.8167	-111.6515	46.6970
0.30	-112.4636	47.1304	46.18	0.03	-111.8477	46.8000	-111.6522	46.6918
0.43	-112.4007	47.0901	263.33	0.16	-111.7833	46.7592	-111.6453	46.6880
0.41	-112.3389	47.0821	1.73	0.00	-111.7842	46.7607	-111.6444	46.6885
0.84	-112.3316	47.0786	20.59	0.01	-111.8411	46.7506	-111.5250	46.6185
0.42	-112.3201	47.0772	164.23	0.10	-111.6791	46.6897	-111.4277	46.5983
1.35	-112.3471	47.0886	119.06	0.07	-111.6828	46.6814	-111.4866	46.6407
3.50	-112.3668	47.0615	2506.15	1.56	-111.7771	46.2302	-111.6010	46.7360
0.87	-112.3657	47.0657	646.46	0.40	-111.7890	46.2411	-111.6135	46.7083
2.64	-112.3431	47.0219	609.62	0.38	-111.8049	46.2454	-111.6150	46.7073
0.01	-112.3471	47.0254	216.65	0.13	-111.7901	46.2264	-111.6135	46.7062
0.61	-112.3455	47.0264	812.73	0.51	-111.7884	46.2315	-111.6149	46.7067
0.05	-112.3453	47.0242	70.83	0.04	-111.7892	46.2381	-111.6048	46.7210
2.17	-112.6247	47.0061	75.15	0.05	-111.7896	46.2389	-111.5823	46.6823
0.12	-112.6261	47.0068	27.86	0.02	-111.7901	46.2398	-111.5823	46.6823
0.88	-112.6269	47.0078	100.25	0.06	-111.7981	46.2412	-111.7978	46.2414
0.11	-112.6275	47.0081	343.80	0.21	-111.7907	46.2410	-111.7907	46.2418
0.00	-112.6274	47.0083	108.62	0.07	-112.2484	46.5349	-111.8092	46.2266
0.02	-112.4741	46.9107	256.62	0.16	-112.2434	46.5547	-111.7214	46.2504
0.37	-112.8556	46.9239	757.60	0.47	-112.1967	46.5306	-111.6621	46.4192
0.05	-112.8552	46.9236	33.02	0.02	-112.4973	46.7066	-112.0992	46.5745
0.76	-112.8478	46.9208	163.71	0.10	-112.4998	46.7058	-112.6317	46.8972
0.98	-112.8897	46.9145	13.25	0.01	-112.4681	46.6812	-111.2723	46.4876
1.92	-112.8979	46.9056	288.15	0.18	-112.4672	46.6828	-111.3035	46.4899
1.41	-112.6373	46.9032	119.33	0.07	-112.4666	46.6846	-111.2956	46.4915
5.35	-112.8895	46.8994	408.68	0.25	-112.4650	46.6868	-111.1220	46.3573
2.18	-112.6542	46.9009	116.46	0.07	-112.4635	46.6890	-111.2179	46.3513
5.74	-112.6434	46.8913	57.27	0.04	-112.4577	46.6925		
0.10	-112.6365	46.9024	62.64	0.04	-112.4320	46.7996		
0.67	-112.6359	46.9011	235.11	0.15	-112.4371	46.8072		

Appendix A

Polygon		Line				
Acres	X	Y	Length (m)	Length (miles)	X	Y
0.18	-112.5906	46.8950	615.53	0.38	-112.4335	46.8043
0.02	-112.6586	46.8943	188.41	0.12	-112.4969	46.7718
0.08	-112.6592	46.8934	8.95	0.01	-112.2999	46.6703
0.02	-112.6598	46.8928	1061.17	0.66	-112.3075	46.6714
0.22	-112.6539	46.8959	207.53	0.13	-112.3299	46.6800
1.38	-112.7385	46.8817	87.45	0.05	-112.3301	46.6825
1.56	-112.4482	46.8993	356.27	0.22	-112.3268	46.6854
2.91	-112.4463	46.8985	9.89	0.01	-112.3240	46.6797
0.10	-112.6571	46.8934	39.07	0.02	-112.3437	46.5039
0.42	-112.6602	46.8915	94.18	0.06	-112.3463	46.5037
1.62	-112.4354	46.8846	67.22	0.04	-112.3480	46.5035
5.91	-112.4358	46.8779	107.93	0.07	-112.3523	46.5031
0.11	-112.4580	46.8798	41.54	0.03	-112.5185	46.6967
1.08	-112.6426	46.8912	41.11	0.03	-112.5190	46.6964
2.64	-112.6413	46.8925	22.59	0.01	-112.5193	46.6960
0.64	-112.5983	46.8898	41.40	0.03	-112.5221	46.6949
2.42	-112.5957	46.8773	373.55	0.23	-112.5246	46.6941
8.03	-112.5192	46.8902	258.18	0.16	-112.0778	46.5817
14.85	-112.5939	46.8807	219.59	0.14	-112.0741	46.5818
0.66	-112.8844	46.8755	315.13	0.20	-112.0701	46.5810
0.23	-112.8842	46.8747	394.26	0.24	-112.1186	46.5453
0.77	-112.8842	46.8710	251.04	0.16	-112.1195	46.5422
0.42	-112.8828	46.8680	255.50	0.16	-112.1214	46.5437
4.73	-112.8573	46.8499	22.63	0.01	-112.1206	46.5461
11.60	-112.8500	46.8405	112.38	0.07	-112.1208	46.5452
2.54	-112.8537	46.8381	457.65	0.28	-111.6529	46.8135
1.78	-112.7051	46.8439	228.55	0.14	-111.6322	46.8077
0.98	-112.7053	46.8403	91.37	0.06	-111.6809	46.6845
0.95	-112.7101	46.8465	91.52	0.06	-111.8410	46.7442
15.18	-112.8183	46.8354	28.82	0.02	-111.8396	46.7419
8.53	-112.7840	46.8392	6,090.40	3.78		
1.92	-111.6596	46.8660				
3.86	-112.7715	46.8296				
23.93	-111.6534	46.8612				
7.26	-111.7404	46.8476				

Acres	Polygon	
	X	Y
22.33	-111.7074	46.8580
4.40	-111.7316	46.8507
5.19	-111.7254	46.8524
0.02	-111.7436	46.8448
0.57	-111.7458	46.8440
0.01	-111.7067	46.8581
2.03	-111.7216	46.8523
0.15	-111.7229	46.8520
0.03	-111.7458	46.8426
0.05	-111.6550	46.8583
0.66	-111.7608	46.8371
8.11	-111.7577	46.8388
1.96	-111.7581	46.8372
1.64	-111.7623	46.8353
3.49	-111.7614	46.8348
2.15	-111.7648	46.8332
5.12	-112.4340	46.8052
0.31	-112.4296	46.8156
9.72	-111.8994	46.8207
19.52	-111.9009	46.8297
3.61	-112.4427	46.8113
10.58	-112.4578	46.8138
0.14	-111.8116	46.8274
0.39	-111.7797	46.8262
0.21	-111.7781	46.8262
3.57	-111.7733	46.8270
2.35	-111.6564	46.8217
2.83	-111.6498	46.8228
3.58	-111.8128	46.8237
0.44	-111.8114	46.8258
1.07	-111.8139	46.8231
0.00	-112.5979	46.7844
1.04	-112.6027	46.7800
1.99	-112.6005	46.7821
0.15	-112.5759	46.8054

Appendix A

Acres	Polygon	
	X	Y
0.11	-112.5964	46.7844
1.55	-111.7922	46.8211
6.09	-111.8155	46.8171
2.89	-111.8102	46.8162
0.65	-111.8165	46.8126
1.73	-111.8130	46.8160
9.38	-111.8173	46.8140
0.81	-111.8269	46.8072
3.89	-111.8183	46.8141
1.68	-111.6625	46.8122
0.06	-112.4554	46.7876
0.00	-112.4573	46.7893
0.17	-111.6277	46.8042
4.17	-111.6218	46.8032
6.68	-111.6253	46.7990
2.22	-111.8304	46.7958
12.78	-111.6279	46.7930
4.75	-111.6376	46.7776
0.52	-111.6443	46.7726
9.61	-111.6473	46.7683
5.14	-111.6314	46.7863
0.66	-111.6332	46.7833
0.90	-111.6423	46.7743
0.47	-111.7136	46.7920
1.92	-111.8222	46.7895
35.24	-112.6030	46.7693
39.12	-112.6084	46.7686
1.74	-112.5974	46.7635
1.65	-112.5984	46.7616
3.63	-111.6017	46.7713
5.96	-111.4372	46.7777
7.90	-111.8448	46.7615
12.31	-112.5964	46.7475
20.22	-111.6597	46.7686
0.26	-111.6013	46.7704

Appendix A

Acres	Polygon	
	X	Y
1.09	-111.6635	46.7688
17.13	-111.6699	46.7656
0.03	-112.4078	46.7488
4.82	-112.4086	46.7489
88.50	-111.6789	46.7574
0.87	-111.7836	46.7588
4.91	-111.4209	46.7634
112.57	-111.6862	46.7538
0.07	-111.5936	46.7580
9.04	-111.5952	46.7571
0.24	-111.5939	46.7569
0.07	-111.5943	46.7565
0.06	-111.5957	46.7565
3.02	-111.7656	46.7511
1.17	-111.6819	46.7498
105.23	-111.6958	46.7447
7.34	-111.8643	46.7455
29.16	-111.6974	46.7472
96.50	-111.7082	46.7427
68.52	-111.7230	46.7397
103.53	-111.7578	46.7336
114.04	-111.7275	46.7381
11.67	-111.7297	46.7382
132.71	-111.7061	46.7393
0.09	-111.6964	46.7386
4.93	-111.6947	46.7398
20.25	-111.7316	46.7321
0.33	-111.7293	46.7338
0.31	-111.5038	46.7356
0.05	-111.5031	46.7339
65.85	-111.7470	46.7281
3.36	-112.5140	46.7035
1.61	-112.5189	46.7060
46.97	-111.7455	46.7264
0.56	-111.6877	46.7293

Appendix A

Acres	Polygon	
	X	Y
2.55	-111.6739	46.7268
0.41	-111.6848	46.7271
1.30	-111.6825	46.7266
73.72	-111.7547	46.7214
25.98	-111.7728	46.7140
0.00	-111.7563	46.7201
3.06	-111.7828	46.7115
0.02	-111.7839	46.7106
2.40	-111.7787	46.7124
2.14	-111.7048	46.7207
0.01	-111.7057	46.7194
0.02	-111.7007	46.7255
4.31	-111.4986	46.7273
0.25	-111.4899	46.7189
0.91	-111.4884	46.7156
5.65	-111.4910	46.7103
156.43	-111.7723	46.7172
6.11	-111.7627	46.7208
0.24	-111.7613	46.7191
20.87	-111.7850	46.7118
18.60	-111.7814	46.7140
0.01	-111.7816	46.7160
0.04	-111.7829	46.7174
0.21	-111.4873	46.7250
0.86	-111.6074	46.7216
0.74	-111.6962	46.7089
632.06	-111.6965	46.7121
1.06	-111.6056	46.7207
0.43	-111.6067	46.7190
3.40	-111.6024	46.7181
1.51	-111.5939	46.7170
0.47	-111.7139	46.7160
0.56	-111.4788	46.7192
29.61	-111.7479	46.7119
1.65	-111.7770	46.7127

Appendix A

Acres	Polygon	
	X	Y
0.01	-111.7757	46.7117
0.03	-111.6114	46.7147
1.48	-111.5328	46.7074
18.46	-111.5306	46.7116
5.14	-111.7855	46.7096
2.40	-112.4869	46.6921
2.45	-112.4969	46.6896
0.04	-111.4885	46.7118
1.17	-111.4898	46.7114
4.67	-111.5843	46.7079
7.12	-111.6275	46.7065
9.79	-111.4939	46.7075
1.17	-111.6152	46.7057
21.98	-111.4975	46.7024
39.04	-111.6491	46.6984
3.09	-111.6148	46.7020
4.36	-111.6166	46.7003
26.39	-111.6516	46.6970
0.58	-111.6183	46.6981
6.87	-111.5126	46.6987
0.07	-111.5120	46.6960
11.85	-111.5027	46.6975
1.11	-111.6222	46.6967
3.78	-111.6041	46.6935
1.39	-111.6020	46.6948
2.95	-111.6043	46.6917
17.70	-111.6393	46.6907
0.81	-111.6264	46.6937
0.34	-111.6516	46.6914
15.92	-111.6438	46.6888
0.04	-112.3160	46.6750
7.77	-111.6565	46.6871
0.00	-111.6514	46.6889
21.44	-111.6469	46.6880
0.69	-111.6498	46.6890

Appendix A

Acres	Polygon	
	X	Y
7.68	-111.5218	46.6894
0.00	-111.6060	46.6892
3.40	-111.5828	46.6879
0.21	-111.5856	46.6809
4.13	-111.5832	46.6837
0.19	-111.5834	46.6806
0.62	-111.6403	46.6867
5.77	-111.6449	46.6844
0.57	-111.6432	46.6857
9.18	-111.5215	46.6867
0.38	-111.6443	46.6834
0.14	-111.6449	46.6838
3.10	-111.4469	46.6876
0.27	-111.6062	46.6829
2.59	-111.6045	46.6843
2.61	-111.5819	46.6829
0.19	-111.6490	46.6806
1.02	-111.6489	46.6803
0.19	-111.3522	46.6861
0.00	-111.3515	46.6847
4.10	-111.4525	46.6838
3.32	-111.6506	46.6798
5.76	-111.5633	46.6802
0.27	-111.7374	46.6717
80.29	-111.7128	46.6709
2.07	-111.4482	46.6812
14.62	-111.7428	46.6706
0.00	-111.7457	46.6724
0.39	-111.7325	46.6701
7.68	-111.7248	46.6742
3.69	-111.7284	46.6718
0.29	-111.7271	46.6718
1.27	-111.6526	46.6772
4.40	-111.4387	46.6807
1.55	-111.5016	46.6790

Appendix A

Acres	Polygon	
	X	Y
1.62	-111.6577	46.6750
0.08	-111.5660	46.6761
7.43	-111.5329	46.6758
0.00	-111.5343	46.6748
8.38	-111.5823	46.6733
0.63	-111.7455	46.6690
1.80	-111.7441	46.6690
0.04	-111.7458	46.6703
16.34	-111.7207	46.6681
5.47	-111.6572	46.6672
19.90	-111.6951	46.6641
2.65	-111.4150	46.6725
168.45	-111.6825	46.6637
3.13	-111.6915	46.6627
3.10	-111.6580	46.6637
0.03	-111.6588	46.6627
1.85	-111.6818	46.6639
1.75	-111.6964	46.6633
1.29	-111.6888	46.6636
0.10	-111.6892	46.6632
1.24	-111.6860	46.6629
1.87	-111.6850	46.6621
22.78	-111.5498	46.6630
14.38	-111.5424	46.6618
2.74	-111.3805	46.6636
3.01	-111.4098	46.6613
31.51	-112.3038	46.6415
4.70	-111.5430	46.6580
0.84	-111.5068	46.6576
4.05	-111.5190	46.6510
0.07	-111.5215	46.6511
0.50	-111.5195	46.6498
3.68	-111.4095	46.6549
0.35	-111.3712	46.6557
0.23	-111.4027	46.6478

Appendix A

Acres	Polygon	
	X	Y
0.81	-111.4963	46.6459
0.61	-111.4279	46.6461
12.52	-111.4637	46.6440
0.42	-111.4314	46.6431
1.24	-111.4383	46.6396
0.02	-111.4380	46.6402
0.53	-111.5019	46.6416
0.77	-111.4329	46.6430
0.50	-111.3966	46.6364
0.88	-111.5669	46.6325
0.85	-111.5002	46.6322
3.00	-111.4732	46.6312
0.30	-111.4726	46.6301
4.67	-111.4912	46.6260
8.05	-111.4683	46.6262
28.76	-111.4749	46.6261
2.56	-111.4944	46.6259
0.73	-111.3883	46.6278
0.88	-111.3874	46.6264
21.75	-111.5053	46.6140
22.22	-111.4764	46.6236
8.22	-111.4653	46.6244
4.09	-111.4689	46.6230
0.13	-111.4680	46.6232
10.31	-111.4900	46.6202
50.74	-111.4965	46.6189
5.95	-111.5021	46.6151
2.85	-111.4619	46.6210
1.28	-111.4941	46.6189
0.67	-111.5068	46.6166
2.57	-111.4913	46.6184
2.25	-111.4618	46.6169
6.41	-111.3801	46.6147
0.43	-111.3903	46.6092
0.16	-111.3887	46.6099

Appendix A

Acres	Polygon	
	X	Y
0.95	-111.3819	46.6132
0.02	-111.4530	46.6098
1.47	-111.4634	46.6102
4.59	-111.4564	46.6084
1.61	-111.4663	46.6075
1.59	-111.4577	46.6054
0.70	-111.4147	46.6001
0.56	-111.4015	46.5995
4.80	-111.4175	46.6002
0.01	-111.4179	46.6016
0.28	-111.4155	46.6045
3.60	-111.4196	46.6011
0.00	-111.4206	46.6002
21.84	-111.4243	46.5985
73.84	-112.0798	46.5815
0.07	-112.0888	46.5783
0.77	-112.0886	46.5745
11.33	-112.0893	46.5768
5.96	-112.0941	46.5745
2.58	-112.1056	46.5701
1.93	-112.0536	46.5504
0.18	-112.0974	46.5705
0.13	-112.0971	46.5709
0.38	-112.0957	46.5711
0.05	-112.0941	46.5711
0.53	-112.0458	46.5517
2.48	-112.0452	46.5531
3.27	-112.0823	46.5479
15.70	-112.1240	46.5481
13.44	-112.1186	46.5457
3.95	-112.1155	46.5460
0.76	-112.0758	46.5460
1.18	-112.0677	46.5459
0.50	-111.4253	46.5586
3.77	-111.4269	46.5576

Appendix A

Acres	Polygon	
	X	Y
0.75	-112.1115	46.5418
0.54	-111.4231	46.5553
1.96	-111.4290	46.5530
0.86	-111.4230	46.5536
4.16	-111.4235	46.5526
4.15	-111.4175	46.5481
2.99	-111.4240	46.5478
0.48	-112.1893	46.5302
0.22	-112.1884	46.5314
3.23	-112.2541	46.5264
0.22	-112.2569	46.5255
0.19	-112.2553	46.5270
0.85	-112.2570	46.5227
9.01	-112.2586	46.5223
1.21	-111.4145	46.5452
7.50	-112.5329	46.5098
6.98	-112.3506	46.5038
5.08	-112.3455	46.5043
0.29	-112.0961	46.4896
1.13	-111.2102	46.5034
1.10	-111.7040	46.4384
4.11	-111.7012	46.4292
17.50	-111.6643	46.4177
0.14	-111.2245	46.3700
1.24	-111.1721	46.3643
2.38	-111.1672	46.3632
4.62	-111.1038	46.3584
6.50	-111.1845	46.3545
4.47	-111.2103	46.3484
5.32	-111.2194	46.3474
0.29	-111.1608	46.3485
0.73	-111.1471	46.3457
16.19	-111.1516	46.3448
0.78	-111.7496	46.3310
1.52	-111.2216	46.3342

Acres	Polygon	
	X	Y
0.24	-111.1811	46.3304
0.03	-111.1784	46.3318
0.97	-111.1768	46.3325
47.62	-111.1996	46.3287
2.19	-111.1672	46.3310
7.91	-111.2082	46.3243
0.33	-111.1723	46.3202
3.42	-111.7321	46.3061
1.28	-111.0973	46.3098
16.83	-111.7510	46.2932
7.61	-111.7792	46.2880
0.18	-111.7492	46.2782
1.99	-111.7746	46.2768
0.38	-111.7795	46.2768
0.82	-111.7464	46.2649
2.61	-111.7462	46.2636
0.08	-111.7476	46.2635
0.29	-111.7481	46.2646
11.89	-111.7290	46.2532
1.60	-111.7390	46.2495
4.82	-111.8041	46.2455
5.85	-111.7159	46.2434
3.59	-111.7908	46.2408
10.94	-111.7876	46.2389
5.48	-111.7513	46.2387
2.57	-111.8281	46.2368
1.05	-111.7260	46.2382
2.15	-111.7786	46.2320
2.67	-111.2211	46.2398
2.77	-111.7762	46.2292
3,965.01	Total Acres	

Appendix A

Phlox kelseyi var *missoulensis*

Acres	Polygon		Line Length (m)	Length (miles)	Line		Point X	Point Y
	X	Y			X	Y		
5.71	-111.5665	46.8722	101.80	0.06	-111.5764	46.8795	-111.7170	46.6842
1.09	-111.7605	46.6920	460.02	0.29	-111.5801	46.8802		
0.63	-111.7676	46.7000	354.86	0.22	-111.5876	46.8826		
1.51	-111.7675	46.6957	52.47	0.03	-112.4013	46.4728		
0.53	-111.7657	46.6943	209.85	0.13	-112.4023	46.4737		
1.04	-111.7629	46.6928	42.52	0.03	-112.3308	46.6562		
1.10	-111.7397	46.6882	446.76	0.28	-112.3203	46.6542		
1.08	-111.7411	46.6890	1232.74	0.77	-112.3163	46.6472		
0.51	-111.7254	46.6830	25.41	0.02	-112.3281	46.6570		
0.33	-111.7259	46.6816	71.46	0.04	-112.3243	46.6554		
1.08	-111.4525	46.6842	21.86	0.01	-112.3233	46.6553		
1.50	-111.7117	46.6739	399.28	0.25	-112.3299	46.6777		
0.00	-111.7107	46.6771	39.23	0.02	-112.3228	46.6808		
0.64	-111.7113	46.6764	395.75	0.25	-112.3244	46.6790		
1.02	-111.7143	46.6747	216.22	0.13	-112.3260	46.6759		
0.40	-111.7093	46.6735	314.84	0.20	-112.3280	46.6736		
0.28	-111.7459	46.6756	277.72	0.17	-112.3074	46.5569		
0.39	-111.7453	46.6754	398.34	0.25	-112.3107	46.5571		
0.74	-111.4393	46.6808	705.75	0.44	-112.3111	46.5606		
0.94	-111.6873	46.6711	5,766.89	3.58				
0.03	-111.6943	46.6678						
0.85	-112.2918	46.6485						
1.09	-112.2984	46.6472						
0.30	-112.2766	46.6564						
0.28	-112.2780	46.6562						
0.01	-112.2773	46.6555						
14.05	-112.2815	46.6545						
17.59	-112.2846	46.6506						
0.10	-112.2961	46.6477						
0.04	-111.4143	46.6723						
0.69	-111.6831	46.6653						
1.69	-111.6789	46.6641						
3.44	-112.2876	46.6471						

Appendix A

Acres	Polygon	
	X	Y
10.04	-112.2781	46.6518
9.08	-112.2824	46.6509
0.69	-111.4104	46.6621
1.97	-112.5129	46.5270
0.85	-112.5060	46.5255
0.36	-112.3234	46.5311
2.78	-112.4284	46.5150
31.61	-112.4370	46.5125
0.00	-112.5344	46.4593
0.26	-112.5339	46.4592
118.27	Total Acres	

Appendix A

Polygonum douglasii ssp austinae

Acres	Polygon		Line	Point				
	X	Y		X	Y			
1.40	-112.8897	46.9287	Length (m)	79.75	Length (miles)	0.05	-111.6829	46.6813
10.98	-112.8923	46.9296		13.87		0.01	-112.4802	46.8084
0.23	-112.8948	46.9289		130.92		0.08	-112.4390	46.7600
0.24	-112.8542	46.9232		148.56		0.09	-112.4377	46.7590
0.16	-112.8505	46.9221		168.35		0.10	-112.4330	46.7580
17.94	-112.8494	46.9229		303.26		0.19	-112.3108	46.6721
0.85	-112.8480	46.9212		844.72		0.52		
0.60	-112.8468	46.9216						
2.65	-112.8537	46.9152						
12.92	-112.8298	46.9150						
12.03	-112.8173	46.9095						
3.63	-112.8893	46.8993						
0.02	-112.6585	46.8943						
0.10	-112.6589	46.8939						
0.22	-112.6594	46.8932						
0.73	-112.8791	46.8842						
0.09	-112.4486	46.8998						
0.33	-112.6602	46.8914						
0.45	-112.5985	46.8898						
0.52	-112.5940	46.8775						
1.22	-112.5963	46.8772						
5.53	-112.5190	46.8902						
13.41	-112.5928	46.8810						
1.00	-112.8621	46.8507						
3.56	-112.8572	46.8498						
0.66	-112.8365	46.8363						
8.93	-112.8551	46.8414						
0.95	-112.8562	46.8381						
6.65	-112.8362	46.8377						
16.25	-112.8182	46.8354						
3.81	-111.6550	46.8590						
0.05	-111.6550	46.8583						
17.23	-111.9005	46.8252						

Appendix A

Acres	Polygon	
	X	Y
1.65	-112.4581	46.8145
1.76	-112.4558	46.8132
0.38	-112.4534	46.8124
0.40	-112.4552	46.7876
1.98	-111.6220	46.8035
0.05	-111.6200	46.8029
3.09	-112.6087	46.7636
2.26	-112.4389	46.7600
1.61	-112.4377	46.7588
1.85	-112.4394	46.7577
0.66	-111.8475	46.7683
4.84	-112.4086	46.7489
2.12	-111.6846	46.7531
1.72	-111.7295	46.7394
0.72	-111.6876	46.7294
0.18	-111.6754	46.7270
0.59	-111.6721	46.7266
0.05	-111.7609	46.7180
4.57	-111.4914	46.7099
0.80	-111.7612	46.7179
21.76	-111.7720	46.7185
8.88	-111.7818	46.7196
19.02	-111.7773	46.7169
0.06	-111.6068	46.7218
40.03	-111.6876	46.7136
30.95	-111.7097	46.7100
0.70	-111.7112	46.7120
163.90	-111.6993	46.7120
94.33	-111.6885	46.7092
0.93	-111.6030	46.7184
0.39	-111.6011	46.7178
0.28	-111.5995	46.7174
0.22	-111.5954	46.7171
0.31	-111.7138	46.7160
0.74	-111.5323	46.7082

Appendix A

Acres	Polygon	
	X	Y
3.78	-111.5292	46.7135
0.59	-111.5305	46.7110
0.73	-111.5327	46.7073
3.36	-111.5843	46.7078
7.01	-111.6275	46.7066
2.90	-111.4932	46.7082
2.98	-111.4943	46.7068
0.00	-111.6155	46.7057
10.14	-111.4966	46.7034
2.39	-111.5002	46.6996
0.29	-111.6477	46.6957
0.00	-111.6153	46.7019
1.36	-111.6162	46.7014
0.55	-111.6167	46.7005
0.38	-111.6170	46.6999
0.29	-111.6174	46.6994
2.84	-111.6513	46.6952
0.74	-111.6527	46.6943
3.31	-111.6531	46.6957
0.07	-111.5133	46.7000
1.59	-111.5012	46.6988
0.71	-111.5055	46.6952
0.15	-111.6218	46.6967
0.02	-111.6226	46.6960
12.45	-111.6400	46.6904
0.00	-111.6423	46.6935
0.30	-111.6518	46.6913
1.06	-111.6494	46.6905
1.47	-111.6472	46.6898
5.04	-111.6439	46.6878
0.03	-111.6461	46.6894
0.00	-111.6513	46.6890
0.69	-111.6530	46.6872
0.08	-111.6471	46.6895
1.17	-111.6495	46.6890

Acres	Polygon	
	X	Y
18.92	-111.6468	46.6879
0.37	-111.5221	46.6908
0.02	-111.5832	46.6886
2.07	-111.5832	46.6879
0.54	-111.5835	46.6856
0.38	-111.5855	46.6809
3.49	-111.5831	46.6823
0.14	-111.5837	46.6801
4.59	-111.6446	46.6846
0.17	-111.5201	46.6865
1.99	-111.5820	46.6829
0.07	-111.3522	46.6862
0.48	-111.6510	46.6800
5.14	-111.5634	46.6802
0.04	-111.5625	46.6804
0.95	-111.5016	46.6792
0.03	-111.5660	46.6762
0.96	-111.5812	46.6744
5.61	-111.6744	46.6631
0.60	-111.5495	46.6644
0.01	-111.5516	46.6645
7.24	-111.5506	46.6623
5.32	-111.5488	46.6633
0.13	-111.5484	46.6615
5.02	-111.5427	46.6615
2.47	-111.3805	46.6636
2.77	-111.5430	46.6584
0.33	-111.5435	46.6573
12.37	-111.5104	46.6538
3.97	-111.5224	46.6528
23.56	-111.5190	46.6527
8.41	-111.5268	46.6520
0.31	-111.4337	46.6428
0.54	-111.5105	46.6255
6.70	-111.5142	46.6291

Appendix A

Acres	Polygon	
	X	Y
2.17	-111.5179	46.6319
0.00	-111.5180	46.6326
0.62	-111.5113	46.6253
0.48	-111.5000	46.6321
2.10	-111.4731	46.6314
0.40	-111.5011	46.6278
0.18	-111.5013	46.6287
0.17	-111.5007	46.6278
0.06	-111.5001	46.6284
0.67	-111.4904	46.6264
0.61	-111.4903	46.6252
0.59	-111.4696	46.6271
5.00	-111.4681	46.6258
3.25	-111.4714	46.6263
1.69	-111.4784	46.6253
0.07	-111.4706	46.6252
1.13	-111.4940	46.6256
0.56	-111.5098	46.6243
0.22	-111.5084	46.6238
8.83	-111.5077	46.6213
1.09	-111.5054	46.6180
0.25	-111.5070	46.6192
0.07	-111.5111	46.6248
4.73	-111.5042	46.6157
0.34	-111.5065	46.6173
0.17	-111.5070	46.6182
6.31	-111.4778	46.6237
0.61	-111.4749	46.6228
2.08	-111.4669	46.6245
1.02	-111.4696	46.6228
0.06	-111.4900	46.6207
0.07	-111.4896	46.6205
53.06	-111.4971	46.6189
11.00	-111.5014	46.6184
1.05	-111.4941	46.6188

Appendix A

Acres	Polygon	
	X	Y
4.55	-111.5066	46.6173
0.40	-111.3802	46.6151
0.32	-111.3819	46.6135
1.59	-111.4663	46.6075
0.04	-111.4178	46.6017
0.40	-111.4146	46.6002
4.23	-111.4177	46.6003
0.45	-111.4193	46.6016
2.15	-111.4196	46.6008
6.05	-111.4253	46.5989
11.06	-112.2200	46.5549
0.17	-112.2078	46.5538
2.49	-112.2094	46.5532
1.80	-112.0823	46.5478
0.05	-112.1886	46.5314
4.36	-111.2251	46.3708
1.55	-111.1724	46.3644
1.26	-111.1667	46.3632
3.27	-111.1040	46.3584
0.27	-111.1025	46.3579
1.30	-111.1846	46.3556
3.41	-111.1845	46.3538
12.17	-111.1539	46.3448
24.71	-111.2209	46.3365
10.11	-111.1937	46.3269
18.53	-111.2037	46.3302
1.35	-111.1674	46.3314
3.24	-111.2079	46.3242
0.90	-111.2074	46.3246
0.01	-111.2211	46.2401
986.02	Total Acres	

APPENDIX B.

Maps of
Potential Habitat for Sensitive Species
in Mapped Weed Areas

