# Olympic Marmot Citizen Science Monitoring Program

2012 Field Season Annual Report

Photo by Ude-Gardner Team (starting out the day from Swimming Bear Lake)

**Summary**:

The summer of 2012 was the third full year of the Olympic Marmot Monitoring Program. New to the program this year was the addition of sites in Olympic National Forest; with the addition of those areas the program now encompasses the entire range of the species (!).

In 2012 we had 92 volunteers in 32 groups participate in the program; a total of 4024 volunteer hours were donated. Volunteer training was held on four Wednesdays in the month of August. Following training, surveyors spent from 1-8 days in a variety of areas of the Park and Forest, ranging from the front-country on Hurricane Hill to the deep in the park along the Skyline trail. Volunteer surveyors in all regions traversed high-elevation meadows and rock-fields looking for and documenting sign of marmots and marmot burrows.

Although the late season snowpack was above average, it fortunately was not as high as it was in 2012. Volunteers surveyed for marmots at 63 habitat clusters. Persistent snow precluded surveys in some of the survey units, but surveyors were able to completely survey 279 units and partially survey 32 others. Of the units in core portion of the survey sample that were completely surveyed, 52% were found to be currently occupied by marmots, 18% were abandoned (surveyors saw past but not recent sign of marmot use), and 30% had no sign of marmots. These results are comparable to what was observed in 2010 and 2011.

**Introduction**:

In the mid-1990s Olympic National Park biologists grew concerned about the status of the Olympic marmot, a housecat-sized rodent found only in the Olympic Mountains. At that time, marmots were reported to have disappeared from several areas of the Park where they used to occur. In the early 2000s a large-scale field study conducted by University of Montana (UM) researchers determined that the species had indeed declined throughout the park, and was continuing to decline at an alarming rate. The research results indicated that the decline was due to unsustainable levels of predation by coyotes. Warm winters in the late 20$^{th}$ century may have played a role in the decline, as the coyote is favored by low snowpack. Further warming due to ongoing climate change also threatens the marmots' subalpine meadow habitat. Now that the UM study is complete, park biologists need to collect data about the status and trends of the marmot population to allow Park Management to make informed management decisions about the protection of this species.

Marmots appeared to be suitable for monitoring by volunteers because they live in places people like to go, they are active during the day, and their burrows are easily seen even when they are not active. In addition, recently there has emerged in the field of wildlife science the use of presence–absence monitoring programs, in which researchers track the distribution of a species over time by surveying specific areas 1 to several times a year and assess whether the species of interest were present or not. This method is less time and resource intensive than techniques which involve counting animals and deriving a population estimate, yet it yields valuable data that can be readily analyzed and can serve as a powerful tool for tracking trends in populations and their distribution over time.

For the data to be of value to inform management decisions, we needed to establish standard monitoring protocols, procedures for recruiting and training volunteers, and a system for managing and analyzing the resulting data. Spring-boarding off the MS thesis of Julia Witczuk (2007), and using seed monies supplied by Washington's National Park Fund, Sue Griffin (the lead researcher on the UM project) was hired to design and implement the beta version of the Citizen Science Olympic Marmot Monitoring Program. The program was designed over the winter of 2009-2010, with areas of selected marmot habitat broken in survey units, units aggregated into habitat clusters that could be surveyed in a day, and then clusters that were in close proximity aggregated into trips that could be surveyed by groups of 2-4 people. Survey trip length varied from 3-7 days with trip length varying by proximity to the trailhead and other logistical factors. The design was based on the scheme devised by Julia Witcuck but modified for surveyor safety (eg. we removed areas of steep slopes).

Volunteers were recruited in the spring of 2010, and the program field tested in July and August of that year. During that trial year we confirmed that volunteers could indeed safely and reliably survey high elevation back-country areas for marmots, and that the data the volunteer surveyors collect is comparable to that gathered by trained bio-technicians. The decision was made to continue the program for as many years as possible into the future.

**Recruiting**:

In 2012 volunteers were recruited several ways. An email was sent to all 2011 volunteers in late February asking if they would like to participate again. New volunteers were recruited through a through a press release that was issued in March 2012 and also via the Park's website.

In the press release volunteers were directed to review the program, get background information on marmots and marmot ecology, and get sign-up forms through the webpage. The 5-day trips filled up quickly, however enrollment for the difficult 8 day trips and day hikes remained open until July. We had 122 people in 45 groups sign up, however by the end of the summer several cancelled for various reasons, and we ended up having 92 volunteers in 32 groups participate in the program. 65% of the volunteer surveyors were returnees, with 34% back for the second year in a row. Group sizes ranged from 2-7 people, with ages ranging from 12 to retired. The majority of volunteers came from western Washington and Oregon. Total volunteer hours in 2012 were 4024.

For safety reasons all groups must have at least two people. Although we had to turn away some volunteers, all were given some time to find hiking buddies, and that seemed to work out well.

**Program implementation:**

Some of the feedback from the 2010 surveys was that surveyors were hampered by persistent snowpacks in some areas of the Park. Consequently, in 2011 we decided to not start the surveys until August. This was fortuitous, for both 2011 and 2012 turned out to have an even higher late season snowpack than 2010. The deep snows did interfere with some of the early August 2012 surveys, but by the end of the summer all sites were accessible (or as accessible as they normally are).

Day-long training sessions were held on four Wednesdays: August 1$^{st}$, 8$^{th}$, 15$^{th}$ and 29$^{th}$. We skipped the week of August 22 to perform elk surveys, however some crews that attended training earlier in the month surveyed over that period; this seems to work well, and relaxed the pressure on the need to quickly turn around supplies on a weekly basis.

New this year was our affiliation with Huxley School of the Environment – a Western Washington University Program stationed at Peninsula College. Through this partnership we were able to conduct the classroom portion of the training in a real classroom on the college campus – a great improvement over what we were able to do in years past. Training day started at 9:30 with group check-in and gear distribution (data sheets, maps, GPSs, park radios, bear canisters, binoculars, and back-country permits). We then went into the lecture hall and covered a review the natural history of Olympic marmots, the implications of climate change and other threats the future of the marmots, overview of the survey protocols, safety during back-country travel and surveying, leave no trace camping, and use of Park radios. After a quick lunch, training was continued in the field up on Hurricane Hill, where volunteers went over and practiced the use of the GPSs, how to navigate to and through the survey units, recognize marmot sign, and record data. After training they then ventured into the park for 4-7 days, traversing survey units in high-elevation meadows and rock-fields, looking for marmots and marmot burrows. The GPS units had the survey areas loaded onto to them, and the surveyors were also able to recorded their routes and mark where they found marmots and marmot sign, allowing park staff to confirm that the survey units were actually found and traversed. Several units were surveyed twice so staff will be able determine how consistently volunteers detect marmot presence (a requirement of the analysis of presence – absence analysis).

**Results** *(all results are provisional):*

With the addition of the USFS lands, the 2012 sampling frame contained 406 survey units grouped into 74 clusters. Those clusters were aggregated into 28 different trips (Table 1). 44 clusters (in 16 trips) are the core of the program, and are to be sampled at least once every year. The remaining 24 clusters are assigned to be sampled occasionally, as resources permit. Prior to the 2012 season, volunteer groups were assigned to the one of the four training sessions and to a survey trip on a first come/ first serve basis. Units were assigned in the following priority: 1) covering the annual panel, 2) the new survey areas on USFS lands, 3) areas on the occasional panel that did not get surveyed in 2011, and 4) scheduling repeat visits to all of the annual trips that were less than 8 days. We assigned groups to one of their top 3 choices if at all possible. As the season wore on and various groups canceled the schedule became a bit unbalanced, but last minute enrollees helped a great deal. However one trip in the annual panel did not get covered (Lost Creek/Cameron Pass).

| | | | | | Training Session | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Survey Trip** | **Clusters to be Surveyed on Trip** | **Work period** | **Difficulty** | **Freq of survey** | **Aug 1** | **Aug 8** | **Aug 15** | **Aug 22** | **Aug 29** |
| Hurricane Area | Hurricane West, Hurricane East, Elwha | *3-4 days | Medium | annual | x | | | | **X** |
| Visitor Center | Visitors Center, Sunrise, Steeple | *3-4 days | Low | annual | | | | | **X** |
| Klahhane Ridge | Mt. Angeles, Klahhane | *4 days | High | annual | **X** | | | | |
| Obstruction Area | Eagle Point, Obstruction, Marmot Flats, Badger Valley, Lillian | *5 days | Variable | annual | x | | **X** | | |
| Appleton / Eagle Pass | Appleton Pass, Eagle Pass | 5 days | Medium | annual | | | X | | **X** |
| Grand Valley | Upper Moose, Upper Grand East, Grand Pass, Moose/Gladys Valley, Moose/Gladys Ridge, Grand View (occasional) | 5 days | Medium | annual | | | **X** | | x |
| Heart / Swimming Bear | Heart Lake, Swimming Bear Lake | 5 days | Medium | annual | | **X** | | | **X** |
| Hoh Lake | Bogachiel, Hoh Lake | 5 days | Medium | annual | | | X | | X |
| Seven-Lakes Basin | Lunch Lake, High Divide | 5 days | Medium | annual | | | **X** | | **X** |
| Upper Lena Lake Area | Lena, Scout Lake, Milk Lake | 5 days | Medium | annual | | x | | | |
| Anderson Pass / LaCrosse Pass | Anderson, LaCrosse Pass | 8 days | High | annual | | | | **X** | |
| Baileys | Cat Peak, Mt. Carrie, Ferry (occasional) | 8 days | High | annual | | | | x | x |
| Dose/ 1000-Acre Meadows | Dose Mdws, 1000-Acre | 8 days | Medium | annual | | | **X** | | |
| LaCrosse Basin | Lacrosse Basin, Buck Lake, Marmot Lake | 8 days | Medium | annual | | **X** | | | |
| Lost Creek/ Cameron | Lost Creek, Cameron Pass | 8 days | Medium | annual | | | | | |
| Skyline / Seattle | Skyline, Lake Beauty, Mt. Seattle | 8-10 days | High | annual | | | | x | X |
| | | | | | | | | | |
| Deer Park | Maiden Peak, Deer Park | *4 days | Medium | occasional | | | | **x** | |
| Dodger Point | Dodger Point | 4-5 days | Medium | occasional | | **X** | | | |
| Lake of the Angels | Lake of the Angels, Stone | 5 days | Moderate/ high | occasional | **X** | | | | x |
| Lillian Basin | Lillian Lake | 5 days | High | occasional | | | | | |
| Royal Basin | Upper Royal, Royal, Shelter Rock, Deception | 5-6 days | Low | occasional | | **X** | | | **X** |
| Gray Wolf Basin | Gray Wolf, Cedar Lake, Cedar South | 8 days | Medium | occasional | | | **X** | | |
| Home Sweet Home / Hopper | Home Sweet Home, Hopper | 8 days | High | occasional | | | | | |
| O'Neil Pass | O'Neil Pass, O'Neil Basin | 8 days | Medium | occasional | **X** | | | | |
| Sunnybrook Meadows | Mystery, Sunnybrook, Home Lake | 8 days | High | occasional | | | | | |
| **USFS** | | | | | | | | | |
| Marmot Pass | Marmot Pass, Buckhorn, Copper (incidental) | 5 days | Medium | occasional | **X** | | | | |
| Silver Lake | Silver Lake/ Mt Townsend | 5 days | Medium | occasional | | | | | **X** |
| Mildred Lakes | Mildred Lakes (Mt Gladys incidental) | 5 days | Medium | occasional | | | **X** | | |

*=day trips

**X=** all or most of the units surveyed

x= cluster partially surveyed

Despite the high late season snowpack, volunteers were able to survey for marmots at 63 habitat clusters throughout the park; only 11 clusters – 9 of which were in the occasional group – were not visited. Persistent snow precluded surveys in some of the survey units, especially early in the year or in areas in the western Olympics where snowfields persisted longer. However, of the 351 survey units assigned to be surveyed in 2012, surveyors were able to completely survey 279 units, partially survey 32 and unable to survey 40 others (Figures 2).

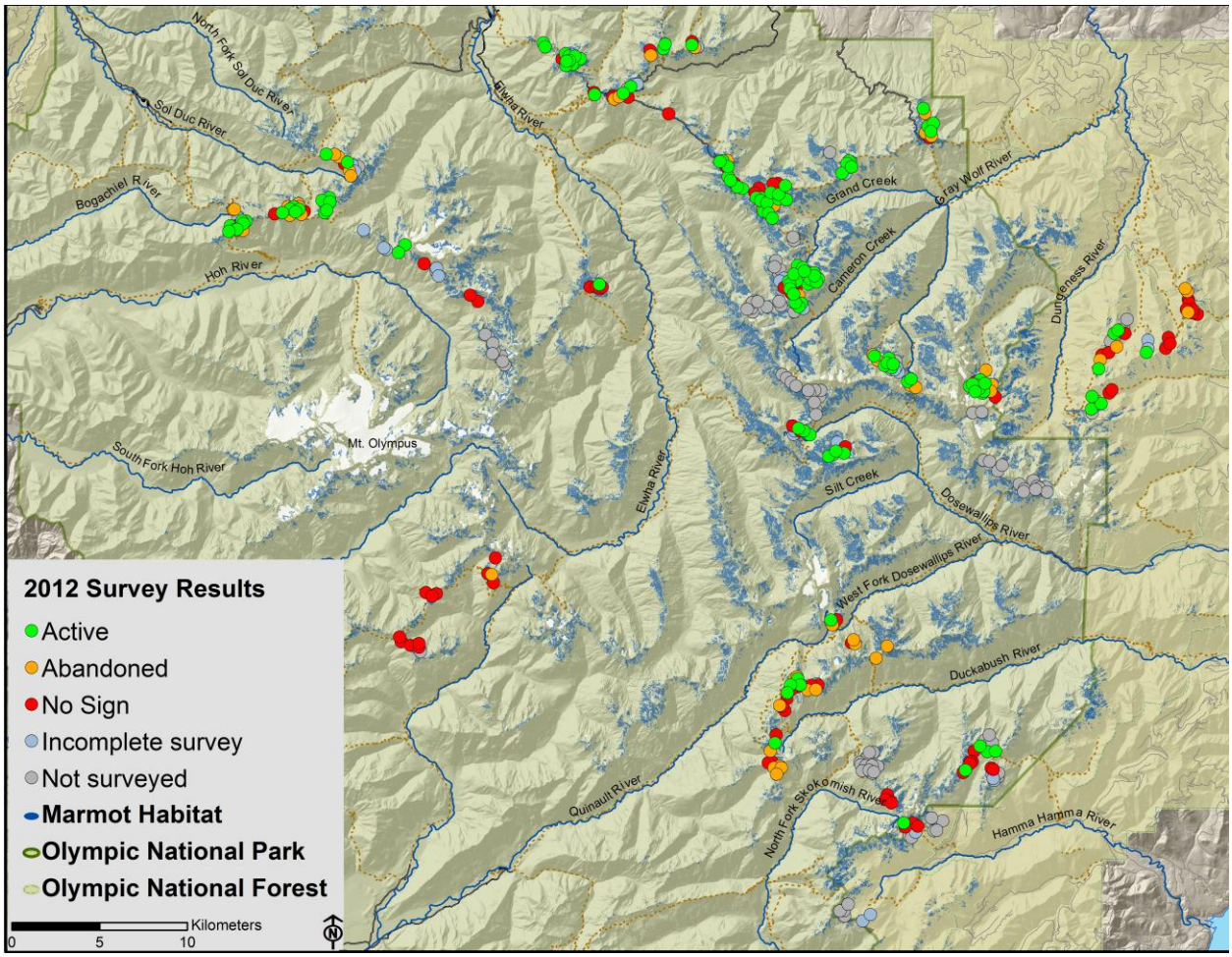


Figure 2. Location of survey units and survey results for units that were completely surveyed in 2012.

The 44 core clusters contain a total of 241 units. In 2012 78.8% of the units in the core were completely surveyed, 8% partially surveyed and 13% not surveyed (Figure 3c). This completion rate is similar to that of 2010 and 2011 (Figure 3a, b).

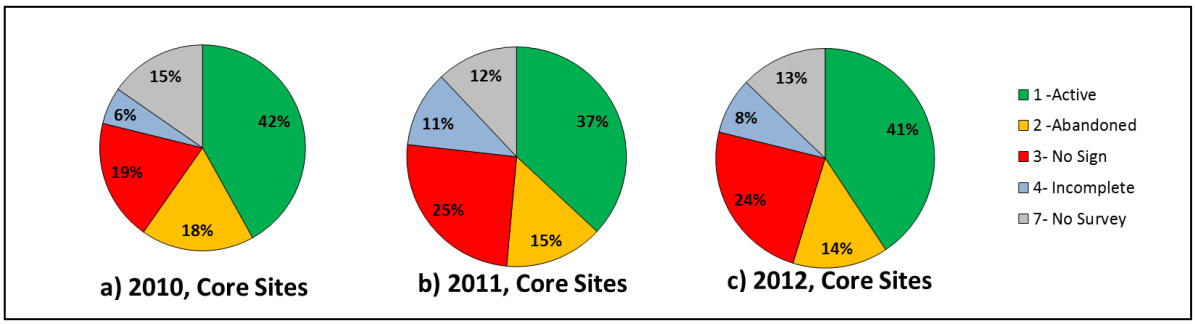



Figure 3. Survey results for units in the core sites, 2010-2012 (n=241 units).

Of the units that were completely surveyed in the core clusters in 2012, 52% were found to be occupied by marmots, where volunteer surveyors either saw marmots or fresh marmot sign. 18% of the survey units were abandoned (surveyors saw past but not recent sign of marmot use), and 30% had no sign of marmots (Figure 4). The rate of occupancy has varied between 53 and 48 % during the three years of the survey (Figure 4).

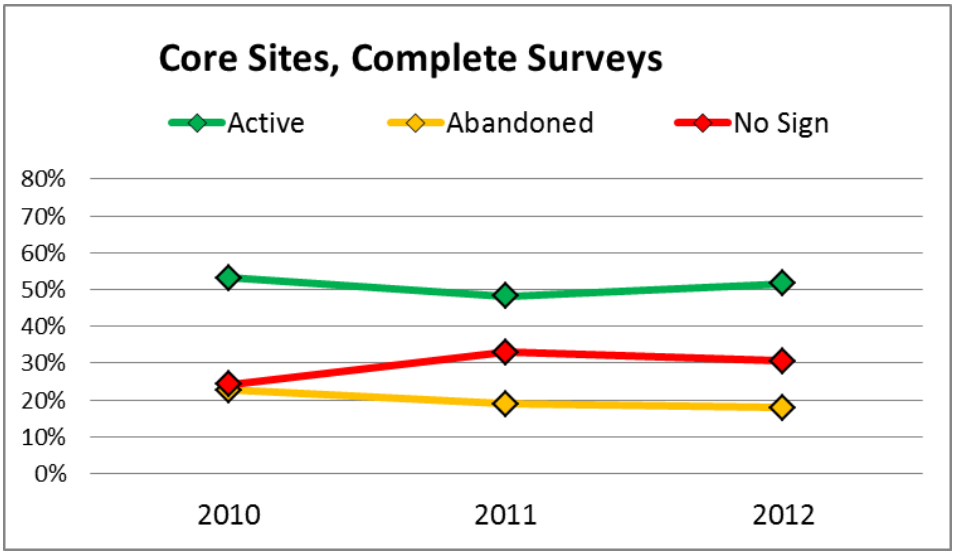
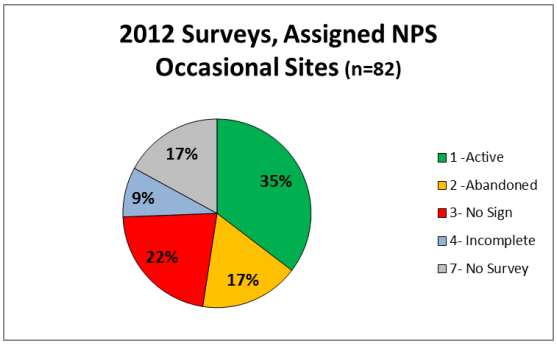



Figure 4. Survey results for units in the core sites that were completely surveyed.




In 2012 68 of the assigned survey units in the occasional clusters were completely or partially surveyed, and of those 35% were occupied (Figure 5). Year to year comparisons of these sites are less straightforward, as not all sites are surveyed each year.

Figure 5. Survey results for units in the occasional clusters that were surveyed in 2012.

**USFS Sites**: In the winter of 2012, we started the process of adding USFS lands to the marmot monitoring program. In that effort we adapted the habitat model developed by Roger Hoffman that was developed to predict Olympic marmot habitat in the park, and extrapolated it to similar habitats outside the park on USFS lands. Patches of identified habitat were then evaluated using GIS tools, and contiguous clumps of habitat were grouped into likely survey units. Units were then evaluated in terms of access and safety (steepness either on the site or the route in), size, and distribution. 46 units in 8 clusters were mapped, and 4 different trips were identified: 1) Marmot Pass: a 5-6 day trip for groups of 4-6 to survey 20 units in 3 clusters (Buckhorn, Marmot Pass, and East Copper Creek), 2) Silver Lake: a 4 day trip to survey 2 clusters (Silver Lake and Mt. Townsend), 3) Lake of the Angels: two clusters (Whitehorse South and Whitehorse North) were added to an existing NPS trip, and 4) Mildred Lakes: a 4 day trip to survey 6 units near Mildred Lakes (Figure 6).

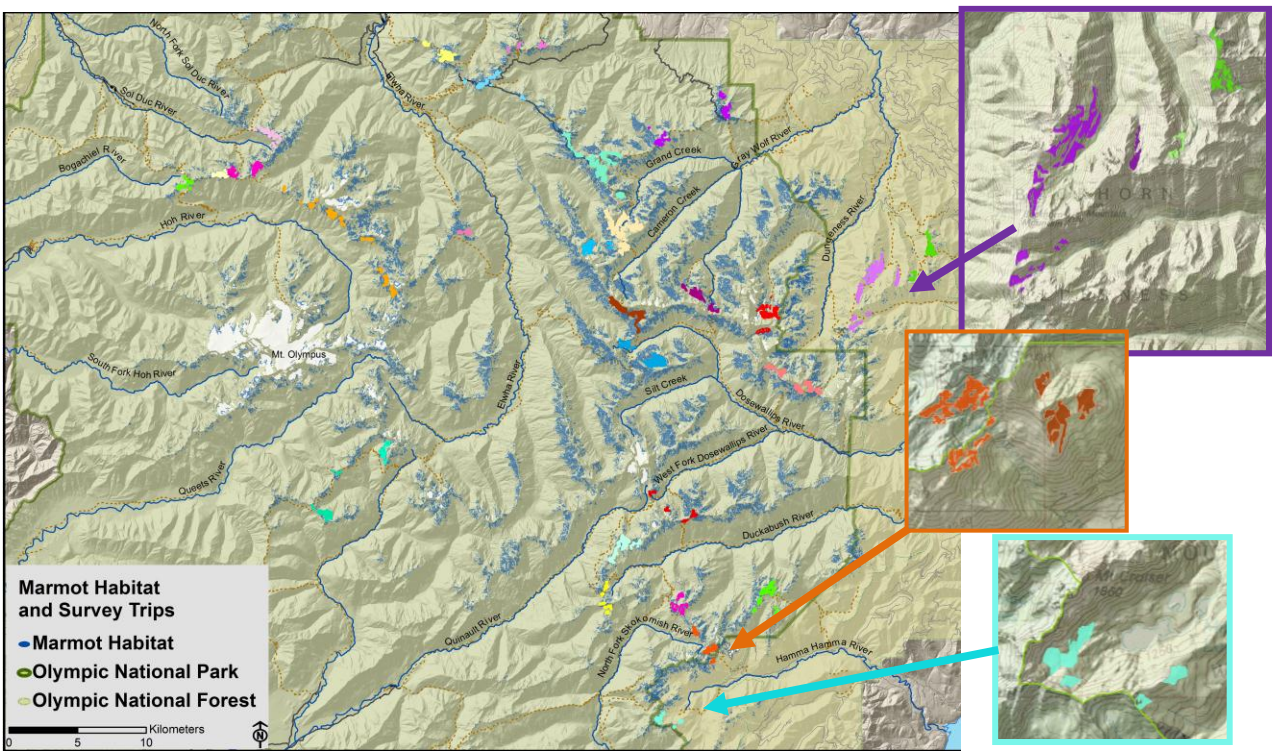
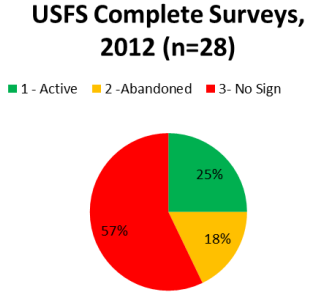


Figure 6. The location of the new units and clusters located on USFS lands. a) Marmot Pass (purple) and Silver Lake (green) trips, b) Lake of the Angles additions (orange), and c) Mildred Lakes (teal).

Unlike the survey units in the park, the USFS survey units were not ground-truthed prior to the 2012 survey season. Consequently, the surveyors who signed up for these sites were informed that there was a level of uncertainty as to the suitability of the units, and their ease of access. This first year volunteers not only gathered baseline information on where marmots are and are not found, but also provided feedback on which units should be dropped from the surveys, modified, or added. Of the 46 survey units identified on USFS lands, volunteers were able to completely survey 28, partially survey 5, and unable to survey 13. The reasons for the



incomplete or lack of survey varied, ranging from unsuitable habitat, too steep, or not enough time to get to all the units in the allotted time frame. Of the 28 units that were surveyed, only 25% were occupied by marmots in 2012.

**Regional Patterns:** Over the past 3 years there has been a distinct pattern of differing percentages of habitat units that are active, abandoned, or have no sign of marmot use in different regions of the Park. The greatest use is in the northeastern side of the Peninsula, where 70% of the completely surveyed units were occupied. Conversely, on the southwest no occupied units have been observed in the past 3 years; in 2012 8% of the units are abandoned and 92% had no sign of marmots (Figure 8).

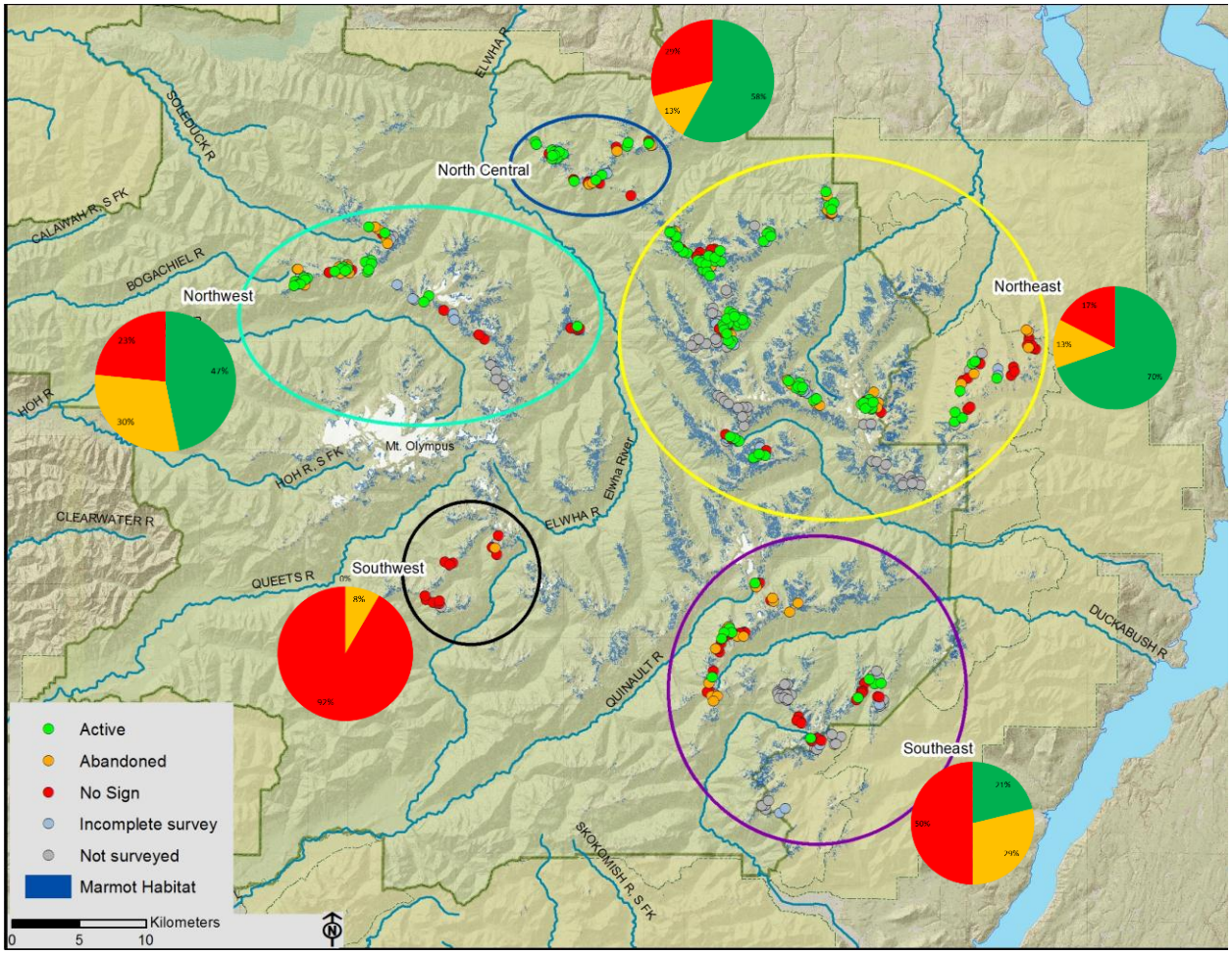


Figure 8. Regional patterns of marmot presence in 2012.

**Double Observer Trials**: 59 survey units had complete surveys conducted by two different groups. Of those 59, in 40 instances (69% of the time) the surveyors had the same result (26 occupied, 4 abandoned, and 10 no sign). Of the 19 instances when groups came to different conclusions, in 8 cases one group called a unit abandoned and the other found sign of marmots, in 4 one group saw no sign of marmots, whereas the other called the unit occupied, and in 7 one group found no sign and the other found abandoned burrows.

**Conclusions and plans for 2013:**

This was the third year of the full program implementation, and all in all, things went pretty smoothly. We miss the loss of Sue's expertise, but after two years of co- training, we were sufficiently up to speed to implement the program without her.

Although it is too early to do any statistical analyses, there is enough data to eyeball some trends. Based on three years of surveying in the clusters that make up the program core, the occupancy rate of the population appears to have been stable. There are, however, distinct regional patterns, and whether the trend is the same in all areas of the park is unknown. We have had 3 years in a row of above average late season snow pack, which may have been a contributing factor. In addition, Sue's observations indicate that pup production has been relatively high, especially in 2012.

We plan to continue the program in 2013 (with some modifications listed below) and 2014. Following the completions of 5 years of data, we will seek additional resources to support statistical analyses of the data set.

**Outreach and publications:**

Presented a poster on the project at the annual meeting of the wildlife society, Portland OR, Oct 2012.

**Recommended modifications for 2013**:

**1)** Need to double book more due to high rate of cancelations. Try to push the press release a bit more this year (was not so well advertised last year) – with the addition of USFS lands, would be good to sign up ~ 140 people in ~ 50 groups.

**2)** Large groups are sometimes hard to find; be flexible and split Grand and Lena into 2 trips and assign smaller groups to a portion of it. Most likely want to do this too for the Marmot Pass/ Buckhorn units.

**3)** Use of Peninsula College Science lecture hall is fantastic. Next year expand relationship with Huxley.

**4)** GPS use continues to improve. Our instructions get better, but we need to still spend more time on it. It was suggested that we cover this more in the classroom phase and then back it up in the field (good idea). There is some confusion stemming from the use of 2 types of GPSs; try to get more Garmin 62s and phase out use of 60s. Based on feedback from 2011, tried to give out a GPS for everyone this year – however not everyone wanted to carry that many. I think with the purchase of 8 more we will be in good shape

**5)** New this year we were able to get back-country permits ahead of time – this had huge impacts on smoothing things out and making it easier.

**6)** Keep with schedule of 4 trainings in August, on Weds. Keep a break in the training mid-session. This helps a lot with cycling the gear – especially with the longer 8 day trips where people are ending up on the south side of the peninsula. New this year was a place to return gear at the USFS ranger station in Quilcene. That was a big help to folks.

**7)** Pictures went smoother; increase use of the Picassa site, and facebook.

**8)** Do a better job providing suggested routs to folks – explore the printing out of old tracklines that worked.

**9)** To Dos:

a. Revisit and refine the USFS units.

   i. Using feedback from this year and tracklines, drop some units, redesign others.

   ii. There are gaps in distribution: explore the possibility of some exploratory trips: near Mt Jupiter, Murdock Lakes, sites near Lake of the Angels.

b. Revisit and refine NPS units.

   i. There are some mapping errors – one unit is always a confusion in the skyline trip. Run this and others down, and correct base maps on GIS and GPSs

   ii. There are several clusters (eg. Eagle Pass), and units within clusters that people have not been able to get to for 3 years. Most are due to safety and/ or access issues, or that they are not marmot habitat. Look at these on a case by case basis and either drop, redraw, or add to the occasional panel.

   iii. There is a real gap in survey distribution in the southwest. Explore the addition of some occasional units there.

**Acknowledgements:** In 2012 this project was supported by a continuing grant from Washington's National Park Fund and funding from the USFS. Training space was provided by Huxley School of the Environment and Peninsula College. As planned, all the operation in 2012 was implemented by NPS staff; this program would not have been a success without the assistance of a lot of people. Significant assistance was given by Heather Stevens of Volunteer office and Scott Kinghorn and the rest of the staff at the Wilderness Information Center in coordinating volunteer registration, and entrance, front-country camping and back-country camping permits. Program organization and training days were made much smoother due to the assistance of Kiley Barbero (SLN and Volunteer Office). Behind the scenes Kathy Beirne prepared the GPSs, developed the field maps, and processed data from the GPSs. Liz Grahm did some pre-trip scoping to most of the USFS sites, and Tom Kay and member of the landbird monitoring crew performed some surveys while in the field performing other duties. Tom and Julia Buisik also entered all the data. We are also grateful to Karen Holtrop from the USFS for weekly schlepping up bear cans loaded with gear from Quilcene. Finally, this whole endeavor would not have been possible without the hard work of the volunteer citizen scientists!