

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

Clayton, D. R., and D. H. Olson. 2007. Conservation assessment for the Oregon slender salamander (*Batrachoseps wrighti*). Version 1.0

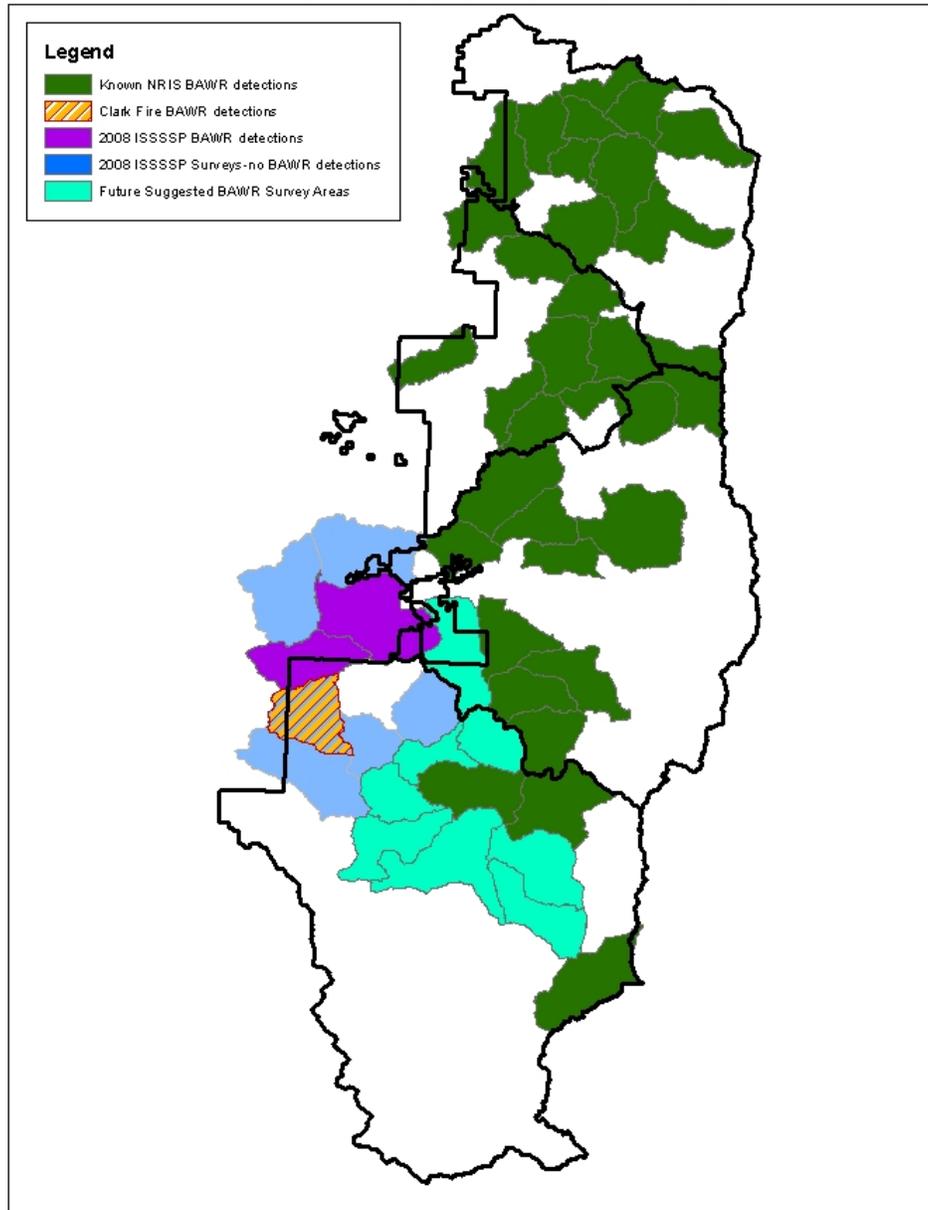
Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for survey and manage terrestrial mollusk species from the Northwest Forest Plan. Version 3.0. Bureau of Land Management, Roseburg, Oregon.

Suzuki, N. 2008a. Assessment of risk to conservation of the Oregon slender salamander (*Batrachoseps wrighti*) in the western Oregon Cascade Range. Appendix 2 to Conservation Assessment for the Oregon Slender Salamander. Department of Zoology, Oregon State University, Corvallis, Oregon.

Suzuki, N. 2008b. Developing Landscape Habitat Suitability Models for the Oregon slender salamander (*Batrachoseps wrighti*) in the western Oregon Cascades. Appendix 1 to Conservation Assessment for the Oregon Slender Salamander. Department of Zoology, Oregon State University, Corvallis, Oregon.

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Wildlife Biologist
10/24/2008

2008 ISSSSP BAWR Survey Results with Reference to NRIS Locations for Willamette National Forest



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

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: _____

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:** _____

ASPECT (deg): _____ **ASPECT – MIN. (deg):** _____ **ASPECT - MAX. (deg):** _____ **ASPECT SOURCE:** _____

ELEV. (ft): _____ **ELEV. – MIN. (ft):** _____ **ELEV. - MAX. (ft):** _____ **ELEV. SOURCE:** _____

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

***LANDFORM:** _____ **STAND AGE:** _____

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

SERIAL 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 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

NOTES: _____

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.

Latitude/UTM E	Longitude/UTM N	Obs ID	Notes

PLEASE ATTACH MAPS of Observation or Site when helpful.

THREATS

***THREAT TYPE(S):**

NOTES: _____

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):

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

Survey Type (Code – definition):

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

Survey Method:

- | | | | |
|-------------------------|--------------------------|------------------------|-----------------------|
| 1) Acoustic, Man. Rov. | 12) Cluster Buster | 24) Line Transect | 35) Road Survey |
| 3) Aerial Survey | 14) Cursory | 25) Lynx Analysis Unit | 36) Snap Trap |
| 4) Area Constrained | 15) Fixed Stations | 26) Mist Net | 37) Snow Track |
| 5) Bait Station | 16) Group Belt Transect | 27) Mod_Line_Trans | 38) Telemetry |
| 6) Belt Transect | 17) Hair Trap | 28) Other | 39) Time |
| Constrained | | | |
| 7) Breeding Bird Survey | 18) Hand Net | 29) Pitfall Trap | 40) Unspecified |
| 8) Call Stations | 19) Harp Trap | 30) Point Counts | 41) Variable Plot |
| 9) Camera | 20) Incidental | 31) Popn. Est. Lincoln | <u>Edits 3/13/07:</u> |
| 10) Casual Observation | 21) Individual Tree Exam | 32) Quadrat | Complete |
| 11) Ccall_Wlk_Thrgh | 22) Intuitive Controlled | 33) Random Placements | Key Feature Sample |

Protocol Names:

- | | |
|--|---|
| 1) Amphibians S&M, Version 3.0, 10/99. adjusted 1997 | 20) Great Gray Owl S&M, April, 1995; |
| 2) Amphibians. Olson et al 1997. Sampling amphibians in lentic habitats. 1/12/2004 | 21) Great Gray Owl S&M, Version 3.0, |
| 3) Amphibians. Heyer et al 1994. Meas. & Mon. Biol. Div.: Stnd. Meth. | 22) Ground Squirrel Surveys, WDFW, 2003 |
| 4) Aquatic Amphibian Survey Protocol, Fellers & Freel, 1995 | 23) Lichens S&M, Version 2.1, 9/22/03 |
| 5) Aquatic Mollusk S&M, 2003. Strayer and Smith. Am. Fish. Soc. Mon. | 24) None |
| 6) Aquatic Mollusk S&M, Version 2.0, 10/29/97 | 25) Other |
| 7) Area-Based Sampling, Aerial Counts, Boat Counts: Pac. Seabird Grp. Protocol 10/2002 | 26) Red Tree Vole S&M, Version 2.1, |
| 8) Area-Based Sampling: Inventory methods for colonial-nesting freshwater birds. 3.0, 10/18/99 | 27) Salamander S&M (Del Norte), Version |
| 9) Area-Based Sampling: Inventory methods for marsh birds: Bitterns and Rails 3.0, 10/18/99 | 28) Salamander S&M (Larch Mt.), Version |
| 10) Breeding Bird Survey, MAPS. Point counts, banding efforts, rapid inventory 3.0, 10/18/99 | 29) Salamander S&M (Shasta), Version |
| 11) Bryophytes S&M, Version 2.0, 12/03/99 | 30) Salamander S&M (Siskiyou Mt), |
| Version 3.0, 10/18/99 | 31) Salamander S&M (Van Dyke's), |
| 12) CVS Grid Survey, S&M Bryophytes, Lichens, Vascular Plants 5/30/2001 | 32) Surveying for Pygmy Rabbits, unpub. |
| Version 3.0, 10/18/99 | |
| 13) CVS Grid Survey, S&M Fungi v. 1.5, am. 5/25/2001 | |
| Ulmschneider et al, 2004 draft | |

- | | |
|---|---|
| 14) CVS Grid Survey, S&M Mollusks v. 2.1, rev. 3/1/2001
10/29/97 | 33) Terrestrial Mollusk S&M, Version 2.0, |
| 15) Call-and-Response Survey, Takats et al 2001. (owl)
02/21/2003 | 34) Terrestrial Mollusk S&M, Version 3.0, |
| 16) Call-and-Response, Bull et al 1990 (& Bate 1995.) (woodpecker)
12/1998 | 35) Vascular Plants S&M, Version 2.0, |
| 17) Call-and-Response, Fuller & Mosher 1981. (goshawk) | 36) WDFW Grouse Survey Protocol, 2004 |
| 18) Fungi S&M, Version 2.0, 5/13/98
Technical Report 157, 1995 | 37) Zielinski and Kucera, USDA General |
| 19) Great Gray Owl S&M, April, 1995
5/5/06. Seitz et al. USFS/BLM | 40) Mardon Skipper Protocol, draft 1.0, |

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
amphibians | 10) Larvae - Pre-adult stage of many insects & |
| 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) Pupae - 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) Hatchling - 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
concentration | 19) Licking Minerals - Ingesting soil at a known mineral |
| 2) Bedding - Sleeping or in preparation for sleeping
copulation | 20) Mating/Courting - Any mating behavior including prior to |
| 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
mating pair | 24) Pair Formation - A behavior signifying the formation of a |
| 7) Dead - No longer living. | 25) Perching - standing in elevated spot (e.g. branch) |
| 8) Denning - Inhabiting a ground shelter
call | 26) Responding to Call - A vocal response to a human-created |
| 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) Fleeing - Moving swiftly away from
mate | 31) Territorial Behavior - To defend resources and/or attract a |
| 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) DUFU - 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 - Rift Valley |
| 12) BOTT - 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) SCRE - Scree |
| 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 - Shoal |
| 20) COFA - Colluvial Fan | 49) LAKE - Lake | 78) SLOU - Slough |
| 21) COLL - Colluvium
(Undiff) | 50) LAPA - Lava Plain | 79) STTE - Stream Terrace |
| 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
(Valley) | 55) MOUN - Mountain | 84) TROU - Trough (Glacial) |
| 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 | 34) Mud - Mixture of water and silt- or clay-sized earth material |
| 2) Bank - Ground bordering a stream, lake, road, etc. | 35) Nest - Natural nest built by wildlife |
| 3) Bark - Attached, loose, or detached | 36) Other - Other substrate not included in this list of values. |
| 4) Bog - Water-logged area with low-nutrient, acidic soil | 37) Pebble - Particles larger than a granule, smaller than a cobble |
| 5) Boulder - Rock fragments larger than a cobble | 38) Pond - Body of standing water smaller than a lake |
| 6) Branch - Woody limb of a living tree or shrub | 39) Quarry - An area used for rock or gravel extraction |
| 7) Bridge - Any structure that provides access over an obstacle | 40) Road - Improved or maintained roads |
| 8) Brush/Slash_Pile - A mound of cut woody debris | 41) Roadside - The disturbed area adjacent to a road surface |
| 9) Cavity - A hollow or hole, usually in a tree | 42) Rock_Basalt |
| 10) Cliff - Steep or overhanging rock face | 43) Rock_Conglomerate |
| 11) Cobble - Larger than a pebble, smaller than a boulder | 44) Rock_Metamorphic |
| 12) Dead_Shrub - Any shrub that is no longer living
the surface | 45) Rock_Outcrop - Part of a rock formation that appears above
the surface |
| 13) Ditch - A long narrow excavation in the earth | 46) Rock_Sedimentary |
| 14) Duff - Organic top layer of forested soils | 47) Rock_Ultramafic |
| 15) Dung/Scat - Animal excrement | 48) Rock_Unspecified |
| 16) Fen - A nutrient-rich wetland that is less acidic than a bog | 49) Rock_Volcanic |
| 17) Fungi - Any type of fungus used as substrate | 50) Rootwad - Root mass of a fallen tree |
| 18) Gravel - Rock particles between 2 and 75 mm in diam | 51) Sand - 0.05 - 2 mm rock particles |
| 19) Human_Structure - A structure made by humans (specify) | 52) Sand_Beach - Sand on the shore of a body of water |
| 20) Ice - Frozen water | 53) Sand_Dune - Loose sand piled up by the wind |
| 21) Lake - A large inland body of standing water | 54) Shrub - Typically a many-stemmed woody perennial < 8ft tall |
| 22) Ledge - Narrow shelf on a rock wall or cliff face
(0.05 mm) | 55) Silt - Smaller than sand, larger than a clay particle (0.002 -
0.05 mm) |
| 23) Lek - An area used by some birds for courtship displays | 56) Snag - A standing dead tree or a stump |
| 24) Lichen - Any type of lichen used as substrate | 57) Soil_Serpentine |
| 25) Lithosol - A shallow soil comprised mostly of bedrock | 58) Soil_Unspecified - Unspecified soil type |
| 26) Litter - Vegetative debris covering majority of soil surface | 59) Stem - The main branch of a live shrub or herbaceous plant |
| 27) Log - The large trunk of a fallen tree | 60) Stump - The remaining base after a tree has been felled |
| 28) Macrophyte - Large aquatic plant | 61) Swamp - Land covered with water and thick vegetation |
| 29) Meadow - Meadow where moisture level is unknown | 62) Talus - Pile of rock rubble below a cliff or chute |
| 30) Meadow_Dry - Meadow with no wetland features | 63) Tree - Any type of tree |
| 31) Meadow_Moist - Meadow with seasonally saturated soil | 64) Unspecified - No data given about substrate |
| 32) Meadow_Wet - Meadow with year-round saturated soil
(specify) | 65) Water - Any place where the water is above the ground |
| 33) Moss - Any type of moss used as substrate | 66) Woody_Debris - Any dead wood in contact with the ground |

Threat Types:

- | | | |
|--------------------------|-----------------------------------|--------------------------|
| 1) Abiotic (specify) | 13) Human_Activity (specify) | 25) Riparian_Disturbance |
| 2) Collecting | 14) Hydrological_Change (specify) | 26) Road_Construction |
| 3) Competition (specify) | 15) Insects (specify) | 27) Road_Maintenance |
| 4) Compliance | 16) Invasive_Species (specify) | 28) Road_Other (specify) |
| 5) Erosion (specify) | 17) Mining (specify) | 29) Succession |
| 6) Fire_Direct | 18) Mitigation | 30) Timber (specify) |

- | | | | |
|-----------|-------------------------------|--------------------------------|-------------------------------|
| (specify) | 7) Fire_Exclusion | 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
- 1) 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 |
| 5) Hibernation | 11) Nesting | 17) Rearing | 23) Substrate |
| 6) In | 12) On | 18) Roost | 24) Under |

Feature Type:

- | | | | |
|---|--------------------------|-----------------------|-----------------------|
| 1) Agricultural_Land
Edit 3/13/07: | 32) Dung/Scat | 63) Migration route | 94) Sand_Dune |
| 2) Algal_Mat | 33) Fen | 64) Mine | 95) Scabland |
| 6) Bird/Bat Box | | | |
| 3) Bank | 34) Fence | 65) Mineral lick | 96) Scrape/Rub |
| 67) Moraine | | | |
| 4) Bark
New: Pool | 35) Foraging | 66) Mineral_Deposit | 97) Seep |
| 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) Herd Boundary | 72) Nest_Structure | 103) Soil |
| 11) Bridge | 42) Hibernaculum | 73) Opening/Clearing | 104) Spring |
| 12) Brush/Slash_Pile | 43) Hive | 74) Other | 105) Spring-Cold |
| 13) Building | 44) Human Structure | 75) Pasture | 106) Spring-Hot |
| 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 |
| 24) Crevice | 55) Log | 86) Rock | 117) Vernal_Pool |
| 25) Critical Habitat | 56) Macrophyte | 87) Rock_Garden-Dry | 118) Wallow |
| 26) Culvert | 57) Marsh | 88) Rock_Garden-Moist | 119) Waterfall |
| 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 | |