Amphibians of the Big Creek Drainage, Frank Church River of No-Return Wilderness Area

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Abstract: During the summer of 2001, I conducted visual encounter surveys of amphibians in the Big Creek drainage of central Idaho and compared these surveys to previous data to determine occurrence, distribution, relative abundance, and habitat relationships. Columbia Spotted Frogs (*Rana luteiventris*), Long-toed Salamanders (*Ambystoma macrodactylum*), Western Toads (*Bufo boreas*), and Rocky Mountain Tailed Frogs (*Ascaphus montanus*) were detected in the early 1990s. The extensive wildfires of 2000 burned many previously sampled sites, so I examined changes in amphibian populations related to the effects of fire. Each site was classified as an individual stream reach, lake/pond, or wetland area. Forty-two sites were sampled in 1994 and 52 sites sampled in 1995. I repeated a portion of the earlier surveys and extended the sampling effort to an additional 30 sites in 2001. There were 105 common lentic sites and 81 streams surveyed throughout all three years of study. Columbia Spotted Frogs were the most abundant and widely distributed amphibian throughout the study area; occurring at 73% of the 105 lakes, ponds, and pools. There were more spotted frog breeding sites detected in 1994-1995 data ($n = 17$) than in 2001 ($n = 15$). Long-toed Salamander larvae occurred at 36% of the 105 lentic sites. In 2001, there were more salamander breeding sites ($n = 22$) than in the previous 1990's data ($n = 12$). Western Toads were only found at four different lentic sites during the surveys, but incidental observations were common ($n = 20$) in 2001. There are only two known breeding sites for the western toad in the entire study area. There were 64 sites with fire disturbance in 2001. Columbia Spotted Frog breeding locations were limited at five (8%) sites with fire disturbance ($P = 0.0118$). If all life stages are considered the presence of these frogs did not seem to be effected by the existence of fire. Long-toed Salamander breeding sites were located at 11 (17%) of the 64 sites with fire disturbance. Rocky Mountain Tailed Frogs were present at more sites in previous studies ($n = 24$) than in the 2001 field season ($n = 10$). All of the streams with tailed frogs present in 2001 had some fire disturbance. Fish were present at 17 sites in 1994 (40%), at 5 sites in 1995 (10%), and at 22 sites in 2001 (24%). I identified 18 potential long-term monitoring sites within the Big Creek drainage and its surrounding tributaries to evaluate changes, trends, and effects of fire disturbance.

1.0 Introduction and Justification:

1.1 Importances and Significance-

Over the last fifty years many species of amphibians throughout the world have declined markedly, and in some cases become extinct (Heyer 1993). In many cases, these declines are attributable to adverse human influences; however, herpetologists have also observed decreases in populations that are in relatively pristine and remote areas (Heyer 1993). Pristine areas such as wilderness areas act as "controls" or reference sites that can be used to evaluate or reflect broad scale environmental problems.

Numerous populations of true frogs and toads appear to be declining in North America (Corn and Fogelman 1984; Wake 1991). Declining populations have been detected or suspected for about 30% of all the amphibian species in the United States

(Bury et al. 1995). The majority of the declines have been documented for pond breeding anurans, particularly frogs of the genus *Rana* and toads of the genus *Bufo* (Corn 1994). Biologists are concerned about these apparent declines because amphibians are important components of ecosystems (Scott and Seigel 1992). Corn and Bury (1990) stressed that these animals are sensitive to environmental fluctuations. Amphibians are sensitive to environmental quality because they have a biphasic life cycle, occupy both terrestrial and aquatic habitats, and they have moist, permeable skin (Nussbaum et al. 1983). Amphibian habitats have been altered in many ways due to agriculture practices and urbanization. By 1990, 53% of the original wetlands in the contiguous United States had been lost (Dahl 1990).

Most amphibians of high-elevation wilderness areas or national parks do not suffer from obvious habitat loss or alteration, but they face the risk of wildfire, pollutants, and effects from introduced species. The effects of fire on aquatic systems may be direct and immediate or indirect and sustained over an extended period of time (Gresswell 1999). Intense fires and subsequent impacts on hydrologic regimes, erosion, debris flows, and riparian cover can strongly impact the structure and function of aquatic systems (Rieman and Clayton 1997). Sediments apparently clog interstitial spaces of the substrate inhabited by larvae, which are particularly important to the early life stages of amphibians (Ministry of Environment, Lands and Parks 2000). Studies have shown the reproductive success of lentic breeding amphibians (e.g. *Bufo boreas*) decreased with increases in the duration and frequency of flooding and changes in discharge rates (Olson et al. 1997). Extreme levels of pH or dissolved metals in breeding ponds could negatively influence the survival and/or development of larval amphibians (Corn et al. 1989, Harte and Hoffman 1989, Corn and Vertucci 1992).

subalpine. The USDA Payette National Forest administers the majority of the land in the Big Creek drainage.

3.2 Study Species-

Columbia Spotted Frogs (*Rana luteiventris*), Long-toed Salamanders (*Ambystoma macrodactylum*), Western Toads (*Bufo boreas*), and Rocky Mountain Tailed Frogs (*Ascaphus montanus*) have all been observed within the Big Creek drainage of the Frank Church Wilderness Area. Spotted frogs, Long-toed Salamanders, and Western Toads are found in lentic habitats, and tailed frogs are found in lotic habitats.

3.3 Sampling Site Selection-

I resampled 42 sites previously sampled in 1994 and 1995. Observations from pre-fire sites (1994 and 1995) were compared with post-fire sites (2001) to detect changes and trends regarding fire disturbance and amphibian presence/absence. In addition, I chose watersheds that most likely contained suitable habitat for amphibians, such as ponds, lakes, and streams. Observations made by reputable sources traveling through the study area aided in eight additional site locations. I also searched topographical maps for suitable habitat such as wetlands and meadows.

3.4 Equipment-

To obtain +/- 10-meter accuracy GPS locations I used a 3000 XL Magellan (Thales Navigation, Inc.), which was non-differentally correctable. Water temperatures were taken with a Ben Meadows, Model 2JA-111042 Pocket Thermometer. A hand-held pH (pHep® +) meter and a Model 4, 0.01mS/cm conductivity reader were used. Each location was documented with a Cannon 80 Tele, 35 mm camera, using standard print film, for ease in future determination of sites and to document the extent of fire disturbance.

3.5 Environmental Measurements-

Each site was classified according to Cowardin et al's. (1979) criteria of wetland and deepwater habitats. The physical and biological characteristics of each sampling site were described using a standard form developed by the U.S. Fish and Wildlife Service for amphibian surveys (Appendix I). Observations of fire disturbance extent, predators (e.g., fish or snakes), and amphibian deformities were also recorded on the data sheet.

3.6 Amphibian Sampling-

Search techniques that were used to obtain counts were visual encounters, cover-turning, dip netting, and listening. I searched all shorelines, pools, and near-shore waters of each site at a rate slow enough to minimize detection failures. At each site, information was recorded concerning the following factors: percent cover, percent shallows (<0.5 m), the extent of emergent vegetation, substrate composition, evidence of fire disturbance, and the presence of potential amphibian predators (e.g., fish or garter snakes). Temperature, pH, conductivity, and photographic documentation for each site as collected to aid in the description of habitat associations. Water temperature was taken within the shade at a depth of 1 cm using a mercury thermometer. Conductivity and pH meters were calibrated every week.

Search time, a basic index for wildlife studies is the number of animals observed per unit time, and is calculated as the total time spent searching multiplied by the number of qualified observers (Olson et. al. 1997). Each site surveyed was timed to estimate an overall search effort. Search time, the amount of potential amphibian habitat, dimensions of the watershed, and number of amphibians encountered were all recorded. Possible predators, such as garter snakes or fish species, were recorded by observation during the sampling period. In lacustrine (e.g., lakes) and palustrine (e.g., pools, marsh) habitats, I

surveyed the entire perimeter of the body of water. Dip-nets were an effective tool for catching and observing all life stages of amphibians. At each site one or two people sampled around the edge of the waterbody; if only a single individual was sampling then a zigzag pattern was incorporated.

Some streams had at least two sites sampled previously; one at the mouth and another near the upper portion of the stream. The sites I searched were 10 meters in length and surveying consisted of firmly holding dip-nets in place, while periodically overturning and sifting through rocks, cobble, and gravel upstream from the nets. When a certain area was well investigated the nets were examined for the presence of tailed frog tadpoles.

3.7 Sampling Schedule-

Throughout the past decade there have been multiple observations of amphibians in the Big Creek Drainage. Early data from Dr. Peterson consisted mostly of sites near the ranch. D. Duncan conducted surveys from June 30 to July 15, 1994. J. Karl sampled within this study area from June 1 to July 1, 1995. The 2001 survey started on May 31 and continued through August 13. A few of the common sampled sites near the ranch were sampled multiple times throughout all years.

3.8 Voucher Specimens-

There were two Western Toad metamorphs collected from Bear Lake wetland within Cougar Basin, located southwest of Taylor Ranch. One Long-toed Salamander larvae was collected from Burnt Lake because it had lost a front limb and represented a possible unnatural deformity.

3.9 Data Management and Statistical Analyses-

Data forms from the U.S. Fish and Wildlife Service were used to record all individual site information. After the 2001 field season, pre- and post-fire data were transferred to Microsoft Excel spreadsheets for statistical analyses. Combining the 1990's data with the 2001 data, I was able to evaluate significance in the presence/absence, distribution, abundance, and habitat associations of the four amphibian species detected within this study. The only sites that were used for comparison were sites that were commonly sampled in all three years of the study. The S-Plan 2000 statistical program was used to conduct nonparametric (e.g. contingency tables and Fisher's exact testing). These analyses were used due to their high resolution and limited errors. ArcView 3.2 was used to distribution maps for location of all amphibian life stages noted during the study.

4.0 Results:

Duncan sampled 42 sites in 1994, Karl sampled 52 sites in 1995 (Fig. 2), and I sampled 90 sites in 2001 (Fig. 3). Columbia Spotted Frogs, Long-toed Salamanders, Western Toads, and Rocky Mountain Tailed Frogs were observed during this study. I sampled 64 sites in 2001 that had been burnt in the 2000 fire; 41 sites were lentic and 23 sites were lotic.

Highest numbers of amphibians throughout the 2001 field season were detected at *Bufo* moose pond (my name), Belvidere basin, Papoose area (my name), Burnt area (my name), and Cougar basin (Table 1). Columbia Spotted Frogs, Long-toed Salamanders, Western Toads, and Rocky Mountain Tailed Frogs were all observed during the 1995 and 2001 sampling seasons. The overall sampling effort for all three years of the study is summarized in (Table 2). The number of sites where each species was detected, the

percentage of species present per year sampled, and the overall percentage of the species present throughout the entire study are summarized in Table 3. Columbia Spotted Frogs occurred at 22 of 42 lentic sites in 1994, at 9 of 52 lentic sites in 1995, and at 48 of 90 lentic sites in 2001. Long-toed Salamanders occurred at 8 of 42 lentic sites in 1994, at 6 of 52 lentic sites in 1995, and at 23 of 90 lentic sites in 2001. Western Toads were not found in the 1994 survey. Western Toads occurred at 2 of 52 lentic sites in 1995 and at 3 of 90 lentic sites in 2001. Rocky Mountain Tailed Frogs occurred at 9 of 42 stream sites in 1994, at 15 of 52 stream sites in 1995, and at 10 of 90 stream sites in 2001.

Columbia Spotted Frogs were found in lacustrine or palustrine wetland types and were the most abundant and widely distributed amphibian throughout the 3 years of this study (Fig. 4); occurring at 73% of the 105 lakes, ponds, and pools. Columbia Spotted Frogs were most abundant in the Cougar Basin complex, Belvidere Basin complex, and Papoose Area during the 2001 sampling year (Table 1). Mean elevation in which spotted frogs occurred was at 1922 m, which is the highest mean elevation for any of the species detected. There were more spotted frog breeding sites detected in the 1994-1995 data ($n = 17$) than in 2001 ($n = 15$). I observed significant difference for Columbia Spotted Frog breeding sites and the presence of fire in the 2001 field season (Fisher's exact test = $P = 0.0118$). I observed a significant statistical value. Columbia Spotted Frogs were less likely to breed in unburned areas (Table 4). These breeding locations were significantly limited at five (12%) sites with fire disturbance. The overall presence of any life stage of these frogs did not seem to be impacted by the existence of fire (Table 4).

Long-toed Salamanders were also widely distributed throughout the study area, and their larvae were found at 36% of the 105 lentic sites (Fig. 5). Long-toed

Salamanders were prevalent at the Burnt Area (Table 1) and other high elevations. Though this species mostly occurs at higher elevations, there was a slough at Taylor Ranch, located at 1250 meters, which had larvae from May 31 through August 7. No juveniles or adults were ever observed at this site throughout the three-year study. In 2001, there were more salamander breeding sites ($n = 22$) than in 1994 –1995 data ($n = 12$), but the Fisher's exact test showed no statistical significance ($P = 0.1067$). Long-toed Salamander breeding sites were located at 11 (27%) of the 41 lentic sites with fire disturbance (Table 5).

In 2001, a new breeding location, at Bear Lake wetland, was documented that was not observed in previous years. There are only 2 known breeding sites for the Western Toad in the study area. There were limited observations of Western Toads across the study area and statistical tests could not accurately depict differences in distribution (Fig. 6). Western Toads were found at five different lentic sites during the surveys, but incidental observations of adults were common ($n = 20$) in 2001.

Rocky Mountain Tailed Frogs had a disjunctive distribution throughout the study area (Fig. 7). These frogs were present at more sites in previous studies ($n = 24$) than in the 2001 field season ($n = 10$). All of the streams with tailed frogs present in 2001 had fire disturbance. Tailed frog breeding sites were more present in burned areas than in unburned areas (43%). There were two streams sampled that were unburned and 23 streams that were burned.

Columbia Spotted Frogs were the most abundant with about 6200 tadpoles, 300 juveniles, and 300 adults. Western Toads had the next highest abundance with 2000 tadpoles, 0 juveniles, and 2 adults (Fig. 8). Long-toed Salamanders had about 600 larvae, 6 juveniles, and 10 adults. Rocky Mountain Tailed Frogs were found to have the least

abundance with 28 tadpoles and no juveniles, metamorphs or adults. The sampling period for many of these sites was too late in the year to detect adults.

The number of sites in 2001 with snakes (e.g. Western Terrestrial Garter Snake (*Thamnophis elegans*)) or fish (e.g. sculpin or trout) present and the percentage of snakes or fish present were recorded (Table 6). There were a variety of fish detected at individual sites, but trout were observed more by observers, and the actual estimate of fish present at sampling sites is probably an underestimate. Fish were present at 17 sites in 1994 (40%), at 5 sites in 1995 (10%), and at 22 sites in 2001 (24%). The presence of other potential predators was noted in 2001, and of the 90 sites sampled, 40 sites had snakes or fish that were observed (44%) (Table 6).

5.0 Discussion:

Columbia Spotted Frog

Columbia Spotted Frogs inhabited a variety of elevations throughout the Big Creek drainage. My results agree with the findings of Munger et al. (1994), in which spotted frogs were shown to inhabit higher elevation ranges. When combining the 1994 and 1995 data as "no fire disturbance" and comparing it to some 2001 "fire disturbed" sites, it was evident that Columbia Spotted Frog breeding sites were located at areas with little to no fire disturbance. Munger et al. (1994) suggested that spotted frogs appear to be more susceptible to environmental changes. Sediment loads, flooding conditions, and turbidity of the sites may contribute to the limited distribution of spotted frog breeding sites in fire disturbed areas. Habitat conditions at higher elevations provide summer and winter habitat as well as cover. Even though this species seemed to be a habitat generalist throughout the study area, my data indicate that spotted frog breeding sites were not common in fire disturbed sites.

Long-toed Salamander

Long-toed Salamander breeding sites were relatively evenly distributed throughout my study area. There were a limited number of sites where Long-toed Salamander adults or juveniles were detected. Because they frequently disperse from the breeding locations and travel to terrestrial environments after metamorphosis, the dates of sampling could have made detection difficult for these life stages. Although the Fisher's exact test did not reveal any significance between burned and unburned areas, there may be significance if the sample size was larger.

Western Toad

Western Toads had the most restricted distribution of all the species detected in the study area, and I suggest that more effort be dedicated to detecting more breeding locations for this species. The *Bufo* Moose Pond, in the Cabin Creek complex, and Bear Lake wetland are the only known breeding sites for western toads in the Big Creek drainage. Western Toads have been documented as having extensive movement patterns. Bartelt (2000) found that radio telemetered toads can move up to 400 m in a single day and up to 2.4 km within three weeks. Adults were detected 9-10 km east of the *Bufo* Moose Pond, and I speculate that there may be another breeding site closer to Taylor Ranch. The Bear Lake Wetland is higher in elevation then *Bufo* Moose Pond and has both a lower conductivity level and water temperature. These individuals may be traveling further than observed in previous research. I would also suggest a more thorough effort in trying to detect western toad breeding sites. Western Toads have relatively long life spans (~ 20 yrs) and the adults that are being detected could be older individuals.

Rock Mountain Tailed Frog

Rocky Mountain Tailed Frogs were limited in distribution throughout the entire study area. The power for including statistical significance difference for tailed frogs was limited due to small sample size, thus an expected increase in sample size would lead to higher power.

The sampling effort in 2001 was greater than previous years, so the overall change in species numbers may be due to this increase in sampling effort and duration of the study. The 2001 surveys detected about half the number of breeding sites compared to the 1990's surveys (26 vs. 38). This difference could be due to the wildfire disturbance or the presence of drought or other environmental changes.

Management Considerations

There is a need for comprehensive conservation plans to ensure protection or living resources. Agencies should rely upon inventory and monitoring to determine the condition of these protected resources and to explain how and why these conditions may change (Hall and Langtimm 2001). Extinction and colonization of amphibian species richness can be affected by environmental factors (Hecnar and M'Closkey 1996). There should be either an assessment of the status of amphibians or long-term monitoring at certain sites with both high and low productivity to determine future trends.

The future management of these populations should consist of long-term monitoring within the Big Creek drainage. The three years of this study offer a representation of which species are present within the Big Creek drainage. I identified 18 long-term monitoring sites within the Big Creek drainage and surrounding tributaries to evaluate changes, trends, and effects of fire disturbance (Table 7). Criteria for site selection were based on (1) sites being distributed evenly throughout the study area (2)

sites covering various elevations and wetland types (3) sites having at least two amphibian species present in past monitoring effort (except tailed frog sites), and (4) sites that are accessible, within 1-3 days, from the Taylor Ranch. One of the most important protocol factors to be incorporated is to repeat monitoring surveys with the same methodology in consecutive years.

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Table 1: Amphibian presence at all of the sites surveyed in the 2001 field season. The highest number of amphibans observed at each site are highlighted in the locality column. The total number of species detected are highlighted at the bottom of the table.

LOCALITY	Columbia Spotted Frog	Long-toed Salamander	Western Toad	Rocky Mountain Tailed Frog
Taylor Ranch-Airstrip	0	0	0	0
Mouth of Rush Creek	0	0	0	0
Taylor Ranch-Airstrip Pool #1	0	0	0	0
Taylor Ranch-Airstrip Pool #2	0	10	1	0
Bufo Moose Pond, Cabin Creek Complex	1503	20	2000	0
Cabin Creek Pond #1	3	0	0	0
Cabin Creek Pond #2	2	0	0	0
Cabin Creek Pond #3	1	0	0	0
Cabin Creek Pond #4	3	0	0	0
Cow Creek Springs	0	0	0	0
Mouth of Cave Creek	0	0	0	0
Floodplain of Cabin Creek	1	0	0	0
Cabin Flats #1	10	0	0	0
Cabin Flats #2	5	0	0	0
Cabin Flats #3	5	0	0	0
Cabin Flats #4	2	20	0	0
Cabin Flats #5	9	0	0	0
Rush Creek Beaver Pond	7	20	0	0
Dunce Creek #1	0	0	0	1
Dunce Creek #2	0	0	0	1
Goat Creek #1	0	0	0	9
Goat Creek #2	0	0	0	8
Cougar Creek #1	0	0	0	1
Cougar Creek #2	0	0	0	1
Big Creek Pool, down stream	1	0	0	0
Cliff Creek #1	0	0	0	0
Cliff Creek #2	0	0	0	1
Pioneer Creek #1	0	0	0	1
Pioneer Creek #2	0	0	0	0
Cougar Springs, near cougar Ck	0	0	0	0
Lick Lake	0	0	0	0
Spring @ head of Coxey Creek	0	0	0	0
Crooked Creek pond #1	4	0	0	0
Crooked Creek beaver pond #2	45	0	0	0
Old cabin backwater, Crooked Creek	0	0	0	0
Upper Crooked Creek	0	0	0	0
Snowshoe Mine pond	2	20	0	0
Pond below Camp Creek #1	2	0	0	0
Pond below Camp Creek #2	1	0	0	0
Pond below Camp Creek #3	1	5	0	0
Pool above Big Ramey Creek	0	0	0	0
Mouth of Big Ramey Creek	0	0	0	0
Mouth of Whiskey Creek	0	0	0	0

LOCALITY	Columbia Spotted Frog	Long-toed Salamander	Western Toad	Rocky Mountain Tailed Frog
Horseshoe Lake, Belvidere Basin	26	0	0	0
Horseshoe Pond, Belvidere Basin	1	0	0	0
Sandpiper Lake, Belvidere Basin	1135	6	0	0
Sandpiper Pond, Belvidere Basin	51	14	0	0
Mid Lake, Belvidere Basin	8	4	0	0
Lord Lake, Belvidere Basin	0	0	0	0
Drop-Off Pond, Belvidere Basin	80	0	0	0
Lord Pond, Belvidere Basin	93	42	0	0
Beauty Lake, Belvidere Basin	3	6	0	0
Belvidere Lake, Belvidere Basin	0	0	0	0
Tower Lake	75	11	0	0
Edwardsburg Marsh #1	0	36	0	0
Edwardsburg Marsh #2	2	0	0	0
Lillypad Pond, Papoose Area	684	4	0	0
Dragonfly Lake, Papoose Area	400	10	0	0
Trapper Lake, Papoose Area	38	0	0	0
Papoose Lake, Papoose Area	1144	0	0	0
Cold Meadows	35	1	1	0
Cabin Creek Airstrip Pond	0	0	0	0
Cabin Creek Pond #1	5	0	0	0
Spring North of Cabin Ck Pond #1	5	0	0	0
Cabin Creek Pond #4	1	30	0	0
Upper Cabin Creek	0	0	0	0
Cabin Creek-Bufo Moose Pond	1	0	0	0
Cabin Creek Flats-Runoff pool	4	0	0	0
Cabin Creek Flats-Beaver Pond	1	1	0	0
Lower Cabin Creek	0	0	0	0
Cabin Flats #4	1	0	0	0
Cabin Flats #5	0	0	0	0
Cabin Flats #1	0	0	0	0
Burnt Lake, Burnt Area	0	214	0	0
Spring @ head of Burnt Creek, Burnt Area	0	2	0	0
Moonlight Pond, Burnt Area	0	100	0	0
Lick Lake, Cougar Basin	8	0	0	0
Bear Lake Wetland, Cougar Basin	1100	40	0	0
Bear Lake, Cougar Basin	45	0	0	0
Fish Lake, Cougar Basin	33	0	0	0
Cougar Lake, Cougar Basin	5	0	0	0
Catherine Lake, Cougar Basin	160	1	0	0
West Fork Monumental Pond	1	40	0	0
Mouth of Holy Terror Creek	0	0	0	0
Mouth of Mud Creek	0	0	0	0
Mouth of Snowslide Creek	0	0	0	1
Mouth of Wild Horse Creek	0	0	0	4
Mouth of Monumental Creek	0	0	0	0
Mouth of Crooked Creek	0	0	0	0
Mouth of Beaver Creek	0	0	0	0
Total Amphibians Detected	**6752**	**657**	**2002**	**28**

Year	# Sites Sampled	Total # of Sites	Sampling Effort
1994	42	184	23%
1995	52	184	28%
2001	90	184	49%

Table 2: Overall sampling effort per year, amphibian surveys (1994, 1995, 2001), Big Creek drainage, central Idaho.

1994	Species	# of Sites	% Presence/ Year	Overall % Sampling Effort
	Columbia Spotted Frog	22	52%	12%
	Long-toed Salamander	8	19%	4%
	Western Toad	NA	NA	NA
	Rocky Mt.Tailed Frog	9	21%	5%

1995	Species	# of Sites	% Presence/ Year	Overall %
	Columbia Spotted Frog	9	17%	5%
	Long-toed Salamander	6	12%	3%
	Western Toad	2	4%	1%
	Rocky Mt.Tailed Frog	15	29%	8%

2001	Species	# of Sites	% Presence/ Year	Overall %
		48	53%	26%
	Long-toed Salamander	23	26%	13%
	Western Toad	3	3%	2%
	Rocky Mt.Tailed Frog	10	11%	5%

Species	*% Observed*
Columbia Spotted Frog	43%
Long-toed Salamander	21%
Western Toad	
Rocky Mt.Tailed Frog	18%

Table 3: The number of sites with each species, the percentage of species present per year, and the overall percentage of species present throughout the entire study. The total percentage of observations per species for all three years.

	Selected Sites	UTM Northing	UTM Easting
1	Bufo Moose Pond, Cabin Creek Complex	4999248	662217
2	Taylor Ranch-Airstrip Pool #2	4996449	668870
3	Rush Creek Beaver Pond	4996265	668190
4	Snowshoe Mine Pond	5006295	651411
5	Sandpiper Lake, Belvidere Basin	4988492	627365
6	Sandpiper Pond, Belvidere Basin	4988492	627389
7	Lord Pond, Belvidere Basin	4988104	628266
8	Tower Lake	4988447	629451
9	Lillypad Pond, Papoose Area	5006601	670964
10	Dragonfly Lake, Papoose Area	5007763	672292
11	Bear Lake Wetland, Cougar Basin	4989266	635325
12	Cabin Creek Pond #4	5000986	662775
13	Cold Meadows	5016696	661272
14	Goat Creek #1	4996973	672545
15	Dunce Creek #1	4997041	674308
16	Mouth of Wild Horse Creek	4999316	644169
17	Cliff Creek #2	4996602	669752
18	Pioneer Creek #1	4996463	669090

Table 7: Sites selected for a long-term monitoring program based out of Taylor Ranch.

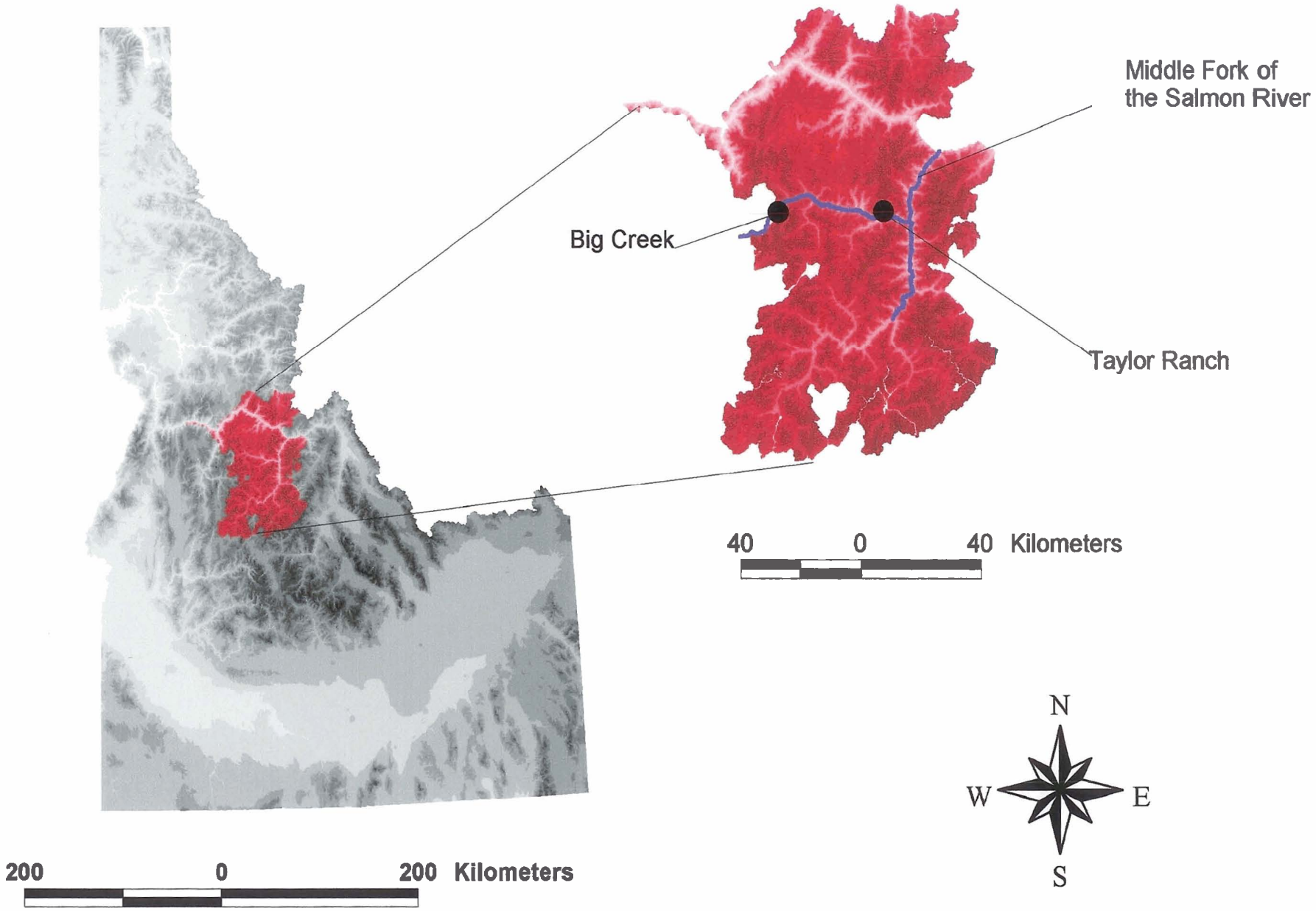


Figure 1. Big Creek study area location map, Frank Church Wilderness, central Idaho.

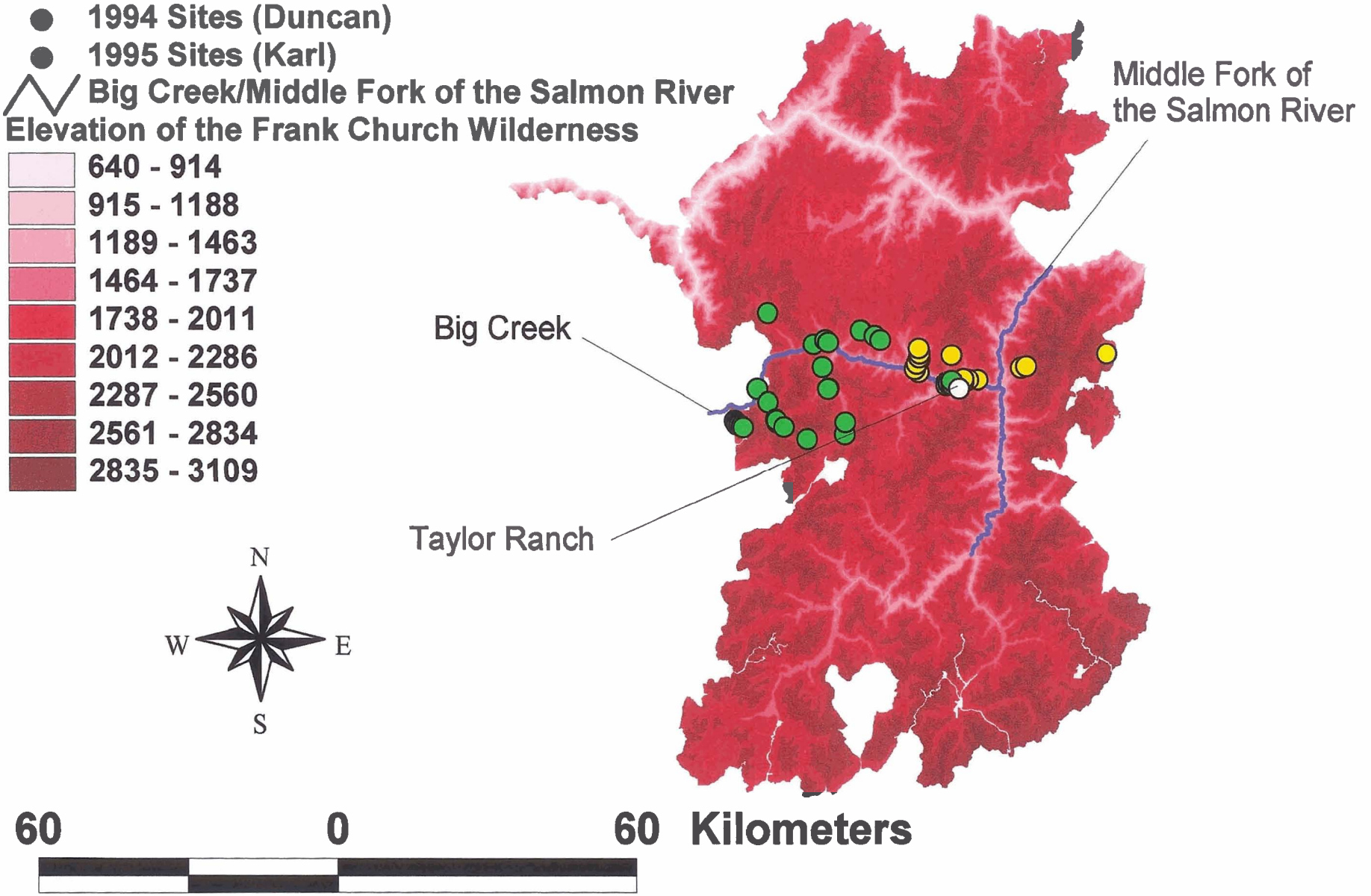


Figure 2. Sites Sampled in 1994 and 1995 by D. Duncan and J. Karl.

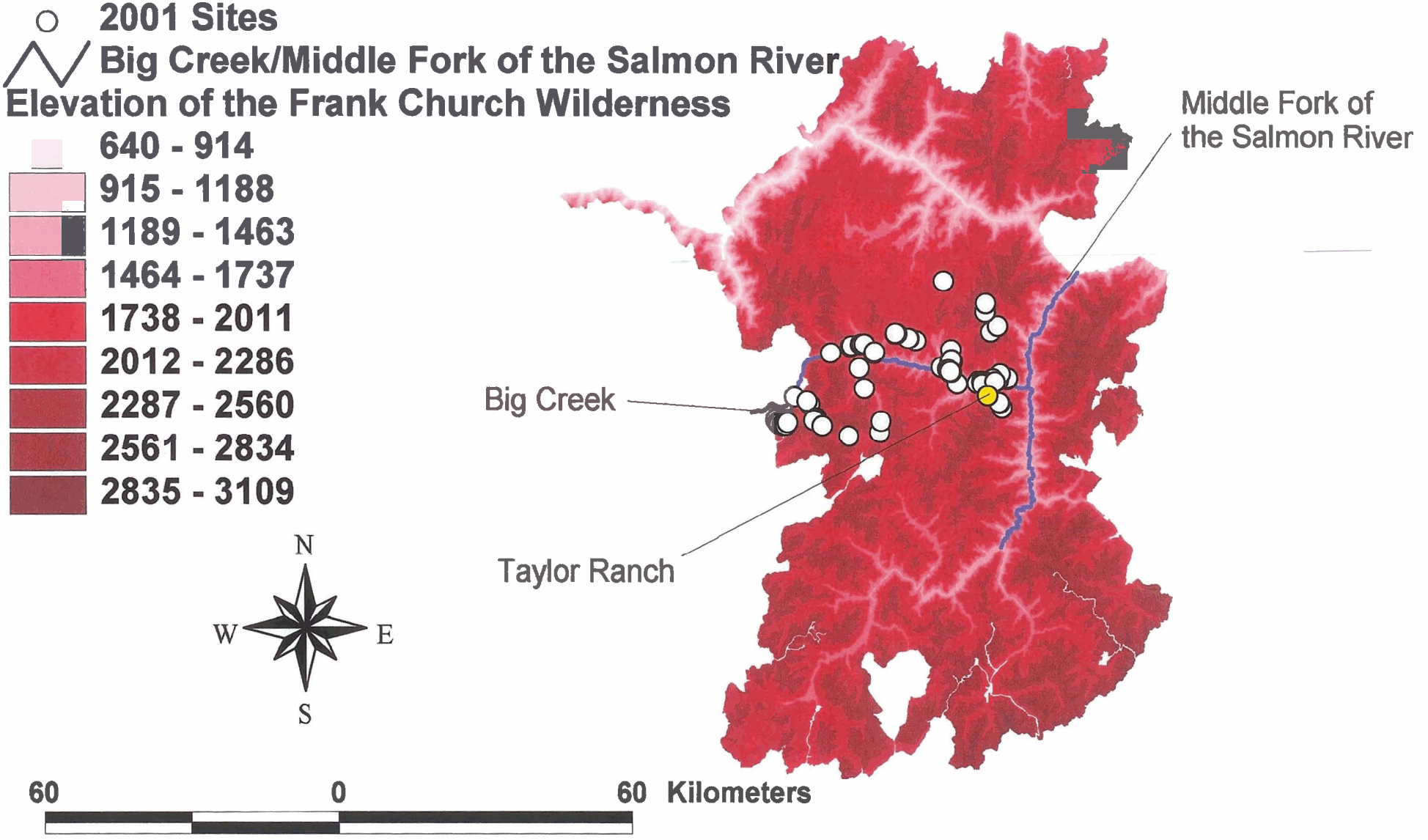


Figure 3. Sites Sampled in 2001 by C. Strobl.

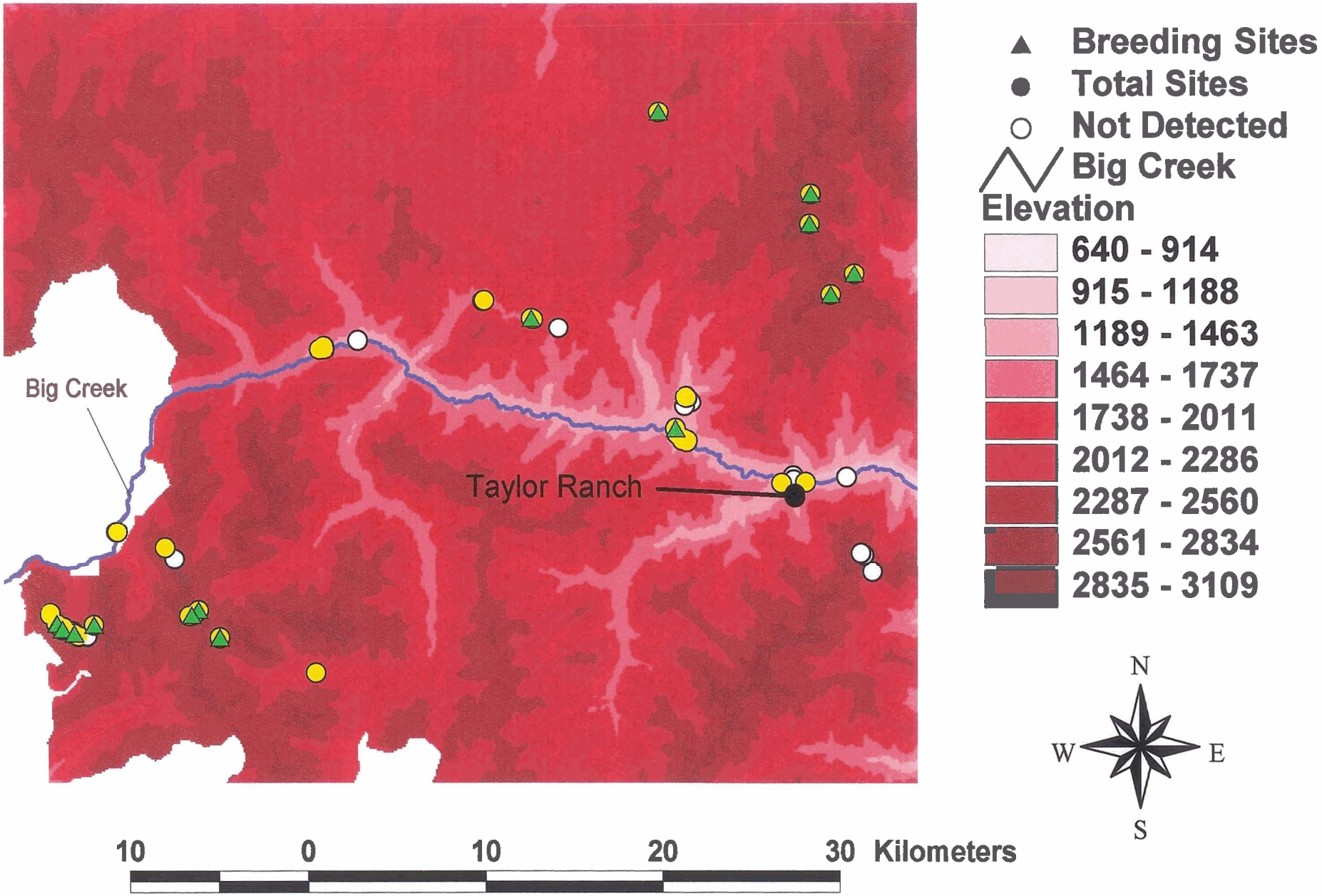


Figure 4. Columbia Spotted Frog (Rana luteiventris) distribution in 2001.

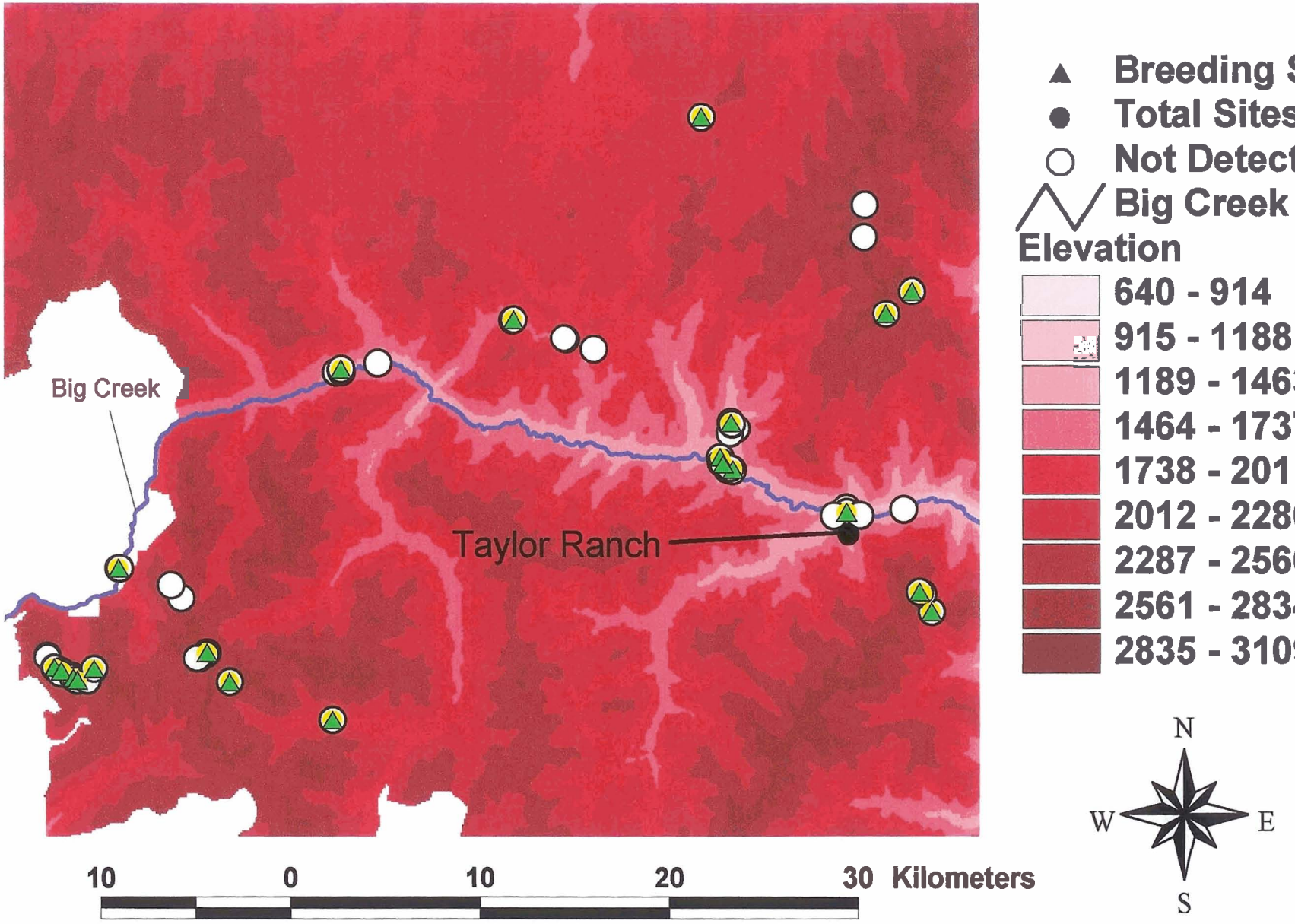


Figure 5. Long-toed Salamander (Ambystoma macrodactylum) distribution in 2001.

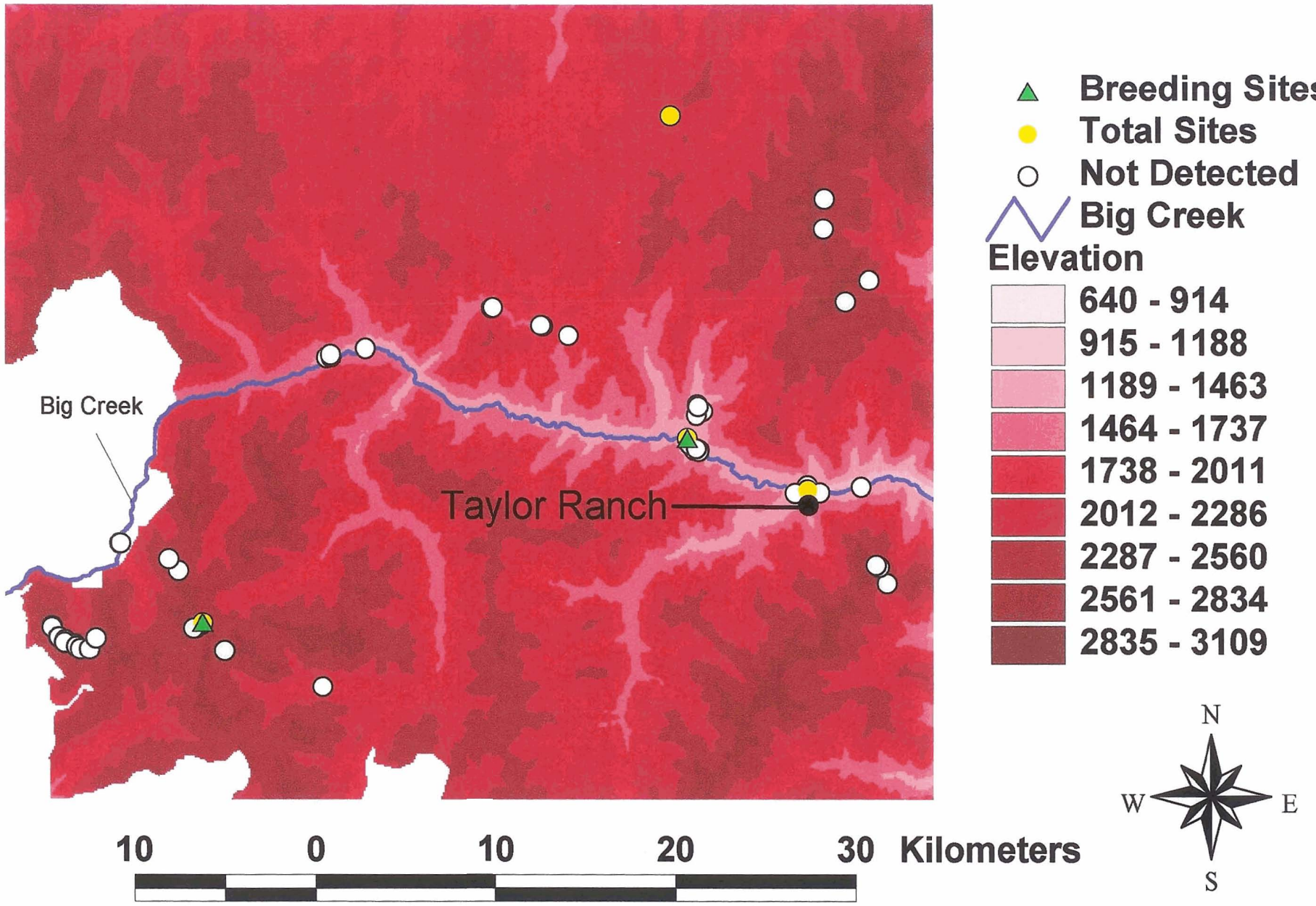


Figure 6. Western Toad (Bufo boreas) distribution in 2001.

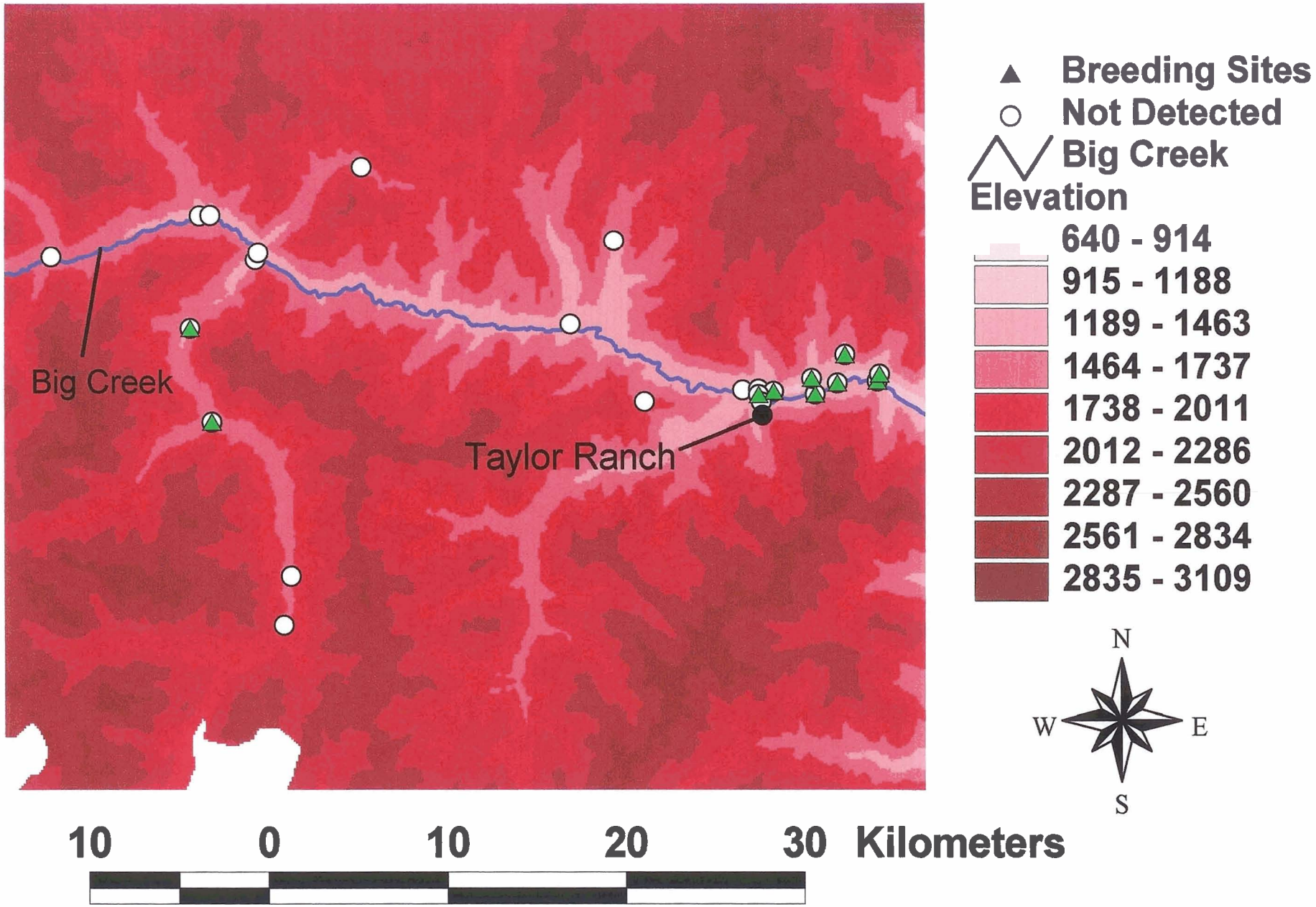
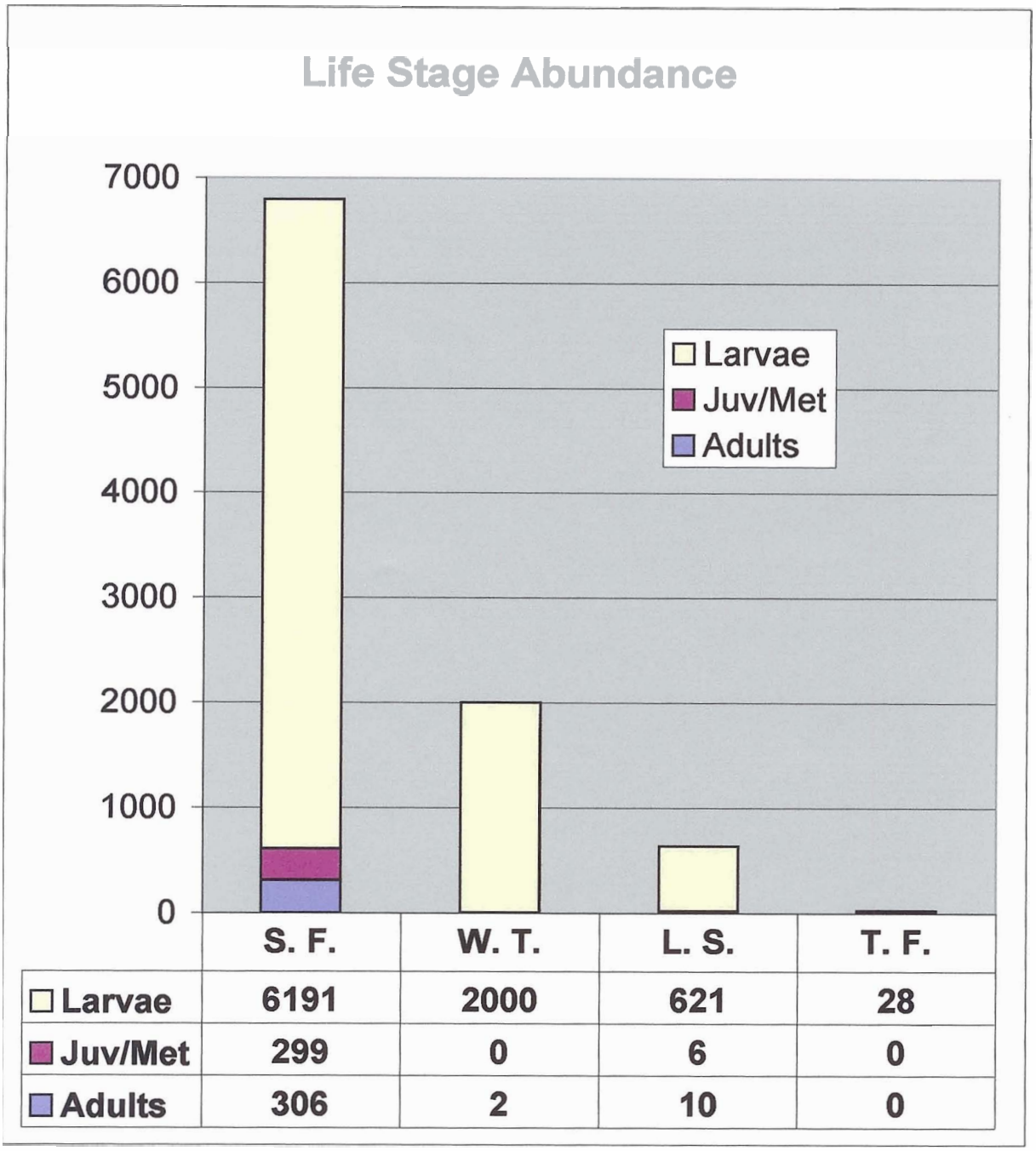


Figure 7. Rocky Mountain Tailed Frog (Ascaphus montanus) distribution in 2001.



	S. F.	W. T.	L. S.	T. F.
Larvae	6191	2000	621	28
Juv/Met	299	0	6	0
Adults	306	2	10	0

Figure 8: Life stage abundance for 2001 data of the Columbia Spotted Frog (S.F.), Western Toad (W.T.), Long-toed Salamander (L.S.), and the Rocky Mountain Tailed Frog (T.F.).

Appendix I

AMPHIBIAN SURVEY DATA SHEET - modified after S.P. Corn, NBS, Fort Collins, CO (ver. 1 May 1996)

Herpetology Laboratory, Idaho State University and Idaho Museum of Natural History, Box 8007, Pocatello, ID 83209
(208) 236-3922 voice 236-4570 FAX e-mail: petechar@isu.edu

DATE	BEGIN TIME	END TIME	OBSERVERS
LOCALITY			

STATE		COUNTY		MAP NAME	OWNER	ELEVATION
T	R	S		UTM ZONE/DATUM	NORTHING	EASTING

AMPHIBIAN AND REPTILE SPECIES PRESENT (INDICATE NUMBERS IN CATEGORIES IF POSSIBLE)

SPECIES	ADULT	JUVENILE	METAM.	LARVAE	EGGS	CALLING	TECHNIQUE(S)	VOUCHER

FISH PRESENT YES ??? NO FISH SPECIES:

ENTIRE SITE SEARCHED? YES NO IF NO, IDICATE AREA: meters of shoreline habitat

WEATHER: RADIATION: CLEAR PARTIAL OVERCAST WIND: CALM LIGHT MEDIUM HEAVY

AIR TEMPERATURE (1 M SHADED) °C OR F % CLOUD COVER: PRECIPTATION: SNOW RAIN

WATER TEMPERATURE (1CM) pH: CONDUCTIVITY SAMPLE?

COLOR CLEAR STAINED TURBIDITY CLEAR CLOUDY

SITE DESCRIPTION PUT SKETCH AND ADDITIONAL COMMENTS ON BACK OF SHEET

ORIGIN NATURAL MAN-MADE MAN-MODIFIED DRAINAGE PERMANENT OCCASIONAL NONE

SITE TYPE TEMPORARY or PERMANENT LAKE/POND MARSH BOG STREAM SPRING/SEEP ACTIVE or INACTIVE BEAVER POND

NATIONAL WETLAND INVENTORY CLASIFICATION GAP ANALYSIS COVER TYPE (IF KNOWN)

STREAM ORDER 1 2 3 4 5 6

SITE LENGTH m	SITE WIDTH m	MAXIMUM DEPTH < 1M 1 - 2 M > 2 M

PRIMARY SUBSTRATE SILT/MUD SAND/GRAVEL COBBLE BOULDER/BEDROCK OTHER:

% OF LAKE MARGIN WITH EMERGENT VEGETATION 0 1 - 25 25 - 50 >50

EMERGENT VEGETATION SPECIES (IN ORDER OF ABUNDANCE)					
NORTH SHORELINE CHARACTERISTICS	SHALLOWS PRESENT	SHALLOWS ABSENT	EMERGENT VEG PRESENT	EMERGENT VEG ABSENT	
DISTANCE TO FOREST EDGE m	FOREST TREE SPECIES				