

Version 3.0

Chapter V

Survey Protocol for the Del Norte Salamander (*Plethodon elongatus*)

Version 3.0

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ABSTRACT

Surveys to detect the presence of the Del Norte salamander are needed on federal lands when proposed management activities may affect Del Norte 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 species is protected in California and Oregon. State permits are needed prior to survey for these animals in California and Oregon. Surveys are conducted only in potential habitat for the species when such habitat occurs in or adjacent to proposed project areas that occur within the Survey Zone for the species. Surveys must occur from late fall to late spring under restricted environmental conditions (ambient temperature between 4.5-25 °C, soil temperature between 4.5-20 °C, relative humidity 45% or greater, no freezing 48 hours prior to survey, with a high elevation exception in California). 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 systematic searching of the suitable habitat in order to ensure complete coverage of that habitat. If Del Norte salamanders are not found, a total of three complete surveys of the habitat are conducted. Site visits must be at least ten days apart. Presence is confirmed when one or more Del Norte salamanders are found.

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INTRODUCTION

This survey protocol was developed in response to the Record of Decision for the Northwest Forest Plan (USDA and USDI 1994) for determining the presence of the Del Norte salamander, *Plethodon elongatus* (PLEL), 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 PLEL populations and habitat.

Before initiating surveys, read this entire document and its companion (Chapter I), 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 Del Norte 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 V.1), with various coverages (Chapter II)**
- **Revised Survey Zones**
- **Revised Data Forms**
- **Range has expanded in response to federal survey effort detecting new sites**
- **More complete habitat description provided**
- **Expanded seasons, including winter and late spring if conditions warrant**
- **No surveys should occur if there has been freezing within previous 48 hours (rather than 24 hrs), with a high elevation exception in California**
- **Air relative humidity for surveys remains at a minimum of 45%**
- **Minimum air temperature for surveys was lowered to 4.5°C, from 9°C**
- **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

The USDA and USDI (1994; Table C-3, p. C-59, C-28) states that PLEL is a Component 2 species under the Survey and Manage provision, 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 mitigation options in this upland matrix include identifying locations (talus areas inhabited by the species) by using a standardized survey protocol, then protecting the location from ground-disturbing activities." 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. If a detection of the target species occurs, the surveyors may terminate the search.

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, PLEL 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 Fish and Wildlife is required to capture or take this species.

In California, PLEL is a Species of Special Concern and a scientific collecting permit from the California Department of Fish and Game (CDFG) with an additional letter of permission is required for handling this salamander. Scientific collecting permits and letters of permission should be applied for well in advance of the survey date to ensure they arrive before the onset of the field season. Surveyors will be required to summarize their captures by area at the end of the year, at which time they may apply for a new permit. One permit may sometimes cover multiple permittees, check with CDFG for permit details.

Surveyor Training--Training of field personnel is necessary prior to conducting surveys for PLEL (Chapter I). Surveyors must be able to identify PLEL and sympatric salamander species, identify PLEL habitats, understand the known ecology and behavior of this animal, and fully understand the survey procedures for 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 PLEL are detected and positively identified. If PLEL is detected, the surveyors may terminate the survey. Once presence is determined, it is assumed a population occurs at the site and all contiguous suitable habitat (see below) is managed to maintain PLEL 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 PLEL, the requirements for Survey and Manage have been met and the site would not need to be managed according to PLEL management recommendations (Olson 1999). 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). General references for identification and basic natural history include Stebbins (1985), Nussbaum et al. (1983), Leonard et al. (1993), and Corkran and Thoms (1996).

The Del Norte salamander is a patchily distributed and relatively uncommon species of terrestrial salamander endemic to northwestern California and southwestern Oregon (Leonard et al. 1993, Stebbins 1985). It was first collected in 1911 and described as a species in 1916 (Van Denburgh 1916). It is a member of the family Plethodontidae, the lungless salamanders. This genus of salamanders respire entirely through their skin and are completely terrestrial.

Although not aquatic, the Del Norte salamander is very sensitive to temperature and moisture extremes. They only occur in relatively cool, moist microhabitats. This species will move up and down through the substrate as the microclimate at the surface changes. For example the salamanders may move deep into the substrate in response to sustained freezing temperatures making detection at the surface impossible. The species is generally only surface active under very restricted microclimatic conditions. They are active only during fall, winter and spring rains. PLEL have been found when soil temperatures ranged from 2.5 - 25° C (range sampled = 2.5 - 33° C) and ambient temperatures ranged from 0.8 - 27° C (range sampled = 0.8-31° C; Welsh and Lind 1995; K. Raftery and K. Schmidt, pers. comm.). Ninety-six percent of all animals found during surveys from 1989 to 1998 in California were found when air temperature fell between 4.5° C and 25° C (n=913) and 98% of captures occurred when soil temperatures fell between

4.5°C and 20° C (n=918). High relative humidity is also an important predictor of surface activity for this species. Ninety-six percent of all animals (n=846) found during a sampling of PLEL sites in 1989 were found when the relative humidity was 45% or above (range sampled = 14-100%; Welsh and Lind 1995; K. Raftery and K. Schmidt, pers. comm.). There may be a time lag that will affect how fast the animals will respond to changes in microhabitat conditions at the surface. Sustained harsh and unfavorable conditions may cause them to fail to respond quickly to good surface conditions and it may take up to 2-3 days for them to become surface active.

Species Identification

An adult PLEL is distinguished by having a modal number of 18 costal grooves (range 17 - 20) and 6.5 - 7.5 intercostal folds between adpressed limbs (Nussbaum et al. 1983, Corkran and Thorns 1996). Del Norte salamanders are the longest-bodied of the western Plethodontids (approximately 12-77mm SVL). Adults have a dark background color of dark brown, gray or black (Plates V.1-2). Flecking may occur on the sides and occasionally on the dorsum. Adults may show a faint copper dorsal stripe. Juveniles have a distinct copper dorsal stripe, other coloration is similar to adults. In the "contact zone" with the Siskiyou Mountains salamander, *Plethodon stormi* (PLST, see Survey Zone, below), PLEL has been found with 6.0 intercostal folds between adpressed limbs (L. Ollivier, pers. obs.). Surveyor training is needed to be able to identify this animal.

Range

Currently this species is known in southwestern Oregon and northwestern California (Figure V.1). It occurs in Del Norte, Humboldt, Trinity, and Siskiyou counties in California and Coos, Curry, Douglas, and Josephine counties in Oregon. The known range of the Del Norte salamander has grown since 1993 and the onset of federal surveys under the Survey and Manage provision (see Chapter II, Figures 11.3 and 11.8). This species has been found from sea level to 1570 m in elevation.

Habitat

Welsh and Lind (1995) described the habitat of PLEL as older forests with a closed, multi-storied canopy (composed of both conifers and hardwoods), with a cool moist microclimate, and rocky substrates dominated by cobble-sized pieces.

- Habitat:**
- **Forested rocky soils (i.e. rock on rock)**
 - **Rock outcrops**
 - **When rock is not present, PLEL in coastal redwoods use down wood for cover and substrate**
 - **Exposure, vegetation, slope, and aspect may vary**

Welsh and Lind (1995) characterized the optimum habitat for PLEL as older forests with a closed, multi-storied canopy (composed of both conifers and hardwoods) with rocky substrates dominated by cobble-sized pieces. Del Norte salamanders occur in surface and subsurface forest microhabitats. Abundances are significantly higher in late-successional forest, densities can approach 0.6 animals per square meter. Canopy closure is typically high on occupied sites, the average canopy of 30 known sites sampled in 1989 for this species was 72.5% (range 2-98%) (Welsh and Lind 1995).

In inland sites the Del Norte salamander is considered a surface rock obligate, and has rarely been found far from surface rock deposits or fissured rock outcrops (Plates V.3-6) (Welsh and Lind 1995, Nussbaum 1974). Nussbaum et al. (1983) reported that talus depths in occupied habitat of the Siskiyou Mountains salamander, a closely related species to PLEL, ranged from 0 - 45.7 cm deep. In the coastal redwoods this species has been found using downed woody material in areas where rock is sparse (L.Ollivier, pers. obs.). Sites occupied by PLEL generally have layered rock substrates 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 deep enough to retreat into environmental conditions warrant. During periods of surface activity this species may occasionally be found under bark or logs in association with surface rock. Surveyor training is needed to recognize the range of habitat conditions suitable for this species.

SURVEY PARAMETERS

Triggers

Survey triggers identify when surveying is needed for this species. Triggers are land management activities or proposed projects that result in surveys because they may adversely affect these animals or their habitats.

Trigger Criteria--Surveys for PLEL are triggered when the proposed activity:

- 1. is within the range of the Northwest Forest Plan, and**
- 2. is within the Survey Zone for the species, and**
- 3. is in an area in which there is suitable habitat for the species, and**
- 4. may affect animals directly or indirectly by degrading (altering) habitat.**

Ground-disturbing activities, in addition to some other types of forest management practices and land uses, could severely compromise these animals, which occur in the surface layer of forest substrates. Adverse effects on surface microhabitats are the specific concern. Surface microhabitat conditions important for these plethodontid salamanders include the three-dimensional physical structure of the substrate and surface cover features, and microclimate

(e.g., temperature/moisture regime). Concerns for management include maintenance of the integrity of substrate interstices, and cool, moist surface regimes. Proposed management activities that degrade these habitat elements are triggers.

Activities with little or no ground-disturbance may affect microhabitats, microclimates, and the animals. For example, forest canopy removal by aerial techniques may affect forest floor microclimates. Chemical applications may affect animals directly by creating inhospitable habitats. Some chemical applications (e.g., pesticides) may affect amphibians indirectly by impacting their prey-base.

Trigger Decision Process - Land management activities should be evaluated on a case-by-case basis as to whether or not they represent triggers. The above four criteria should be evaluated to make this management decision. Site managers are expected to have the greatest discretion with regard to the last criterion, "does the proposed project adversely affect the habitat conditions for PLEL, or the animals themselves?" Site conditions or project implementation may affect whether a particular activity is a trigger.

Activities that May Not Trigger Surveys--Surveys may not be triggered for activities that are determined to have low potential to effect this species or its habitat. This may include activities that do not adversely affect: 1) integrity of surface/subsurface interstices, 2) surface cover features that may be important refugia, and 3) the microclimatic regime in likely habitat. A change in habitat is not necessarily an adverse effect on habitat, and this distinction should be evaluated. Direct and indirect effects on the animals and their habitats should be considered. Thus, not all ground disturbing activities may trigger surveys in potential habitat. For example, 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.

Specific examples of triggers and non-triggers include:

- A. Most proposed timber management activities, including thinning, regeneration harvest and salvage would trigger surveys. These activities will likely affect habitat through the reduction of canopy and high levels of substrate disturbance.
- B. Road construction or reconstruction would trigger surveys, routine road maintenance would 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.
- C. Recreational development, such as campground creation or expansion would trigger surveys, routine maintenance would not trigger surveys. Development or expansion of

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recreational sites can involve overstory reduction and substrate disturbance, while maintenance only involves work in previously disturbed sites.

- 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 (1 June - Sept. 30). Existing quarries are highly disturbed sites and are usually occupied 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 30 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 reduction of fuel loads and to remove slash after felling operations would not trigger surveys if burning was conducted with a cool under-burn, such that 50% of the duff layer, most large woody debris would be left intact, and there was no net loss of canopy. This species has evolved with fire and fire effects do not generally extend into the substrate. Some individuals active at the surface may be directly impacted, this is reduced by burning in late spring and summer. Creation of tractor lines is not proposed as a fire exemption.
- 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 less than 30 years old 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 PLEL habitat.
- J. Seeding of native species of grasses or plants would not trigger surveys. This type of activity has low potential to disturb PLEL habitat.

- K. Construction or reconstruction of fences would not trigger surveys unless the construction would lead to increased disturbance within PLEL 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 PLEL substrate. Surveys would not be triggered for removal of forest products such as mushrooms, bear grass, fir boughs, and Christmas trees because of the low potential for disturbance to PLEL 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 PLEL 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 PLEL habitat.

The above list of examples is not an exhaustive list. If a special case arises and the survey procedures do not appear applicable, full documentation should accompany management decisions.

Adjacent Area Surveys

Adjacent area surveys are needed if potential habitat is identified next to a project and the proposed project could result in degradation of the microhabitat and microclimate conditions for salamanders in those adjacent areas. Surveys of areas adjacent to proposed site-disturbing activities should be considered on a case-by-case basis. Depending on site conditions and potential effects to habitat and microclimate, there is discretion when determining the width of adjacent area to survey. Effects on microclimates (e.g., edge effects, Chen et al. 1995), microhabitats, and slope stability should be considered. Recommended distances for adjacent area surveys are provided in Table V.1. The adjacent area widths are cross-referenced to the management recommendations for the species so that the survey area matches to the corresponding management recommendations in the companion management document (Olson 1999). A qualitative analysis should be conducted and documentation of the decision should be provided (see also Chapter 1).

Justification for not surveying in adjacent areas may be considered under circumstances that are not expected to affect potential PLEL 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 proposed 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).

Table V.1: Adjacent Area Survey Width Recommendations (Chen et al. 1995).

Management Activity	Disturbance Parameters	Disturbance Intensity	Recommended Adjacent Area for Survey *
Trail construction	Tread 0.6-1.3m, linear disturbance only	Low	0m, survey trail route only
Road	Roadbed 2.5-5.2m	Moderate	10-30m on either side of road center line
Timber Harvest	Thinning >70% retention	Moderate	0-60m, depending on site conditions
Timber Harvest	Thinning <70% retention	Moderate-high	0-120m, depending on site conditions
Timber Harvest	Regeneration harvest, 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 suggested guidelines and site-specific conditions will determine actual adjacent area survey widths.**

Examples of projects that trigger and do not trigger adjacent area surveys are:

1. Regeneration timber harvest and most forest density management projects would trigger adjacent area surveys. These projects could degrade habitat in adjacent areas through microclimate edge effects and potential loss of substrate integrity.

2. Road construction and reconstruction may trigger adjacent area surveys. These projects may degrade habitat in adjacent areas through microclimate edge effects and substrate integrity effects.
3. Recreational development, such as campground development or expansion may trigger adjacent area surveys. These projects may degrade habitat in adjacent areas through reduction of surface cover from firewood collection, increased disturbance to habitat due to dispersed recreation activities, and microclimate edge effects if canopy is removed.
4. Trail construction would likely not trigger adjacent area surveys. If canopy is not to be removed for creation of the trail, microclimate would not be effected.

Site Location

Survey Zone--The entire geographic area where surveys are required for PLEL is termed the Survey Zone (Figure V.1). It includes the known range and a bordering area of 25 miles radius from the edge of the known range, except in the PLST/PLEL shared area in California and PLST/PLEL contact zone in Oregon (see below, Figures V.1 and V.2). This shared area arises as a result of extensive federal surveys since 1993. Further adjustments to the survey zone boundary may be made annually as new information on the actual range of the species becomes available. The edges of the range for PLEL have not been fully mapped and may change as surveys increase the number of known sites.

In California, in the Klamath River area of contact between the two species, PLST and PLEL, there will be a "shared" Survey Zone (Figure V.1 and V.2). Within this Zone, surveys are to be conducted only until one of the two species is detected. Whichever species is detected first will determine management guidelines. 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.

In Oregon, along the PLST/PLEL contact zone, the eastern PLEL Survey Zone boundary is also the westward Survey Zone boundary of PLST (Chapter IV). This portion of 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.

Survey Area--Within the Survey Zone boundaries, the Survey Area includes PLEL 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 V.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 surveyed for PLEL should include appropriate habitat in the form of surface and subsurface rock. Sites occupied by PLEL generally have layered rock substrates with at least some cobble-sized rock that serve as cover objects. Discrete pockets of habitat that are greater than 75m apart (edge-to-edge with no intervening habitat) should be considered separate and would require separate surveys. If sites are within 75m of each other, they can be considered to be part of the same survey.

Survey Timing

Seasons--Surveying for animals must occur during the appropriate months: generally late fall through late spring. This time period includes the fall and spring rainy seasons (see below). Spring usually offers a longer period of time with appropriate conditions for surveying, this is the preferred survey season. Areas of high elevation (generally above 5,000 ft, 1524 m) may not be free of snow late spring 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 site visit must be conducted during appropriate microclimatic conditions in the spring.

Intervals Between Site Visits--Site visits must be separated by at least 10 days. Preferably, site visits will occur at least every 10 days, although weather events may cause longer periods to pass between site visits. With this interval, it is 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 to be a minimum of four person-hours per ten acres of suitable PLEL habitat. As an example, a twenty acre area of habitat would require 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 PLEL are highly dependent on local environmental factors such as relative humidity and temperature. These factors must be taken into careful consideration in determining when to survey for these animals. The following conditions must be met before surveying may proceed:

Air Conditions-- The air temperature and relative humidity must meet the following criteria. Relative humidity must be a minimum of 45%. At potential sites surveyed for PLEL, the air temperature must fall between 4.5-25 °C (L. Ollivier, pers. obs.). In addition, freezing temperatures cannot 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 PLEL have been somewhat surface-active after light freezes (approximately -2 °C on the night prior to survey). 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 moisture must meet the following constraints. The soil temperature, taken 10 cm below the surface, must fall between 4.5-20°C. As a qualitative measure of soil moisture, soil below the first layer of rock within the area being searched must be moist to the touch. The substrate below the first layer of rock within the area to be 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 site visit 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

subdrainage and at or near the elevation 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 can be sought to verify the identity of the animal.

SURVEY PROTOCOL

General Guidelines

For all surveys conducted for PLEL, 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 protocol 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 PLEL capture.
- d. All of the surveying is done in a walk and turn [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 of the rock substrate (e.g., rock on rock or downed woody debris on rock) or may be interspersed (e.g., rock mixed with soil or leaf litter). For this protocol the "surface" is generally considered to be within the upper 30 cm of the top of the substrate. Search under moss mats and leaf litter often found covering rock substrates in addition to the first layer of rock.
- 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 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. 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, talus, 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 PLEL populations. Soil type maps may also enable one to narrow the search area somewhat by keying in on specific soil types with high percentages of gravel and cobble substrates.

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 activity area to locate areas containing surface rock. Place plot center in the center of the area with the greatest concentration of surface and subsurface rock 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 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 of these patches of suitable habitat should be surveyed for occupancy.

Data Form Completion (see Appendix V.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 searching): 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 above. If soil and substrate conditions are not within

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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 humidity (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 relative humidity (also canopy closure, see below).

- Measures:
- Surface temperature (°C) measured 10 cm below surface.
 - Soil moisture: dry by touch or 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 V.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 (TCS)

Begin searching by hand anywhere in the patch of habitat. Turn all cover objects, carefully lift moss mats, and sift leaf litter as you systematically move around the area. Expand searching across the patch of habitat using a search pattern that thoroughly covers all of the suitable habitat in the patch. One possible pattern is to search in concentric circles from the plot center (Welsh 1987). 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 away along their designated search path, 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 the time each observer spends searching.

If animals are captured record the following information:

- a. **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 the 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 the original capture location as possible. While searching, attempt to return rocks and other large cover objects back to original positions. Replace moss mats, where possible. When an individual PLEL is found, searching can be stopped (record time), "presence" is designated, the entire habitat patch is designated occupied (see below), and the habitat becomes a known site and is entered into the known site database.

Site Delineation

Once PLEL is detected, the first detection location will become the "site" for the Known Site Database (i.e. point locality). To delineate a PLEL site for known site management, all suitable surface rock habitat, as determined by a qualified biologist, that is contiguous with an occupied site should be considered occupied. The full extent of the occupied suitable habitat should be identified and managed as described in the Management Recommendations (Olson 1999). If patches of suitable habitat are separated by no more than 75 meters, then the additional patches should also be considered occupied. If there is doubt as to the occupancy status of suitable habitat near a known site, survey the site using this same survey protocol. This may include contiguous rocky habitats. Unoccupied habitats may be identified by additional surveys to further delineate sites. The potential ecological value of contiguous but possibly currently unoccupied habitat (in regard to 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 sampling and survey zone adjustments in subsequent years. It is recommended that PLEL survey and management procedures be reviewed at regular intervals. During reviews, 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 population 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 PLEL 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 macrohabitat 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 searches 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 are 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 the best time to survey is late fall to late spring, and spring is preferred, it may be possible to encounter PLEL outside of this time-window if conditions are conducive.

Searching During Marginal Conditions-- The need for good environmental conditions has been stressed for protocol surveys, but it is possible to find the target species when conditions are marginal (however, fewer PLEL 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 II 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.**

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Welsh, Hartwell H., Jr.; Lind, A.H, 1995. Habitat correlates of the Del Norte salamander, *Plethodon elongatus* (Caudata: Plethodontidae), in northwestern California. J. Herpetology. 29(2): 198-210.

Figure V.1 Known distribution of the Del Norte salamander. The heavy line represents the combined Del Norte/Siskiyou Mountains salamander survey zone. The survey zone was created using data available through 1998.

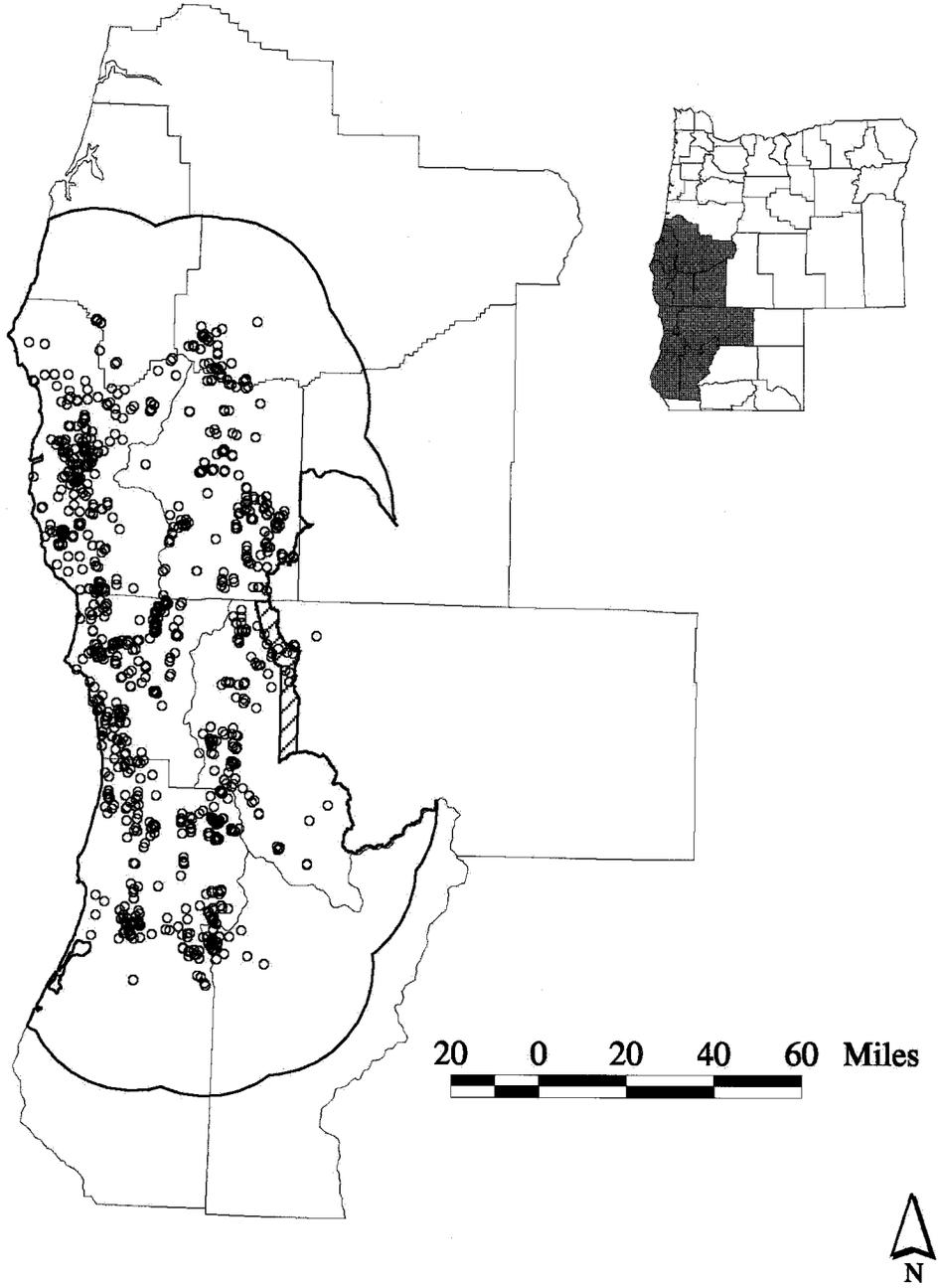


Figure V.2. Known sites of Siskiyou Mountains and Del Norte salamanders with species survey zones (heavy line) and combined species survey zone (cross hatching).

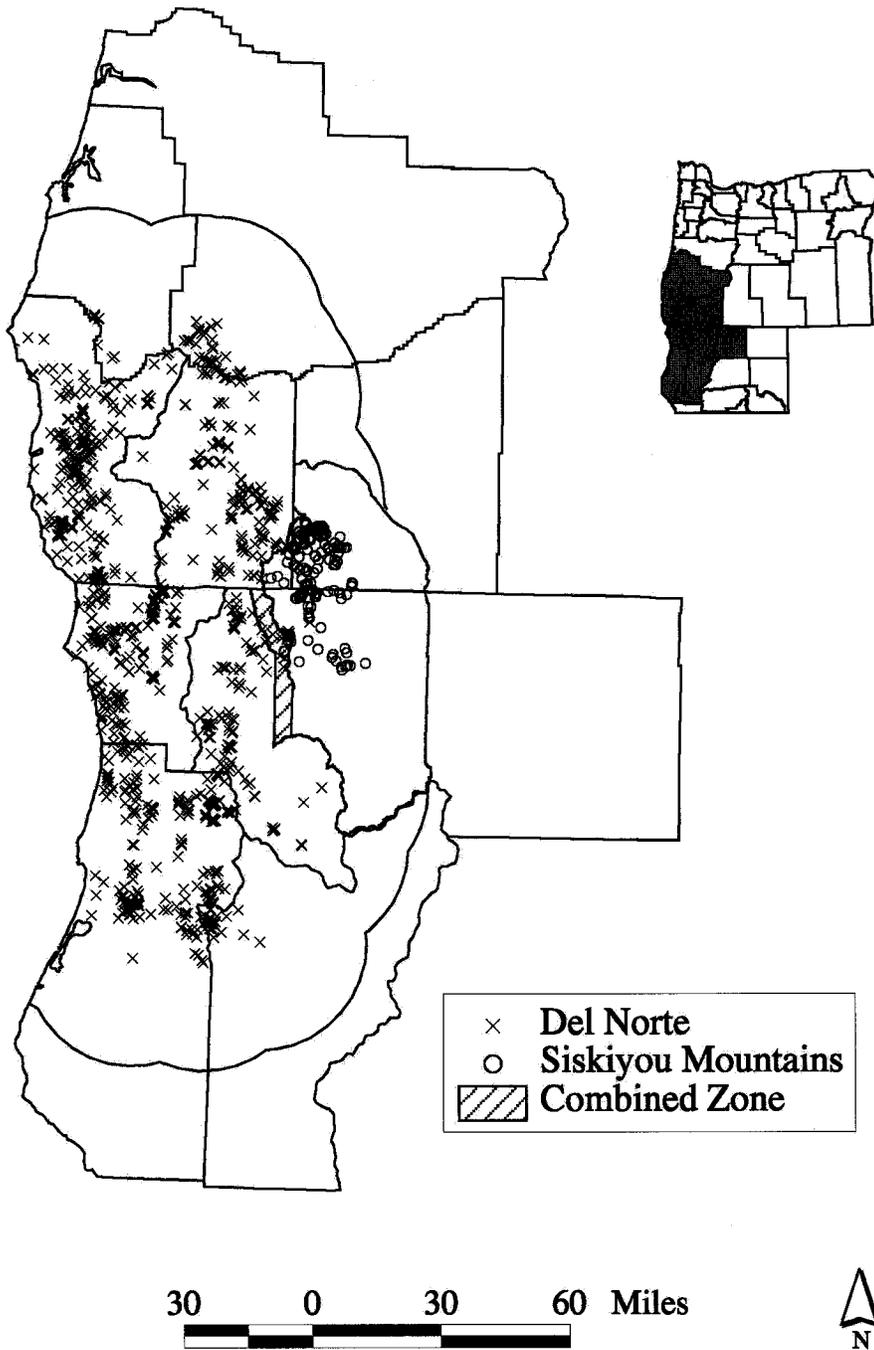
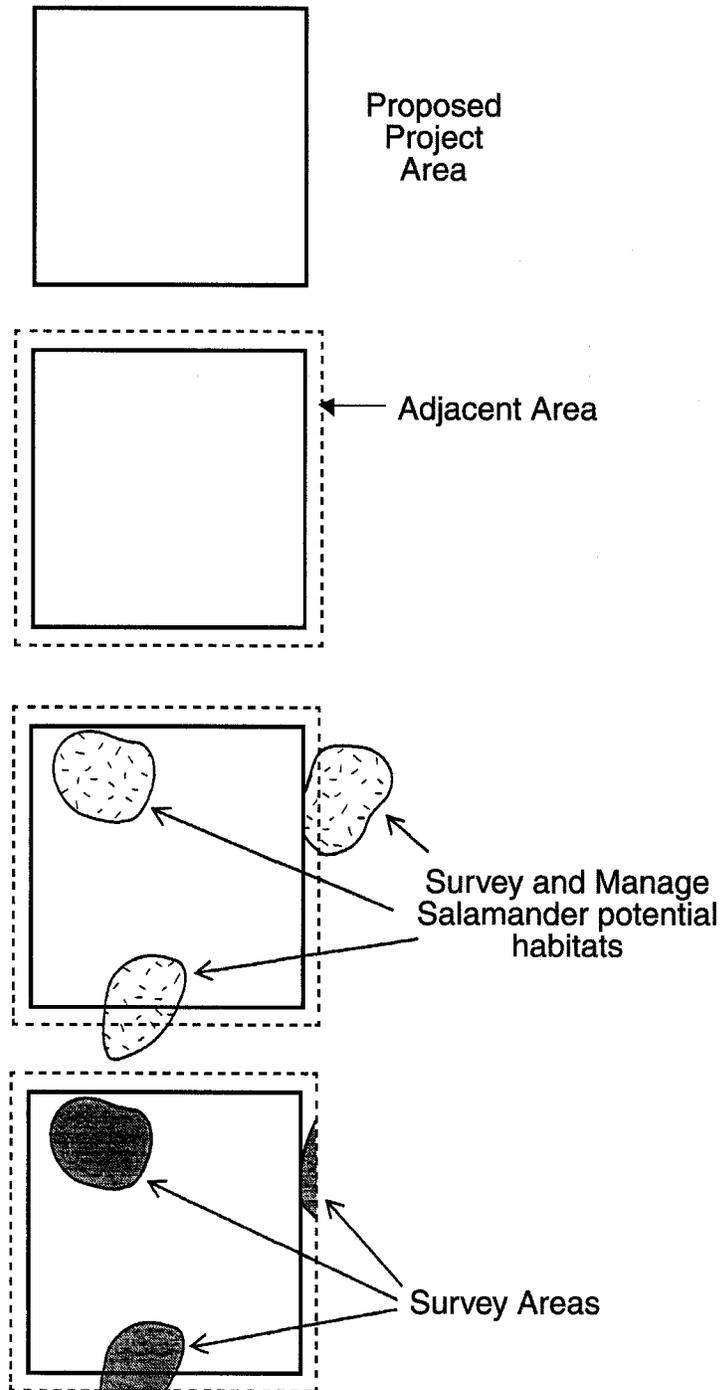


Figure V.3. Delineating the survey area. the adjacent area shown may vary in width (Table V.1).



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Plate V.1 Adult Del Norte salamander (*Plethodon elongatus*) (Photo by William P. Leonard).

Plate V.2 Adult Del Norte salamander (Photo by William P. Leonard).

Plate V.3 Del Norte salamander habitat (Photo by Lisa Ollivier).

Plate V.4 Del Norte salamander habitat - rock mixed with and covered by leaf litter (Photo by Lisa Ollivier).

Plate V.5 Del Norte salamander habitat (Photo by Lisa Ollivier).

Plate V.6. Del Norte salamander habitat. Close-up of habitat shown in Plate V.4. Interstitial spaces between rock filled by leaf litter and detritus. (Photo by L. Ollivier).



Plate V.1



Plate V.2



Plate V.3



Plate V.4



Plate V.5



Plate V.6

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Appendix V.1: 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	_____	_____	_____	_____	_____	Average Across Soil Stations
S	_____	_____	_____	_____	_____	
E	_____	_____	_____	_____	_____	
W	_____	_____	_____	_____	_____	
Average X 1.04	_____	_____	_____	_____	_____	

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

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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. Rrecord 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) Air Temp Relative Humidity
 Clear / Partly Cloudy / Very Cloudy (°C) Wet bulb Dry bulb %
 Start _____
Wind (circle one) Middle _____
 None / Light / Moderate / Strong End _____

Moisture (circle one) Froze last night? (circle one)
 Dry / Foggy / Intermittent Rain / Light Rain / Heavy Rain Yes No Unknown

	Station Number					Average
	1	2	3	4	5	
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
					6 = soil
			Total minutes:	_____	

DETECTIONS (Mandatory)

Species	Stage	Cover	Object	Substrate	Species	Stage	Cover	Object	Substrate
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

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