

Version 3.0

Chapter IV

Survey Protocol for the Siskiyou Mountains Salamander (*Plethodon stormi*)

Version 3.0

OCTOBER 1999

**David R. Clayton
Lisa M. Ollivier
Hartwell H. Welsh, Jr.**

AUTHORS

DAVID R. CLAYTON is a wildlife biologist, USDA Forest Service, Rogue River National Forest, 6941 Upper Applegate Rd., Jacksonville OR. 97530

LISA M. OLLIVIER is a research wildlife biologist, USDA Forest Service, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA. 95521

HARTWELL H. WELSH, Jr. is a research wildlife biologist, USDA Forest Service, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA. 95521

Version 3.0

ABSTRACT

Surveys to detect the presence of the Siskiyou Mountain salamander are needed on federal lands when proposed management activities may affect Siskiyou Mountain salamander populations or their habitat. This protocol is recommended to standardize survey efforts for species-detection on federal lands. State regulations must be recognized; this is a California State Threatened species, and it is protected in Oregon. State permits are required prior to surveys. Surveys need to be conducted on federal lands covered by the Northwest Forest Plan, and within the Survey Zone for the species, in an area in which there is suitable habitat for the species, and the proposed project may affect animals directly or indirectly by altering habitat. Surveys must occur from late fall to late spring under restricted environmental conditions (ambient temperature between 4-20 °C, soil temperature between 3.5-18 °C, relative humidity 65% or greater, no freezing 48 hours prior to survey [high elevation exceptions to the freezing constraints]). The preferred survey period is spring, at least one site visit must be conducted during the preferred spring survey season. The minimum search effort for any site is four person hours per ten acres of habitat. The search method involves expanding concentric circles or random searching of the suitable habitat in order to ensure complete coverage of that habitat. If Siskiyou Mountains salamanders are not found, a total of three complete surveys of the habitat need to be conducted. Site visits must be at least 10 days apart. Presence is confirmed when one or more Siskiyou Mountain salamanders are found.

Version 3.0

TABLE OF CONTENTS

INTRODUCTION 131
 Main Revisions and Clarified Procedures 131
 Survey Requirements 132

GENERAL BIOLOGY AND ECOLOGY 133
 Species Identification 134
 Range 134
 Habitat 134

SURVEY PARAMETERS 135
 Triggers 135
 Adjacent Area Surveys 138
 Site Location 139
 Survey Timing 141
 Environmental Conditions 141
 Reference Sites..... 142
 Voucher Specimens 142

SURVEY PROTOCOL 143
 General Guidelines 143
 Survey Ethics 143
 Safety Issues 144
 Prior To Sampling 144
 Data Form Completion 144
 Time-Constrained Search 146
 Site Delineation 147
 Survey Season Review 147

OPTIONAL SAMPLING 147
 Surveys Beyond First-Detection 147
 Supplemental Habitat Characterization 148
 Supplemental Searches 148

DOCUMENTATION OF SURVEY DECISIONS 149
ACKNOWLEDGMENTS 149
REFERENCES 150
FIGURES AND PLATES 153
APPENDIX IV. 1: PLEL/PLST Data forms and Instructions 159

INTRODUCTION

This survey protocol was developed in response to the Record of Decision for the Northwest Forest Plan (USDA and USDI 1994) to determine the presence of the Siskiyou Mountains salamander, *Plethodon stormi* (PLST), on federally owned and managed lands. It provides the conceptual framework and steps to conduct surveys in areas where proposed projects have the potential to affect PLST populations and habitat.

Before initiating surveys, read this entire document and its companion (Chapter 1), which addresses general information and guidelines for the Survey and Manage amphibians. Knowledge of the basic biology and management guidelines for this species (Olson 1999) will facilitate an understanding of the survey procedures.

Main Revisions and Clarified Procedures

This protocol is revised from the 1996 draft protocol (Olson et al. 1996). The list below summarizes the main revisions and clarified procedures specific to Siskiyou Mountains salamander surveys. Revisions have resulted from new information, and extensive review comments provided by agency executives, managers, field specialists, species-experts, and non-agency scientists. Revisions are for clarification, to refine procedures for optimizing sampling, but do not significantly alter survey effort compared to the 1996 draft protocol.

- **Flexible and fixed survey elements are clarified**
- **Survey triggers are defined and are discretionary**
- **Adjacent area survey distances are more discretionary, rather than 180 m**
- **Photographic plates of animals are included to aid species identification**
- **Photographic plates of habitats are included to aid habitat identification**
- **Summary of known site record compilation is included (Chapter II)**
- **Maps of known site locations (Figure IV.1), with other coverages (Chapter II)**
- **Revised Survey Zone, narrowing the area for surveys**
- **Revised Data Forms**
- **Range has expanded in response to federal surveys effort detecting new sites**
- **More complete habitat description is provided**
- **Expanded survey seasons, including winter and late spring if conditions warrant**
- **No surveys may occur if there has been freezing within previous 48 hours (rather than the night prior to survey), with a high elevation exception in California**
- **Minimum soil temperature for surveys was lowered to 3.5°C, from 4.5°C**
- **Air relative humidity for surveys was changed to $\geq 65\%$, from 45%**
- **At least 1 of 3 site visits must be conducted in the spring**
- **10+ day survey interval (instead of 21 days)**
- **Search route is discretionary**

Survey Requirements

USDA and USDI (1994; Table C-3, p. C-59 and C-28) states that PLST is a Component 2 species under the Survey and Manage provisions and is a Protection Buffer species. Component 2 direction is to "survey prior to proposed activities and manage known sites," while Protection Buffer guidelines state "Additional surveys conducted using a standardized protocol must be undertaken to delineate range and identify subpopulations." The guidelines of this chapter present the parameters and procedures for triggering and conducting a survey to meet the requirements for federal land management activities. Surveys are conducted to determine if the species is present at the site.

State Regulations--The states of Oregon and California have requirements for both the handling and collecting of these animals. Capture and handling is necessary to identify these salamanders, thus the following regulations are to be followed. In Oregon, PLST is a State Sensitive species, listed in the Vulnerable category, and considered Protected wildlife (OAR 635-44-130). A permit from the Oregon Department of Fisheries and Wildlife is required to collect or take this species.

In California, PLST is a State Threatened species and it is prohibited to handle these organisms without a Memorandum of Understanding in place with the California Department of Fish & Game. The state needs to be notified if any incidental mortality occurs, and specimen needs to be preserved and routed as per their direction.

Surveyor Training-- Training of field personnel is necessary prior to conducting surveys for PLST (Chapter I). Surveyors must be able to identify PLST and any sympatric salamander species, identify PLST habitat, understand the known ecology and behavior of the animal, and fully understand the survey procedures for their standardized implementation under field conditions.

Training Requirements

Two-day training session

- **One day of lecture and species identification**
- **One day of field instruction**

Surveyor skills include

- **Ability to identify all salamander species encountered**
- **Ability to identify target species' likely habitat**
- **Knowledge of species' microhabitat associations**
- **Knowledge of species' microclimate associations**
- **Knowledge of species' surface activity patterns**
- **Knowledge of survey protocol and its implementation**
- **Knowledge of documentation procedures, dataforms and discretionary decisions**

Presence-- "Presence" is determined when one or more PLST are detected and positively identified. If PLST is detected, the surveyors may terminate the survey. Once presence is determined, it is assumed that a population occurs at the site and all contiguous habitat (see below) is managed to maintain PLST at the site according to current guidelines (Olson 1999).

Not Detected-- "Not detected" is designated if the target species is not observed after three site visits during each of which full surveys have been conducted. After the site has been surveyed three separate times with no detection of PLST, the requirements for Survey and Manage have been met and the site would not need to be managed according to PLST management recommendations. The term "absence" is to be avoided, because it is an absolute that can not be determined after only three site visits.

GENERAL BIOLOGY AND ECOLOGY

Much of the natural history and ecology of this species is reviewed in Olson (1999). A general reference for identification is Stebbins (1985).

The Siskiyou Mountains salamander was first collected in May 1963 and described as a species in 1965 (Highton and Brahme 1965). It is a member of the family Plethodontidae, the lungless salamanders. The members of the genus *Plethodon* respire primarily through their skin and are completely terrestrial.

Although not aquatic, PLST is very sensitive to temperature and moisture regimes and only occurs in relatively cool, moist microhabitats. This species will move up or down through the substrate as microhabitat conditions become favorable for them. The species is generally only surface active under very restricted microclimatic conditions. They are usually active only during the fall, winter and spring rains. PLST have been found when soil temperatures ranged from 3.5-18°C (range 0.5-18°C), and ambient temperatures were between 4-20°C (range=1-24°C), (Nussbaum 1973; D. Clayton pers. obs.). High relative humidity is also an important predictor of surface activity for this species. Ninety-one percent of all animals (N=620) found during surveys from 1992 to 1998 in the Applegate and Klamath River Valleys were found when the relative humidity was at or above 65% (range=31%-100%), (D.Clayton unpubl. data). In addition, capture rates were greatly influenced by relative humidity, above 65%RH the capture rate was 3.7 animals per hour and the capture rate below 65%RH was only 1.5 animals per hour. There also may be a time lag that will affect how fast the animals will respond to changes in microhabitat conditions. Harsh and unfavorable conditions such as hard freezing, inundation, or very dry conditions may cause them to not respond quickly to good surface conditions and it may take up to two or three days for them to become surface active (Taub 1961).

Species Identification

An adult *P. stormi* is distinguished by having a modal number of 17 costal grooves and 4 to 5.5 intercostal folds between adpressed limbs (Nussbaum et al. 1983). Siskiyou Mountains salamanders are slim and long-bodied (approximately 14-70 mm SVL), and are chocolate-brown to purplish-brown, dorsally, with varying amounts of light flecking on the head, sides, and limbs (Plate IV.1). Adults may have a faint lighter brown dorsal stripe, and the ventral color is grayish-purple. Juveniles tend to be black or very dark brown with flecking, often exhibit a light brown or tan dorsal stripe, and are gray ventrally (Plate IV.2). Surveyor training is needed to be able to identify this animal. In the contact zone with the Del Norte salamander (*Plethodon elongatus*, PLEL, see Survey Zone, below), PLST has been found with 5.5 costal folds between adpressed limbs and with copper dorsal stripes (D.Clayton, L. Ollivier, pers obs.).

Range

This species is known only from southwestern Oregon and northwestern California (Figure IV.1). It occurs in Siskiyou County, California, in Jackson and Josephine Counties, Oregon. The known range of the Siskiyou Mountains salamander has roughly doubled since 1993 and the onset of federal surveys under the Survey and Manage provision. This species is known to occur up to 1800 meters (6,000 feet) in elevation. Along its western edge, its range is contiguous with the that of the Del Norte Salamander (Figure IV.2).

Habitat

The Siskiyou Mountains salamander is considered a talus or rock substrate obligate, and has rarely been found far from talus deposits or fissured rock outcrops, (Plates IV.3-4), (Herrington 1988; Stebbins 1966; Nussbaum 1974). Suitable habitats for PLST are listed below.

- Habitat:**
- **Rock outcrops**
 - **Forested rocky soils**
 - **Rock on rock substrates**
 - **Exposure, vegetation, slope, and aspect may vary**

Nussbaum (1974) characterized optimum habitat for PLST as stabilized talus in old growth stands with high canopy closure and a northern aspect. Abundances are significantly higher in late- successional forest, capture rates can approach 30 individuals per hour. Canopy closure is typically high on occupied sites, the average canopy of 52 known sites in 1992 was 72% (range 2-100%)(D Clayton, pers. obs.). Catastrophic loss of canopy can extirpate the animals from a given site. An occupied site clearcut in 1990 was sampled in 1991 and 40 individuals were found, after one year only one individual was found and since 1993, no PLST have been found at

the site (D. Clayton, pers. obs.). While some occupied sites may occur within relatively young forest, canopy closure are still high on these sites. Occupied sites on south and east facing slopes also typically have higher amounts of canopy closure than do north and west facing sites.

Nussbaum et al. (1983), reported that talus depths in occupied PLST habitat ranged from 0-45.7 cm deep with an average depth of 10-30cm. Generally, this species is found predominantly in forested situations with rocky substrates. Sites suitable for PLST include appropriate habitat in the form of surface and subsurface rock deep enough for the animals to retreat into as environmental conditions warrant. Sites occupied by PLST generally have layered rock substrate with at least some cobble-sized rock that serve as cover objects. Because of this species' physiological requirements (e.g., respiration through the skin), the species is typically found in rocky substrates that are deep enough to retreat into when conditions become too harsh for the animal at the surface. During wet weather, this species occasionally may be found under bark or logs in association with suitable rock substrates. Surveyor training is needed to be able to identify the full range of suitable habitats.

SURVEY PARAMETERS

Triggers

Triggers are the parameters that initiate the survey. These are generally project proposals that include ground disturbance or other activities that may negatively impact PLST or their habitats. Triggers are cross-referenced to the management recommendations for this species (Olson 1999), such that if PLST habitat protection is recommended in response to an activity, it may be considered a trigger.

Trigger Criteria--Surveys are triggered only when the proposed activity occurs:

- 1. on federal lands covered by the Northwest Forest Plan, and**
- 2. within the Survey Zone for PLST, and**
- 3. in an area in which there is suitable habitat for PLST, and**
- 4. the proposed project may affect animals directly or indirectly by altering habitat.**

As ground-disturbing activities occur on or in the substrate, they have the potential to severely affect this species. Adverse effects on the substrate microhabitat is the specific concern. Surface microhabitat conditions important for this species include the physical structure and surface cover features, and the microclimate (e.g., temperature/moisture regime). Concerns for management include the maintenance of the integrity of substrate interstices and cool, moist surface regimes. Proposed management activities that may affect these habitat elements are survey triggers.

Activities with little or no ground-disturbance may also affect microhabitat for this species. For example, chemical applications may affect individual animals directly by creating inhospitable habitats. Some chemical applications (e.g., pesticides), may also affect amphibians indirectly by impacting their prey-base.

Trigger Decision Process- Land management activities should be evaluated on a case-by-case basis whether or not they represent obvious triggers. To make this management decision, the four above criteria should be evaluated. For the last criterion, "does the proposed project adversely affect the habitat conditions for the species or the individual animals?" Site managers are expected to have the greatest discretion with regard to this final criterion. Site conditions or project implementation timing can affect whether or not a particular activity is a trigger (see also Chapter 1).

Activities that May Not Trigger Surveys--Surveys may not be triggered for activities that are determined to have low potential to affect this species or its habitat. This may include activities that do not affect substrate integrity, or the microclimatic regime within suitable habitat. In addition, if a particular activity does not affect microhabitat conditions and it is timed so that the activity occurs when the animals are not surface active (e.g., during dry, summer months), and thus not expected to affect the animals themselves, the activity may not trigger surveys. See also Chapter 1 for further discussion of triggers.

Specific examples of triggers and non-triggers include:

- A. Most proposed timber management activities, including thinning, regeneration harvest and salvage would trigger surveys. These types of activities involve reduction of canopy and high levels of disturbance to the substrate.
- B. Road construction or reconstruction would trigger surveys. Routine road maintenance may not trigger surveys. Road construction and reconstruction can involve high levels of substrate disturbance and removal of overstory. Routine maintenance typically involves only those activities within the already disturbed road prism that is not likely to be habitat for PLST.
- C. Recreational development, such as campground creation or expansion would trigger surveys. Routine maintenance may not trigger surveys. Development or expansion of recreational sites can involve overstory reduction and substrate disturbance, while maintenance only involves work in previously disturbed sites that may not be likely habitat.

Version 3.0

- D. Most mining activities, including new rock source development would trigger surveys. Rock removal at existing rock sources would not trigger surveys if no outward expansion of the site occurs and if activities are conducted when the animals are not active at the surface (generally 1 June - 30 Sept.). Existing quarries are highly disturbed sites and may be occupied only seasonally by the animals. The seasonal restriction reflects that time when the animals are unlikely to occupy the site and activities conducted at this time will avoid direct impacts to individual animals.
- E. Chemical applications (e.g. pesticides, herbicides, fertilizers) within suitable habitats would trigger surveys. Surveys would not be triggered if applications are proposed within plantations less than thirty years old. Plantations are disturbed sites that generally do not provide suitable habitat due to low canopy closure and disturbed substrate and likely have not been re-colonized by the species.
- F. Prescribed fire as necessary for the reduction of fuel loads and species-habitat improvement, and slash after felling operations, would not trigger surveys if burning is conducted when PLST are not active at the surface (generally 1 June - 30 Sept.), and no net loss of canopy would occur. This species has evolved with fire and fire effects do not generally extend into the substrate. Consequently, if fire is introduced to a site when the animals are not active near the surface, direct effects to individuals may be reduced or avoided.
- G. Road decommissioning - Surveys of roads would not be triggered for road decommissioning as it is unlikely the substrate affected within the road prism during decommissioning would be suitable habitat for the species.
- H. Replanting and timber stand improvement (pre-commercial thinning) of plantations thirty years old or less would not trigger surveys. Plantations are disturbed sites that generally do not provide suitable habitat due to low canopy closure and disturbed substrate and likely have not been re-colonized by the species.
- I. Hazard tree removal of single trees and clearing blow-down from roads would not trigger surveys. This type of activity has low potential to impact to PLST habitat.
- J. Seeding of native species of grasses or plants would not trigger surveys. This type of activity has low potential to disturb PLST habitat.
- K. Construction or reconstruction of fences would not trigger surveys unless the construction would lead to increased disturbance within PLST occupied habitat, such as might occur with livestock collection devices.

- L. Special Forest Products: Proposed removal of talus for flagstone or burl harvest would trigger surveys because of the potential for disturbance to PLST substrate. Surveys would not be triggered for removal of forest products such as mushrooms, bear grass, fir boughs, and Christmas trees because of low levels of potential for disturbance to PLST habitat.
- M. Surveys would not be triggered for removal of small infestations of noxious weeds by hand pulling or digging because of the low potential for disturbance to PLST habitat.
- N. Areas proposed for concentrated wood cutting would trigger surveys due to the potential for canopy reduction, substrate disturbance, and impacts to microhabitat. Dispersed (single tree) wood cutting would not trigger surveys as this type of activity has a low potential to disturb substrate or reduce overall canopy within PLST habitat.

Adjacent Area Surveys

Appropriate habitats within adjacent areas surrounding the proposed project area should be surveyed if the project may affect PLST habitat in adjacent areas. Effects on microclimates (e.g., edge effects, Chen et al, 1995), microhabitats, and slope stability should be considered.

Surveys of areas adjacent to proposed site-disturbing activities should be considered on a case by-case basis (see Table IV.1, below). Depending on site conditions and potential effects to habitat and microclimate, there is discretion when determining the width of adjacent area required for survey. An adequate analysis should be conducted and documentation of the decision should be provided (see also Chapter 1). Guidelines for adjacent area surveys are provided in Table IV.1. These guidelines are cross referenced to the management recommendations for the species (Olson 1999). Although every attempt was made to address most potential activities, this should not be considered an all-inclusive list.

Table IV.1: Adjacent Area Survey Width Recommendations.

Management Activity	Disturbance Parameters	Disturbance Intensity	Recommended* Adjacent Area for Survey
Trail construction	Tread 24-48 in. linear disturbance only	Low	0m, survey trail route only
Road	Roadbed 10-20 ft.	Moderate	10-30m on either side of center
Timber Harvest	Thinning,>60% retention	Moderate	0-60m, depending on site conditions
Timber Harvest	Thinning,<60% retention	Moderate-High	0-120m, depending on site conditions
Timber Harvest	Regeneration, 0-15% retention	High	120-240m, depending on site conditions
Mining/Quarries	Expansion/new quarries	High	60-80m, depending on site conditions
Recreational Development	Expanded or new facilities	Moderate	0-60m, depending on site conditions

* **These widths are intended only as general guidelines, site-specific analysis will determine actual adjacent area survey widths.**

Justification for not surveying in adjacent areas may be considered under circumstances that are not expected to affect potential PLST or their habitats adjacent to activities. In particular, not surveying within adjacent habitat might be considered when: 1) there is no adjacent area ground disturbance expected that would cause salamander mortality; and 2) proposed activities are not expected to alter adjacent area microclimate or microhabitat conditions. For example, although trail construction may be a trigger of surveys along the trail alignment, adjacent areas along trails would not require surveys if adjacent area microclimates remain unaffected (e.g., no timber felling resulting in dominant canopy cover reduction is involved) and if adjacent area microhabitat will remain intact (e.g., blasting is not conducted).

Site Location

Survey Zone--The entire geographic area where surveys are needed for PLST is termed the Survey Zone (Figure IV.1). The results of extensive federal surveys since 1993 have resulted in

Version 3.0

the following adjustments to Survey Zone boundaries. Further adjustments to this survey zone boundary may be made annually as new information on the actual range of the species becomes available.

In Oregon: The Survey Zone extends north from the Oregon/California border at the Applegate/Illinois Valley Ranger District boundary, along the Applegate District boundary until it bisects the western boundary of the Thompson Creek watershed. The Zone continues north along the watershed boundary to the confluence of Thompson Creek and the Applegate River. It then continues northwest along the Applegate River to the Jackson/Josephine County line. It continues north along this county line to Interstate 5. The Survey Zone boundary described thus far is also the eastward Survey Zone boundary of the Del Norte salamander (PLEL, Chapter V). From Interstate 5 at the Jackson/Josephine County line, the PLST Survey Zone goes south along Interstate 5 to the Oregon/California border (see Figure IV. 1).

In California: The Survey Zone follows Interstate 5 south to the R7W/R6W boundary line. It continues south on this line to the Klamath/Shasta-Trinity National Forest Boundary. It continues southwest along the forest boundary to the Scott River/Salmon River District boundary. It then goes northwest along the Scott River/Salmon River boundary to the Humboldt/Mt. Diablo Meridian. The Zone goes north along this meridian to China Point. The line then crosses at the confluence of the Klamath River and Thompson Creek. It continues north along the western watershed boundary of Thompson Creek to the Oregon/California border.

In the Klamath River area of contact between the two species, PLST and PLEL, there will be a "shared" Survey Zone (Figure IV.2). Within this Zone, surveys should be conducted only until one of the species is detected. Whichever species is detected first will determine management for the Survey Area. For species determination, PLST has 4-5.5 costal folds between adpressed limbs, while PLEL has 6-8 costal folds between adpressed limbs.

Shared survey zone: The shared zone extends south along the western watershed boundary of Thompson Creek from the Oregon/California border to the confluence of Thompson Creek and the Klamath River. It continues across the Klamath River at China Point to the Humboldt/Mt. Diablo Meridian. It continues south on the meridian to the Scott/Salmon River boundary at North Fork Camp. It follows northeast along this boundary to Anthony Milne Camp, goes due north along this line to the headwaters of Grider Creek at the Oak Knoll/Scott River District boundary. It extends north along Grider Creek to the confluence of Grider and the Klamath River. It follows northwest along the Klamath River to the Happy Camp/Oak Knoll District boundary. It goes northwest along this line to the Oregon/California border.

Version 3.0

Survey Area--Within the boundaries of the Survey Zone, the Survey Area includes PLST habitats potentially affected by the proposed activity. Surveys may be triggered if appropriate habitat is found at or adjacent to a site proposed for ground disturbing activities and the proposed activity triggers a survey (Figure IV.3).

Habitat is described above. Generally, this species is found in forested situations with rocky substrates and is considered a rocky substrate obligate. The site to be sampled for PLST should include appropriate habitat in the form of surface and subsurface rock. Sites occupied by PLST generally have layered rock substrate with at least some cobble-sized rock that serve as cover objects. Discrete pockets of habitat that are greater than 75 m apart (edge-to-edge with no intervening habitat) should be considered separate and would require separate surveys. If sites are within 75 m of each other, they can be considered part of the same survey.

Survey Timing

Seasons--Surveys for animals must occur during the appropriate months: generally late fall through late spring. These times coincide with the fall and spring rainy seasons (see below). Spring usually offers a longer period of time with appropriate conditions for sampling. Areas of high elevation (generally above 5,000ft., 1450m), may not be free of snow until after the spring period and may be surveyed at a later time if environmental and substrate conditions are met.

Number of Site Visits-- Each site must be visited a total of three times over the course of the spring or fall rainy seasons (see environmental conditions below), unless presence is established. At least one sample period must be conducted during appropriate conditions in the spring.

Intervals Between Site Visits-- Site visits must be separated by at least 10 days. Preferably, sampling will occur at least every 10 days, although weather events may cause longer periods to pass between visits. With this interval, it may be possible to complete a survey effort within a single survey season. However, attention must be paid to environmental conditions that constrain surveys which are described below.

Survey Effort-- Search effort must be a minimum of four person-hours per ten acres of suitable PLST habitat. As an example, a twenty acre area of habitat would need a minimum of eight person-hours of survey time for one visit. A crew of four surveyors could complete this in two hours time.

Environmental Conditions

The activity patterns of PLST are highly dependent on local environmental factors such as relative humidity and temperature. These factors must be taken into careful consideration when

determining when to survey for these animals. The following conditions must be met before surveys may proceed:

Air conditions--The air temperature and humidity must meet the following criteria. Relative humidity of the site must be a minimum of 65%. At potential sites to be surveyed for PLST, the air temperature must fall between 4-20°C (D. Clayton, pers. obs.). In addition, freezing temperatures must not have occurred at the site within 48 hours prior to the site visit.

However, on federal lands in California, sites above 4,500 ft (1372 m) may be searched without the freezing provision. In this area only, it may lightly freeze the night prior to survey. This expanded window of environmental conditions pertains only to this area because normal protocol conditions could not be met at these sites and data have been compiled from this region showing that PLST have been somewhat surface-active after light freezes (approximately -2 °C) . If multiple site visits are necessary to these California high elevation sites, at least one site visit must occur with the low elevation freezing provision: no freezing at the site within 48 hours prior to the site visit. Use of Reference Sites is strongly recommended for these high elevation areas.

Soil conditions-- The soil temperature and humidity must meet the following constraints. The soil temperature, taken 10 cm below the surface, must fall between 3.5-18°C. The substrate below the first layer of rock within the area being searched must be moist to the touch.

Reference Sites

These salamanders are highly sensitive to local climate shifts. Freezing temperatures at a site during the night prior to a survey may cause the salamanders to retreat down into the rock substrates, rendering them undetectable by the search technique. When possible, we recommend the use of reference sites to determine if these animals may be active on a given day near the site to be surveyed. A reference site may be a historic site or even a road cut with the appropriate microhabitat that supports a population. A reference site should be located in the same sub-drainage and at or near the elevation and aspect of the survey site to be informative about potential salamander activity on the survey site. If no individuals are found at the reference site, it is likely that environmental conditions are not suitable and salamander surveys will not be effective and should not be conducted.

Voucher Specimens

Voucher specimens are not needed for this species, due to its status of concern and the required training of field personnel in species identification. This animal is not easily misidentified, once its key characters have been assessed. If there is doubt as to the identification of a captured salamander, local species experts should be sought to verify the identity of the animal.

SURVEY PROTOCOL

General Guidelines

For all surveys conducted for PLST, certain guidelines will help the surveyor know where, when and how to survey:

- a. Survey only during acceptable environmental conditions. The intent is to capture animals that are surface active, so searching deeper than the upper 10-30 cm is not necessary.
- b. Portions of the Survey Area that cannot be safely searched may be omitted.
- c. The search is time-constrained at 4 person-hours for every 10 acres of habitat. Search until the habitat patch has been fully searched, until time is up for that search, or until the first PLST is found.
- d. All of the surveying is done in a walk and turn over [surface objects], hand-search manner. Salamanders, during daylight, are usually found underneath surface objects. Carefully look under surface objects while moving across the patch of habitat. Surface objects may be items on top (e.g., a rock on rock) or may be interspersed (e.g., talus, soil mixture). For this protocol, the surface is generally considered to be within the approximate upper 30 cm of the top of the substrate.
- e. Do not spend too much time in any one place. A maximum of 10 minutes should be spent at any specific spot, whether captures are occurring or not. At the end of this brief time, stop your timer and move to another location a few paces away. Restart your timer and resume searching. It is important to move across the substrate
- f. The walk and turn over method ensures that the observers will cover the area spatially, to maximize the likelihood of capturing the target species, which may be clustered in a small portion of the Survey Area.

Survey Ethics

All surveys should be conducted in a relatively non-destructive manner. Surface objects are lifted and replaced to their original position. Hill sides should be kept relatively intact whenever possible. Bark may be pulled off of logs, but it should be done carefully, so that it can be replaced. Logs that are moderately decayed into large chunks or splits may be separated, but again, the pieces should be replaced as best as possible. However, logs should not be completely

destroyed. Moss mats should be replaced. The intent here is not to abstain from any alteration; that would be next to impossible and would make it difficult to detect salamanders. The intent is to be conscientious about minimizing disturbance to the habitat by using a light-handed approach.

Safety Issues

Field units implementing surveys should be discretionary regarding safety issues as required by site conditions. Safety of surveyors should not be compromised to complete surveys. As such case-by-case decisions are made, managers, supervisors, and field crews should be in communication. We recommend full documentation of the rationale supporting such a decision.

Prior To Sampling

Review Survey Area-A contour map covering the specific proposed project area (e.g., forest management activity, recreational development) is needed when conducting a survey. Features such as pockets of late-seral forest, cliffs, rocky substrates and areas of steep terrain (>40%) should be delineated within the project area boundary, as these areas are the most likely to support PLST populations. Soil type maps also may enable one to narrow the search area somewhat by keying in on specific soil types with high percentages of gravel and cobble.

Location of plot center-The time-constrained search may begin at the plot center (i.e., the approximate center of the largest area of suitable habitat within the Survey Area). To find this location, systematically walk the proposed project area to locate areas containing surface rock with suitable substrate. Place plot center in the center of the area with the greatest concentration of surface and subsurface of searchable size (easily turned by hand), remember to replace rocks and other cover objects in original position after searching to preserve habitat quality. Areas with cover primarily comprised of large boulders and large outcrops are not readily sampled by this search technique. There may be more than one patch of suitable substrate within and adjacent to a proposed activity area. All patches of suitable habitat should be surveyed for occupancy.

Data Form Completion (see Appendix IV.1)

- a. Site Information, Location and Topography: **Mandatory**
 - Project name, unit number and site number, directions to site.
 - Record estimated habitat dimensions, area, and minimum search time.
 - Record Township, Range, Section, quarter section, latitude and longitude.
 - Locate site on a copy of a 7.5 min. topographic-map and attach to data form.
 - Record elevation (m).
 - Record ownership (Forest service (NF, RD), BLM district, RA), non-federal).
 - Record slope and aspect.

b. Time and date: **Mandatory**

- At the time of site entry, record military time.
- Record date (Month, Day, Year)

c. Observer/s Name/s: **Mandatory**

d. Weather (record and measure at plot center prior to sampling): **Mandatory**

- Sky = Clear, Partly cloudy, Very cloudy
- Moisture = Dry, Foggy, Intermittent rain, Light rain, Heavy rain
- Wind = None, Light, Moderate, Strong
- Air temperature (°C) - alcohol, mercury or digital thermometer
- Air relative humidity (%) - psychrometer
- * Air temperature and relative humidity should be taken three times during the survey, at the beginning, middle, and at the end of the survey. If environmental conditions go outside of parameters for survey at any time during the survey, terminate the survey.

e. Soil temperature and moisture: **Mandatory**

Five measurements of these variables are needed to validate survey conditions at the beginning of the survey period. Compare the average of the five measurements to the environmental constraints listed previously. If soil/substrate conditions are not within the bounds previously outlined, surveys should not be conducted. The sites for the measures are located as follows:

Site 1. Locate center of plot to be surveyed. Measure soil temperature and moisture (also canopy closure, see below).

Sites 2-5. Stand at plot center. Measure 15 m in each of the 4 cardinal directions (N, S, E, W) to locate the other four sample points. Measure soil temperature and moisture (also canopy closure, see below).

- Measures:
- Surface temperature (°C) measured 10 cm below surface
 - Soil dry by touch /moist by touch, for soil and litter below the duff layer.

f. Canopy closure: **Mandatory**

Record canopy closure (%) with densiometer at each soil survey station and average to determine overall canopy closure (see data form, Appendix IV.1).

g. Suitable habitat data fields: **Optional**

- Dominant rock size and shape
- Cover type, record % cover by each type using codes provided on form
- Composition of canopy by species group as percent and presence/absence
- Stand age class using codes provided on form

Time-Constrained Search

Begin searching by hand anywhere within the patch of habitat. Turn cover objects, carefully lift moss mats, and sift leaf litter as you systematically move around the area. Expand the search out in concentric circles or by using a search pattern that thoroughly covers all habitat within the plot. Please note: Potato rakes should not be needed or used. Searchers should move about the site, spending no more than 10 minutes searching a small area (whether captures are occurring or not). After 10 minutes of intensive searching in a small area, searchers should move a few paces and begin searching again. When moving to a new site or handling a capture (recording information) the timer stops. Time of search applies only to time spent actively searching for animals. Keep track of time each observer spends searching. At end of search, record actual search time in person-hours and acres searched.

If animals are captured record the following information:

- b. Species - four-letter code (see code sheet) determined by identification keys provided during field training. Record all amphibian species captured.
- b. Stage - juvenile, subadult, or adult
- c. Capture location - for Survey and Manage species, mark and map site. Describe both cover and substrate of captures (what is the animal in, on, and under?). Cover objects and substrate types are provided on data form.

All captures are to be released as close to original capture location as possible. Replace cover object in original position, then place the animal next to the object, allowing animal to return underneath the object. While searching, attempt to return all rocks and other large cover objects back to original positions. Replace moss mats, where possible. When an individual PLST is found, searching can be stopped (record time), "presence" is designated, the entire habitat is

designated occupied (see below), and the habitat becomes a known site and is entered into the known site database.

Site Delineation

Once PLST is detected, the first detection location will become the "site" for the Known Site Database (i.e., a point locality). To delineate a PLST site for known site management, all suitable rock substrate habitat, as determined by a qualified biologist, that is contiguous with an occupied site will be considered occupied. The full extent of this occupied suitable habitat should be identified and managed as described in the Management Recommendations (Olson 1999). If suitable habitat is separated by no more than 75 m, then it also may be considered occupied. If there is doubt as to the occupancy status of habitat near a known site, survey the areas using the same survey protocol. This may include all contiguous rocky habitats. The potential ecological value of contiguous, but possibly currently unoccupied habitat (in terms of desired future conditions, population dynamics, and connectivity), should be considered. Conservative measures are recommended when dealing with this type of rare endemic vertebrate species.

Survey Season Review

Annually, a joint meeting of all parties that have conducted surveys is recommended. Sharing of new sites may affect decisions for surveys and survey zone adjustments in subsequent years. It is recommended that PLST survey and management procedures be reviewed at regular intervals. Field units should assess: 1) adherence to State and Federal standards and guidelines (e.g., renewal of permits, changes in survey protocols, training needs); 2) impacts to animals and habitats; and 3) new information available on this species and its management/protection. All field data should be retained at the field units.

OPTIONAL SAMPLING

Surveys Beyond First-Detection

From a biological standpoint, continuing surveys beyond first-detection is preferred because more information is collected that may be useful later. Continuing surveys can address whether a lone individual or a patch of animals has been detected, if a potential boundary of a population has been found or if specific conditions have triggered salamander surface activity. Such optional surveys will enable a more meaningful estimate of relative abundance to be made. However, it is realized that if a detection is all that is needed to establish a population, then the survey can be completed as soon as one verifiable specimen is obtained. There are several options for continuing surveys:

One survey hour -- Completing one additional survey hour after the target species has been detected may be a minimal additional effort to assess whether a population of animals has been detected.

Complete the survey day or site visit -- The more time and area covered during a survey will provide more information about the PLST population. Completing the surveys planned for that day or site visit may provide critical information as to the relative importance of that habitat in relation to neighboring sites.

Supplemental Habitat Characterization

To streamline surveys, the survey protocol includes collection of few habitat data. To fill knowledge gaps concerning identification of suitable habitat for this species, additional habitat information is needed. A more detailed site characterization is strongly recommended, particularly habitat elements such as forest stand structure and composition (e.g., canopy), and substrate conditions. These data fields are on the data form and it is encouraged that units fill out these fields.

Supplemental Searches

Supplemental searches might prove to be a quick and inexpensive way to detect a target species, if it occurs at a site. Supplemental surveys are completely optional, but are not recommended for use as a standardized protocol. Supplemental surveys may be used as proposed project areas are being prioritized and general field reconnaissance of habitats is being conducted. The following are suggestions for supplemental searches. An important note about supplemental searches is that they should be nondestructive, and specifically should not compromise the efforts of protocol-searches. These types of surveys would only count as an official site visit if animals are found and all data is collected to protocol.

Opportunistic searches -- An opportunistic search is done anywhere, anytime, by any method. It usually translates into "just going out and looking." However, it is recommended to document the time and/or area of effort (or preferably both). Use of a Reference Site is recommended under these conditions.

Off-season searches -- Although surveys may be conducted late fall to late spring, and spring is preferred, it may be possible to encounter PLST outside of this time-window if conditions are conducive.

Searching during marginal conditions -- The need for good environmental conditions has been stressed for surveys, but it is often possible to find salamanders when conditions are marginal (however, fewer PLST are expected to be detected). This type of survey may be done if the crew

finds less than adequate conditions upon arrival at a site. Use of a Reference Site is recommended under these conditions.

DOCUMENTATION OF SURVEY DECISIONS

Due to the discretionary nature of several survey elements (triggers, adjacent area distances), supporting rationale for case-by-case decisions is recommended to accompany activity proposals. In particular, if variance in survey procedures is implemented, the rationale should be documented and a qualitative assessment of the change in Type R error conducted (i.e., risk of not detecting the target species when it is in fact present at a site). Relative to triggers, such rationale should include statements regarding the 4 trigger criteria, listed above. For the fourth criterion, statements should be included regarding the anticipated impacts of the project on: 1) the animals themselves; and 2) habitat conditions (e.g., structure, microclimate). The record of the adjacent area decision rationale should be distinct from the project area trigger decision rationale. Likewise, decisions to survey should be documented separately from decisions on how to manage sites.

Recommendations for Documentation

- **Rationale for trigger decisions should be documented.**
- **Rationale for trigger decisions should be separate from management recommendations.**
- **Rationale for adjacent area survey decisions should be documented separately.**
- **Rationale for any variance to protocol should be documented, with a qualitative assessment of changes to risk of Type II error.**

ACKNOWLEDGMENTS

I would like to thank all the members of the Amphibian Subgroup of the Survey and Manage Team, especially Deanna Olson for her support, editorial comments, and endless hard work on this project. Thanks also to Lisa Ollivier and Hart Welsh for editorial comments, study design, and massive amounts of data. Thanks to Rich Nauman for the known site database, distribution and range maps, and to Bill Leonard for the wonderful photographs of the species. Thanks to all of the various field crews who have worked with this species over the last several years.

REFERENCES

- Chen, J.; Franklin, J.F.; Spies, T.A. 1995. Growing season microclimate gradients from clearcut edges into old-growth Douglas-fir forests. *Ecological Applications* 5: 74-86.
- Herrington, R.E. 1988. Talus use by amphibians and reptiles in the Pacific Northwest. In: Szaro, R.C., Severson, K.E. and Patton, D.R., eds. 1988. Management of amphibians, reptiles, and small mammals in North America. Gen. Tech. Rep RM-166. Ft. Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 216-221.
- Highton, R.; Brahme, A. 1965. *Plethodon stormi* species. November. Amphibian: Urodela: Plethodontidae. Pilot Register of Zoology, Card No. 20.
- Nussbaum, R.A. 1974. A report on the distributional ecology and life history of the Siskiyou Mountains salamander, *Plethodon stormi*, in relation to the potential impact of the proposed Applegate Reservoir on this species. Unpublished report submitted to the Army Corps of Engineers, Portland Division, Portland, Oregon. 70 p.
- Nussbaum, R.A.; Brodie, E.D., Jr.; Storm, R.M. 1983. Amphibians and reptiles of the Pacific Northwest. Moscow, ID: University Press of Idaho. 332 p.
- Olson, D.H. (ed.); Applegarth J.; Bury, R.B.; Clayton D.; Crisafulli, C.; Jones, L.L.C.; Ollivier, L.; Welsh, H.H., Jr. 1996. Survey protocols for Component/Strategy 2 amphibians. Portland OR: Special Interagency Publication, Regional Ecosystem Office, Survey and Manage species. 73 p.
- Olson, D.H. (ed.) 1999 (in review). Management recommendations for Component/Strategy 1 amphibian species. Special Interagency Publication.
- Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Boston, MA: Houghton Mifflin Co. 279 p.
- Stebbins, R.C. 1985. Peterson field guides: Western amphibians and reptiles. Boston, MA: Houghton Mifflin Co. xiv + 336 p.
- Taub, F.B. 1961. The distribution of the red-backed salamander, *Plethodon c. cinereus*, within the soil. *Ecology* 42(4): 681-698.
- U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management. 1994. Record of Decision: for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl. [place of publication unknown]. 74 p. [plus attachment A: Standards and Guidelines: for management of

Version 3.0

habitat for late- successional and old-growth forest related species within the range of the northern spotted owl]. (ROD 1994).Chen, J.; Franklin, J.F.; Spies, T.A. 1995. Growing season microclimate gradients from clearcut edges into old-growth Douglas-fir forests. *Ecological Applications* 5: 74-86.

Version 3.0

Figure IV.1 Known distribution of the Sisk you Mountians salamander. The heavy line represents the species survey zone. The cross hatched area represents the combined Del Norte/Siskiyou Mountains salamander survey zone.

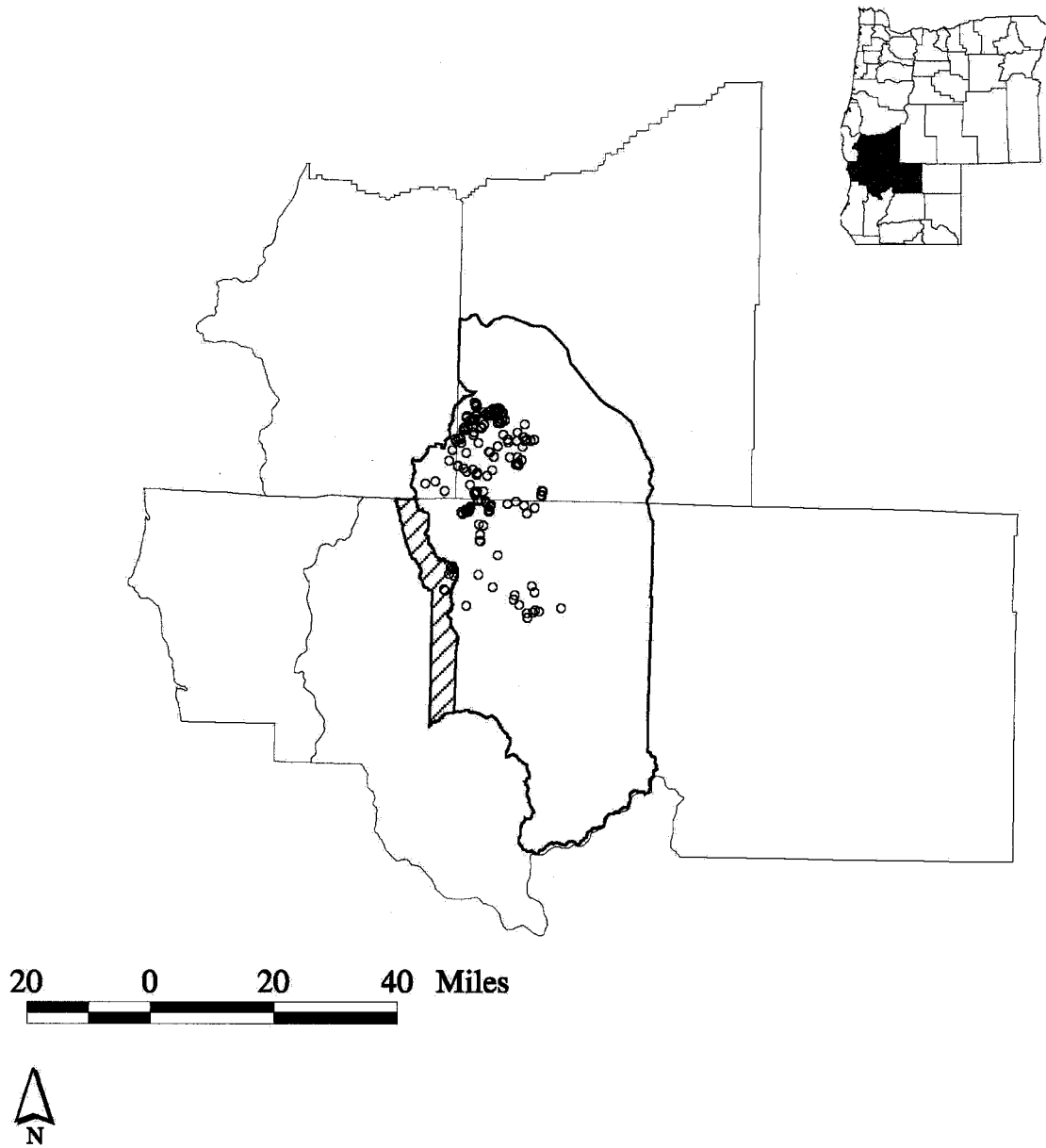


Figure IV.2. Known sites of Siskiyou Mountains and Del Norte salamanders with species survey zones (heavy line) and combined species survey zone (cross hatching).

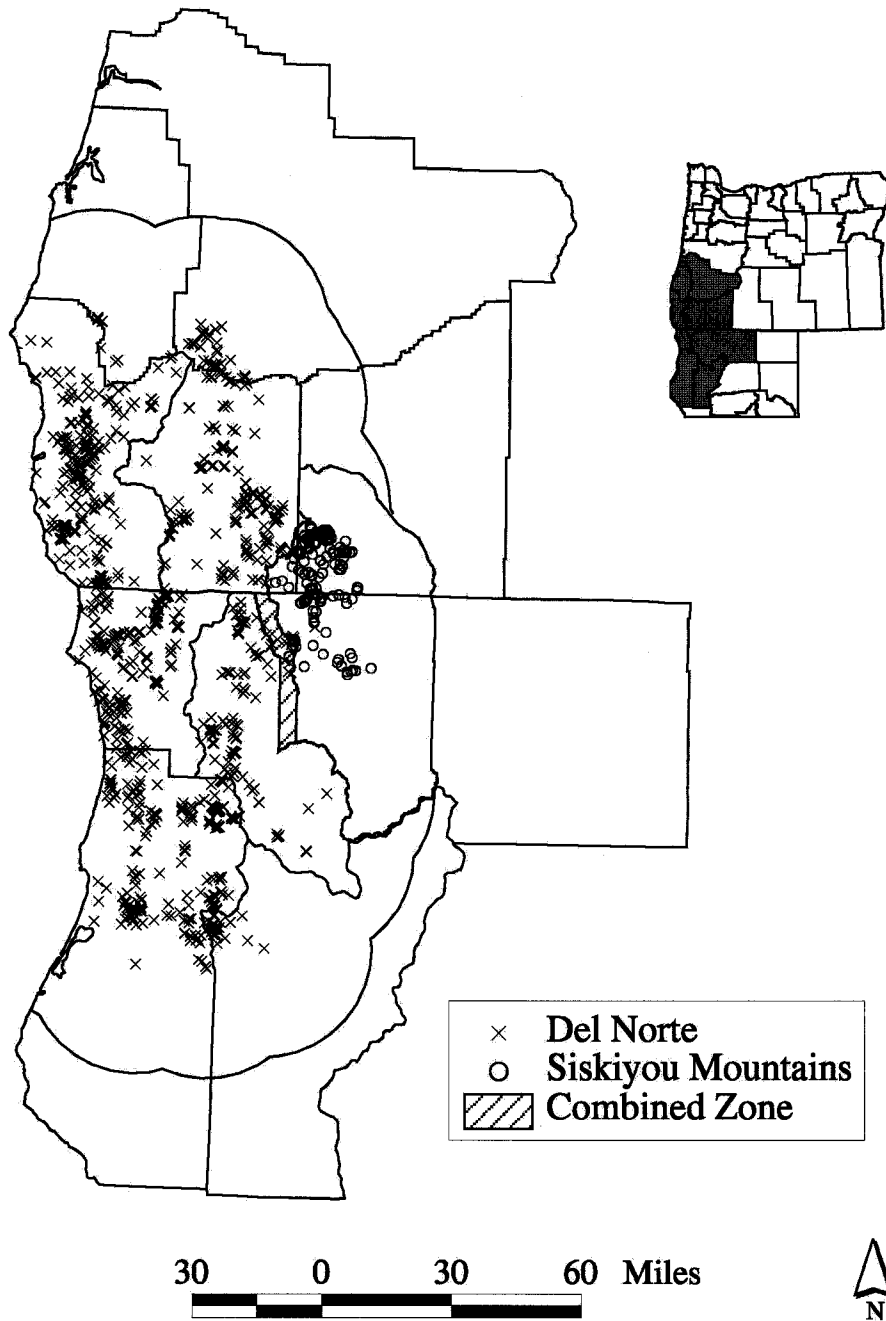
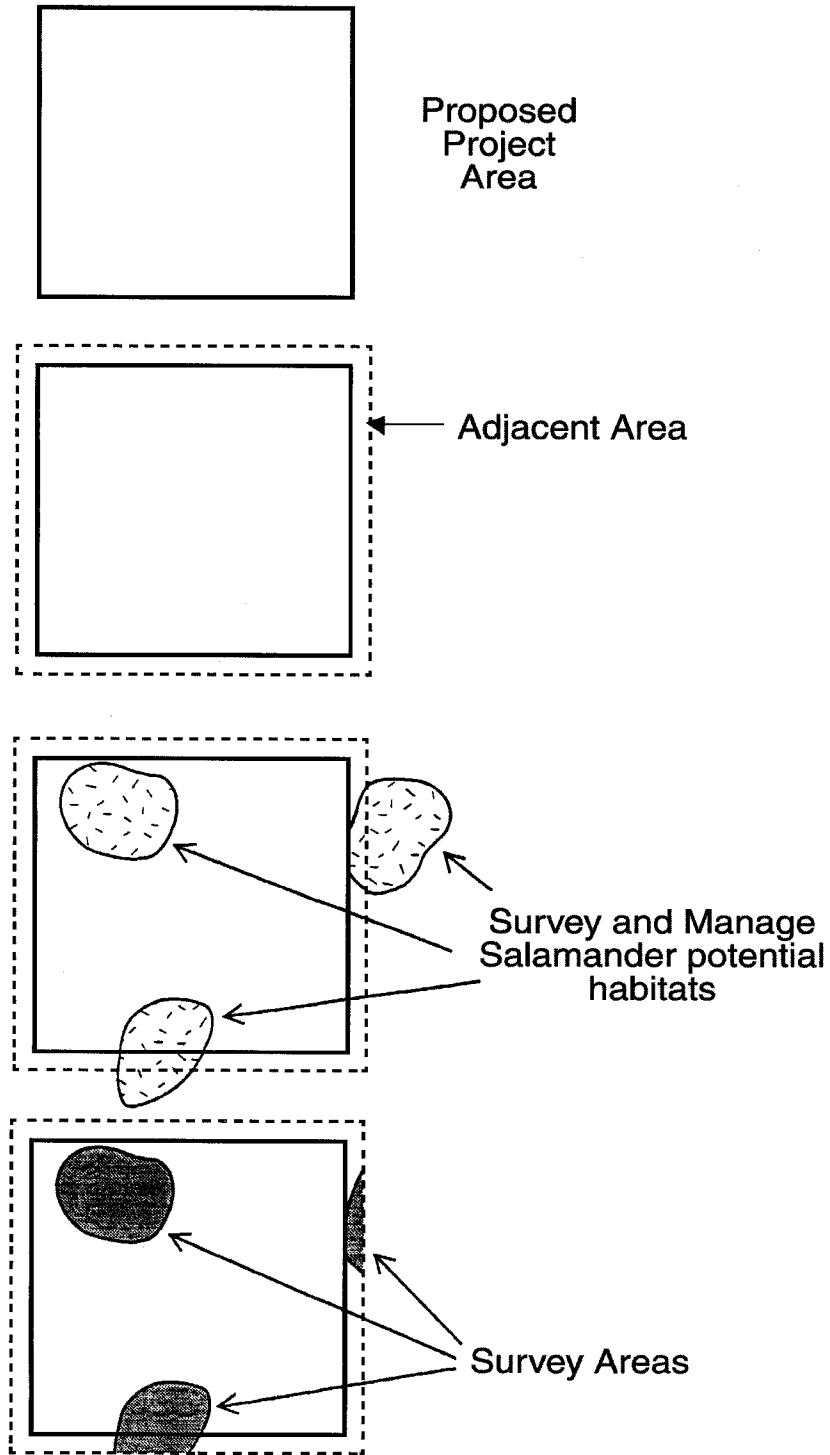


Figure IV 3. Delineating the survey area. The adjacent area shown may vary in width (Table IV.1).



Version 3.0

Plate IV.1 Adult Siskiyou Mountains salamander (*Plethodon stonni*) (Photo by William P. Leonard).

Plate IV.2 Juvenile Siskiyou Mountains salamander (Photo by William P. Leonard).

Plate IV.3 Siskiyou Mountains salamander habitat (Photo by Dave Clayton).

Plate IV.4 Siskiyou Mountains salamander microhabitat. Note layered rock, abundant interstitial spaces and salamander (indicated by arrow) (Photo by Dave Clayton)



Plate IV.1



Plate IV.2



Plate IV.3



Plate IV.4

Version 3.0

Appendix IVA: PLEL/PLST Data Forms and Instructions

PLEL / PLST SALAMANDER SURVEY FORM INSTRUCTIONS

SITE REFERENCE INFORMATION PAGE

Site Information (Mandatory)

Project Name. See list of projects for your area.

Unit Number. See project map.

Site Number. Record site number searched within the same project unit. Number the sites in chronological order.

Estimated Habitat Dimension. Record dimensions (approximate length times width, in feet or m) of habitat polygon.

Estimated Habitat Acreage. Use conversion from square feet to acres (or square meters to hectares) listed on survey form.

Minimum Search Time. Record calculated minimum search time based on estimated habitat acreage.

Location and Topography (Mandatory)

Forest. Record National Forest or BLM Resource Area name.

District. Record Ranger District or BLM District.

Legal. Township, Range, Section #, 1/4 section (NW, NE, SW, SE), 1/16 section (i.e. 1/4 section of the 1/4 section - NW, NE, SW, SE). See quad map.

Quad #. see list of quad maps for your area.

Quad name. name of specific quad map. Elevation. Record to the nearest meter, using an altimeter.

Aspect. Record aspect that the slope faces, using a compass (0-360 degrees).

Slope %. Record slope of the habitat patch, using a clinometer.

UTM_E. Will be added by office personnel.

UTM_N. Will be added by office personnel.

Location description. Directions to the site, describe how to get to the habitat polygon, using information such as mileage, road / spur names, topography (drainages, benches, saddles, etc.), specifying unmarked road forks, etc.

Suitable Habitat Substrate and Canopy (Canopy closure is Mandatory, other measures are Optional)

Dominant Rock Size. Circle one.

Rock Shape. Circle one. **Rubble** = round, **Slate** = flat and platy, **Mixed** = both rubble and slate.

Surface Water. Is water in the stand near search area? Circle all that apply. **Seep, Pond, Stream, None.**

Cover Type and Class. For each cover type listed, record the cover class using the codes listed on the data form.

Canopy. For each canopy element listed, circle yes or no for presence/absence and estimate % cover of habitat polygon.

Stand Age. Circle one. **Pre-canopy** = 0-30 yrs, **Young** = 31-99 yrs, **Mature** = 100-199 yrs, **Old-growth** = 200+ yrs.

Canopy closure. (Mandatory) Record canopy closure using a spherical densiometer (type B, concave not convex) at each soil station. Record amount of canopy closure (i.e. number of dots blocked out by vegetation) in each of the four cardinal directions (N, S, E, W), then average and multiply by 1.04. Then record average across all 5 sites to get average for habitat area.

Attach a Topographic Map (Mandatory)

Show the suitable habitat polygon, area surveyed.

**PLEL / PLST SALAMANDER SURVEY DATA FORM
SITE REFERENCE INFORMATION**

SITE INFORMATION (Mandatory)

Project Name: _____
 Unit Number: _____ Site Number: _____
 Estimated Habitat Dimension: _____ (ft or m) X _____ (ft or m) = _____ (ft² or m²)
 Estimated Habitat Acreage _____ (ft²) X 0.00002295 = _____ (acres)
 or _____ (m²) X 0.0001 = _____ (hectares)
 Minimum Search Time (person hours): _____

LOCATION AND TOPOGRAPHY (Mandatory)

Forest: _____ District: _____
 Legal: T _____ R _____ section _____ 1/4 sec _____ 1/16 sec _____
 Quad #: _____ Quad Name: _____
 Elevation: _____ Aspect: _____ Slope %: _____
 UTM_E: _____ UTM_N: _____
 Location Description: _____

SUITABLE HABITAT – SUBSTRATE AND CANOPY (Optional, Except Canopy Closure)

<u>Dominant Rock Size (circle one)</u>	<u>Cover Type</u>	<u>Cover Class</u>	<u>Cover Codes</u>
Gravel (2-32mm)	Surface Rock	_____	0 = none
Pebble (33-63mm)	Moss	_____	1 = 1-25%
Cobble (65-256mm)	DWD	_____	2 = 26-50%
Boulder (>256mm)	Litter	_____	3 = 51-75%
	Lichen	_____	4 = 76-100%

<u>Rock Shape (circle one)</u>	<u>Canopy (circle yes or no)</u>	<u>%</u>
Rubble / Slate / Mixed	Conifer presence yes no	_____
<u>Surface Water (circle all that apply)</u>	Hardwood presence yes no	_____
Seep / Pond / Stream / None	Shrub presence yes no	_____

Stand Age (circle one): Pre-canopy (0-30 yrs) Young (31-99) Mature (100-199) Old-growth (200+)

Canopy Closure % (Mandatory)

	1	2	3	4	5	
N	_____	_____	_____	_____	_____	
S	_____	_____	_____	_____	_____	
E	_____	_____	_____	_____	_____	
W	_____	_____	_____	_____	_____	
Average	_____	_____	_____	_____	_____	Average Across
X 1.04	_____	_____	_____	_____	_____	Soil Stations

Attach a topo map that shows the suitable habitat polygon and TCS plot center.

PLEL / PLST SALAMANDER SURVEY DATA FORM INSTRUCTIONS

FIELD VISIT INFORMATION PAGE

Site Information (Mandatory)

Project Name. See list of projects for your area. Unit Number. See project map.

Site Number. Record the site number searched within the same project unit. Number the sites in chronological order.

Visit Number. Record the visit number (1, 2, or 3) for the Project-Unit-Site listed above.

Date. Month, Day, Year

Start Time. Record the time when you arrive at plot center and begin to take habitat measurements. Use military 24-hour clock.

End Time. Record the time when you are done collecting habitat measurements or the search is complete, whichever is latest. Use military 24-hour clock.

Actual Search Time. Record total minutes searched.

Acres Searched. Record actual acreage of area searched.

Weather and Soil Conditions (Mandatory)

Microclimate in Protocol. Circle one (Yes or No)

Sky. Circle one (Clear, Partly cloudy, Very cloudy).

Moisture. Circle one (Dry, Foggy, Intermittent rain, Light rain, Heavy rain).

Wind. Circle one (None, Light, Moderate, Strong).

Air Temperature. Record air temperature in °C, taken at beginning, middle and end of search.

Relative Humidity. Record air relative humidity % using a sling psychrometer before beginning search for animals, at the middle of the search and then when search is finished. Record both wet bulb and dry bulb temperatures, then convert to % using a table.

Froze last night. Circle one (Yes, No or Unknown).

Soil Stations (Mandatory)

Soil temperature. Record soil temperature (°C) at 10cm below the surface at each soil station using a soil thermometer. Record the average.

Soil moisture. Enter the correct code (D = dry by touch, M = moist by touch). Take this measurement under the first layer of cover.

Minutes Sampled (by Observer) (Mandatory)

Observer(s). First initial, Last name.

Start time. Record the start time for each person searching.

End time. Record the end time for each person searching.

Minutes. Record the length of search time for each person, in minutes.

Total Minutes Searched. Sum up the search times for all participants.

Detections (Mandatory)

Species. Record the 4-letter code for each species observed.

Stage. Record the life stage for each animal captured (J = juvenile, S = subadult, A = Adult).

Cover object. Record the code for the cover object each salamander was found under. (Cover types: 1= Rock, 2 = Moss, 3 = Downed woody debris, 4 = Leaf litter, 5 = Lichen)

Substrate type. Record the code for what the salamander was found sitting on. (Substrate types: 1= Rock, 2 = Moss, 3 = Downed woody debris, 4 = Leaf litter, 5 = Lichen, 6 = Soil).

Comments: (on back of form) Record any unusual and/or helpful information, such as a piece of equipment was not working, sudden unrecorded weather change, etc.

Attach a Topographic Map (Mandatory)

Show the suitable habitat polygon, area surveyed, location of captures of PLEL or PLST, occupied habitat.

**PLEL / PLST SALAMANDER SURVEY DATA FORM
FIELD VISIT INFORMATION**

SITE INFORMATION (Mandatory)

Project Name: _____
 Unit Number: _____ Site Number: _____ Visit Number: _____
 Date: _____ Start Time: _____ End Time: _____
 Actual Search Time (person hours): _____ Acres Searched: _____

WEATHER AND SOIL CONDITIONS (Mandatory)

Met protocol for microclimate constraints? Yes No

Sky (circle one)

Clear / Partly Cloudy / Very Cloudy

Air Temp

(°C)

Relative Humidity

Wet bulb Dry bulb %

Start _____

Middle _____

End _____

Wind (circle one)

None / Light / Moderate / Strong

Moisture (circle one)

Dry / Foggy / Intermittent Rain / Light Rain / Heavy Rain

Froze last night? (circle one)

Yes No Unknown

Station Number

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Average</u>
Soil temp. (°C)	_____	_____	_____	_____	_____	_____
Soil moisture (D or M)	_____	_____	_____	_____	_____	_____

Observer(s) (Mandatory)	Start time	End time	No. minutes	Stage	Cover / Substrate
_____	_____	_____	_____	J = juvenile	1 = rock
_____	_____	_____	_____	S = subadult	2 = moss
_____	_____	_____	_____	A = adult	3 = DWD
_____	_____	_____	_____		4 = litter
_____	_____	_____	_____		5 = lichen
			Total minutes: _____		6 = soil

DETECTIONS (Mandatory)

<u>Species</u>	<u>Stage</u>	<u>Cover</u>	<u>Object</u>	<u>Substrate</u>		<u>Species</u>	<u>Stage</u>	<u>Cover</u>	<u>Object</u>	<u>Substrate</u>
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____
_____	_____	_____	_____	_____		_____	_____	_____	_____	_____

Attach topo map that shows the suitable habitat, area surveyed, and location of occupied sites.