2008 ISSSSP Surveys for Oregon Slender Salamander (*Batrachoseps wrightorum*) on federal lands managed by the Eugene Bureau of Land Management and the Willamette National Forest

In 2008, surveys were conducted for the Oregon slender salamander (*Batrachoseps wrightorum* [BAWR]) on federal lands in two ownerships: Eugene District of the Bureau of Land Management (BLM) and the southern part of the Willamette National Forest (NF). The purpose was to collect information on detection rates of this species at the southwestern end of its range and to better define its distribution and relative abundance in this area.

Methods: The extent of the southern range has been tentatively defined by Highway 58 based on the professional judgment of the BAWR Working Group. Near the southwestern edge of this range, portions of three 5th-field watersheds with large parcels of federal land ownership that were adjacent to areas of known occurrence or that had few previously reported detections and that were determined to have overall high quality habitat at the watershed scale (Suzuki 2008a) were selected for surveys. These areas included the Lower McKenzie River, Little Fall Creek, and Fall Creek watersheds (Figure 1). Within these three watersheds, it was estimated that funding resources would allow surveys to be conducted at ~40 forest stands. Coarse-filter stand selection was conducted using the following criteria: 1) federal lands; 2) partition of effort between the watersheds; 3) habitat suitability as reflected by the BAWR habitat model maps (Suzuki 2008b), NF and BLM forest cover maps and expert opinion (district wildlife personnel); 4) likely access during spring sampling season; and 5) spacing of surveyed habitat to reduce aggregated sampling and result in a well-distributed pattern of surveys in the area.

A 30 meter resolution grid layer from Suzuki’s model that depicted 4 discrete overall “habitat suitability index” values from low to high (n=1,2,3,4 quartiles from low to high respectively) was used to map “high quality” potential habitat (habitat suitability index n=4). In the Lower McKenzie River watershed, these high quality habitat cells were intersected in ARCGIS with BLM and NF data for stands at least 80 years old to arrive at a final GIS habitat layer from which to select survey plots. BLM stand ages were based on its corporate Forest Operations Inventory data, FS stand ages were based on its Owl Suitability Habitat layer for stands at least 80 years old. Additional selection criteria included within 0.1 mile from an access road, elevation below 3000 feet, no recent fire or harvest events, stands at least 1.0 mile apart, and stand patch size of at least 20 acres. In the Little Fall Creek, and Fall Creek watersheds, we identified the potential stands by intersecting habitat suitability index = 4 with late successional reserve areas and suitable access.

A key component of BAWR habitat is downed wood (Clayton and Olson 2007). No quantitative information on the quality and amount of down wood was available for use as a selection criteria. Based on past field visits, known fire history, and on stand age, BLM subjectively chose stands that were presumed to have a higher potential for high quality and amounts of down wood habitat. By choosing areas managed as late
successional reserves, the FS also selected for stands with a higher potential for high amounts of downed wood.

Twenty four stands were identified for sampling in the Lower McKenzie River watershed. In the Little Fall Creek and Fall Creek watersheds, 20 stands were selected from a larger number of mapped old-forest sites, including 5 stands in Little Fall Creek watershed, 8 in the main Fall Creek drainage, and 7 in the Winberry watershed (a sub-watershed of Fall Creek). At each stand, two 10-acre parcels were surveyed. The selection of the 10-acre parcels within the stand was done in the field by the surveyors identifying areas with sufficient leaf and woody debris to warrant one hour of searching. Surveys were standardized using the Terrestrial Mollusk Survey protocol, Version 3.0 (Duncan et al. 2003). Fauna and habitat observation forms are shown in Appendices 1-3. Each 10-acre survey consisted of two 20 minute intensive searches of downed wood and litter concentrations plus 20 minutes of walk-about searching of likely hiding cover for a total search time of one hour/10-acre area. Surveys were conducted from March 10–May 29, 2008, by FS wildlife personnel.

**Results:** Two 10-acre surveys were conducted in a total of 44 stands. The results are summarized in the attached spreadsheet. One hundred eighty two salamanders of 7 species were recorded, including 8 BAWR. BAWR were detected in only 1 of 24 stands searched in the Lower McKenzie River watershed. This detection was the second documented occurrence of the species in that watershed. BAWR were detected in 2 of 5 stands searched in the Little Fall Creek watershed and these are the first records of the species in that watershed. No BAWR were detected in 7 stands searched in the Winberry sub-watershed of Fall Creek where the species has not been previously reported. We also did not detect BAWR in 8 stands surveyed in the main Fall Creek area, even though several stands were adjacent to where U.S. Geological Survey personnel detected numerous BAWR following the Clark Fire (unpublished FS NRIS location information). Detection rates of BAWR were much lower in our surveys than reported in more northern areas of their range (Dede Olson, PNW, Corvallis, personal communication). Figure 1 shows survey locations with respect to 6th field watersheds with known locations for the Willamette National Forest. Also shown are other likely watersheds where future surveys might be considered to better define the southern range of the species.

Clouded salamanders (*Aneides ferreus*), followed by ensatina (*Ensatina eschscholtzii*) and western redback salamanders (*Plethodon vehiculum*) were the most abundant salamanders detected during the surveys. The abundance of coarse woody debris and litter was subjectively rated as low in most of the surveyed stands in the Lower McKenzie River watershed and good to excellent in surveyed late-successional stands in the other watersheds. The 2008 data for BLM stands were entered into GEOBOB. The FS data will be entered into NRIS Wildlife in 2009.
Literature Cited


/s/ Joe Doerr
Wildlife Biologist
10/24/2008
Appendix 1. OR / WA BLM GeoBOB Flora/Fauna Survey Form, pg 1.

(Circle appropriate option when a list is provided, Bold items are required fields, *key to codes on cheat sheet. See data dictionary for Field Name and List of Value definitions.)

SURVEY
Survey ID: ___________ Admin Unit: ___________ Sub Admin: ___________
Date: ___________ *Location Accuracy: ___________ Survey area
( ac): ___________ *Observer(s): ___________ USGS Quad: ___________

GPS model / software used:
UTM: ___________ E ___________ N Zone: ___________ Datum: ___________
Legal Description: T ___________ R ___________ S ___________ Quarter Section ___________ Meridian: ___________
W ___________ H ___________ D
Related documents / files:

Notes:

______________________________

VISITS
Visit ID: ___________ *Survey Type: ___________

*Survey Method: ___________ Project Name: ___________ Project Unit: ___________

*Protocol Name: ___________
Observes:

Contractor: ___________ Bid: ___________
Visit Start Date: _______ End Date: _______ Date Accuracy: Day, Exact, Hour, Month, Previous Year, Year

Estimated Actual Survey Area (acres and/or percent of whole):

Notes:

______________________________

TARGET SPECIES List all species that are the focus of the survey. Record Negative data in the GeoBOB Add_Obs table (use Inventory / Neg Obs button in Survey form). Positive data goes in Flora_Sites or Fauna_Obs tables.

<table>
<thead>
<tr>
<th>Species Code</th>
<th>Scientific Name</th>
<th>Found (Y/N)</th>
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<tbody>
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</table>
HABITAT/ENVIRONMENTAL CONDITIONS

Slope (%): _______   Slope – min.: _______   Slope – max.: _______   Slope source: _______
Aspect (deg): _______   Aspect – min. _______  Aspect – max. _______   Aspect source: _______
Elevation (ft): _______   Elevation – min.: _______   Elevation – max.: _______   Elevation source
source:   C = Calculated,  M = Measured,  E = Estimated,  G = GPS generated (for elevation only)

*Landform: ________________________  Stand Age: ___________
Stand Structure:   Multiple Canopies,  One Canopy,  Two Canopies,  Unspecified
Seral Stage:   Pioneer,  Early (20-39yrs),  Mid (40-79yrs),  Late (80-200yrs),  Climax
Percent Cover:   1) Overstory: _______      Overstory min.: _______    Overstory max:________
  2) Understory: _______   Understory min.: __________    Understory max:________
~Fire Presence:  Absent,  Burned,  Complete Burned,  High Scorched,  Mod Scorched,  Part Scorch,  Very
  High Scorch
Topographic Position (rel. to overall slope):   Bottom,  Lower,  Mid,  Ridge,  Upper.      *Substrate:

Soil Texture Class:   Clay,  Clay Loam,  Loam,  Sand,  Silt,  Silt Loam,  Sandy Loam,  Other
Air Temperature (F): _________    Relative Humidity (%): _________   Soil Temperature (F):

Soil Moisture:   Dry,  Moist,  Wet                Light Index:   Full Shade,  Full Sun,  Part Shade
Precip:   Dry,  Fog,  Misty Rain,  Rain,  Sleet/Hail,  Snow         Wind:   Calm,  Gusty,  Light,  Moderate,
  Windy (15+ mph)
Notes:
______________________________________________________________________________________
  ~If fire was present within the last 5 years
INVENTORY OBSERVATIONS
Create a list below of species (other than those on the target list) found during the survey. Indicate percent cover, abundance for each species, and the quantity. Enter data into GeoBOB Add_Obs table (use Inventory / Neg Obs button in Survey form).

<table>
<thead>
<tr>
<th>Species Code</th>
<th>Scientific Name</th>
<th>% Cover</th>
<th>*Abundance</th>
<th>Quantity</th>
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</table>
Appendix 2. OR / WA BLM GeoBOB v 1.2 OBSERVATIONS & SITE FORM – FAUNA, pg 1.
(Circle appropriate option when a list is provided, Bold items are required fields, *key to codes on cheat sheet. See data dictionary for Field Name and List of Value definitions.)

OBSERVATIONS

OBS ID: ____________________________  SPECIES CODE: _______________

SCIENTIFIC NAME: __________________________  COMMON NAME: __________________________

UTM: ______________________ E, ______________________ N  ZONE: _______________ DATUM: _______________

LAT: _______________ W,  LONG: _______________ N  GPS model & software used: __________________________

*OBSERVATION TYPE: _______________________________  DATE: _______________________________

DATE ACCURACY: Day, Exact, Hour, Month, Previous Year, Year  RELIABILITY: Excellent, Good, Fair, Poor, Unknown

LOCATION ACCURACY: _______________

TOTAL QUANTITY: ___________  QUANTITY ESTIMATED?: Y / N

DISTRIBUTION: Clumpy, Linear, Scattered-Even, Scattered-Patchy  ABUNDANCE: Unknown, Abundant, Common, Uncommon, Rare

OBSERVERS:
______________________________________________________________________________________

__

Notes:

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__________________________________________________________

DETAIL OBS

QUANTITY: ___________  GENDER: Female, Male, Neuter, Hermaph, Unknown  *AGE: ___________

*ACTIVITY: _______________  CONDITION: Dead, Excellent, Fair, Good, Injured, Live, Poor, Sick, Unknown

REPRO-STATUS: Non-repro, Repro, Unknown, N/A

NOTES: ________________________________________________________________

__________________________________________________________

HABITAT/ENVIRONMENTAL OBS

SLOPE (%): ______  SLOPE – MIN. (%): ______  SLOPE – MAX. (%): ______  SLOPE SOURCE: ____________


Source: C = Calculated, M = Measured, E = Estimated, G = Used GPS (elevation only)

*LANDFORM: ____________________________________________________________________________

STAND STRUCTURE: Multiple Canopies, Single Canopy, Two Canopies, Unspecified

SERAL STAGE: Pioneer, Early (20-39yrs), Mid (40-79yrs), Late (80-200yrs), Climax

PERCENT COVER: 1) OVERSTORY: ________, OVERSTORY MIN: ________, UNDERSTORY MAX: ________, UNDERSTORY MIN: ________

~FIRE PRESENCE: Absent, Burned, Complete Burned, High Scorched, Mod. Scorched, Part Scorched, V. High Scorch

TOPO. POSITION (rel. to overall slope): Bottom, Lower, Mid, Ridge, Upper.  *SUBSTRATE:

SOIL TEXTURE: Clay, Clay Loam, Loam, Sand, Silt, Silt Loam, Sandy Loam, Other

AIR TEMPERATURE (F): _____________  RELATIVE HUMIDITY (%): _____________  SOIL TEMP. (F):

SOIL MOISTURE: Dry, Moist, Wet  LIGHT INDEX: Full Shade, Full Sun, Part Shade

PRECIP.: Dry, Fog, Misty Rain, Rain, Sleet/Hail, Snow  WIND: Calm, Light, Moderate, Windy, Gusty
ADDITIONAL OBSERVATION LOCATIONS

If more than one observation is found in the survey area and that is within the survey site, record the location, Obs ID, and notes here. If specifics about the additional observations need to be recorded (feature, detail observation, or collection information) complete a separate Obs form.

<table>
<thead>
<tr>
<th>Latitude/UTM E</th>
<th>Longitude/UTM N</th>
<th>Obs ID</th>
<th>Notes</th>
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PLEASE ATTACH MAPS of Observation or Site when helpful.

THREATS

*THREAT TYPE(S):

NOTES:__________________________________________

_______________________________________________________________________________

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ASSOCIATED OBS

Create a list below of non-target species found in the same geographic location as the observation. If needed, indicate percent cover, abundance and/or quantity for each species.

<table>
<thead>
<tr>
<th>Species Code</th>
<th>Scientific Name</th>
<th>% Cover</th>
<th>Abundance</th>
<th>Quantity</th>
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COLLECTIONS

COLLECTION ID: _____________________________________________
COLLECTION TYPE: Voucher, Museum, Commercial, Photo, ID Tag, None, Other
DATE: ___________________
COLLECTOR: _____________________________________________
REPOSITORY: ___________________ IDENTIFIER: ___________________
Photo ID: ________________________________
VERIFIER: ____________________ Verification Date: ________________
VERIFIED SPECIES CODE: ______________________
COLLECTION NOTES: ____________________________________________
_________________________________________________________________

FAUNA SITES

SITE ID: ___________________________ SITE NAME: _______________________
SITE ALT. ID: _____________________ SITE SPECIES CODE: ___________________
ADMIN UNIT: ____________________ SUB-ADMIN UNIT: ____________________ LOCATION ACCURACY: __________
SITE STATUS: (locally): Extinct, Extirpated (sp. & habitat), Occupied, Undetected, Unknown, Unoccupied  TOTAL QUANTITY: ___________ QUANT. ESTIMATED?: Y / N  AREA OCCUPIED (ac):

VISIT PURPOSE: Incidental, Inventory, Treatment (specify in notes), Monitoring – Annual/ Fed. Listed, Monitoring – Grazing, Monitoring – Long-Term, Monitoring – Unspecified, Monitoring – Fire, Research, Revisit, Resurvey, Unspecified

DATE: ________________ DATE ACCURACY: Day, Exact, Hour, Month, Previous Year, Year

REVISIT NEEDED: Y / N  REVISIT SCHEDULED DATE: ________________________________________________

OBSERVERS: ____________________________________________________________________________________

NOTES: ________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

PLEASE ATTACH MAPS of Observation or Site when helpful.
Appendix 3. **GeoBOB Data Entry Code/Value CHEAT SHEET / LOOK-UP LIST**

### Location Accuracy (Code – definition):

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>GENERATED - Generated by GeoBOB application.</td>
</tr>
<tr>
<td>2)</td>
<td>GPS1-Precision w/n 3 ft or less</td>
</tr>
<tr>
<td>3)</td>
<td>GPS2-Precision w/n 30 ft or less</td>
</tr>
<tr>
<td>4)</td>
<td>GPS3-Precision w/n 300 ft or less</td>
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<tr>
<td>5)</td>
<td>MAN1-Manuscripted to w/n 150 ft of actual location</td>
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<tr>
<td>6)</td>
<td>MAN2-Manuscripted to w/n 300 ft of actual location</td>
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<tr>
<td>7)</td>
<td>MAN3-Manuscripted to w/n 1/8 mile of actual location</td>
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<tr>
<td>8)</td>
<td>MAN4-Manuscripted to w/n 1/4 mile of actual location</td>
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<tr>
<td>9)</td>
<td>MAN5-Manuscripted to w/n 1/2 mile of actual location</td>
</tr>
<tr>
<td>10)</td>
<td>MAN6-Precision of manuscripted location cannot be determined</td>
</tr>
<tr>
<td>11)</td>
<td>TR10-Legal description to the 1/64 section (w/n 10 acres)</td>
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<tr>
<td>12)</td>
<td>TR40-Legal description to the 1/16 section (w/n 40 acres)</td>
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<tr>
<td>13)</td>
<td>TR160-Legal description to the ¼ section (w/n 160 acres)</td>
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<tr>
<td>14)</td>
<td>TR320-Legal description to the ½ section (w/n 320 acres)</td>
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<tr>
<td>15)</td>
<td>TR640-Legal description to the section (w/n 640 acres)</td>
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<tr>
<td>16)</td>
<td>VAGUE-Observation documented in vague</td>
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### Survey Type (Code – definition):

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<thead>
<tr>
<th>Code</th>
<th>Definition</th>
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<tbody>
<tr>
<td>1)</td>
<td>Follow-up - A visit done to confirm a species report</td>
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<tr>
<td>2)</td>
<td>Incidental - Observation made while surveying for another species</td>
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<tr>
<td>3)</td>
<td>Inventory - List of species recorded in a survey</td>
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<tr>
<td>4)</td>
<td>Monitoring - Planned &amp; repeated visits to existing observations/sites</td>
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<tr>
<td>5)</td>
<td>Project Clearance - Surveys done prior to project implementation</td>
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<td>6)</td>
<td>Purposive - Surveys done in areas where the species is expected to occur</td>
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<tr>
<td>7)</td>
<td>Research - Done for research purposes only</td>
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<td>8)</td>
<td>Unspecified - Survey type not recorded</td>
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### Survey Method:

<table>
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<tbody>
<tr>
<td>1)</td>
<td>Acoustic, Man. Rov.</td>
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<td>2)</td>
<td>Cluster Buster</td>
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<td>3)</td>
<td>Aerial Survey</td>
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<td>4)</td>
<td>Cursory</td>
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<td>5)</td>
<td>Bait Station</td>
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<td>Belt Transect</td>
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<td>7)</td>
<td>Breeding Bird Survey</td>
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<td>Call Stations</td>
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<td>Camera</td>
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<td>Casual Observation</td>
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<td>Constrained</td>
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<td>Incidental</td>
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<td>Lynx Analysis Unit</td>
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<td>Mod_Line Tran</td>
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<td>Other</td>
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<td>Quadrat</td>
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<td>Random Placements</td>
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<td>Road Survey</td>
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### Protocol Names:

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<td>4)</td>
<td>Aquatic Amphibian Survey Protocol, Fellers &amp; Freel, 1995</td>
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<td>6)</td>
<td>Aquatic Mollusk S&amp;M, Version 3.0, 10/29/97</td>
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<td>8)</td>
<td>Area-Based Sampling: Inventory methods for colonial-nesting freshwater birds. 3.0, 10/18/99</td>
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<td>9)</td>
<td>Area-Based Sampling: Inventory methods for marsh birds: Bitters and Rails 3.0, 10/18/99</td>
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<td>10)</td>
<td>Breeding Bird Survey, MAPS. Point counts, banding efforts, rapid inventory 3.0,10/18/99</td>
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<td>11)</td>
<td>Bryophytes S&amp;M, Version 2.0, 12/03/99</td>
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<tr>
<td>13)</td>
<td>CVS Grid Survey, S&amp;M Fungi v. 1.5, am. 5/25/2001</td>
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<tr>
<td>15)</td>
<td>CVS Grid Survey, S&amp;M Fungi v. 1.5, am. 5/25/2001</td>
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</tbody>
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Ulm Schneider et al, 2004 draft
14) CVS Grid Survey, S&M Mollusks v. 2.1, rev. 3/1/2001 10/29/97
20) Mardon Skipper Protocol, draft 1.0, 5/5/06. Seitz et al. USFS/BLM

Observation Types:

1) Aural  9) Hair Sample  17) Sign
2) Burrow  10) Hive  18) Track
3) Camera Set  11) Kill Site  19) Ultrasonic Recording
4) Capture  12) Nest (Invert)  20) Unknown
5) Check Station  13) Other  21) Visual
6) Excrement  14) Radio Telemetry  22) Visual and Aural
7) Feather  15) Scent  23) Voucher Specimen
8) Found Dead  16) Shell  24) Webbing

Age Class (Code – definition):

1) Adult - Able to reproduce  10) Larvae - Pre-adult stage of many insects & amphibians
2) Chick - Newly hatched young of any bird  11) Metamorphosing - Larval to adult phase
3) Declining - Growing old  12) Nestling - Has not left the nest
4) Egg Mass - Group of eggs  13) Pupa - Inactive phase from larvae to adult
5) Egg/Embryo - Not yet hatched  14) Sub-adult - Independent, but unable to reproduce
6) Fledgling - Can fly, but depends on parents  15) Tadpole - Larval stage of a frog or toad
7) Hatching - Recently hatched, downy  16) Unknown - Unknown age
8) Instar - Larval stage of insects  17) Yearling - Has not completed its second year
9) Juvenile - Has not reached sexual maturity  18) Young - In the early stages of development

Activity (Code – definition):

1) Basking - Resting in a sunny location  19) Licking Minerals - Ingesting soil at a known mineral concentration
2) Bedding - Sleeping or in preparation for sleeping  20) Mating/Courting - Any mating behavior including prior to copulation
3) Begging - Soliciting food from an adult or parent  21) Migrating - Seasonal movement
4) Birthing - The act of giving birth  22) Nesting - Building or occupying a nest
5) Brooding/Incub - Sitting on eggs  23) Other - Any activity not captured in the list of values
6) Circling - Flying in a circular pattern  24) Pair Formation - A behavior signifying the formation of a mating pair
7) Dead - No longer living.  25) Perching - standing in elevated spot (e.g. branch)
8) Denning - Inhabiting a ground shelter  26) Responding to Call - A vocal response to a human-created call
9) Displaying - A type of courting activity  27) Resting - Stopping action for an extended period
10) Estivating - Summer dormancy  28) Roosting - Resting on a perch for an extended period
11) Feeding/Drink - Any such activity including feeding young  29) Spawning - Depositing eggs in water
12) Fighting - Engaged in physical aggression  30) Swimming - Moving through water
13) Fleeting - Moving swiftly away from  31) Territorial Behavior - To defend resources and/or attract a mate
14) Flushed - flying/chased from a concealed place  32) Unknown - An activity was not determined
15) Flying - Traveling by air  33) Vocal - An audible sound detected
16) Grooming - Cleaning  34) Walking - Moving slowly by foot
17) Hibernating - Winter dormancy  35) Wallowing - Wading or rolling on the ground
18) Hunting/Forage - Searching for food

Landform (Code – definition):

1) ALFA - Alluvial Fan  30) DUFI - Dune Field  59) PENI - Peninsula
2) ALLU - Alluvium  31) ESCA - Escarpment  60) PINN - Pinnacle
3) ALVA - Alluvial Valley  32) FLAT - Flat  61) PLAI - Plains
4) BALD - Bald  33) FLOO - Floor  62) PLAT - Plateau
5) BALL - Ballon  34) FLPL - Floodplain  63) POTH - Pothole
6) BASI - Basin  35) FOOT - Foothills  64) RANG - Range
7) BAY - Bay  36) GAP - Gap  65) RAVI - Ravine
8) BENC - Bench  37) GLUP - Glaciated Uplands  66) RIDG - Ridge
9) BLOW - Blowout  38) GULC - Gulch   67) RIPA - Riparian
10) BLUF - Bluff        39) GULL - Gully   68) RIVE - River
11) BOLS - Bolson       40) HEAD - Headwall 69) RTVA - Riff Valley
12) BOT – Bottomland    41) HIGH - Highland 70) SADD - Saddle
13) BR - Bar             42) HILL - Hills   71) SAND - Sandhills
14) BREA - Break         43) HUMM - Hummock 72) SCAB - Scabland
15) CANY - Canyon        44) INBA - Intermontane Basin 73) SCOU - Scour
16) CHAN - Channel       45) ISLA - Island   74) SCOU - Scour
17) CIRQ - Cirque        46) KARS - Karst   75) SEBO - Semi-Bolson
18) CLIF - Cliff         47) KNOB/MOUD - Knob/Mound 76) SEEP - Seep
19) COAS - Coast         48) LAHA - Lahar   77) SHOA - Shool
20) COFA - Colluvial Fan 49) LAKE - Lake   78) SLOU - Slough
21) COLL - Colluvium     50) LAPA - Lava Plain 79) STTE - Stream Terrace

(Undiff)

22) COPL - Coastal Plain 51) LAPL - Lava Plateau 80) SWAL - Swale
23) DELT - Delta         52) LEDG - Ledge   81) TALU - Talus
24) DEPR - Depression    53) LOWL - Lowlands 82) TIPL - Till Plain
25) DEST – Depos. Stream Terr. 54) MORA - Moraine 83) TREN - Trench
26) DIVI - Divide        55) MOUN - Mountain 84) TROU - Trough (Glacial Valley)
27) DRAI - Drainage      56) NOTC - Notch   85) VALL - Valleys
28) DRAW - Draw          57) OTHER - OTHER  86) WASH - Wash
29) DRFI - Drumlin Field 58) PEAK - Peak

Substrate (Code – definition):
1) Algal_Mat - Algal mat or a layer of algae
2) Bank - Ground bordering a stream, lake, road, etc.
3) Bark - Attached, loose, or detached
4) Bog - Water-logged area with low-nutrient, acidic soil
5) Boulder - Rock fragments larger than a cobble
6) Branch - Woody limb of a living tree or shrub
7) Bridge - Any structure that provides access over an obstacle
8) Brush/Slash_Pile - A mound of cut woody debris
9) Cavity - A hollow or hole, usually in a tree
10) Cliff - Steep or overhanging rock face
11) Cobble - Larger than a pebble, smaller than a boulder
12) Dead_Shrub - Any shrub that is no longer living
13) Ditch - A long narrow excavation in the earth
14) Duff - Organic top layer of forested soils
15) Dung/Scat - Animal excrement
16) Fen - A nutrient-rich wetland that is less acidic than a bog
17) Fungi - Any type of fungus used as substrate
18) Gravel - Rock particles between 2 and 75 mm in diameter
19) Human_Structure - A structure made by humans (specify)
20) Ice - Frozen water
21) Lake - A large inland body of standing water
22) Ledge - Narrow shelf on a rock wall or cliff face
23) Lek - An area used by some birds for courtship displays
24) Lichen - Any type of lichen used as substrate
25) Lithosol - A shallow soil comprised mostly of bedrock
26) Litter - Vegetative debris covering majority of soil surface
27) Log - The large trunk of a fallen tree
28) Macrophyte - Large aquatic plant
29) Meadow - Meadow where moisture level is unknown
30) Meadow_Dry - Meadow with no wetland features
31) Meadow_Moist - Meadow with seasonally saturated soil
32) Meadow_Wet - Meadow with year-round saturated soil (specify)
33) Moss - Any type of moss used as substrate
34) Mud - Mixture of water and silt- or clay-sized earth material
35) Nest - Natural nest built by wildlife
36) Other - Other substrate not included in this list of values.
37) Pebble - Particles larger than a granule, smaller than a cobble
38) Pond - Body of standing water smaller than a lake
39) Quarry - An area used for rock or gravel extraction
40) Road - Improved or maintained roads
41) Roadside - The disturbed area adjacent to a road surface
42) Rock_Basalt
43) Rock_Clonolgerate
44) Rock_Metamorphic
45) Rock_Outcrop - Part of a rock formation that appears above the surface
46) Rock_Sedimentary
47) Rock_Ultermuratic
48) Rock_UNSPECIFIED
49) Rock_Volcanic
50) Rootwad - Root mass of a fallen tree
51) Sand - 0.05 - 2 mm rock particles
52) Sand_Beach - Sand on the shore of a body of water
53) Sand_Dune - Loose sand piled up by the wind
54) Shrub - Typically a many-stemmed woody perennial < 8ft tall
55) Silt - Smaller than sand, larger than a clay particle (0.002 - 0.05 mm)
56) Snag - A standing dead tree or a stump
57) Soil_Serpentine
58) Soil_UNSPECIFIED - Unsatisfied soil type
59) Stem - The main branch of a live shrub or herbaceous plant
60) Stump - The remaining base after a tree has been felled
61) Swamp - Land covered with water and thick vegetation
62) Talus - Pile of rock rubble below a cliff or chute
63) Tree - Any type of tree
64) Unsatisfied - No data given about substrate
65) Water - Any place where the water is above the ground
66) Woody_Debris - Any dead wood in contact with the ground

Threat Types:
1) Abiotic (specify)
2) Collecting
3) Competition (specify)
4) Compliance
5) Erosion (specify)
6) Fire_Direct
7) Human_Activity (specify)
8) Hydrological_Change (specify)
9) Insects (specify)
10) Invasive_Species (specify)
11) Mining (specify)
12) Mitigation
13) Riparian_Disturbance
14) Road_Construction
15) Road_Maintenance
16) Road_Other (specify)
17) Succession
18) Timber (specify)
7) Fire_Exclusion (specify) 19) Not_Protected 31) Treatment_Mechanical
8) Fire_Other (specify) 20) Off_Road_Vehicles 32) Treatment_Other (specify)
9) Fire_Suppression (specify) 21) Pathogen/Disease (specify) 33) Treatment_Spray (specify)
10) Grazing_Direct 22) Pipelines 34) Unknown
11) Grazing_Indirect 23) Pollution (specify) 35) Wildlife (specify)
12) Herbivory (specify) 24) Recreation

**Decay Class (Code – definition):**

1) 1 – Log recently fallen/limbs present
2) 2 – Log small twigs absent/ snag bark 50% loose
3) 3 – Log trace of bark/snag bole form intact
4) 4 – Log bark absent/snag loosing bole shape
5) 5 – Log decomposed/snag form mostly gone

**Feature Use:**

1) Basking/Loafing 7) Macrohabitat 13) Other 19) Rub or Claw
2) Breeding/Mating 8) Maternity 14) Perch 20) Scent/Marking Post
3) Courtship Ritual 9) Microhabitat 15) Plucking Post 21) Seasonal
4) Feeding 10) Near 16) Protection 22) Shelter
6) In 12) On 18) Roost 24) Under

**Feature Type:**

1) Agricultural_Land 32) Dung/Scat 63) Migration route 94) Sand_Dune
Edit 3/13/07:
2) Algal_Mat 33) Fen 64) Mine 95) Seabland
3) Bank 34) Fence 65) Mineral lick 96) Scrape/Rub
67) Moraine
4) Bark 35) Foraging 66) Mineral_Deposit 97) Seep
New: Pool
5) Bedrock 36) Forb 68) Moss 99) Shrub
7) Bog 38) Gravel 69) Mud 100) Shrub_Wetland
8) Bole 39) Guzzler/Cistern 70) Needles 101) Silt
9) Boulder 40) Headland 71) Nest 102) Snag
10) Branch 41) Hibernaculum 72) Nest_Structure 103) Soil
11) Bridge 42) Herb Boundary 73) Opening/Clearing 104) Spring
12) Brush/Slash_Pile 43) Hive 74) Other 105) Spring-Cold
14) Burrow 45) Ice 76) Pebble 107) Stem
15) Burrow System 46) Individual Territory 77) Pit 108) Stream
16) Calving/Fawning 47) Island 78) Pole/Post 109) Stream-Ephemeral
17) Cave 48) Jetty 79) Pond 110) Stream-Perennial
18) Cavity 49) Lake 80) Potential Habitat 111) Stump
19) Clay 50) Ledge 81) Prairie 112) Summer Range
20) Cliff 51) Lek 82) Pumice 113) Swamp
21) Cobble 52) Lichen 83) Quarry 114) Talus
22) Communal Day Roost 53) Lithosol 84) Riparian 115) Trail
23) Communal Night Roost 54) Litter 85) Road 116) Tree
27) Dead Shrub 58) Maternal Colony 89) Rock_Outcrop 120) Wetland
28) Deciduous_Leaves 59) Meadow 90) Rookery 121) Winter Range
29) Den 60) Meadow-Dry 91) Rootwad 122) Woody_Debris
30) Ditch 61) Meadow-Moist 92) Sand 123) Yearlong Range
31) Duff 62) Meadow-Wet 93) Sand_Beach