A SURVEY OF THE NEZ PERCE NATIONAL FOREST FOR THE COEUR D'ALENE SALAMANDER (PLETHODON IDAHOENSIS).

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ABSTRACT

During May and September of 1990, I conducted a field survey to document the distribution of the Coeur d'Alene Salamander (Plethodon idahoensis on the Nez Perce National Forest. I visited historically recorded localities along the Selway River and Meadow Creek, and searched for additional populations in the drainages of the Selway and South Fork Clearwater Rivers. I was not able to find salamanders outside the Selway River drainage despite repeated searches, and such repeated visits were necessary to locate salamanders at most successfully searched localities. I could not find P. idahoensis at Selway historical localities adjacent to Glover Creek and 1.0 mile W. of Glover Creek. I found the salamander in seven new places, one on Meadow Creek, and six on the Selway River.

Regional difficulty in finding salamanders is attributable to suboptimal weather during my surveys and to the possibility of small or well¯dispersed salamander populations. That repeated searches were required to find the salamander illustrates the importance of such repeated efforts in surveying for E. idahoensis. My results suggest that this species may be more widespread in the Selway drainage than assumed previously, and make it difficult to discount the possibility that the salamander occurs in the South Fork Clearwater drainage. The South Fork drainage, however, appears to receive so little precipitation that it may be outside the climatic range favored by P. idahoensis.

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STATEMENT OF PROBLEM

The Coeur d'Alene Salamander (Plethodon idahoensis) (Collins 1990) is the only lungless salamander (plethodontidae) known from the northern Rocky Mountains (Nussbaum et al. 1983). This unique amphibian is classified as a Species of Special Concern by the Idaho Department of Fish and Game, and as a Sensitive Species by both the Idaho office of the Bureau of Land Management and the U. S. Forest Service in Region 1 (Groves 1988).

Plethodon idahoensis is potentially sensitive to environmental disturbances brought about by highway construction, stream diversion, and modern forestry practices. The intensity of these disturbances in areas inhabited by E. idahoensis is bound to increase in the future, given the inevitable increase in our region's human population. To assure our ability to recognize reductions in the salamander's numbers and identify any causal factors, it is therefore important that the salamander's occurrence now be documented as completely as possible.

Initial statewide surveys (Groves 1988, Wilson and Simon 1987) did much to elucidate the salamander's distribution and habitat associations but were necessarily cursory given the large geographic area in study, the inaccessibility of many regions potentially inhabited by the salamander, and the difficulty of encountering extant colonies of an animal as secretive as P. idahoensis. Subsequent surveys (Groves 1989, Groves and Cassirer 1989, Wilson and Simon 1988) were needed to fill gaps between known localities. These also revealed the likely eastern and western extent of the salamander in Montana and Idaho. The present study is a continuation of these recent efforts and has involved an intensive field survey for E. idahoensis, at the southern end of its range in the Nez Perce National Forest.

BACKGROUND

Plethodon idahoensis occurs in forested, mountainous regions on either side of the Idaho-Montana border from just north of the Canadian boundary south through the Selway River drainage. In Idaho, it is most readily encountered in the drainages of the St. Joe and North Fork of the Clearwater Rivers. In Montana and British Columbia, appears concentrated in the Kootenai River drainage (Wilson et al., in review; Holmberg et al. 1984).

The salamander was first encountered on the Nez Perce National Forest by James E. Lynch, Jr. in 1979 (Lynch 1984, pers. comm.). Lynch's earliest collections were on the north bank of the Selway River, between Cache Creek and Gedney Creek. Groves (1988) cited these collection sites as adjacent to Glover Creek, one mile west of Glover Creek, 1.5 miles west of Glover Creek, and 3.5 miles west of Glover Creek. In 1986, Lynch also found the salamander at the base of a falls on Cascade Creek, 10 miles upstream on the Selway from Race Creek Campground. In all, Lynch's Nez Perce National Forest searches have included various streams on the north side of the Selway River from Three Links Creek to Lowell, streams crossing Trail 343 between Big Fog Mountain and Parsons Lake, Gedney Creek up to 3 miles from its confluence with the Selway, and Meadow Creek up to 8 miles from its confluence with the Selway (Lynch 1984a). Lynch visited every known P. idahoensis locality during his graduate studies at the University of Idaho, and characterized his collection sites along the Selway as the most xeric he ever encountered. He also found these areas seasonally unproductive in his searches (Lynch 1990, pers. comm.).

Diller and Wallace (1985) unsuccessfully searched the upper Selway River, and concluded that much of this drainage is likely too dry to support populations of P. idahoensis. Groves surveyed the Middle and South Forks of the Clearwater River in 1987, also encountering dry conditions that prevented him from finding salamanders at the historical Selway localities (Groves 1988). Until early spring 1989, when Groves (Groves and Cassirer 1989) found a single P. idahoensis in a seepage near Little Creek in the Meadow Creek drainage, it appeared that the Selway River basin contained the southernmost localities in Idaho. Groves' discovery prompted speculation that the southern

Nez Perce National Forest, which has been incompletely surveyed, herpetologically, might contain additional P. idahoensis populations. The purpose of this study has been to explore this possibility, with the southernmost searches centered along Meadow Creek and in the drainage of the South Fork Clearwater River. In addition, I have attempted to document more completely the distribution of the salamander in the Selway River drainage.

METHODS

I performed fieldwork during May and September of 1990, hoping to take advantage of cool, moist weather conducive to the salamander's surface activity (Lynch 1984b; Wilson and Larsen 1988). I visited all previously reported P. idahoensis localities on the Nez Perce National Forest. To find new localities I surveyed by driving and hiking, looking for sites to search actively for salamanders. Experience has shown that P. idahoensis can be seasonally difficult to find, even at established localities (Wilson and Simon 1988). For this reason, I repeatedly visited and searched areas in which I found no salamanders in my initial surveys. During surveys, I searched obviously and potentially moist sites as I encountered them. These included streamsides, seepages, talus, alluvial deposits, and forest floors (Appendix 1).
I searched with a flashlight at night when possible. My day-searching methods involved digging, raking litter and bryophyte mat, displacing wood and rocky material, and prying fractured rock. The duration of a search depended upon the areal extent of moist substrates in a site. Night-searches of small seepages were as short as 10 minutes; searches along streams typically lasted 30 to 40 minutes. Voucher specimens collected during this survey are being used in behavior experiments in the laboratory at the Zoology Department, Washington State University (WSU), and will eventually be deposited in the Conner

At each locality, I collected information to be deposited in the Idaho Natural Heritage Program database. This information included the types of moisture sources and refuges used by salamanders; site aspect, measured with a magnetic compass; overhead cover, estimated with a spherical densiometer (Lemmon 1956); and slope, measured with a clinometer. I obtained site elevations from U. S. Geological Survey topographic maps.

RESULTS

I was not able to find salamanders outside the Selway River/Meadow Creek drainages despite repeated searches, and such repeated visits were necessary to locate salamanders at most successfully searched localities (Figure 1, Appendix 1). I could not find E. idahoensis at the Selway River historical localities adjacent to Glover Creek and 1.0 mile W. of Glover Creek. I found the salamander in seven new places described below:

Twentymile Bar

Salamander found amidst rock fragments in a seepage on a roadcut. N. side of Road 223, 0.2 mi E. of milepost 9. Elevation is 1600 ft. USGS Quad: Stillman Point 7.5 min. In Sect. 28; T32N, R8E. 46°, 5', 10" N; 115°, 28', 40" W (Figure 2A).

Site is a fracture seepage with an aspect of 1240 at the base of a 10 m high rockface. Deep colluvium and fractures likely provide shelter for resident salamanders. Rocky substrates extend along 25 m of roadway. The rockface breaks a 500 slope sparsely forested in Pseudotsuga menziesii and Thuia plicata. Within the seepage there is a 68% overhead cover from the rockface, Pseudotsuga, Thula, and Betula. Water from the seepage fills a ditch along the roadside and percolates to the Selway River below. There was little change in the amount of water in this pool during the summer, but the site was mostly dry by Sept.

I visited the site at night on 22 May and 24 Sept., and during the day on 30 May and 1 June (Appendix 1; 8). I found one immature salamander near the top of the colluvium on 1 June.

Cache Creek

Salamander found amidst cobbles along a creek 100 m N. of Road 223. Elevation is 1680 ft. U. S. G. S. Quad: Stillman Point 7.5 min. In Sect. 25; T32N, R8E. 46°, 4', 40" N; 115°, 23', 29" W (Figure 2C).

Cache Creek at the capture site runs along a 150 bench forested primarily in Thuja olicata. The creek is a perennial, cascading stream with bryophyte covered cobbles,, Massed rock fragments that comprise the bench likely provide the primary local underground shelter for salamanders. Site aspect is 2260; a 90% overhead cover is provided primarily by tree canopy. I visited this site once during the day on 30 Sept. and found a single immature salamander (Appendix 1; 11).

Unnamed Creek 1.

Salamander found amidst rock fragments in the bed of an intermittent creek 400 m It. Of its crossing with Road 223. This creek is the first one encountered on Road 223 E. of Twentyfive Mile Bar. Elevation is 1720 ft. U. S. G. S. Quad: Selway Falls 7.5 min. In Sect. 32; T32N, R9E. 46°, 4', 26" N; 115^{0}, 22', 30" W (Figure 2F).

Site is at the base of a 3 m high, fractured rockface, which is one of a series along this 39° creekbed. Overhead cover of 78% is provided by the rockface, the steep walls of the creek, and Thuja, plicata. There is much downfall and slash. Aspect is 1700. Colluvium, fractures, and deadfall make up potential retreats for salamanders. Streamflow changed considerably during the study: in May the creek was a series of cascades and falls; by Sept. most surfaces in the creekbed were dry.

I found one immature salamander during the day on 29 Sept. I also day-searched here on 26 May (Appendix 1; 19)

0.2 Mile East of Glover Creek.

Salamander found in a seepage on a roadcut, N. side of Road 223, 0.2 mi E. of Glover Creek. Elevation is 1700 ft. U. S. G. S. Quad: Selway Falls 7.5 min. In Sect. 32; T32N, R9E. 46°, 4', 8" N; 115°, 21', 25" W (Figure 2G).

Site is a 4 m high fracture seepage with aspect of 200^{0}. The rockface breaks a 42° slope sparsely forested in Pseudotsuaa menziesii and Pinus ponderosa. A 92% overhead cover is provided by the rockface; Thuja olicata along the road; and a single Detula, the roots of which cover much of the damp surface in the seepage. Fractures in the rockface provide the most obvious salamander retreats. Water pools at the base of the seepage and percolates to the Selway River below. This was the only heavily flowing fracture seepage along this stretch of Road 223 (Appendix 1; 13, 17, 22, 23) that did not dry substantially during the study.

I visited the site repeatedly at night and observed one subadult salamander on 1 Sept. Other visits were on 22 May, 24 May, 31 May, and 9 Sept.

Falls Creek.

Salamander found under bryophyte mat on cobbles along the stream, 75 m S. of its confluence with the Selway River. Elevation is 1700 ft. USGS. Quad: Selway Falls 7.5 min.

In Sect. 4; T31N, R9E. 46°, 3', 36" N; 115°, 20', 21" W (Figure 2H).

This is a perennial stream that flows along a cobbly, 13° bench forested primarily in Thuja plicata. Site aspect is 17°; tree canopy provides an 83% overhead cover. Cobbles are massed to depths of several m, visible at the creek's mouth; these likely provide shelter to resident salamanders.

I searched the stream once during the day on 30 Sept. and found one immature salamander (Appendix 1; 18).

Unnamed Creek 2.

Salamander found amidst rock fragments in the bed of an' intermittent creek 150 m N. of its crossing with Road 223. Creek is 1.3 mi W. of Gedney Creek. Elevation is 1800 ft. U. S. G. S. Quad: Selway Falls 7.5 min. In Sect. 4; T31N, R9E. 46°, 3', 44· N; 115°, 20', 25" W (Figure 2I).

Site is at the base of a 20 m high fractured rockface in a colluvial pile. Overhead cover of 62% is provided by the steep rockface and by Thula plicata. Aspect is 158°; streambed slope below the rockface is 20^0. Fractures and colluvium likely provide underground shelter for salamanders. Streamflow changed substantially during the study: in May the rockface was covered by a falls; in Sept. it was a damp seepage.

I found one immature salamander here during the day on 29 Sept. also searched here on 26 May and 31 May (Appendix 1; 19).

Unnamed Creek 3.

Salamander found amidst rock fragments a t the base of a falls 60 m W. of Meadow Creek, 0.9 mi S. of Slim's tamp. Elevation is 1840 ft. U. . G. S. Quad: Selway Falls 7.5 mina In Sect. 24; T31N, R9E. 46^0 , 1', 9" N; 115°, 17', 14" W (Figure 3A).

Site is on a perennial stream with *a* falls over a 20 m high fractured rockface. Water pools at the base of the rockface and a shallow cave is undercut into the rock. There is considerable bryophyte mat on rock surfaces and on downfall in the stream. An 86% overhead cover is provided by the rockface as well as Thuia plicata and Tsuga heterophvlla. Aspect is 160°; the rockface breaks *a* slope of 40°. Fractures and colluvium likely provide the main underground shelter for salamanders.

I searched this area during the day on 9 Sept when I found one immature salamander on the north side of the pool. I also searched here unsuccessfully on 29 Sept. (Appendix 1; 40)

Unnamed Creek 4.

Salamander found amidst rock fragments on the floor of a cave just E. of Trail 726, S. of Little Creek between 3 and 4 mileposts. Elevation is 2600 ft. U. S. G. S. Quad: Anderson Butte 7.5 min. In Sect. 36, T31N, R10E. 45°, 58', 57" N; 115°, 16', 55" W (Figure 3B). Site is a cave formed by a large boulder in this intermittent stream's bed. The stream flows down a 43^0 slope with a 278^0 aspect. Above the trail in the area of the cave is an open area with sparse Pseudotsuga menziesii. Thula plicata grows along the stream's margins. Overhead cover is 66%. The cave has a floor of 9 m^2, heavily covered with small rock fragments and bryophyte. Fractures are likely shelter for resident salamanders. Water levels dropped substantially during the study. In May there was a wispy

I visited this site on 27 May and 9 Sept., and found one immature salamander on my second visit (Appendix 1; 45).

Groves (1988) provided data on most of the historical localities on the Selway River. For those localities in which I found P. idahoensis, I recorded the following additional information.

3.5 Miles West of Glover Creek

Salamander found amidst rock fragments along a roadcut N. of Road 223 (Figure 2B). Site is a colluvial pile 3 m high extending along 50 m of roadway. Fractured bedrock is exposed in the roadcut, which breaks a 50^0 slope sparsely forested in Pseudotsuga menziesii. Thuia plicata

grows along the banks of the Selway River in this vicinity. Overhead cover is 52%; aspect is 188^0. Fractures and colluvium provide underground shelter. This site was damp with groundwater in May, but was superficially dry by Sept.

I found an immature salamander while digging deeply in damp talus here during he day on 30 Sept. I also day-searched the site on 1 June and night-searched it on 22 May (Appendix 1; 10).

1.5 Miles West of Glover Creek**.**

Salamanders found amidst rock fragments along a roadcut N. of Road 223 (Figure 2d). Site i s a 10 m high roadcut that breaks a 50^0 slope sparsely forested in Pinus ponderosa and Pseudotsuga menziesii. The site appears slumped, with much-fractured rockface covered with

soil and colluvium extending along 30 m of roadway. Thuja plicata grows to the W. Overhead cover is 56%; aspect is 230^0. Fractures and colluvium provide underground shelter. Groundwater was apparent here during May and Sept., pooling along 10 m of roadway. However, the site was mostly dry by Sept.

I observed what I thought was a fleeing P. idahoensis while digging here on the night of 31 May, and collected a subadult during the day on 1 June. I also night-searched the site on 22 May, 24 May, and 29 Sept. (Appendix 1; 12).

Cascade Creek.

Salamander found under a rock at the base of a falls 100 m above Trail 4, 10 mi E. of Race Creek Campground (Figure 2J). Site is at the base of a 30 m falls that breaks a 25° creekbed. Aspect is 125°. The surrounding hills are fairly open with few Pinus ponderosa,. Thuja olicata grows near the Selway River 150 m distant. The site's 53% overhead cover is provided by the rockface of the falls, and by Betula in the stream. Fractures and colluvium provide underground shelter. I found one subadult salamander here on 17 Sept. under the first rock I lifted. I found no more in a 1 hr search in the fall's spray zone and along the stream below (Appendix 1; 34).

I am not certain as to the exact locations of the historical (localities 1.0 mile W. of Glover Creek and adjacent to Glover Creek (Figure 2), but these general areas appear similar to the sites 3.5 and (1.5 miles W. of Glover Creek, with regard to moisture sources and underground shelter. I searched them on 22 May, 31 May, 1 Sept., Sept, and 29 Sept. (Appendix 1; 13, 14).

DISCUSSION

Because their cutaneous respiration requires a moist integument, terrestrial plethodontid salamanders such as Plethodon, idahoensis avoid desiccating situations. In non-tropical regions plethodontids are also intolerant of high temperatures. Their distribution and abundance may therefore be strongly influenced by a combination of microhabitat and broad climatic variables (Feder 1983).

In general, the types of microhabitat I found associated with E. idahoensis in the Selway drainage did not differ from what has been reported previously. Bedrock fractures and interstitial spaces in colluvium are the most commonly reported underground retreats for this species (Groves and Cassirer 1989), and are used by salamanders for daytime shelter, oviposition, and avoidance of regional climatic extremes (Herrington 1988; Wilson et al., in review). Also as I encountered in new Selway localities, all previously reported P. idahoensis collection sites occur near streams or involve surface expressions of groundwater roves 1988, 1989; Groves and Cassirer 1989;Wilson and Simon 1987, 1988). Groves (1988) showed that site aspect and overhead cover may not be important limiting factors to the salamander in Idaho; the Selway drainage sites appear consistent with this finding.

Many Selway localities occur in comparatively arid settings. Cascade Creek, for example, appears surrounded by habitat types in the Pinus ponderosa, series (Cooper et al. 1987). However, I have encountered E. Idahoensis in similar situations in the Kootenai and Clark Fork drainages of Montana (Wilson and Simon 1987). It is conceivable that occupation of such regions is permitted by the salamander's close association with streams and seepages (Wilson and Larsen 1988). These moisture sources may or may not be perennial: localities in the Kootenai and Clark Fork drainages, as well as some along Coeur d'Alene Lake, Idaho, involve intermittent moisture sources similar to those at Selway localities (roves 1989, Wilson and Simon 1988).

Sites that dry superficially during the summer typically occur in areas in which prevalence of standing water, streams, or springs indicates a locally high water table, which itself reflects locally heavy precipitation (Miller 1977). In these sites, the water table may be seasonally tracked by salamanders as it rises above-ground in the spring and fall, and goes underground during our region's annual summer drought (Daubenmire 1969). Many Selway River localities seem to fit this pattern, a factor that appears partly responsible for the difficulty in finding E. idahoensis in them.

One's ability to find E. idahoensis, is correlated with the number of salamanders at or near the surface. This number, even in perennial seepages, is reduced during hot, rainless periods and on nights when substrate temperatures drop toward 40°F (Wilson and Larsen 1988). It is also possible that a low minimum temperature on one night can reduce surface activity on subsequent nights (Groves and Cassirer 1989). Climatic conditions during my searches in the

Selway drainage were, for the most part, less than ideal and this probably contributed to the difficulty I had in locating salamanders. In late May, I worked during rainy nights with minimum temperatures in the low forties that seemed slightly less than optimal and may have been preceded by colder nights. My best luck came at the end of the month after **sustained,** warmer rains. Weather data for September (not available for early May) from the Fenn Ranger Station show that this month on the Selway was mostly dry, with scant precipitation on the seventh and eighth, and little more on the twenty-seventh. Maximum temperatures were in the nineties until the sixteenth. My searches were most successful after the last day of rainfall during a period of maximum temperatures in the eighties, and minimums, somewhat less than ideal, in the low forties.

Groves (1989) speculated that microhabitat type may seasonally effect one's ability to find E. idahoensis, suggesting that streamsides are most productively searched during the fall when water levels are lowest. I found this to be true with the streamsides I examined. Because the courtship of Q. idahoensis is performed above-ground and occurs in the fall (Lynch 1984b), this season may generally be the best time to locate salamanders, provided the weather is favorable. The difficulty I and others have had in finding salamanders in the Selway drainage, plus the fact that new localities can be discovered with repeated efforts, illustrates the importance of such repeated searches in surveying for E. idahoensis, and suggests that this species may be more widespread in the Selway drainage than assumed previously.

Because of the possibility that suboptimal weather effected the number of salamanders I encountered, it is difficult for me to make estimates of population sizes. However, Selway populations appear smaller or, at least, more well dispersed than those on the North Fork Clearwater River. In the latter region, fractured bedding-planes in Belt Precambrian sedimentary rocks may provide more extensive underground shelter than is found on the Selway, which is underlain by granitics, and seem to result in locally more dense salamander populations (Groves and Cassirer 1989 Plilson and Simon 1987).

Metamorphosed Belt rock occurs in the South Fork Clearwater drainage (Cooper et al. 1987) and I searched many bedding-plane fracture seepages in the region. However, weather during my spring and fall surveys was far from optimal. Minimum temperatures throughout these surveys were in the thirties; weather data from the Red River Ranger Station shows no precipitation for September and maximum temperatures into the nineties preceding and during

my field work locally. Although these less than ideal conditions make it difficult to discount the possibility that the salamander occurs in the South Fork Clearwater drainage, they reflect the comparatively severe climate of this region one that is possibly outside the range favored by E. idahoensis.

Plethodon idahoensis is part of a disjunct coastal biota of the Rocky Mountains primarily north of the Salmon River that is sustained by almost coastal levels of precipitation (Daubenmire 1975; Nussbaum et al. 1983). Superimposing the distribution of E. idahoensis (Wilson et al. in review) and precipitation charts (Pacific Northwest River Basins Commission 1969) reveals that virtually all known populations inhabit regions averaging greater than 20 in of precipitation. This minimum appears typical for western plethodons (Ramotnik and Scott 1988; compare Brodie 1971, Nussbaum et al. 1983, and Herrington and Larsen 1985 with Kahrl 1979, and Pacific Northwest River Basins Commission 1969). The South Fork Clearwater River basin presently receives less than 20 in average annual precipitation and was possibly even less moist in recent prehistoric times because of secular warming 6700 yr ago (Daubenmire 1975). A desiccating climate, unsuitable for E. idahoensis may therefore be a long-term characteristic of this drainage.

The relatively xeric climate of the South Fork drainage is reflected in the absence of Western Red Cedar (Thuja plicata) from regions containing my southernmost searches (Cooper et al. 1987). This moisture dependent organism is another element of the disjunct coastal biota and is associated with most known P. idahoensis localities (Wilson and Simon 1987, 1988; Wilson, unpublished data). Although the salamander can reside in fairly dry habitat types (see above), these are typically not far from more moist ones. My impression while working the South Fork drainage was that relatively moist habitat types (e.g., the Pseudotsuca menziesii or Abies arandis series; Cooper et al. 1987) are not abundant until one approaches 5000 ft elevation, the apparent elevational limit of E. idahoensis (Wilson and Simon 1987).

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Figure 1. The distribution of Plethodon idahoensis in the Nez Perce National Forest. Dashed lines denote Nez Perce National Forest boundaries. The closed circles represent all know P. idahoensis localities. Numbers correspond to those n Appendix 1 and represent areas searched.

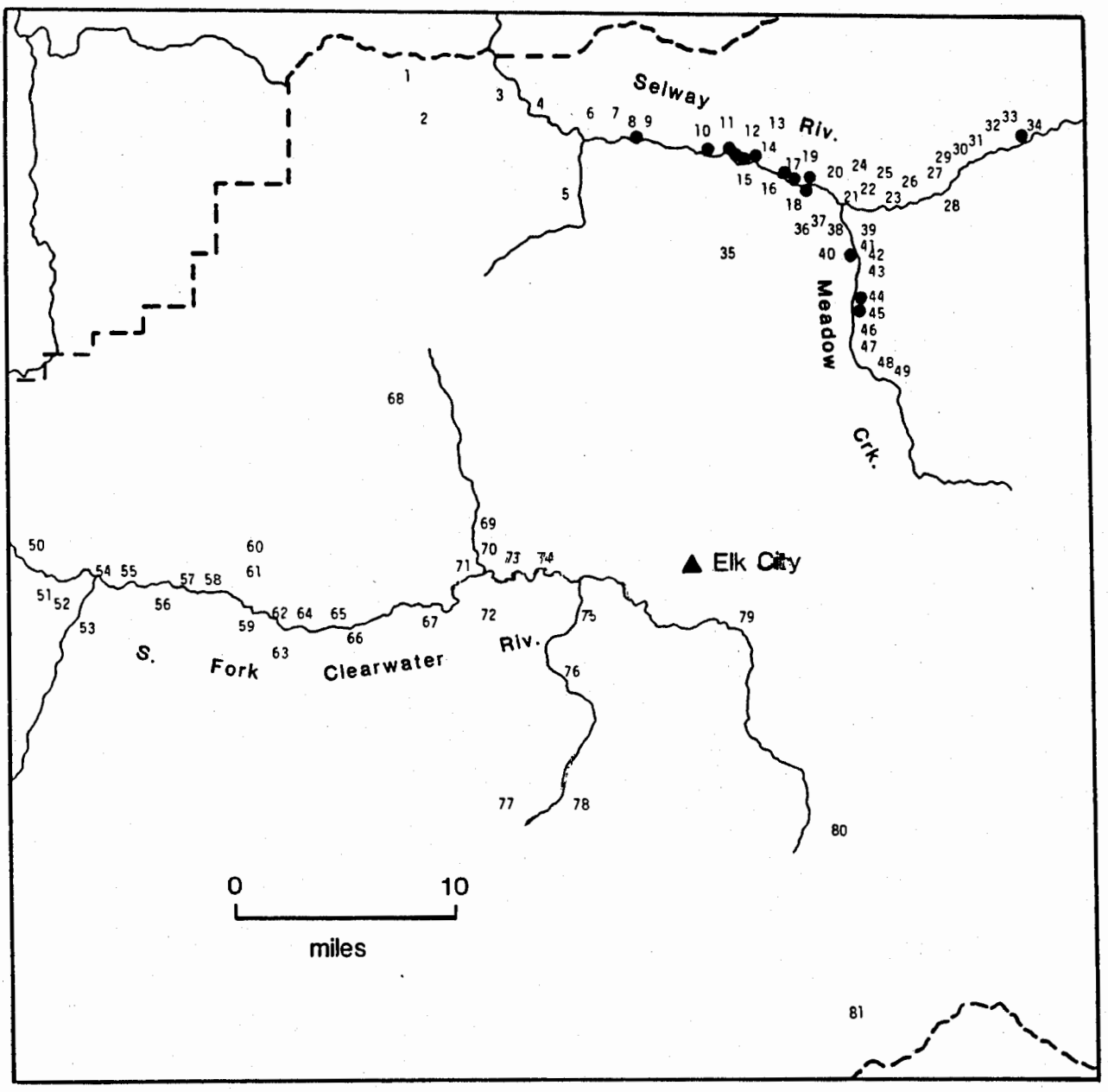
Selway
Riv.
Meadow
Crk.
Elk City
S.
Fork
Clearwater
Riv.
0
10
miles

Figure 1

Figure 2. Plethodon idahoensis localities on the Selway River. Circled letters correspond to new collection sites and successfully searched historic localities discussed in the Results section. Open circles represent historical localities in which P. idahoensis was not encountered. The figure is adapted from U. S. G. S. 7.5 min. topographic maps.

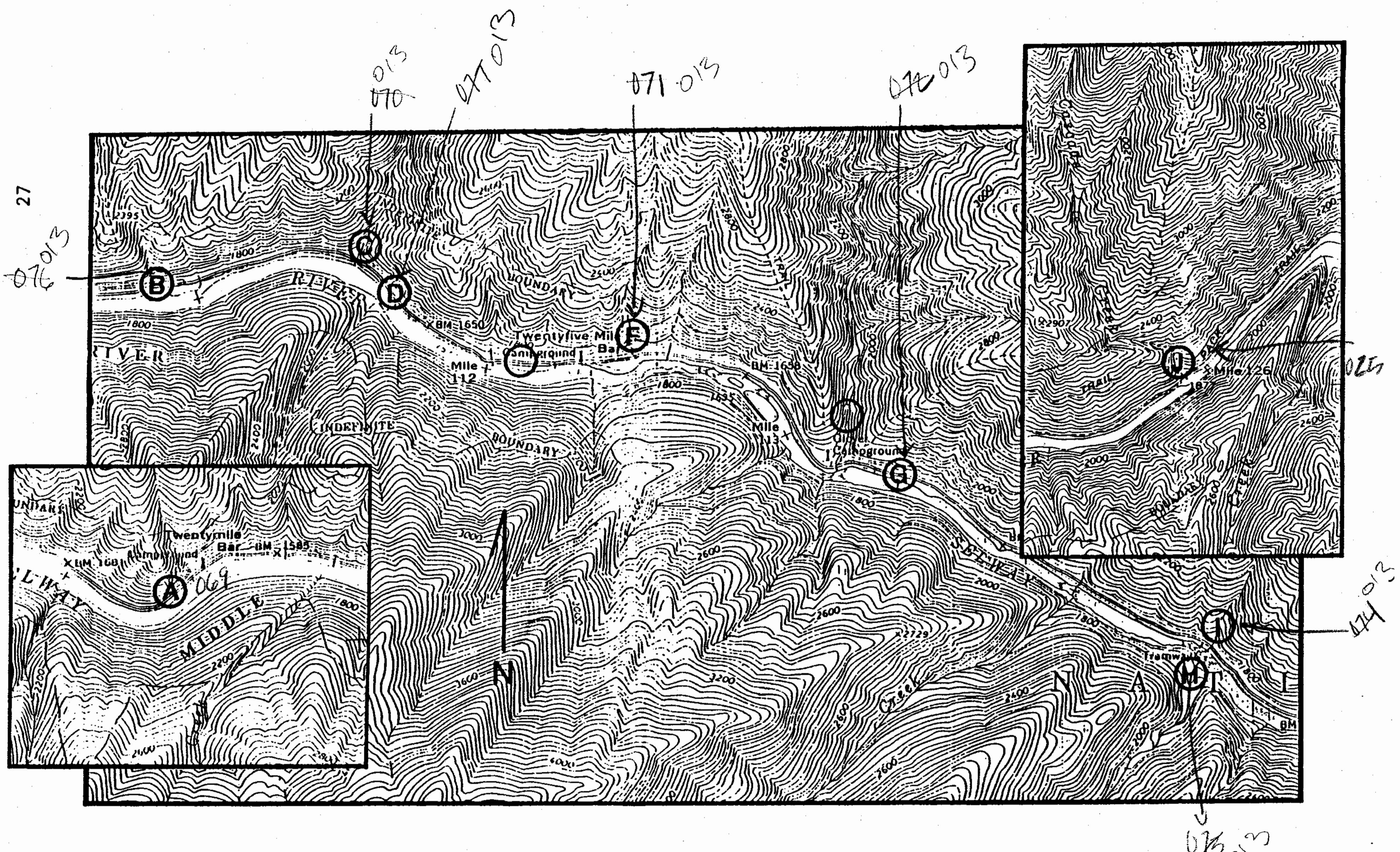
Twentyfive Mile Bar
Campground
Mile 112
BM 1650
BOUNDARY
INDEFINITE
RIVER
Twentymile Bar
Campground
MIDDLE
SELWAY
Mile 113
Old Campground
BM 1638
Mile 126
TRAIL
Creek
Tramway
N
A
B
C
D
F
G
J
M
I

Figure 2

Figure 3. Plethodon idahoensis localities in the Meadow Creek drainage. Circled letters correspond to new collection sites discussed in the Results section. Open circle represents an historical locality in which P. idahoensis was not encountered. The figure is adapted from U. S. G. S. 7.5 min. topographic maps.

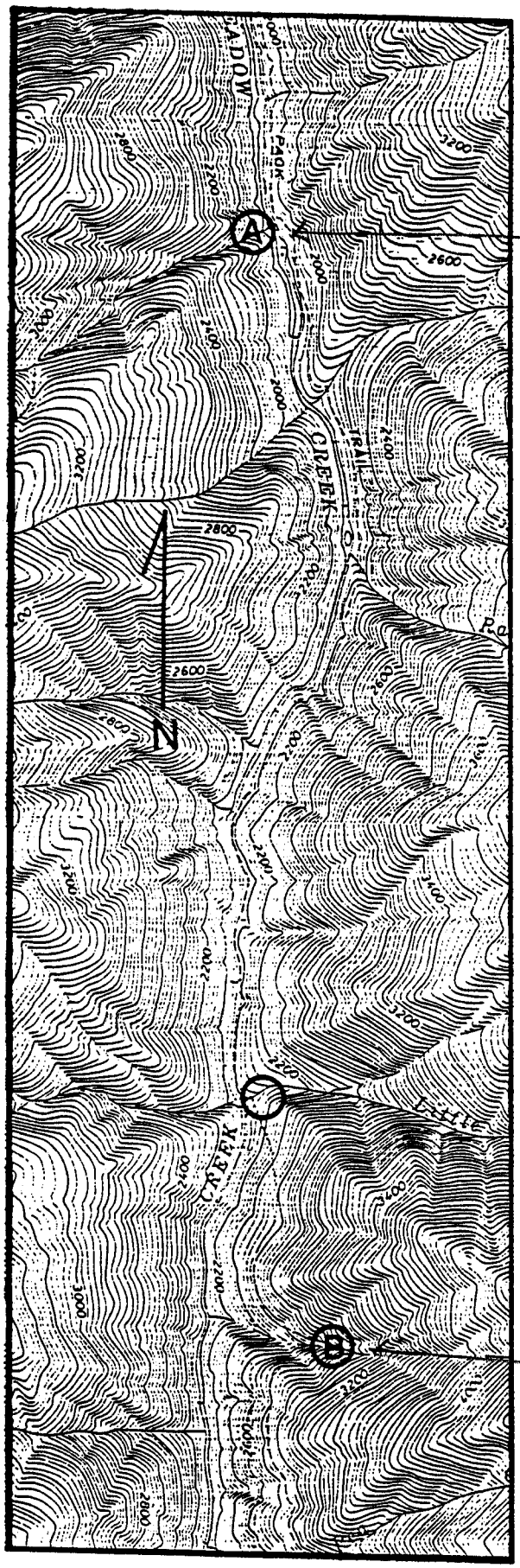

Figure 3

Appendix 1. Areas searched for Plethodon idahoensis, during the 1990 survey. Numbers correspond to those in Figure 1. Visit dates are indicated and (N) denotes at least one night search.

Selway River Drainage:

1. Lodge Creek, S. bank of Selway River, 1.6 mi downstream from Three devils Campground. 29 Sept.

2. Seepages on Road 170, 7.1-9.4 mi from junction with Road 223. 26 May.

3. Creeks and seepages on Road 170, 2.1-9.4 mi from junction with Road 223. 26 May, 29 Sept. (N).

4. Johnson Creek on Road 223. 22, 24 May (N).

5. Creeks and seepages on Road 651, 0.7-4.0 mi from junction with Road 223. 26 May.

6. Rackliff Creek. 30 May.

7. Nineteen Mile Creek. 30 May.

8. Seepage on Road 223, 0.2 mi E. of 9 milepost. 30 May, 1 June, 24 Sept. (N).

9. Slide Creek. 30 May.

10. Talus on Road 223, 3.5 mi W. of Glover Creek. 22, 24, 31 May, 1 June, 30 Sept. (N).

11. Cashe Creek. 30 Sept.

12. Seepage on Road 223. 1.55 mi W. of Glover Creek. 22, 24, 31 May, 1 June, 29 Sept. (N).

13. Seepages on Road 223, between Cache Creek and 17 milepost. 22, 31 May, 1, 29 Sept. (N).

14. Glover Creek. 2 Sept.33.

15. Unnamed creek, S. bank of Selway River across from Glover Creek. 30 Sept.

16. SOB Creek, S. bank of Selway River across from Glover Creek. 30 Sept.

17. Seepages on Road 223, 0.2 and 0.4 mi E. of Glover Creek. 22, 24, 31 May, 1, 9 Sept. (N).

18. Falls Creek, S. bank of Selway River. 30 Sept.

19. Unnamed creeks crossing Road 223 from 0.7 mi W. of Glover Creek to 1.4 mi W. of Gedney Creek. 26, 31 May, 29 Sept.

20. Gedney Creek along Trail 108. 24 May.

21. Boulder field above Road 223, 0.2 mi E. of Gedney Creek. 31 May. (N)

22. Seepages on Road 223 in vicinity of Selway Work Center. 22, 24 May.

23. Seepages on Road 223, 0.2-0.8 mi E. of Meadow Creek Bridge. 24 May. (N)

24. Seepages on Road 319, 0.7-0.2 mi from junction with Road 223. 17 Sept.

25. Race Creek, N. bank of Selway River. 25 May.

26. Packer Creek. 10 Sept.

27. Tepee Creek. 10 Sept.

28. Otter Creek. 10 Sept.

29. Maiden Creek. 16 Sept.

30. Hidden Creek. 16 Sept.

31. Power Creek. 16 Sept.

32. Unnamed creek between Power and Ballinger Creeks. 16 Sept.

33. Seepage on Trail 4 between Ballinger and Cascade Creeks. 16 Sept.

34. Cascade Creek. 17 Sept.

35. Seepage on Road 9720, 0.3 mi from junction with Road 443. 17 Sept.

36. Creeks and Seepages on Road 443 between Falls Point and Selway Falls Campground. 17, 30 Sept.

37. Talus along Road 443, 1 mi S. of Meadow Creek Bridge. 24 May.

38. Unnamed Creek near Selway Falls Campground. 25 May.

39. Seepages on Road 290 between summit and Road 443. 8 Sept. (N).

40. Falls on unnamed creek, W. bank of Meadow Creek, 0.9 mi S. of Slim's Camp. 9, 29 Sept.

41. Seepages on Trail 726 between Squirrel Creek and Slim's Camp. 25 May.

42. Squirrel Creek. 25 May.

43. Rabbit Creek. 25 May.

44. Little Creek and nearby seepages on Trail 726. 23, 25 May, 9, 18, 29 Sept.

45. Unnamed stream on Trail 726, S. of Little Creek between 3 and 4 mileposts. 27 May, 9 Sept.

46. Pea Creek. 27 May, 18 Sept.

47. Reverse Creek. 27 May, 18 Sept.

48. Pell Creek. 27 May, 18 Sept.

49. Indian Hill Creek. 27 May, 18 Sept.

South Fork Clearwater River Drainage:

50. Seepages on Highway 14 between 10 and 13 mileposts. 16 May (N).

51. Grouse Creek, S. bank of South Fork Clearwater River. 24 Sept.

52. Talus along Road 309, 1.2-2.0 mi S. of junction with Highway 14. 17 May.

53. Seepages and creeks on Road 309, 3.0-4.7 mi S. of junction with Highway 14. 16, 17 May, 26 Sept. (N).

54. Meadow Creek. 16 May.

55. Seepage on Highway 14, 0.1 mi E. of Meadow Creek. 16 May, 19, 26 Sept. (N).

56. John's Creek, S. bank of South Fork Clearwater River. Seeps on Trail 407. 20 May.

57. Little Medicine Creek. 17 May.

58. Seepages on Highway 14 between the 21 and 24 mileposts. 16 May, 19 Sept. (N).

59. Huddleson Creek, S. bank of South Fork Clearwater River. 24 Sept.

60. Creeks and seepages on Road 648, 0.5-2.0 mi N. of junction with Road 469. 17 May, 26 Sept.

61. Creeks and seepages on Road 469, 1.0-4.6 mi N. of junction with Highway 14. 17 May, 26 Sept. (N).

62. Silver Creek. 17 May.

63. Talus, S. bank of South Fork Clearwater River, 1.6 mi upstream from Silver Creek. 24 Sept.

64. Surveyor Creek (falls). 21 May, 19, 25 Sept. (N).

65. Droogs Creek (falls). 21 May, 19, 25 Sept. (N).

66. Creeks on Road 1875, 0.2 and 3.6 mi S. of junction with Highway 14. 20 May, 25 Sept.

67. Buckhorn Creek, S. bank of South Fork Clearwater River. 24 Sept.

68. Haysford Creek on Road 1858. 21 May.

69. Creeks on Road 1858, 1.9-4.6 mi N. of junction with Highway 14. 21 May.

70. Seepages on Road 1858, 0-3.9 mi N. of junction with Highway 14. 21 May, 25 Sept. (N).

71. Seepages on Highway 14 between the 37 and 39 mileposts. 20 , 21 May, 19, 25 Sept. (N).

72. Creeks on Road 1110, 2.6-3.5 mi S. of junction with Highway 14. 20 May.

73. Allison Creek. 19 May.

74. Seepages on Highway 14 between the 40 and 42 mileposts. 19, 21 May, 19, 25 Sept. (N).

75. Seepages and talus on Road 233, 0.8-6.3 mi S. of junction with Highway 14. 19, 21 May, 24 Sept. (N).

76. Creeks on Road 233, 5.5-7.3 mi S. of junction with Highway 14. 19 May, 24 Sept.

77. Creeks and talus on Road 233, 0.3-2.3 S. of junction with Road 311. 19 May, 24 Sept.

78. Creeks on Road 31, 0.8 and 2.0 mi S. of junction with Road 233. 19 May.

79. Seepages on Road 222, 1.3-6.7 mi from junction with Highway 14. 21 May.

80. Trapper Creek and seepages on Road 1190, 0.8-1.5 mi from junction with Road 222. 21 May, 25 Sept.

81. Noble and Mallard Creeks. 25 Sept.