Report – Year 4 of the terrestrial vertebrate resurvey of the "Grinnell sites" in Yosemite National Park

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EXECUTIVE SUMMARY

The "Grinnell Resurvey" of Yosemite National Park was extended during the 2006 field season for two specific subprojects: (1) at the request of Park biologists, we completed a small, non-volant mammal survey of upper Kerrick Meadow (below Buckeye Pass and west of Peeler Lake, in the northeastern corner of the Park) as part of a targeted goal of generating base-line data on species diversity in parts of the Park that had never been surveyed. Ten species of small mammals were trapped, including the northern-most records in the Park for the Lyell shrew (*Sorex lyelli*) and Alpine chipmunk (*Tamias alpinus*). Additionally, we also trapped the Heather vole (*Phenacomys intermedius*), a species targeted at the beginning of the resurvey project in 2003 as of special concern by Park biologists. Overall, this fauna is rather typical of the community that occurs along the crest of the Sierra Nevada in the Park from Mt. Lyell north to this locality. (2) Targeted resurveys for the presence of Alpine chipmunks and American pika (Ochotona princeps), two species for which our revisits to the original "Grinnell sites" throughout the Park had suggested upward retraction of their lower elevational limits. The focus of these targeted resurveys were those localities where only limited work was done during the "Grinnell era" (1914-1915), including a number of specific talus slopes where pika had been observed. These targeted resurveys confirm that the Alpine chipmunk now cannot be found below about 9,600 ft elevation, where it had originally been found down to 7,800 ft (Glen Aulin) and was common around Tuolumne Meadows (8,900-9,100 ft). For the pika, while this species is now apparently extirpated at the lowest elevational sites where it was recorded during the Grinnell surveys (Glen Aulin down to Waterwheel Falls, elevations of 7,800 to 7,600 ft), the species is still present on the talus slopes east of Tenaya Lake at an elevation of 8,300 ft. The elevational retraction of this species is thus not as substantial as that of the Alpine chipmunk. We will target additional talus slopes and granite outcrops in the elevational range between 8,000 and 9,000 ft in the coming year to get a better idea of the overall distribution of this species in the Park.

INTRODUCTION

We completed the resurvey of birds, mammals, and herptiles (amphibians and reptiles) at the original set of "Grinnell sites" along their Yosemite transect in 2005. This past year we focused attention on three research areas that either stem from the original Grinnell survey and our resurvey results or extend those surveys to new parts of Yosemite National Park. Each of these involves only species of small mammals.

Two species of small mammals that have apparently experienced range retraction at their lower elevational limits over the past near-century are the alpine chipmunk (*Tamias alpinus*) and pika (*Ochotona princeps*). The distributions and status of both species has thus become a focus of interest by us and Park biologists. Survey methods and results for both species in 2006 are detailed in Part I and Part II of this report, respectively. One of the goals of the increased alpine

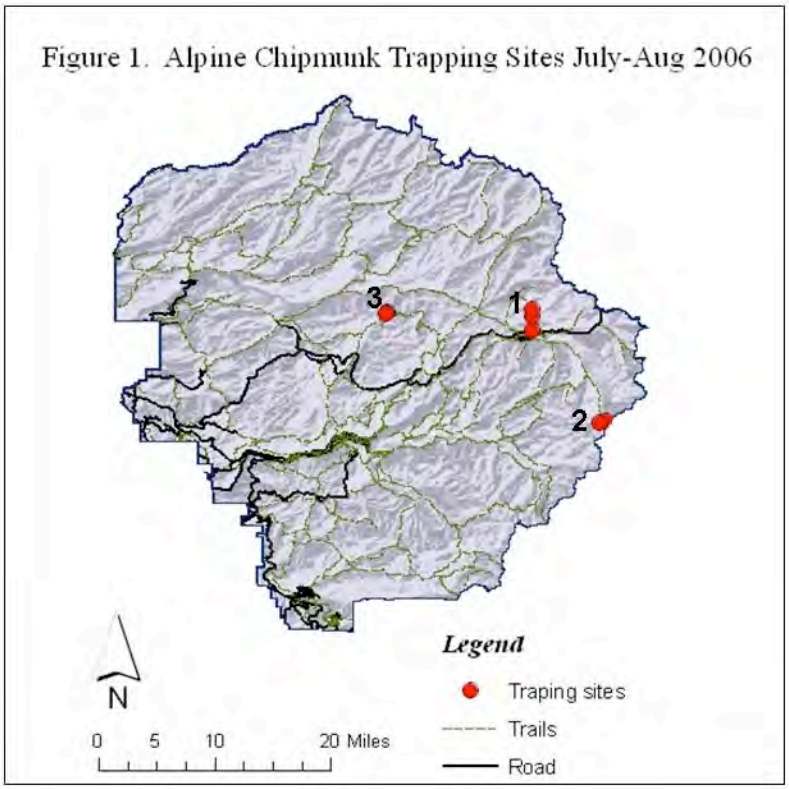
chipmunk surveys was to obtain adequate modern tissue biopsy samples for molecular genetic comparison to DNA that has been extracted from museum specimens collected during the original Grinnell surveys. We are interested in determining to what degree there has been a loss of genetic diversity coordinate with the species' range retraction.

We also completed the small mammal survey in upper Kerrick Meadow, in the northeastern corner of the Park, as detailed in Part III. At the request of the NPS, we identified three sites in the northern tier of the Park for mammal surveys, all areas that had never been visited nor surveyed in the past. These sites included upper Virginia Canyon, below Virginia Pass; Dorothy Lakes and Grace Meadows; and Kerrick Meadow. Our original goal was to visit all three areas in summer 2005, but delay in the melting of the heavy snowpack that year restricted access such that we rescheduled the Kerrick Meadow survey until summer 2006. Specimens collected under the terms of our NPS permit have been deposited in the Museum of Vertebrate Zoology; all data are available from the archival database via the MVZ website (http://mvz.berkeley.edu) under accession number 14191.

Pending approval by the NPS, we intend to revisit Yosemite National Park in 2007 to extend our targeted surveys for both alpine chipmunks and pikas and to resample key high elevation sites. Also, in collaboration with biologists with the USGS-Yosemite Field Office, we will begin targeted small mammal surveys in the more isolated high elevation ranges within the Park that have either not been surveyed before or not visited in recent decades. These areas include the Clark Range, Cathedral Range, Kuna Crest, Mt. Hoffmann, and Young Lakes-Mt. Conness. Species of special concern in each of these five areas are alpine chipmunks and pikas, but general small mammal surveys will be undertaken in each area as well.

Part I: Alpine Chipmunk Survey

Three general localities in the park were surveyed for alpine chipmunks (*Tamias alpinus*) between July 17 and August 26, 2006. Due to heavy snowfall last year, Tioga Pass Road did not open as early as expected and we were unable to get to all four sampling areas that were proposed for the summer. We did, however, manage to sample for *T. alpinus* at Lembert Dome and Dingley Dome near Tuolumne Meadows (Locality 1), Upper Lyell Canyon (Locality 2) and the Ten Lakes (Locality 3) areas (Figure 1). All three of these localities were sampled by Grinnell and his team and a series of *T. alpinus* were collected at each of these sites in 1915. In our contemporary resurvey of the park, the Tuolumne Meadows area and the Upper Lyell area were sampled in 2005, and Upper Lyell was also sampled in 2003. However, Ten Lakes had not been visited by the resurvey team before the summer of 2006. In 2005, in the Tuolumne Meadows area the resurvey team sampled on Juniper Ridge where *T. alpinus* were found in the 1915. The target species was not caught or seen on Juniper Ridge in 2005. Only one *T. alpinus* was caught at Upper Lyell Canyon in 2005. The lack of alpine chipmunks in these areas suggested that perhaps there has been a decline in alpine chipmunk populations in Yosemite National Park since the Grinnell era. The objectives of our sampling for the summer of 2006 were to 1) Increase our existing contemporary sample size of n=2 from Upper Lyell Canyon; 2) To resurvey the Tuolumne Meadows area again to gain confidence in the apparent absence of *T. alpinus* at a site they were once abundant and 3) To resurvey the Ten Lakes area, an area that had not yet been visited by the resurvey team and one at which Grinnell and his team had found alpine chipmunks.



Methodology

At each locality, at least one trap-line of 40 Sherman traps was set for a minimum of 4 nights. Traps were placed in alpine chipmunk habitat such as at the edges of meadows, in open granite areas with sparse stunted vegetation, and at edges of boulder and talus fields. Traps were baited with oats, spaced about 10m apart, and checked twice a day. All chipmunk species caught were weighed and a small piece (2mm x 1mm) of ear tissue was taken for DNA analyses. After sampling, the animals were released. Upon capture, species identification (i.e. alpine chipmunk, *T. alpinus*, or the lodgepole chipmunk, *T. speciosus,* the two species found in these areas) was recorded. All field identifications have now been confirmed with mitochondrial DNA cytochrome b sequences.

Locality 1: Vicinity of Tuolumne Meadows; Lembert Dome, Delaney Meadow and Dingley Dome, Yosemite National Park (17 July – 23 July)

Justin Brashares, Cole Burton, and Emily Rubidge worked in the vicinity of Tuolumne Meadows between elevations of 9261 - 9737 feet from July 17- July 23, 2007. We set up three trap-lines in the general area. The first trap-line was set up on the northwestern side of Lembert Dome. The trap-line began in a small talus slope and continued through the saddle that consisted of an open lodgepole pine stand, with large boulders and a lot of dead logs. The top of the dome was east of the trap-line. The end of the line went through an open granite slab, with few downed logs, boulders and lodgepole pines. A total of 80 traps were set here, 40 for four nights, and then another 40 for the last two nights. The total number of trap nights was 240 at Lembert Dome (Table 1).

Figure 2. Photos of habitat at Lembert Dome trapline.

After setting up the trap-line at Lembert Dome we continued along the Dog Lake trail and then went north up the Young Lake trail towards Dingley Dome. In Charles Camp's field notes from 1915 they found *T. alpinus* three miles north of Soda Springs near the headwaters of Dingley Creek. Although we didn't make it to this exact location, we did trap in the same vicinity. On the way to Dingley Dome, we set 20 traps at the north edge of Delaney Meadow about 20m east of the trail (Figure 3). This trap-line followed the meadow edge through moist grass with lodgepole pine and ended in a drier area with large rocky outcrops. The trap-line was about 50m from Delaney Creek.

Figure 3. The first photo in the sequence is Delaney Meadow looking east and the last two photos show the trap-line habitat at the meadow edge.

We continued on the Young Lake trail until we could see Dingley dome, and then headed towards it north off the trail. We stopped when the forest opened up into to what looked like good chipmunk habitat. We set up 59 Sherman traps starting out in a mainly lodgepole pine forest with some whitebark pine and junipers and then continued through a more open area with large boulders and rock slabs under the face of the dome (Figure 4). The traps were left for 2 nights and 3 full days. Because we did not catch any chipmunks at this site, and because it took an hour to get to the trap-line from our camp, we decided to pull the traps at the end of the third day.

Figure 4. Habitat of the Dingley Dome trap-line.

Table 1. Summary trap-line information for locality 1 including location, trap effort and habitat type.

Specific Trap-line	Latitude	Longitude	Elevation (ft)	Trap nights (#traps*#nights)	Habitat
Lembert Dome	37.8827	-119.34655	9261	240	Lodgepole pine, granite slab, boulders, dead logs
Delaney Meadow	37.89922	-119.3477	9409	42	Meadow, lodgepole pine, stream edge, rocky outcrops
Dingley Dome	37.90828	-119.3475	9737	118	Lodgepole pine, whitebark pine, juniper, talus, boulders

Results for Locality 1

No alpine chipmunks were captured or seen at any of the three specific trapping sites within the general locality of Tuolumne Meadows area (Table 2). The lodgepole chipmunk (*Tamias speciosus*) was abundant at the Lembert Dome site, as was the golden mantled ground squirrel (*Spermophilus lateralis*) and the deer mouse (*Peromyscus maniculatus*). No chipmunk species were caught at either of the other trapping sites. We did, however, see at least one *Tamias speciosus* at the Dingley Dome site. We caught deer mice at both the Delaney Meadow site and at Dingley Dome, and also caught two *Sorex monticolus* at Dingley Dome.

Table 2. Summary of species sampled or captured and not sampled at Locality 1.

Specific Trap-line	*T. alpinus*	*T. speciosus*	Additional species captured
Lembert Dome	0	15	*Peromyscus maniculatus, Spermophilus lateralis*
Dehlaney Meadow	0	0	*P. maniculatus*
Dingley Dome	0	0	*P. maniculatus, Sorex monticolus*

Locality 2: Upper Lyell Canyon, Yosemite National Park (10 August – 18 August)

Leslie Chow, Peggy Moore, Emily Rubidge, Jim Patton, and Carol Patton revisited Upper Lyell Canyon for a week in August specifically to obtain larger samples of alpine chipmunks for Emily's genetic analyses. Five traplines were established at elevations between 10,240 and 10,754 feet (Fig. 6). Three of these (traplines 1, 2 and 4) had been trapped in 2003 and 2005. A single alpine chipmunk had previously been trapped on line 1 in 2003 and on line 2 in 2005; trapline 4 had been surveyed in both years but had yielded no alpine chipmunks, only the lodgepole pine chipmunk, *Tamias speciosus*. The paucity of alpine chipmunks in 2003-2005

is in contrast to the observations of Charles Camp and other members of the "Grinnell" team, who had visited this area in 1915 and collected 16 individuals. The habitat of traplines 1, 2 and 4 is dominated by whitebark pine, with some lodgepole pine and mountain hemlock and followed along a meadow edge to the west and willow on the banks of the Lyell Fork to the east (Figure 7). Trapline 5 is in the bowl below Mt. Lyell and above tree-line among granite slab exposures. Trapline 3, or the "ridge" trap-line is above tree-line and consisted mainly of talus and boulder field interspersed with stunted whitebark pine, shrubs and grasses (Figure 8).

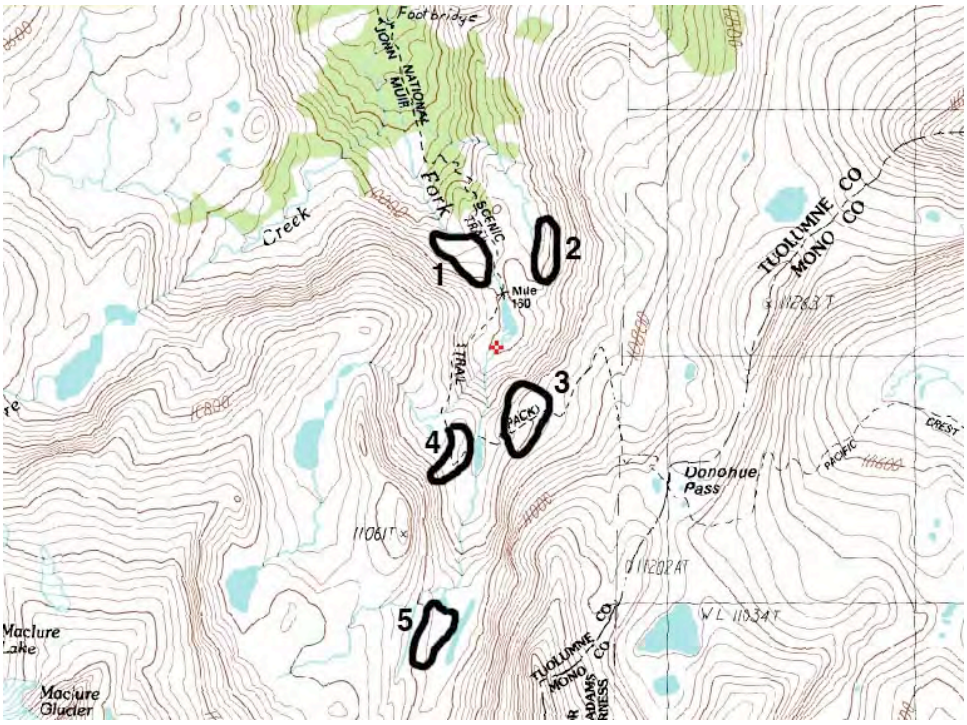


Fig. 6. Position of five traplines in upper Lyell Canyon, August 2006. Traplines 2 and 4 had been trapped in both 2003 and 2005; trapline 1 had been trapped in 2005.

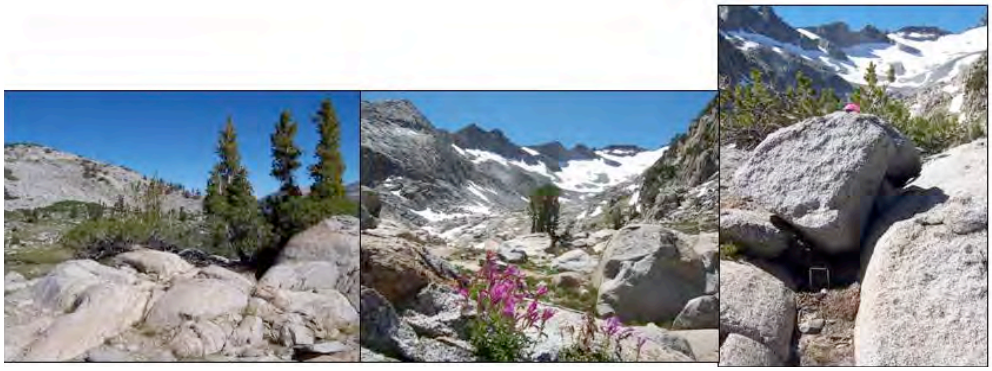


Figure 7. Upper Lyell Canyon lower trap-line habitat

Figure 8. Upper Lyell Canyon ridge trap-line habitat

Eighty Sherman traps were set-up on the ridge line and left for four consecutive nights. By the third morning, we were recapturing the some of the same individuals as identified by the small snip of tissue missing from their ears. The number of trap nights for ridge line was 240. On the fifth day, we moved 40 traps to the lower site and trapped there for two nights, therefore the number of trap-nights at the lower site was 80 (Table 3).

Table 3. Trap-line information at Locality 2 including location, trap effort and habitat

Specific Trapline	Latitude	Longitude	Elevation (ft)	Trap nights	Habitat
Trapline 1	37.76807	-119.25506	10240	120	Talus, boulder field, white-bark pine, shrubs, grasses
Trapline 2*	37.76807	37.76807	10240	480 150	Talus, boulder field, white-bark pine, grasses; willow riparian
Trapline 3	37.76460	-119.25210	10754	240	Talus, boulder field, stunted white-bark pine, grasses, shrubs
Trapline 4	37.76358	-119.25996	10565	80	Whitebark pine, meadow edge, stream edge, rocky outcrops
Trapline 5	37.75675	-119.25855	10710	120	short grass; granite slabs

* Sherman live traps (80 traps over 6 nights) and pitfall cups (30 cups over 5 nights)

Results Locality 2

Alpine chipmunks appeared to be abundant at Upper Lyell Canyon in 2006 compared to 2003 and 2005. A total of 19 were sampled for DNA analysis then released. An additional 10 were collected from the ridge trap-line and prepared for museum specimens bringing the total sample size for DNA analysis to 29 for this year. *T. speciosus* was captured trapline 4 but none were seen or captured on traplines 3 or 5, both of which are above tree-line. Two common species captured included deer mice (*Peromyscus maniculatus*), which was exceedingly abundant in all habitats, long-tailed voles (*Microtus longicaudus*). Additional records of the rare Inyo shrew (*Sorex tenellus*), first captured here last year and the first record of this species in the Park, and heather vole, also captured here in both 2003 and 2005. Pika (*Ochotona princeps*) were both captured and observed, as were golden-mantled ground squirrels (*Spermophilus*

lateralis). Belding ground squirrels (*Spermophilus beldingi*) and yellow-bellied marmots (*Marmota flaviventris*) were common.

Table 4. Summary of species sampled or captured and not sampled at Locality 2

Specific Trap-line	*T. alpinus*	*T. speciosus*	Additional species captured
trapline 1 [Sherman traps only]	0	0	*Peromyscus maniculatus, Microtus longicaudus*
trapline 2* [Sherman traps, pitfall cups]	2	0	*Sorex monticolus, Sorex palustris, Sorex tenellus, Spermophilus lateralis, Peromyscus maniculatus, Phenacomys intermedius, Ochotona princeps*
trapline 3 [Sherman traps]	15	0	*Sorex monticolus, Peromyscus maniculatus*
trapline 4 [Sherman traps]	3	10	*Peromyscus maniculatus*
trapline 5 [Sherman traps]	5	0	*Peromyscus maniculatus*

* trapline 2 consisted of 80 Sherman live traps placed in a boulder field in open whitebark pine and 2 pitfall cup lines in the willow thickets lining both sides of Lyell Fork. All but one shrew came from the pitfall cups. Note the presence of *S. tenellus*, which is the second record for the Park. This species was trapped here in 2005.

Locality 3: Ten Lakes, Yosemite National Park (21 August – 26 August)

Risa Sargent and Emily Rubidge worked at Ten Lakes between elevations of 9278 – 9631 feet for five days at the end of August. Walter Taylor and Tracey Storer sampled the Ten Lakes area in October 1915. They collected seven alpine chipmunks at this site. Similar to the Tuolumne Meadows area, Ten Lakes is at a relatively lower elevation than we currently are detecting alpine chipmunks so it was important to determine if these chipmunks were still present at this site.

We sampled two sites within Ten Lakes, one on the talus slope south of the trail as you come down off the pass (Figure 9), and the other up on the pass through the meadow and into the sandy and rocky outcrop habitat at the meadow edge south of the trail (Figure 10). On the talus line, there was sparse vegetation clustered at the bases of rocks with the occasional stunted mountain hemlock or whitebark pine. We set 30 traps for four nights on the talus line (120 trap-nights; Table 5).

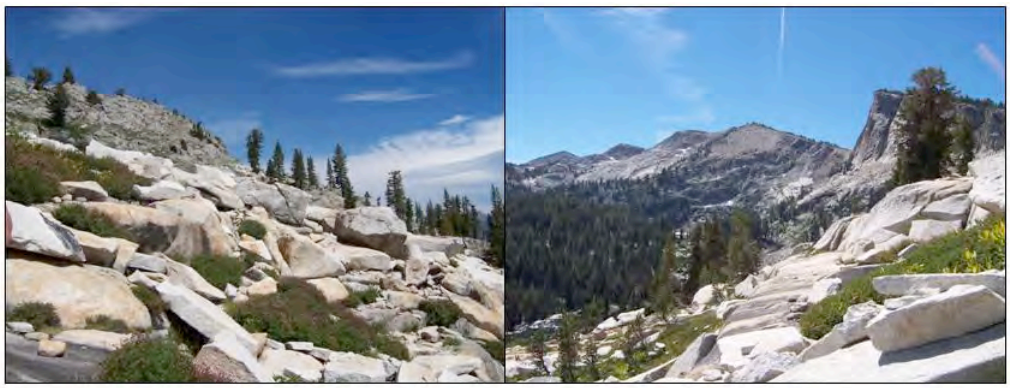


Figure 9. Habitat of Ten Lakes talus trap-line. The first photo is looking north towards the trail and the second is facing south.

The Ten Lakes Pass line started north of the trail in an open mountain hemlock and whitebark pine stand with large rocky outcrops and boulders. It then continued across the trail through the meadow, which consisted of sagebrush, willow around the creek, and corn lilies. The end of the trap-line went back into the open forest on the southeast side of the meadow where the soil was sandy and there were a lot of big boulders and rock slabs in and amongst the trees. A total of 49 traps were set on the pass line, 40 for the first two nights, and then we added 9 more through the meadow for the last two nights giving a total of 176 trap-nights.

Figure 10. Habitat photos of Ten Lakes Pass. Also shown is a T. alpinus in torpor, showing a small snip out of its right ear. Once the animal was warmed up, he fully recovered and was released.

Table 5. Trap-line information at Site 3 including location, trap effort and habitat.

Specific Trapline	Latitude	Longitude	Elevation (ft)	Trap nights	Habitat
Ten Lakes	37.90458	-119.53220	9278	120	Talus, and rock slabs with grasses and shrubs interspersed. Lodgepole and whitebark pine near end of line
Ten Lakes Pass	37.90350	-119.53493	9631	176	Whitebark pine, mountain hemlock, lodgepole pine, meadow, rocky outcrops

Results of Locality 3

Alpine chipmunks appeared to be the dominant *Tamias* species at Ten Lakes. We captured and sampled seven alpine chipmunks and only two lodgepole chipmunks. All

chipmunk species were caught on the higher elevation "pass" line and the majority of them were caught either in or within 50m of the meadow. Both alpine and lodgepole chipmunks were seen foraging in meadow. No chipmunks were seen or captured on the lower talus line. We did, however, catch a number of deer mice, one shrew (*Sorex monticolus*) and one long-tailed vole (*Microtus longicaudus*). Deer mice were also very abundant on the pass line and we caught and released one juvenile Belding's ground squirrel (*Spermophilus beldingi*) in a trap near the edge of the meadow. This species was seen frequently while walking through the meadow.

It is important to note that this site now represents the lowest elevation (9630 feet) that we have detected alpine chipmunks from the contemporary resurveys. Grinnell et al. were detecting them as low as 9200 feet. In order to ascertain an elevational shift, we must visit all low elevation sites with the appropriate habitat and sample for the presence of alpine chipmunks.

Table 6. Summary of species sampled or captured and not sampled at Locality 3.

Specific Trap-line	*T. alpinus*	*T. speciosus*	Additional species captured
Ten Lakes	0	0	*Peromyscus maniculatus, Sorex monticolus, Microtus longicaudus*
Ten Lakes Pass	7	2	*P. maniculatus, Spermophilus beldingi*

Summary

We collected a total of 26 ear tissues from alpine chipmunks from our sampling efforts in the summer of 2006. Most of these came from Upper Lyell, a locality where *T. alpinus* was abundant in the past, but where the resurvey team had difficulty capturing this species in 2003 and 2005. The relative abundance of this species this year is most likely due to natural variation in population size. The presence of *T. alpinus* at Ten Lakes is encouraging as it is the lowest elevation site that the contemporary resurvey team has found alpine chipmunks. The high number of individuals sampled over the summer brings a very important and needed influx of contemporary samples to enable comparison of genetic variation between historical and contemporary populations. Prior to this summer, we only had 19 alpine chipmunk tissues from the park available for modern genetic analyses, now we have 48. We can compare these data to DNA extracted from the 88 individuals collected from the park in the Grinnell era.

Future Sampling

In the summer of 2007, we will continue our sampling of alpine chipmunks for our contemporary analysis of population genetic structure of this species within the park, and across their range in the Sierra Nevada. We propose to revisit both Mt. Hoffman and Glen Aulin, both "Grinnell" sites where alpine chipmunks were found in the past, but have not yet been detected in our present resurvey. We would also like to survey the Gaylor Lakes areas. In July 2006, we observed alpine chipmunks at Gaylor Lakes along the edge of the talus slope on the southwest side of the lake, about 200m west of the trail. Although not a Grinnell site, we propose to sample

the area because it represents a population relatively adjacent to that historically present in Tuolumne Meadows. Other areas we hope to visit are both the Cathedral and Clark ranges and Young Lake and Kuna Crest. We have specimens in the collection that were captured at Young Lake and at one site in Clark Range from the Grinnell expedition in 1915. Data collected from these sites would not only contribute to the historical/contemporary comparison of this species' range and genetic diversity; but also to our contemporary understanding of alpine chipmunk dispersal patterns and population structure in Yosemite National Park.

Part II: Pika Survey

In addition to trapping for alpine chipmunks, we also conducted systematic surveys to determine if pikas (*Ochotona princeps*) were present at sites they were in the past, and using a standardized survey method developed by NPS biologist Erik Beever (NPS Great Lakes Network, Ashland, WI), who has been monitoring pika declines in the Great Basin for the past 15 years. Preliminary results from our resurveys suggest that the distribution of pikas in YNP has retracted upwards in elevation. The surveys conducted in 2006 specifically targeted lower elevation sites where pikas were found by Grinnell and his colleagues. Using the field notes from the Grinnell era surveys we were, in some cases, able to go back to the exact talus slopes that Grinnell, Taylor, Camp and/or others found pikas between 1910-1916 (Table 7). We also surveyed talus habitat opportunistically, often in close proximity to where we were trapping for alpine chipmunks. This opportunistic surveying for pikas contributed to our basic understanding of the distribution of pikas in the park. We visited eight general localities between July 18 and October 9, 2007 (Table 8).

Table 7. Description, coordinates and elevation of pika survey sites including information on past surveys and presence of pikas historically.

Site Name	Description	Latitude	Longitude	Elev (ft)	Date	Grinnell Site?/pikas present?
Lembert Dome	Two talus slopes under northwest side of dome	37.88255 37.88267	-119.34892 -119.34652	9040 9243	July 18	N/unknown
Dingley Dome	Talus slope under southwest side of dome	37.91008	-119.34928	9789	July 19	N/unknown
Talus slope above Soda Springs	Large talus/boulder field north of Soda Springs, under Juniper Ridge; just north of Tuolumne Meadows	37.88390	-119.36207	8951	8951	Y/Y
Gaylor Lakes	Two talus slopes; a) south of trail ascending towards the pass; b) descending from the pass, large	37.90777 37.91040	-119.26422 -119.26720	10394 10430	July 23	N/unknown

	talus/boulder field southwest of trail					
Ten Lakes	Two talus slopes a) Talus field south of trail as you descend towards the lakes; b) Talus slope south of oblong-shaped lake	37.90333 37.89800	-119.53324 119.53098	9325 9097	Aug 24, 25	Y/Y
Grant Lakes	Rock slide/talus east of first lake	37.88586	-119.53812	9306	Aug 25	Y/Y
Glen Aulin	Three talus slopes: a)overgrown boulder field north of trail; b) small talus slope right next to the trail near Cal. Falls; c) Talus on southside of river near footbridge	37.91743 37.92084 37.91005	-119.43824 -119.44341 -119.42341	7810 7638 7665	Oct 9	Y/Y
Tenaya Lake	Large rock slide/talus slope, southeast side of lake near stream inlet	37.8314	119.45014	8331	Oct 10	Y/Y

Our surveys consisted of timed searches of talus slopes, rockslides and boulder fields. The time was noted at the beginning and end of every survey. We searched for pika scat piles, hay piles and urine stains between rocks and under overhangs and in crevices. In every case, where pika sign was detected (i.e. pika sighting, call, scat, or haypile or any combination of these), we detected this sign within the first 15 minutes of our search. In sites where no pika sign was detected, our searches lasted between 30 and 60 minutes. GPS waypoints were collected at locations where pikas were seen, where old haypiles were located and at scat piles. When we heard a call we noted the direction that the call was coming from and took a waypoint to mark that point. In addition to notes on pika sign, we also recorded general notes about the habitat, such as average diameter of rock in talus field, and the surrounded vegetation. The results of these surveys are shown in Figure 11 and Table 8.

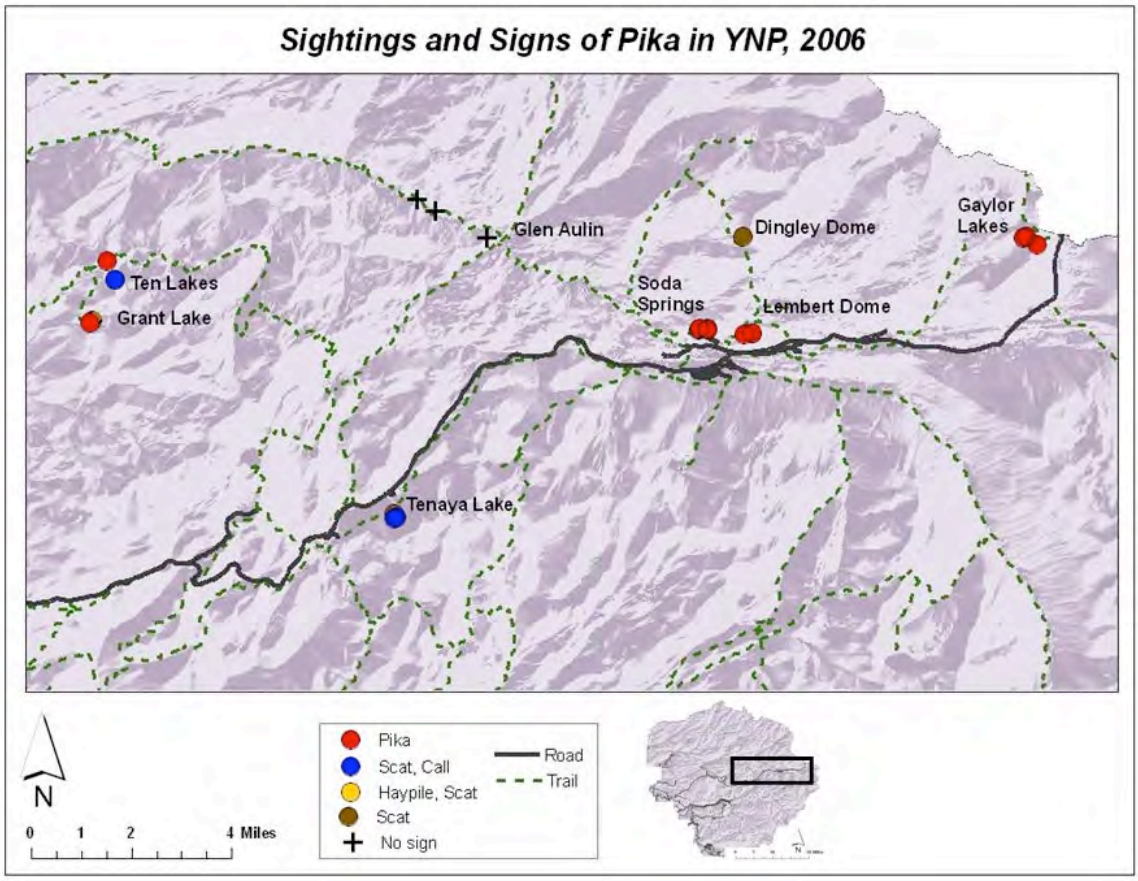


Figure 11. Map showing location and results of pika surveys conducted between July and October 2006.

Table 8. Summary table of results of Pika surveys, YNP 2006

Site Name	Pika or pika sign detected	Other species observed in pika habitat
Lembert Dome	2 pikas, scat piles, old hay piles, calls	*Spermophilus lateralis, Marmota flaviventris*
Dingley Dome	scat piles	*Marmota flaviventris*
Soda Springs	3 pikas, calls, scat piles	*Marmota flaviventris*
Gaylor Lakes	3 pikas, scat piles, calls	*Marmota flaviventris*
Ten Lakes	1 pika, scat piles, calls	*Marmota flaviventris*
Grant Lake	1 pika, old hay piles, scat piles	*Tamias speciosus* near edge of rock-slide
Glen Aulin	No sign	None observed
Tenaya Lake	Calls, scat piles, old hay piles	None observed

Site Photos (Figures 12 – 15)

Figure 12. Lembert Dome talus slope (9243 ft) where pika, scat and hay piles were found. Photograph of pika on the right was taken the lower elevation Lembert Dome talus slope surveyed (9040 ft).

Figure 13. Scat pile and pika habitat surveyed at Dingley Dome site

Figure 14. Large talus/boulder field north of Soda Springs and Tuolumne Meadows. Pika can been seen in photo on the right between the large slabs of rock. No pikas were trapped in 2005 when Sherman live traps were used to detect the presence of alpine chipmunks.

Figure 15. Scat pile and habitat surveyed at the head of Tenaya Lake. This site represents the lowest elevation (8331ft) that pikas have currently been detected in the modern surveys in Yosemite.

Summary and Future Work

Pikas or pika sign, in the form of scat, old haypile and or calls were detected at 7 out of 8 sites surveyed in 2006. In the Grinnell era, pikas were detected in the talus slopes and rockslides around Glen Aulin at a recorded elevation of about 7800ft. We visited this site in 2003 and again in 2006 and no pikas or pika sign were detected on either of these trips. From the field notes written in 1916, several pikas were seen at the Soda Springs talus and the Tenaya talus slopes. Our results suggest that pikas still inhabit these same slopes today. The Tenaya Lake site represents the lowest elevation that the resurvey team has detected pikas in the park (8300ft).

Pikas are not readily detected using the traditional trapping methods for small mammals. The resurvey team has trapped some pikas, but to rigorously determine the presence of these animals at sites surveyed in the past, systematic survey techniques similar to the ones described here will likely provide more reliable results. For example, pikas were not detected via trapping on the Soda Springs slope in 2005, but they were detected by surveying the talus in July 2006. Our recent results from the resurvey of the park prior to this work suggested that pikas had retracted their range by more than 1000ft in the park, but the results from just one site (Tenaya Lake) in this survey have reduced that retraction by 500ft. In order to accurately assess the elevational range of pikas in YNP and if it has changed since the Grinnell era, we need to do a number of things. First, mine the Grinnell field notes for observational (as opposed to specimen) data and map these sites across the park. Second, stratify our sampling effort to ensure that a number of lower, middle and high elevation sites are surveyed; and third, carry out systematic surveys at each of the selected sites.

Part III: Small mammal Survey at Kerrick Meadow

Jim Patton, Carol Patton, Les Chow, and Peggy Moore conducted small mammal surveys in the upper part of Kerrick Meadow from 23 July to 2 August 2006. We used commercial stock from the Virginia Lakes Pack Station to carry gear to the campsite. This area was to be surveyed in summer 2005, but the effort was postponed because of the heavy snowfall that year. We established Sherman trap lines in 7 areas (Fig. 16) encompassing all habitat types (meadow, riparian, conifer forest, rock slab) within approximately a 2 square mile area at the head of the Kerrick Meadow, including Buckeye Pass, just west of Peeler Lake. The entire area had been heavily impacted by water runoff, presumably from rapid snow melt a short while previous to our visit, as dried water runnels were evident down all slopes, even those of shallow inclination, debris piles surrounded the base of willows along the streams, green grass stems were still bent over, pointing downhill, and lower spots in the open meadow were still inundated. It is unclear how the heavy snow pack influenced small mammal abundances. Table 9 provides a list of species surveyed, with comments on significance. Notable records include the Lyell shrew (*Sorex lyelli*) and heather vole (*Phenacomys intermedius*), both species on the Park's list of special concern at the beginning of our surveys in 2003. We have now documented the presence of the Lyell shrew at four localities within the Park boundary, with this record in Kerrick Meadow the most northern for the entire species' range. The heather vole is a rare animal throughout the entire length of the Sierra Nevada, with only a handful of records known prior to the initiation of our surveys. While apparently rare everywhere, we have now recorded this species at five localities within the Park, all at elevations above 7800 ft (Glen Aulin, Snow Flat, upper Lyell Canyon, Virginia Canyon, and Kerrick Meadow).

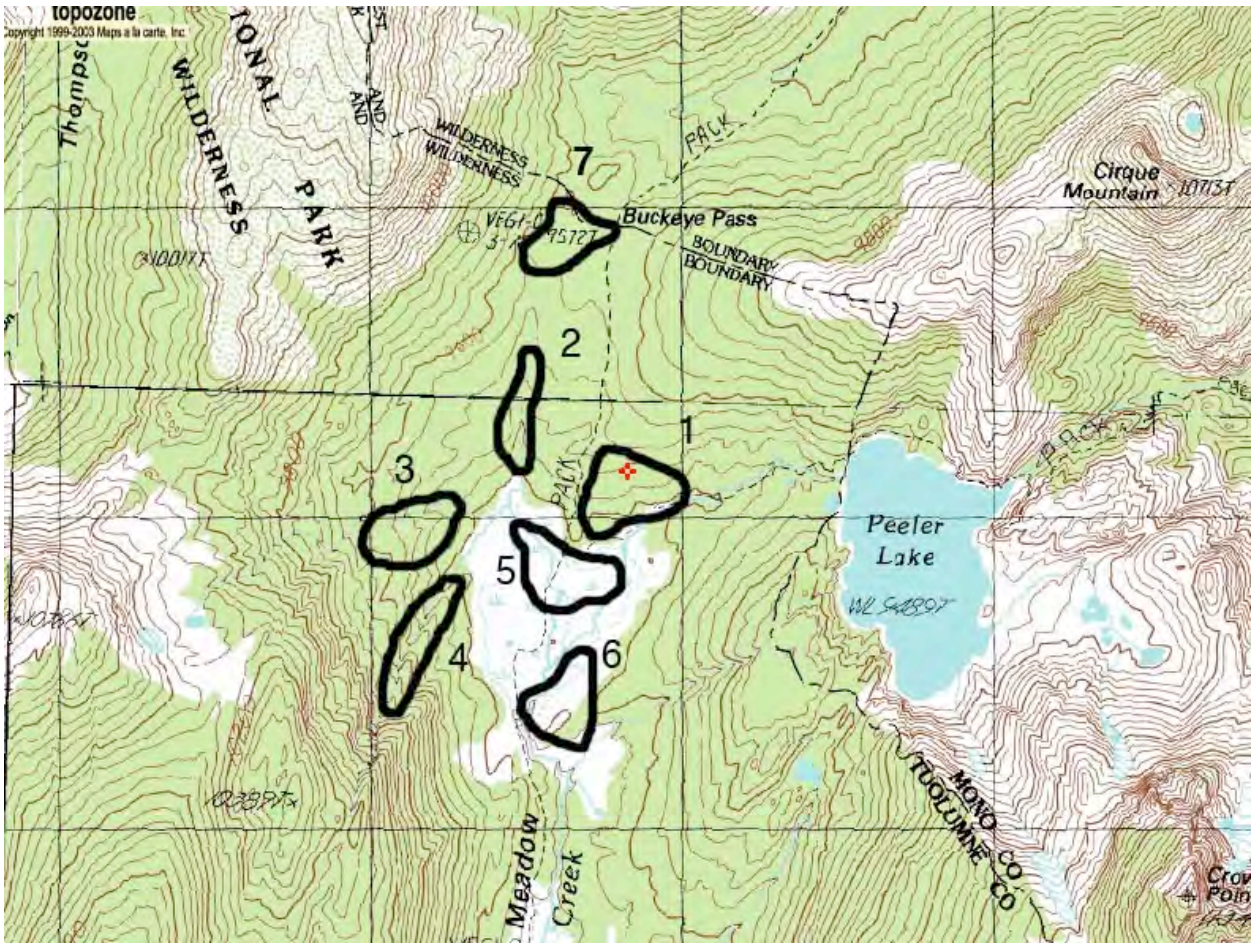


Fig. 16. Upper Kerrick Meadow with general areas of each trap line marked by black lines. GPS corrdinates for each Trap area (typically taken at midpoint of trapline) are: **Trap area 1**: 38.12290ºN - 119.47851ºW, 9495 ft. **Trap area 2**: 38.12444ºN - 119.48238ºW, 9473 ft. **Trap area 3**: 38.11821ºN - 119.48570ºW, 9470 ft. **Trap area 4**: 38.11973ºN - 119.48435ºW, 9472 ft. **Trap area 5**: 38.12110ºN - 119.48235ºW, 9362 ft. **Trap area 6**: 38.11740°N - 119.48120ºW, 9355 ft. **Trap area 7**: 38.13027ºN - 119.47916ºW, 9650 ft.

Trap area 2 contained a mixture of both Sherman live traps and 32oz plastic pitfall cups placed specifically for shrews; Trap area 5 contained both pitfall cups and Macabee gopher traps set specifically for pocket gophers; Trap areas 1, 3, 4, and 7 were Sherman live trap lines only; and Trap area 6 had only Macabee gopher traps. In general, population numbers of all species, with the exception of the deer mouse (*Peromyscus maniculatus*) were low, and overall trap success was poor as a result. Species diversity was also less than might be expected for a "typical" high elevation site in Yosemite, with species such as the water shrew (*Sorex palustris*), Belding ground squirrel (*Spermophilus beldingi*), alpine chipmunks (*Tamias alpinus*), bushy-tailed woodrats (*Neotoma cinerea*), and montane voles (*Microtus montanus*) not detected in our trapping effort or otherwise seen directly or by sign. Similarly, we found no fresh evidence of either marmots (*Marmota flaviventris*) or pika (*Ochtona princeps*). Each of these species is expected to be present in the vicinity of Kerrick Meadow, and in the case of two species (*S. beldingi* and *T. alpinus*), specimens were either collected or otherwise seen here in August of 2005 by Adam Leache and colleagues during their herpetological surveys.

Table 9: Kerrick Meadow: mammal species present, by habitat. * denotes observation only.**

Family	Species	Habitat	Commonness	Number of trap areas	Numbers captured
Soricidae	*Sorex lyelli*[1]	stream side, riparian	uncommon	2	4
	Sorex monticolus[2]	stream side, riparian, forest	uncommon	5	7
Sciuridae	*Spermophilus lateralis*[3]	conifer forest	uncommon	4	5
	Tamiasciurus douglasii	conifer forest	uncommon	***	
	Tamias speciosus	conifer forest	common	2	14
Geomyidae	*Thomomys monticola*	meadows	common	2	6
Muridae	*Peromyscus maniculatus*	forest, riparian	very common	5	166
	Microtus longicaudus	riparian, meadow	common	3	10
	Phenacomys intermedius[4]	conifer forest	rare	1	1
Dipodidae	*Zapus princeps*	riparian	uncommon	2	4

1 *Sorex lyelli* caught only along edge of fast moving stream in pitfall cup. This is the northern most record for this species, and extends the range over most of the alpine and subalpine habitats in Yosemite National Park

2 *Sorex monticolus* caught both in riparian zone along stream edge, in both slow and fast moving water, in pitfall cups, and on drier slopes among heather and granite boulders with Sherman live traps.

3 *Spermophilus lateralis*, usually one of the most commonly seen diurnal ground squirrels in Sierran conifer forests, was very rare during our visit in Kerrick Meadow, suggesting that overwinter mortality had been high, possibly due to the heavy, and later, snow pack two years in a row.

4 *Phenacomys intermedius* is one of the species of special interest to the YNP biologist at the beginning of our resurveys—nowhere common, we have found this species at nearly every site we have visited at an elevation above 8000 ft.