

**Summary of 2010
Marbled Murrelet Monitoring Surveys
In the Santa Cruz Mountains**

**Prepared For:
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INTRODUCTION

This report covers the results of Marbled Murrelet (*Brachyramphus marmoratus*) monitoring surveys completed in 2010 for the Santa Cruz District of California State Parks, and is the first of a three-year monitoring effort for the seabird. The surveys took place at Big Basin Redwoods State Park, Portola Redwoods State Park, Butano State Park and San Mateo County Memorial Park. These surveys are carried out in support of and to follow-up data gathered by previous similar studies completed in the Santa Cruz Mountains from years back as far as 1992. It also continues an ongoing effort to study murrelet populations after the Command oil spill that occurred in 1988.

METHODOLOGY

In previous years, California Department of Fish and Game (DFG) has funded this work; at Portola and Big Basin since 1992 and 1995. At Portola, monitoring years included 1992-1995, 1998, as well as in 2001-2003 and included only one murrelet observation station. The study has been carried out at Big Basin at five survey stations over the years of 1995-1996, 1998, and 2001-2003. During the 1995-1996, and 1998 the monitoring at Big Basin consisted of five surveys at each station during the protocol period. Coverage was minimized during the 2001-2003 years, with just three surveys annually completed at each observing station from mid-June to late-July, with two in July. The 2003-2010 surveys consist of three visits to each survey station at Butano, Big Basin and Memorial, and two stations at Portola having 5 surveys.

LOCATION OF SURVEY STATIONS

Protocol survey station placement is critical to allow for the ability of the certified surveyor to hear or see murrelets (O'Donnell 1995, Pacific Seabird Group Protocol (PSG), 2003) and landscape scale topography may also affect murrelet activity at a given location (Miller and Ralph 1995). Criteria were established to guide selection of new monitoring stations. Criteria for appropriate murrelet monitoring are listed below, in "primary criteria" and "secondary criteria".

Primary Criteria

- 1) A station should be in suitable murrelet nesting habitat in an area known to support murrelet activity. In some cases, depending on patterns of murrelet activity at a site, the nature of available habitat and access, a station might be located adjacent to suitable nesting habitat or in forest with residual old growth trees that is not optimal habitat. Existing knowledge of murrelet occurrence in the parks provided the information necessary information for appropriate murrelet station placement within the four parks, originally placed in previous years to the 2010-2012 study period.
- 2) A station should be within a significant canopy gap that provides a large view of the sky overhead. Gaps might be created naturally (stream corridor, landslide, clearcut, large tree fall, etc) or by humans (campground, road).
- 3) A station should be near a stream, in a valley bottom, or relatively low on a side slope, as murrelets use these corridors as flyways to their inland possible nesting locations. Ridgeline locations should be avoided. Although, if a station is too near a strongly flowing stream, the noise from this can cause missed murrelet detections. Thus, care should be taken to place

these creek-bottom stations in a location along the stream that is less acoustically disturbed by creek noise (Shaw, pers obs).

4) At least one station in each park should be within or immediately adjacent to a main campground as the study coordinators may propose a project to conduct corvid management activities at campgrounds in the future. Survey stations close to campgrounds may help document the presence of marbled murrelets in the area and prioritize which campgrounds may need predatory control. Predatory control is now occurring in all of the parks within and near campgrounds.

Secondary Criteria

6) A station should be at least 500 meters from another station. This serves to improve independence between stations and to sample more broadly within each park.

7) A station should be relatively easy to access in the dark before the survey station begins. Locations requiring extensive “cross country” access have been avoided, as were those requiring long hikes, and areas accessed by driving on dirt roads that might have limited access following some winters or wet weather.

The five stations at Big Basin Redwoods State Park (Redwood Meadow, 100 acre woods, Blooms Creek, Huckleberry 17, and Sempervirens) were established in 1995 in a dispersed pattern in the upper watershed of the East Fork of Waddell Creek. Two did not meet the selection criteria, Sempervirens and Huckleberry 17, have only mediocre sky views. Huckleberry 17 is located in a campground and Redwood Meadow and Blooms Creek are located about 400 meters from campgrounds.

The Peters Creek bridge station at Portola State Park was established in 1992 and met the survey criteria and is located adjacent to the park’s main campground. A new station, Iverson was established in 2001 where Iverson Trail crosses Pescadero Creek, west of the park headquarters.

The Ben Ries station at Butano State Park is on the main park road immediately before the entrance to the Ben Ries Campground and is adjacent (just east) to campsite #1. Little Butano Creek survey station is alongside a large upslope landslide along a park service road that begins at the entrance to the campground.

The Sequoia station at Memorial County Park is in the Sequoia Flat Campground where the main camp road enters the “D” sections of the camp. Memorial survey station is located at Pescadero Creek, adjacent to the Tan Oak Flat picnic area and is at the site of the old “swimming pool” that was in previous years created seasonally within the creek itself. In 2010, the survey station was moved due to an overwhelming amount of noise created by the creek and associated falls (over a manmade structure) immediately adjacent to the station location. The station was moved 100 meters north-northwestern to the campground road above the original survey location. This survey station is far more conducive to acoustical detections, as nearly none of these type detections were received at the original station location.

DAWN MURRELET SURVEYS

Dawn murrelet surveys followed the standard protocol for audio-visual surveys in coniferous dominated forests found within the Pacific Seabird Group, 2003 protocol. Brian Shaw, Myriah Fernandez and Shane Strahs completed all of the surveys during the 2010 survey year. All three surveyors were trained and certified by Mad River Biologists training program conducted at Redwood State and National Parks in northern Humboldt County. In addition to murrelet surveys, all bird species that were detected were counted and are reported here in Appendix 1. Also, immediately following each dawn completed murrelet survey, a corvid survey was completed at or near many of the survey stations. All of these data are discussed and analyzed below.

Seasonal Timing of Surveys

2010 survey dates at each park are found on Tables 1, 2, 3, and 4. Surveys were focused as per protocol, during the peak July activity period. However, also suggested within the protocol, is to complete surveys through the survey period. Thus, surveys were completed from mid-June through early August, with a focus on surveys being completed during the peak mid- to late-July dates.

Big Basin Redwoods State Park

Murrelet activity during the 2010 survey season overall at the five survey stations (surveyed 3 times each) combined show that the total detections (62) and the average total number of detections (4.1) are still continuing to decline or are at near to the lowest single comparative year over the six previous survey years prior to the 2010 year. See **Table 1** for detection totals and comparison. The lowest single year average was 4.4 detections per morning in 2002. This compared to the 55 detections per morning in the peak of the 1995 survey year. Although, detections have not considerably decreased between the seven years since the 2002 surveys were completed. Thus this is at the very least, a stabilizing statistic. There were also ten occupied flight behaviors during the 2010 survey year, which compares in a similar fashion to previous years. Five surveys at Big Basin yielded no detections.

The *Redwood Meadow* station continues to be the center of the highest level of murrelet activity at Big Basin as 46 of all 62 detections at all of the five survey stations (74%) took place here. The viewshed is by far better than any of the other four survey stations located within the park. Thus, detection rates would be expected to be better here through any given year based on this fact alone. Detection rates ranged from 2 to 37 (average 15.3/survey), with the peak occurring during the most-active middle July survey date. This average of 15.3 detection per morning closely matches the average number of detections per morning over the 2002 to 2009 years, which is at 14.3 detections per morning. It should be noted that this 37 detection morning was during a nearly perfect survey morning with a low cloud layer and nearly no wind, and it was during the peak murrelet activity period. These 2010 detection totals would indicate a “moderate” level of murrelet activity.

100 Acre Woods had 6 total detections in 2010, with no subcanopy flights (occupied behavior) observed. Total detections ranged from 0 to 5 over the three-survey period. The average number of detections over the three surveys was 2.0, with one morning of no detections. These numbers are lower than the average number of detections during the 2001-2009 period which had an average of 4.1 detections per morning.

Blooms Creek survey station had a total of 8 detections with one observed occupied behavior. This is an average of 2.7 detections per morning, which is the highest detection average since

the 2006 year. This total is just above the average total of detections received across surveys conducted from 2002 to 2009, which is 2.1 detections per morning.

Huckleberry 17 had one detection in 2010, activity was very low again, but this was the first detection since 2007. This matches closely with the combined 2001-2009 average detection total of 1.7 detects per morning.

Sempervirens had two detections in 2010. These are the first detections received at this station since 2001, a span of 9 years. This is a good sign, and shows that on very good “murrelet weather” survey mornings (2.0-2.5 canopy level cloud cover and nearly no wind) that even at the least traveled sites, but still within decent habitat, murrelets can be detected.

Big Basin Redwoods State Park Murrelet Activity - Trends

Highest murrelet detection totals occurred during their typical peak period of activity July 1-18. In addition to this, the mornings of 7/20 and 7/22 yielded near perfect survey conditions, subsequently producing the top number of murrelets detected during the season in Big Basin State Park. This shows at Big Basin SP within the Redwood Meadow (and all other stations surveyed that morning) survey station, as on the best survey morning (37 detections, on 7/21), detection rates were far higher than during the other two visits (7 detects on 6/22 and 2 detections on 8/4). The importance of weather and seasonal timing cannot be emphasized enough when conducting any type of comparative analyses within a single survey season and when compared to previous years, for the marbled murrelet population trends.

Overall within the park, the peak survey time again was during the typical high-detection mid-late July period. All of the five survey stations received their highest detections during this time.

The overall and single station trend as far as seasonal murrelet detection totals is concerned compares very similarly to the 2001-2009 survey years at Big Basin State Park. Thus, although it appears that if there was a decline in numbers during the 1990's, that this trend may have flattened out and a possible stabilization in the population trend is now occurring. This needs to be examined over the next two murrelet survey seasons. The fact that detections were again received at the *Sempervirens* station is encouraging after eight years of no activity at this location.

See Table 1, Figures 2, 6-11 for representations of data for Big Basin Redwoods SP.

Portola Redwoods State Park

Murrelet activity during the 2010 surveys at Portola Redwoods State Park is summarized in **Table 2**.

Peters Creek survey station had a range of 16-41 detections and an average of 33. Subcanopy flights at *Peters Creek* averaged 6 per visit, with a range of 1 to 9.

Iverson Creek survey station activity had the highest in Portola with a range of 23-82 detections and an average of 40. Activity at *Iverson Creek* was the second highest of all of the survey stations within any of the parks (*Little Butano* station was highest) with the mid-July survey date being the busiest detection morning. There were also several occupied behaviors (subcanopy flights) during all five surveys, with 2 to 13 observed. This station is

located just downstream of one of the parks larger contiguous areas of old-growth redwood forest, thus receives an abundance of murrelet flight traffic both in and out (eastward early in the morning and westward towards the end of the survey morning). As was the case in previous surveys here, there are many very low flying (.5 canopy and below) murrelet detections found here, just above Pescadero Creek. Several detections were seen at below 0.5 canopy directly above the creek.

Portola Redwoods State Park Murrelet Activity - Trends

Detection numbers from the 2010 survey year to previous years compare similarly to the 2003-2009 survey years, with 33 and 40 average detections at Peters Creek and Iverson, respectively in 2010. This compares to 33/35 detections received at Peters Creek in 2003/2004 and 59/39 detects at received Iverson Creek in 2003-2004 years. Thus the Iverson detect number average (40) compares a bit low to the 2003 year (59), but the average detection total of 40 is still a great number for any murrelet stand.

The Peters Creek number is exactly at the two year 2003-2004 average. Additionally, at Peters Creek, the 2002-2004 and 2010 years all compare very low to the mid-1990 average detect data. There is no other comparative data for Iverson earlier than the 2003 survey year, as the station was established in that year. For the Peters Creek station, detection totals have remained somewhat constant through the eight-year survey period, with a downturn in detections in years 2005-2006, 2008 and an anomalous low year in 2009. However over that time period, four of the eight years have had totals averaging over 30 detections per year. The Iverson Creek has also shown a similar set of ups and downs in total average detections over that time period, with 2003-2004 averaging 49 detections/year, with a downturn in detections from 2005-2009, and a 2010 upturn year with 40 detections, which matches more similarly to detections in years past (2003-3004).

The habitat at both survey stations is very good, with large areas of great habitat and many available nesting trees typical of an old-growth redwood forest, and as is typical throughout all of the four parks within this study area.

See Table 2, Figures 3, 12-13 for representations of data for Portola Redwoods SP.

Butano State Park

Murrelet activity during the 2010 surveys at Butano Redwoods State Park is summarized in **Table 3**.

Ben Reis survey station activity ranged from 12-52 detections, with an average of 26. When compared to the previous years data 2003-2009, the 2010 numbers at Ben Reis are between the peak totals in 2003/2004 of 23/48 detections on average, respectively. The low number of 1.3 subcanopy detections received at Ben Reis in 2010 closely mirrors the eight-year average subcanopy detection total at the station. This number is at least partly a result of the small visual window above the survey station. Reis are mostly a result of the small visual window above and because There also is a thick wall of tanoak and small Douglas-fir to the immediate north of the call point, which disallows visuals that could be eye-level above the creek. Thus, this low number of occupied detections could be expected here.

Little Butano, survey station the total detections ranged from 22-122 with an average of 62. The 122 detections are by far the highest number of single morning detections received at any of the park's survey stations during the 2010 survey year. The average of 62 detections is

also the highest of any of the four parks survey stations. The number of subcanopy flights was also high at Little Butano, with an average of 20 occupied behaviors. In contrast to the Ben Reis station the Little Butano station is located with a nice viewshed out and above the creek bottom as well as straight overhead.

Butano State Park Murrelet Activity - Trends

Trends over the eight-year survey period show, similarly to the Portola detection totals, that a downturn in detections occurred at the Ben Reis station during the 2005-2009 years, with a low in 2009 (5 detects/morning), and an upturn again in 2010 (26 detects/morning) more reminiscent of the 2003-2004 survey years (25 detects/morning). However, detection totals over that time have remained somewhat constant at the Little Butano station, with the 62 detections somewhat above the eight year average of 41 detections and nearing the high detection total of 68 detects/morning in 2004. The 122 detection “peak period” total was by far the highest single station morning total of any survey at any of the survey areas.

See Table 3, Figures 4, 14-15 for representations of data for Butano SP.

Memorial Park – San Mateo County

The lowest overall numbers of murrelets were found in Memorial Park. Murrelet activity during the 2010 surveys at San Mateo County Memorial Park is summarized on **Table 4**.

Memorial station had an average of 11 detections; subcanopy detections also were very low, with an average of 1.

Sequoia station had an average of 4 detections and less than 1 average subcanopy detection 1.

These numbers compare fairly similarly to the 2003 year surveys, which averaged 4 detections at Memorial and 10 at Sequoia. The numbers seemed to have flip-flopped from 2003 to 2010, with Sequoia having more detections in 2003 than in 2010 and Memorial having fewer detections in 2003 than in 2010. One reason for this, is that in 2010, the survey station at Memorial was moved just slightly to get away from the noisy creek. The station should not have been placed where it was at the volleyball court/old swim area due to a falls over the old cement structure at that location within the creek. Thus, by simply moving the survey point just 100 meters north to just up and on the road gained more of all types of detections. The original reason for placing the station on the creek was to gain access to “flyway” subcanopy detections. However, this is counter-productive, because while you might gain a few extra flyway occupied behaviors, you lose nearly all but the loudest “keer” detections which can direct your eyes towards visual detections you could be receiving when acoustical conditions are far better. Thus, this is the reason for the increase in overall detections at the Memorial survey station.

There is no clear reason for the decrease in detections at the Sequoia station. The large number of Steller’s Jays at this station likely played a part. It is possible that this could have caused several “misses” on possible acoustical murrelet detections, as sometimes up to 7 or 8 Jays were squawking at once. The background noise decreases longer distance acoustics, and ability to detect “keers”.

Memorial County Park Murrelet Activity - Trends

Numbers through the eight-year 2003-2010 period show that at Sequoia, there was a decent 12/morning detection rate level from 2003-2007, with a fairly substantial drop off in

detections from 2008-2010 (4 detects/morning). Again this could be due to murrelets choosing against this site for landing, nesting or any other life-history behavior as a result of the unruly corvid presence here. Numbers at Memorial station increased significantly from the average 2003-2009 years (1.5 detects/morning) to 11 detects/morning. This is in direct relation to placing the survey station just beyond earshot of the creek and associated falls station location. Future surveys should further play out this trend of increased detections, especially acoustical.

See Table 4, Figures 5, 16-17 for representations of data for Memorial Park in San Mateo County.

CORVIDS

A simultaneous corvid survey was conducted for Steller's Jays (STJA) and Common Raven (CORA) during the two-hour murrelet survey. No specific methodology was used here, besides the simple ability to recognize the sounds and visual appearance of each species. Thus, survey for these two species proved very easy, even while studying the morning sky and forest for murrelets.

Please note that surveyors used their best judgment in not "double-counting" especially the jays, as they are significantly more prevalent and somewhat more mobile. Thus, jays are a bit more difficult not to double count than ravens. Thus, total morning numbers of all counted corvids took this into consideration.

Overall, corvids were found in highest abundance at the Memorial campground and least abundance at Portola campground.

Big Basin Redwoods State Park

Both ravens and jays were found at each of the five murrelet stations within Big Basin State Park. As was the case in most of the 2003-2009 years, numbers were greatest at the Blooms and Huckleberry campgrounds, with average numbers during murrelet surveys averaging 7 to 8 jays and several ravens during the morning survey. The further studies that were completed here also showed abundant numbers of corvids at the campgrounds versus at the off-campground Sempervirens, 100-acre woods, and Redwood Meadows locations, where corvid numbers were significantly lower. For instance, the most jays at any of the non-campground survey locations was 4 one morning at Sempervirens, but averaged around 2 total jays for all three of these off-campground locations on any given morning. Further, numbers of ravens were even fewer, with an average of around 1 raven found at the non-campground survey locations.

Steller's Jay

Overall numbers of STJA decreased somewhat from previous years, with an average of 3.4 jays per morning, where the average of the previous years (2003-2009) was near 9 jays/station.

Common Raven

Overall numbers of CORA decreased negligibly from previous years, with an average of 1.3 ravens per morning, where the average of the previous years (2003-2009) was around 2.3 jays/station.

Portola Redwoods State Park

Both ravens and jays were found at Portola State Park, with numbers at the campground-adjacent to Peters Creek survey station significantly higher than the Iverson Creek survey station. The numbers reflect this, with numbers ranging from 1 to 9 jays (average of 5+) at Peters Creek and less than three per morning at Iverson Creek. The 3 number at Iverson Creek would be considered “normal” and “typical” for jays found in a forest setting. But the 5, 6, and 9 totals on separate mornings found at Peters Creek are indicative of the campground and human use setting. The numbers of ravens found at each station are fairly similar to each other, with less than significant differences between the two. However, jays are typically more abundant overall no matter the setting, so using jays is typically a more realistic and reliable method of showing this scavenger’s use (overuse and pest like behavior) than that of ravens, who typically have fewer numbers, even near campgrounds overall than jays.

Steller’s Jay

Overall numbers of STJA decreased from previous years totals, with an average of 1.2 jays per morning, where the average of the previous years (2003-2009) was near 5 jays per station.

Common Raven

Overall numbers of CORA remained the same from in previous years, with an average of 1.3 ravens per morning, where the average of the previous years (2003-2009) was around 1.5 jays per station.

Butano Redwoods State Park

Both jays and ravens were found within the park, with the Ben Reis survey station near the campground showing far more of both species than the more natural setting of the Little Butano survey station. This is reflected in the numbers, with Little Butano averaging three jays per morning, and Ben Reis averaging 6 to 7 jays per morning, with a top out total of near 15 jays. Raven numbers were significantly higher at Ben Reis also, with three per morning being the average, while 1 raven per morning was found at Little Butano.

Again, three jays and one raven per morning are typical for a natural coniferous forest setting anywhere in California within the mixed conifer zone and below (and sometimes higher in central and southern CA mountains). Thus, the 6 to 7 jays and at least 3 ravens found typically at the Ben Reis near-campground station is related to the human use found at the campground, where corvids “hang-out” waiting and searching for easy food scraps.

Steller’s Jay

Overall numbers of STJA decreased somewhat from previous years, with an average of 4.7 jays per morning, where the average of the previous years (2003-2009) was near 6.5 jays per station.

Common Raven

Overall numbers of CORA remained the same from in previous years, with an average of 2.3 ravens per morning, where the average of the previous years (2003-2009) was 2.1 jays per station.

Memorial Redwoods County Park

Corvids seem to be more of a problem in Memorial Park campgrounds than in the other three state park campgrounds. This is evidenced by the large numbers of jays especially found at the Sequoia survey station, which is directly within the Sequoia Campground section of the park. Numbers show an average of 12 (range of 10-16 per morning) jays found during the survey at this station. Only 2 to 3 ravens were found per morning though. At the non-campground (although not that far from a campground) Memorial survey station totals show an average of 4 jays and 4 ravens observed per morning. This number is still above what would be considered within a “normal” forest setting away from humans. This is due to the fairly close proximity (compared to say the *Sempevirons* site in Big Basin SP) of this station to a campground (only a few hundred meters away). So, this number would be expected here. However, the high number at Sequoia shows a large scavenging population of jays found here due to the high usage by humans of this campground.

Steller's jay

Overall numbers of STJA decreased significantly from previous years, with an average of 5.8 jays per morning, where the average of the previous years (2003-2009) was near 15 jays per station.

Common Raven

Overall numbers of CORA decreased somewhat from in previous years, with an average of 2.2 ravens per morning, where the average of the previous years (2003-2009) was 5.5 jays per station.

See Tables 5 & 6 and Figures 18 and 19 for Corvid data by State/County Park.

AVIAN SURVEYS

An incidental avian study was completed during each two-hour murrelet survey. All avian species identified by sight and/or sound were recorded during the murrelet survey. During murrelet detection voice recording, it is possible that a few of the individual avian species calls could have been missed. The crux of this overall study was to study marbled murrelets. Thus if a complex murrelet detection was being voice recorded into the surveyors handheld device, the importance of that detection exceeded the possible avian calls that could have been heard during the murrelet detection. However, a respectable level of birds were represented as a result of these morning avian surveys.

Songbirds in the parks showed a typical representation of individuals within a redwood forest avian population, with some not quite as typical edge type birds found in a southern coastal redwood (*sempevirons spp*) forest. Notable species that were found that are not quite as typical in these forests, or are notable as large, more important birds at the top of the food chain found within the parks include: pileated woodpecker, red-tailed hawk, northern flicker, acorn woodpecker, hairy woodpecker and downy woodpecker.

There were an abundance of smaller passerine type birds also, with some notable numerously occurring species such as hermit thrush, dark-eyed junco, chestnut-backed chickadee, and pacific-sloped flycatcher. One notable flock of nine California quail was seen during one morning survey at Big Basin SP.

A list of individual birds found within each park is represented by **Table 7**.

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Table 1. Summary of protocol murrelet surveys conducted at Big Basin Redwoods State Park in 2010.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Redwood Meadow	6/22/10	MLF	0	7	1
Redwood Meadow	7/21/10	BKS	50	37	7
Redwood Meadow	8/4/10	MLF	0	2	1
100 Acre Woods	6/23/10	SS	0	1	0
100 Acre Woods	7/22/10	MLF	25	5	0
100 Acre Woods	8/4/10	SS	0	0	0
Blooms Creek	6/23/10	MLF	0	0	0
Blooms Creek	7/21/10	MLF	50	8	2
Blooms Creek	8/3/10	MLF	0	0	0
Huckleberry #17	6/22/10	SS	0	0	0
Huckleberry #17	7/21/10	SS	50	1	0
Huckleberry #17	8/3/10	SS	0	0	0
Sempervirens	6/22/10	BKS	0	0	0
Sempervirens	7/22/10	SS	50	2	0
Sempervirens	8/3/10	BKS	0	0	0

Table 2. Summary of protocol marbled murrelet surveys conducted at Portola Redwoods State Park in 2010.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Iverson	6/25/10	SS	100	31	3
Iverson	7/8/10	BKS	0	23	5
Iverson	7/23/10	BKS	0	33	10
Iverson	7/25/10	SS	100	82	13
Iverson	8/2/10	SS	0	32	2
Peters Creek Bridge	6/25/10	MLF	100	18	1
Peters Creek Bridge	7/7/10	BKS	0	16	5
Peters Creek Bridge	7/22/10	BKS	25	41	9
Peters Creek Bridge	7/25/10	MLF	100	72	7
Peters Creek Bridge	8/2/10	MLF	100	18	7

--5 Surveys were conducted at both Iverson and at Peters Creek Bridge.

Table 3. Summary of protocol marbled murrelet surveys conducted at Butano State Park in 2010.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Little Butano Creek	6/24/10	MLF	0	15	3
Little Butano Creek	7/24/10	MLF	100	52	1
Little Butano Creek	8/5/10	MLF	25	12	0
Ben Reis	6/23/10	BKS	25	42	22
Ben Reis	7/20/10	MLF	100	122	37
Ben Reis	7/26/10	MLF	0	22	0

Table 4. Summary of protocol marbled murrelet surveys conducted at San Mateo Memorial County Park in 2010.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Memorial	6/24/10	BKS	0	19	2
Memorial	7/23/10	MLF	0	10	0
Memorial	8/2/10	BKS	25	4	1
Sequoia	6/24/10	SS	0	1	0
Sequoia	7/23/10	SS	0	8	1
Sequoia	8/4/10	BKS	100	3	0

Table 5. Comparison of murrelet activity levels between years at each park from 1995-2010.

Station	Year	N	<u>All Detections</u> Avg Detects	<u>Occupied Site Detections</u> Average Detects
<i>BIG BASIN</i>				
Redwood Meadow	1995	4	177.0	64.0
	1996	4	97.0	27.5
	1998	4	92.3	33.5
	2001	3	86.3	8.0
	2002	3	18.7	1.3
	2003	3	16.3	1.3
	2004	3	17.0	2.3
	2005	3	14.0	1.3
	2006	3	18.3	9.0
	2007	3	16.3	2.7
	2008	3	12.0	0.0
100 Acre Woods	1995	4	25.3	9.0
	1996	4	9.5	2.0
	1998	4	5.0	3.7
	2001	3	3.7	0.3
	2002	3	2.7	0.0
	2003	3	7.0	2.3
	2004	3	7.0	0.0
	2005	3	1.0	0.0
	2006	3	8.0	3.0
	2007	3	3.0	0.0
	2008	3	6.7	2.3
Blooms Creek	1995	4	44.8	1.5
	1996	4	44.8	1.8
	1998	4	15.0	1.0
	2001	3	23.0	3.0
	2002	3	0.7	0.0
	2003	3	2.7	0.0
	2004	3	1.3	0.0
	2005	3	4.0	0.0
	2006	3	3.0	0.0
	2007	3	2.3	0.0
	2008	3	1.3	0.0
2009	3	1.3	0.0	
2010	3	2.7	0.7	

Table 5, continued.

Station	Year	N	<u>All Detections</u> Average Detects	<u>Occupied Site Detections</u> Average Detects
<i>BIG BASIN</i>				
Huckleberry	1995	4	24.3	7.5
	1996	4	23.3	5.5
	1998	4	14.0	1.0
	2001	3	4.3	0.0
	2002	3	0.0	0.0
	2003	3	3.0	0.7
	2004	3	0.3	0.0
	2005	3	1.0	0.0
	2006	3	6.0	0.3
	2007	3	2.0	0.7
	2008	3	0.0	0.0
	2009	3	0.0	0.0
2010	3	0.3	0.0	
Sempervirens	1995	4	1.3	0.3
	1996	4	4.8	0.0
	1998	4	5.3	0.3
	2001	3	1.0	0.0
	2002	3	0.0	0.0
	2003	3	0.0	0.0
	2004	3	0.0	0.0
	2005	3	0.0	0.0
	2006	3	0.0	0.0
	2007	3	0.0	0.0
	2008	3	0.0	0.0
	2009	3	0.0	0.0
2010	3	0.7	0.0	
<i>All Big Basin Stations Combined</i>	1995	20	54.5	16.5
	1996	20	35.9	7.4
	1998	20	27.4	8.1
	2001	15	23.7	2.3
	2002	15	4.4	0.3
	2003	15	5.8	0.9
	2004	15	5.1	0.5
	2005	15	4.0	0.3
	2006	15	7.1	2.5
	2007	15	4.7	1.9
	2008	15	4.0	0.5
	2009	15	0.6	0.0
2010	15	4.2	0.7	

Table 5, continued.

Station	Year	N	<u>All Detections</u> Average Detects	<u>Occupied Site Detections</u> Average Detects	
<u>Portola</u>					
Peters Creek Bridge	2003	5	33.2	6.0	
	2004	5	35.6	4.4	
	2005	5	18.0	0.2	
	2006	5	18.6	2.4	
	2007	5	30.6	0.8	
	2008	5	19.0	0.6	
	2009	5	5.4	0.0	
	2010	5	33.0	5.8	
	Iverson	2003	3	59.3	28.3
		2004	3	39.3	9.0
2005		3	3.7	0.0	
2006		3	11.7	1.7	
2007		3	8.7	0.7	
2008		3	12.7	2.7	
2009		3	9.7	0.3	
2010		5	40.2	6.6	
<i>All Portola Stations Combined</i>		2003	8	43.0	14.4
		2004	8	37.0	6.1
	2005	8	12.6	0.1	
	2006	8	16.0	2.1	
	2007	8	22.4	0.8	
	2008	8	16.6	1.4	
	2009	8	7.0	0.1	
	2010	10	36.6	5.2	
	<u>Butano</u>				
	Ben Ries	2003	3	23.3	1.3
2004		3	48.0	5.7	
2005		3	13.7	0.0	
2006		3	11.7	0.7	
2007		3	12.7	0.3	
2008		3	10.0	0.0	
2009		3	5.3	0.0	
2010		3	26.3	1.3	
Little Butano Creek		2003	3	34.0	6.0
		2004	3	68.3	22.0
	2005	3	26.7	4.0	
	2006	3	48.0	4.3	
	2007	3	46.3	5.7	
	2008	3	20.7	3.0	
	2009	3	17.7	2.0	
	2010	3	62.0	19.7	

Table 5, continued.

Station	Year	N	<u>All Detections</u> Average Detects	<u>Occupied Site Detections</u> Average Detects	
<i>All Butano Stations Combined</i>	2003	6	28.7	3.7	
	2004	6	58.2	13.8	
	2005	6	20.2	2.0	
	2006	6	29.8	2.5	
	2007	6	29.5	3.0	
	2008	6	15.3	1.5	
	2009	6	11.5	1.0	
	2010	6	44.2	12.5	
	<u>Memorial</u>				
	Memorial	2003	3	4.3	0.0
2004		3	1.0	0.0	
2005		3	1.3	0.0	
2006		3	4.7	0.3	
2007		3	0.7	0.0	
2008		3	0.7	0.0	
2009		3	0.7	0.0	
2010		3	11.0	1.0	
Sequoia		2003	3	9.7	0.7
		2004	3	12.3	1.0
	2005	3	15.3	0.0	
	2006	3	13.7	0.0	
	2007	3	8.7	0.3	
	2008	3	7.0	0.3	
	2009	3	2.0	0.0	
	2010	3	4.0	0.3	
	<i>All Memorial Stations Combined</i>	2003	6	7.0	0.3
		2004	6	6.7	0.5
2005		6	15.3	0.0	
2006		6	9.2	0.2	
2007		6	4.7	0.2	
2008		6	3.8	0.2	
2009		6	1.3	0.0	
2010		6	7.5	0.2	

1. This table only presents data from CDFG or COSTC sponsored surveys. Results from additional non-CDFG or COSTC sponsored surveys are not shown.

Table 6: High counts for Steller’s Jay and Common Raven from 10-minute point counts and 2-hour dawn surveys at each park in 2010.

Station	<u>Stellars</u>	<u>Jay</u>	<u>Common</u>	<u>Raven</u>
	Point Count	2-Hour Survey	Point Count	2-Hour Survey
Big Basin				
Redwood Meadow	2	4	10	13
100 Acre Woods	2	4	1	1
Blooms Creek	6	8	3	4
Huckleberry #17	5	8	2	2
Sempervirens	2	4	1	2
Portola				
Peters Creek	6	12	3	3
Iverson	3	7	1	1
Butano				
Ben Reis	6	10	6	6
Little Butano Ck.	3	6	1	1
Memorial				
Memorial	3	5	4	6
Sequoia	11	16	2	2

Table 7: Average numbers for Steller’s Jay and Common Raven from 2-hour dawn surveys at each park in 2010.

Station	<u>Stellars</u> 2-Hour Survey	<u>Jay</u>	<u>Common</u> 2-Hour Survey	<u>Raven</u>
Big Basin				
Redwood Meadow	2		2.5	
100 Acre Woods	3		1	
Blooms Creek	8		2	
Huckleberry #17	6		3	
Sempevirons	3		1	
Portola				
Peters Creek	3.8		1	
Iverson	5		1	
Butano				
Ben Reis	6		3	
Little Butano Ck.	3		1	
Memorial				
Memorial	4		4	
Sequoia	12		1.5	

Table 8. Avian species list by park – 2 Hour morning murrelet survey avian count.

Big Basin	Portola	Butano	Memorial
Stellars Jay	Stellars Jay	Stellars Jay	Stellars Jay
Common Raven	Common Raven	Common Raven	Common Raven
Dark-Eyed Junco	Dark-Eyed Junco	Dark-Eyed Junco	Dark-Eyed Junco
Hermit Thrush	Hermit Thrush	Hermit Thrush	Hermit Thrush
Pac-Slope Flycatcher	Pac-Slope Flycatcher	Pac-Slope Flycatcher	Pac-Slope Flycatcher
Northern Flicker	Northern Flicker	Northern Flicker	Northern Flicker
Acorn Woodpecker	Acorn Woodpecker	Acorn Woodpecker	Acorn Woodpecker
Pileated Woodpecker	Pileated Woodpecker	Pileated Woodpecker	Pileated Woodpecker
Downy Woodpecker	Downy Woodpecker		Downy Woodpecker
Morning Dove	Morning Dove	Morning Dove	Morning Dove
American Robin	American Robin		American Robin
	Wilson's Warbler	Wilson's Warbler	Wilson's Warbler
Chestnut Backed Chickadee	Chestnut Backed Chickadee	Chestnut Backed Chickadee	
California Quail		California Quail	
	Vaux's Swift		Anna's Hummingbird Vaux's Swift
Hairy Woodpecker			
	Warbling Vireo	Warbling Vireo	
Brown Creeper			
Red-Tailed Hawk			
	Mallard		

Figure 1: California State/County Parks Overview Map: Murrelet Surveys 2010 and Previous Years

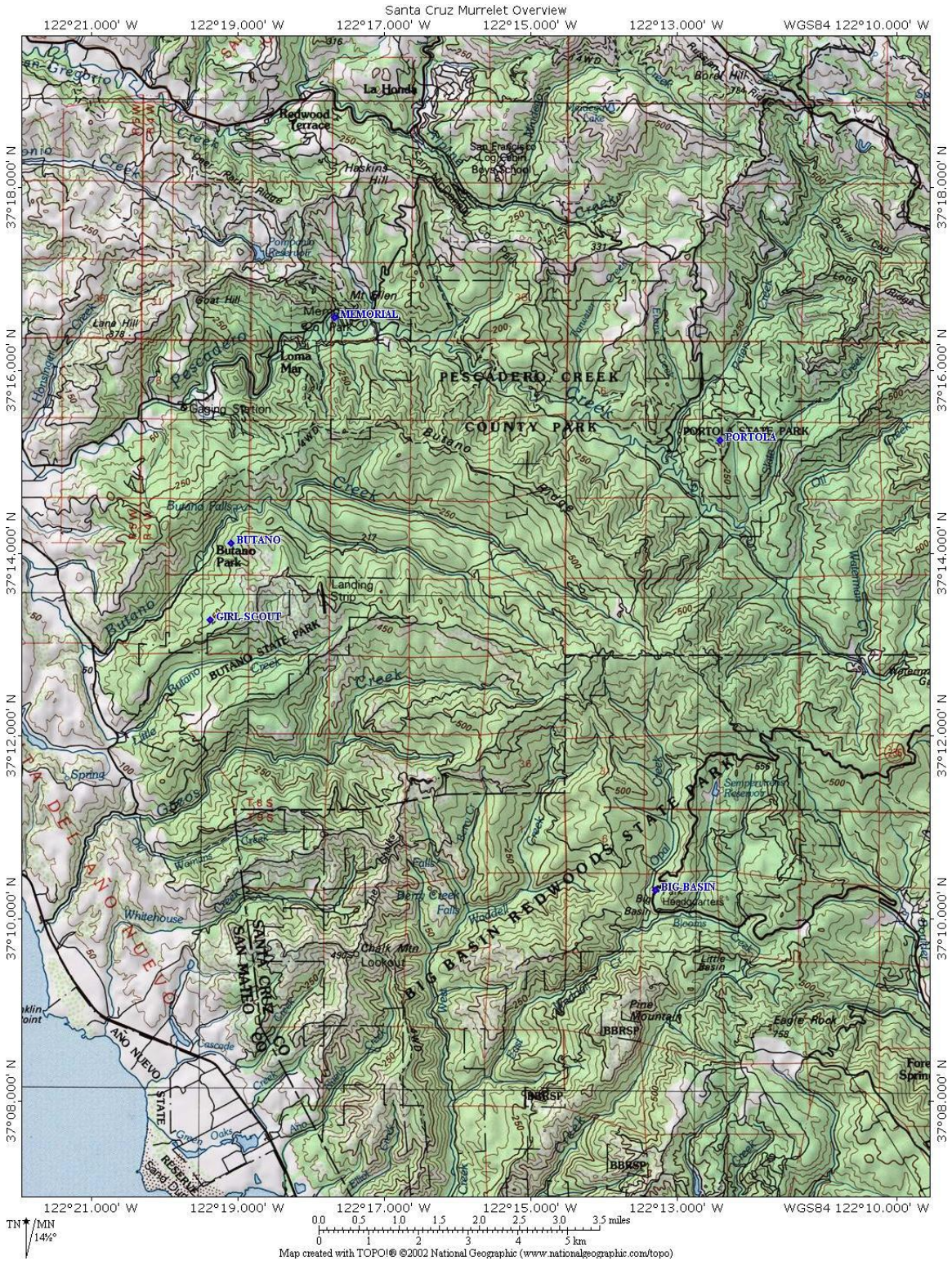


Figure 2: Big Basin Murrelet Survey Station Locations

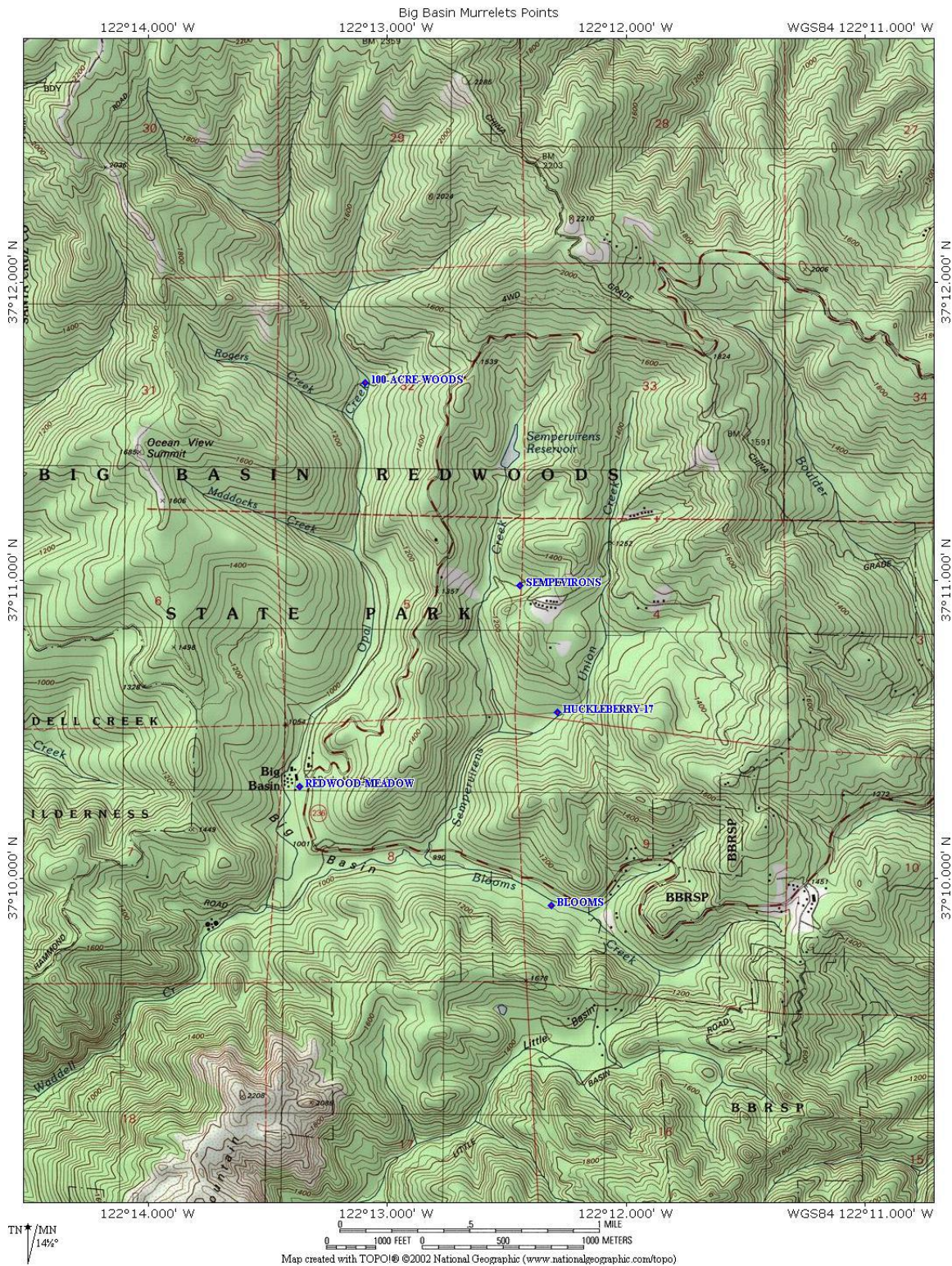


Figure 3: Portola Murrelet Survey Station Locations

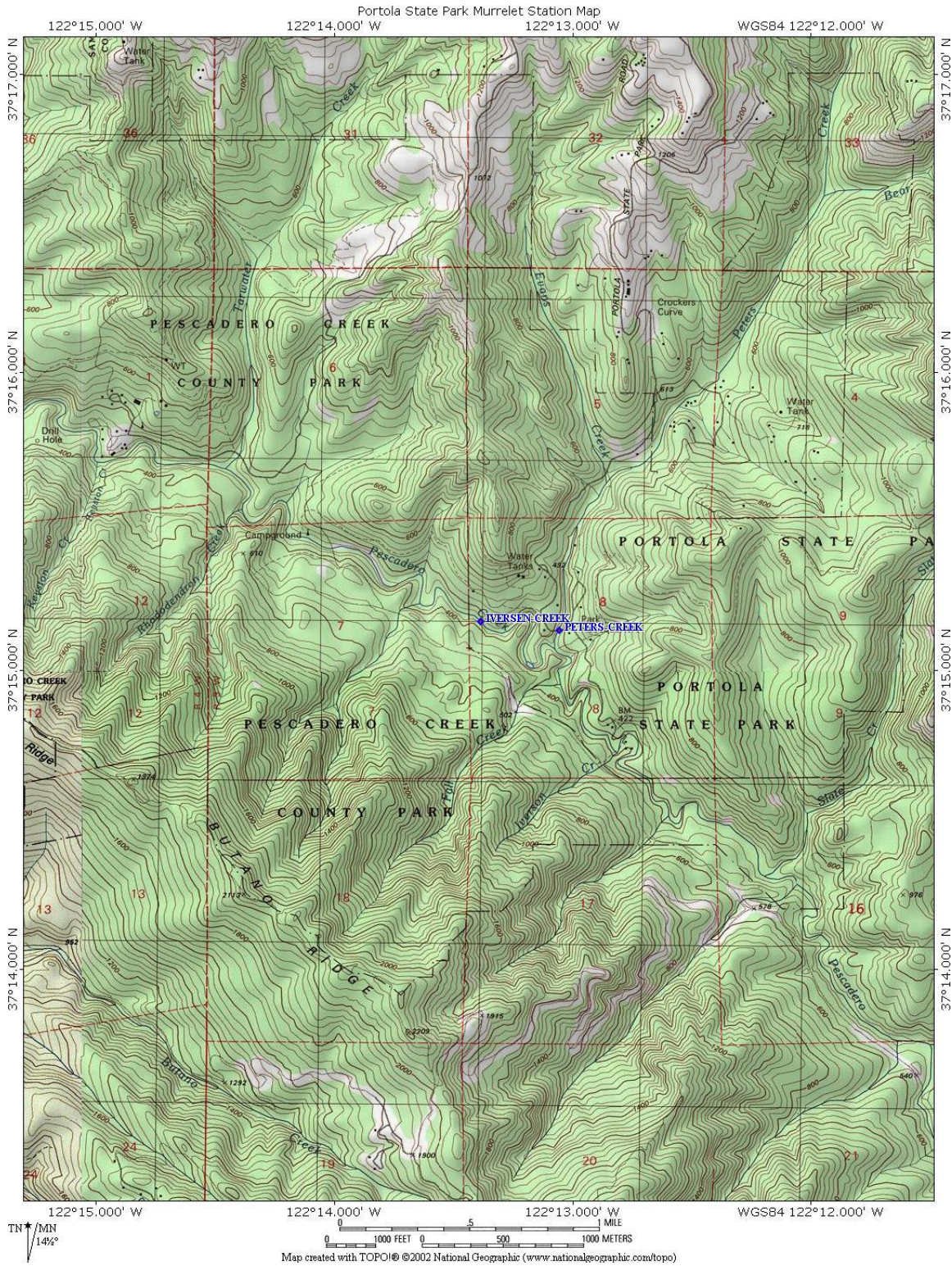


Figure 4: Butano State Park Murrelet Survey Station Locations

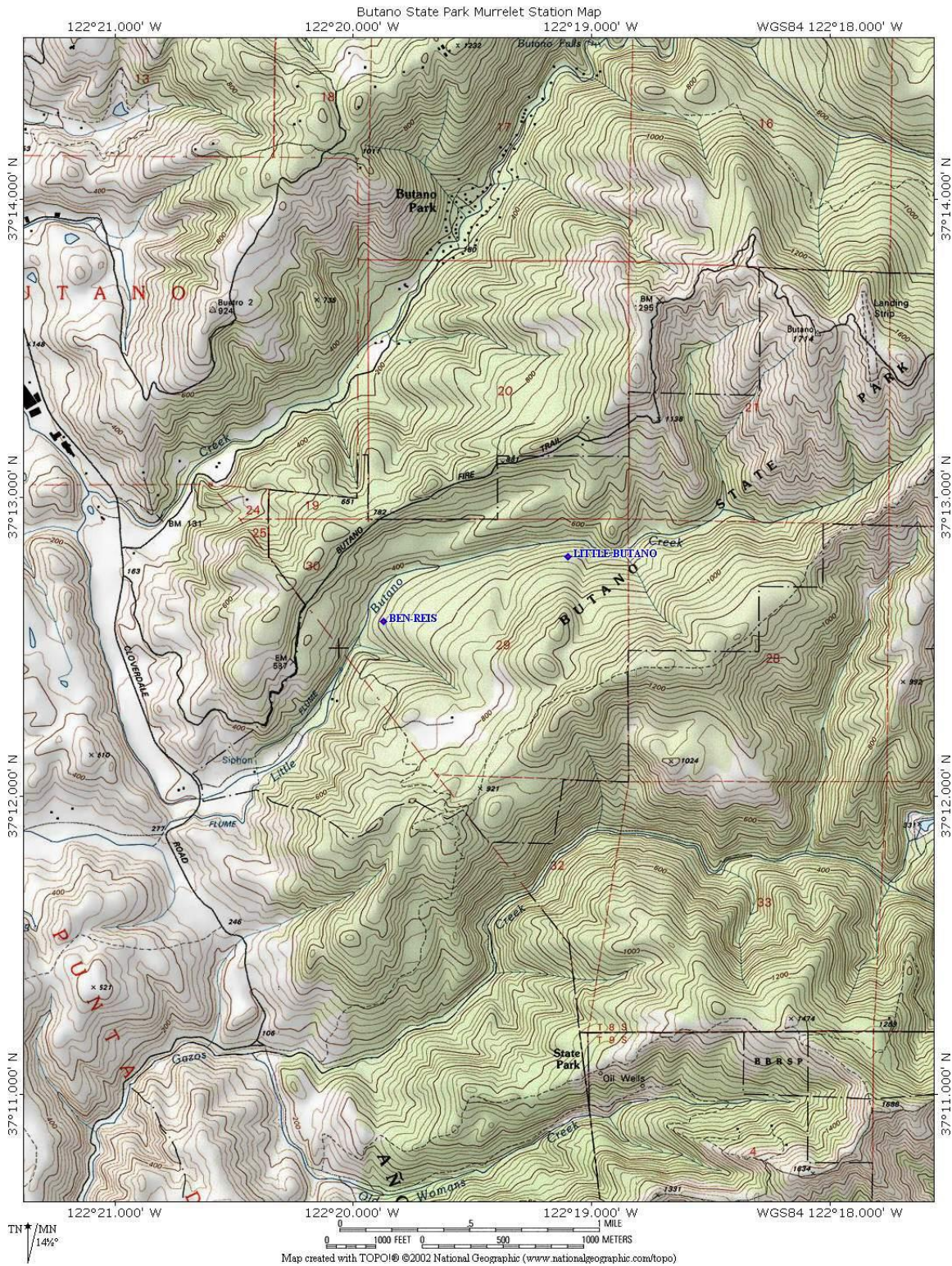


Figure 5: San Mateo County Park Murrelet Survey Station Locations

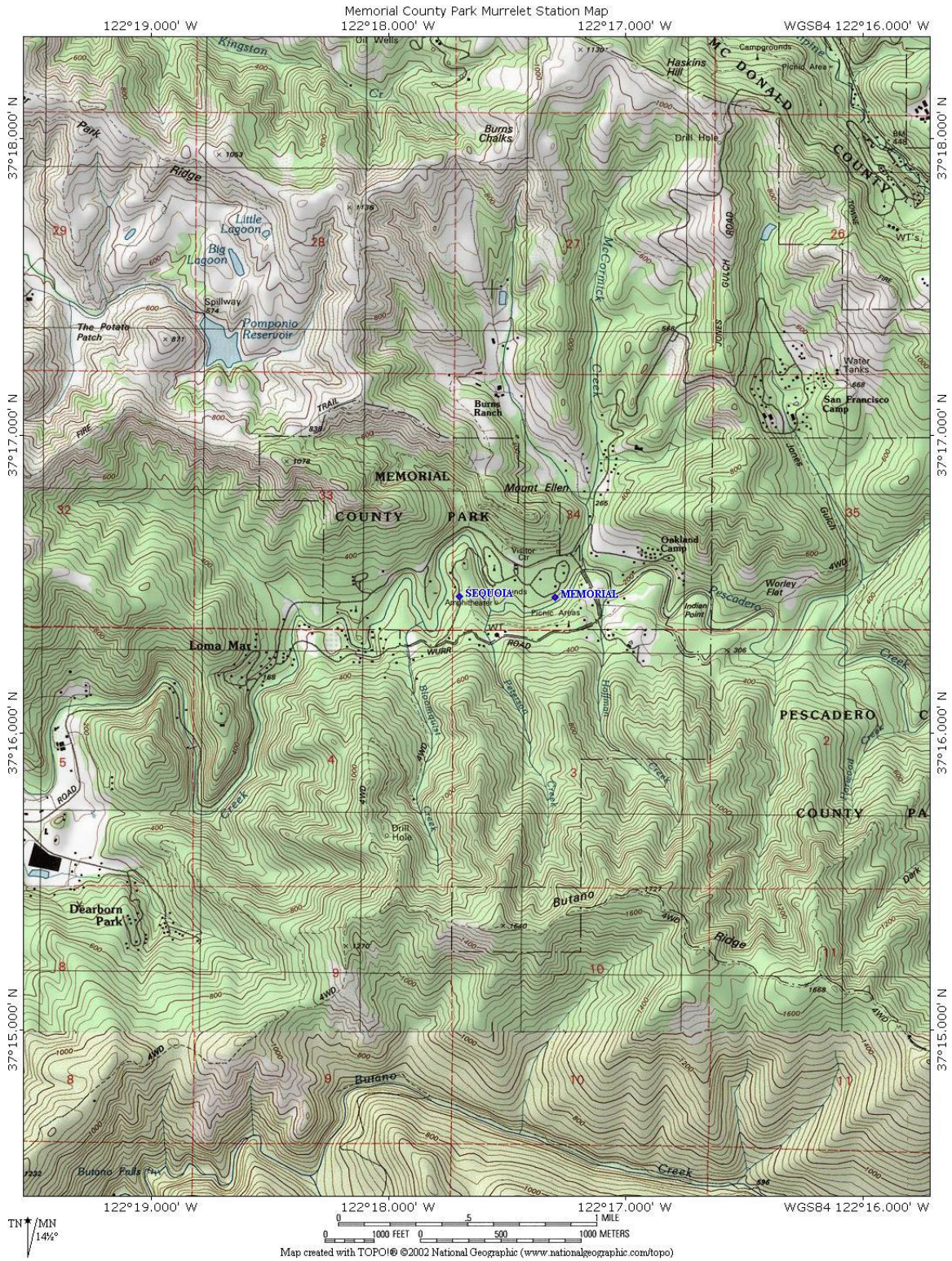


Figure 6: Murrelet Average Detections and Occupied Behavior Averages Per Area – 2010
Three Redwoods State Parks and San Mateo Memorial Park

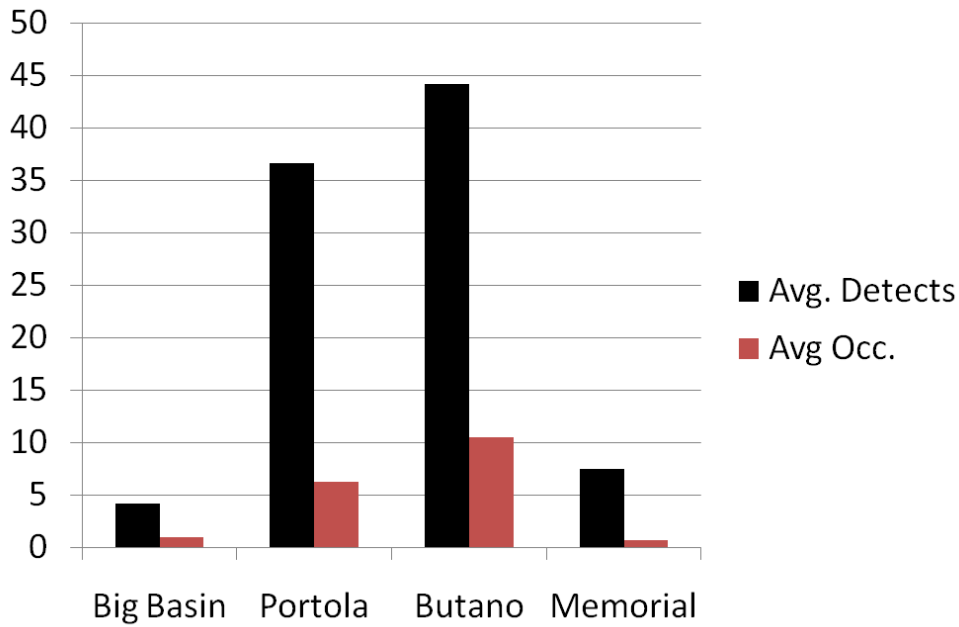


Figure 7: Big Basin State Park - Redwood Meadow Average Number of Total Detections 1993-2003, 2010

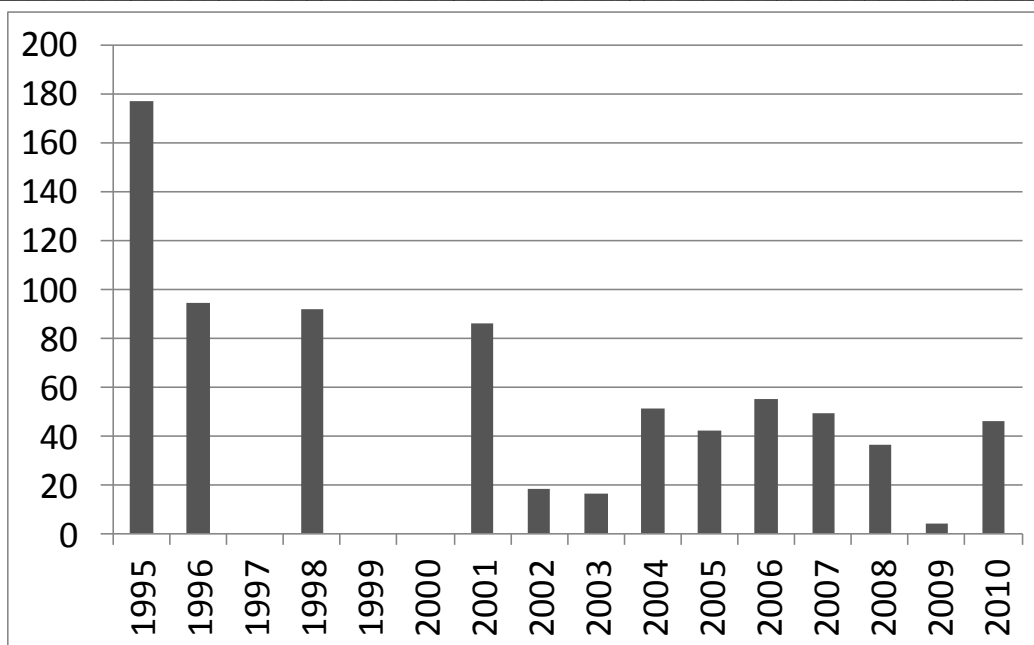


Figure 8: Big Basin State Park – **100 Acre Woods** Survey Station Average Number of Murrelet Detections 1995-2010

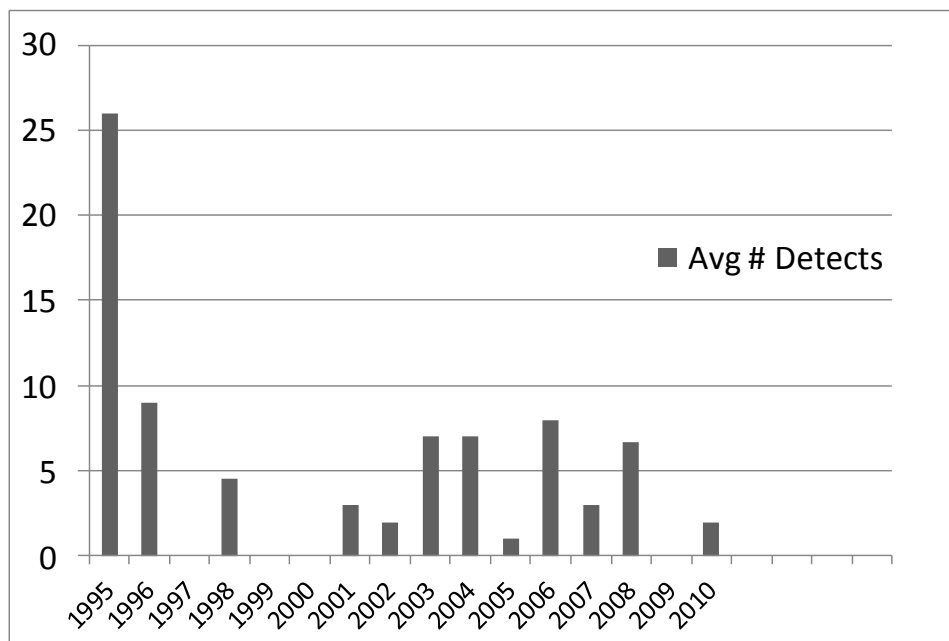


Figure 9: Big Basin State Park – **Blooms** Survey Station Average Number of Murrelet Detections 1995-2010

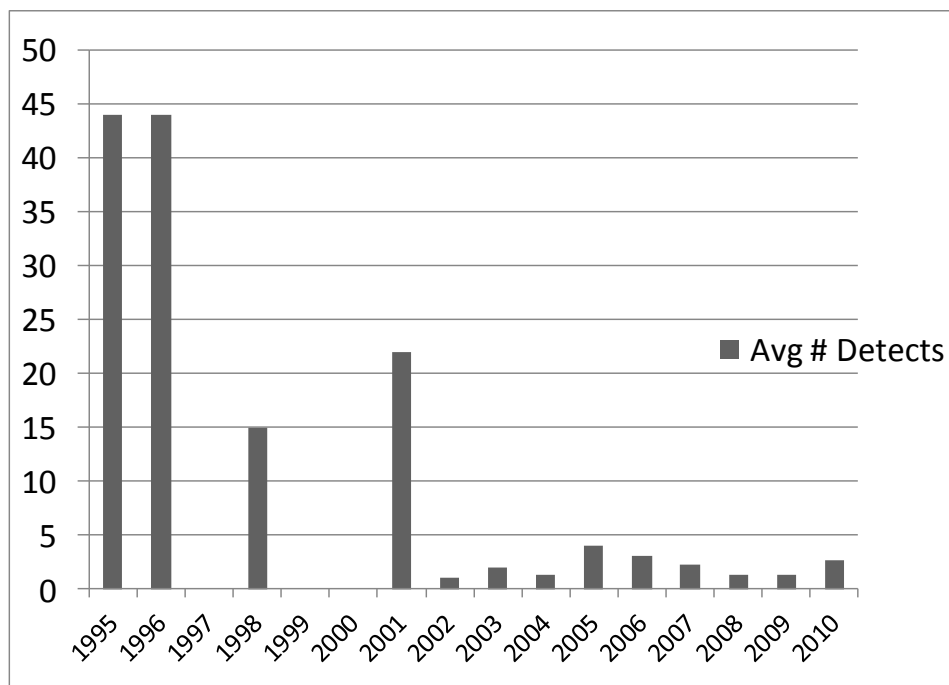


Figure 10: Big Basin State Park –**Huckleberry 17** Survey Station Average Number of Murrelet Detections 1995-2010

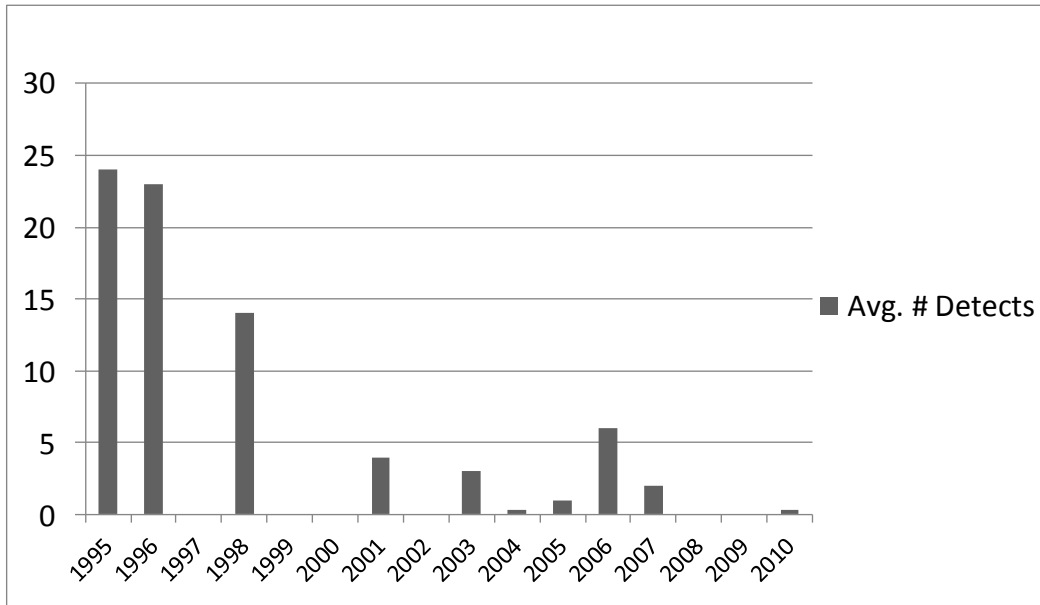


Figure 11: Big Basin State Park –**Sempervirens** Survey Station Average Number of Murrelet Detections 1995-2010

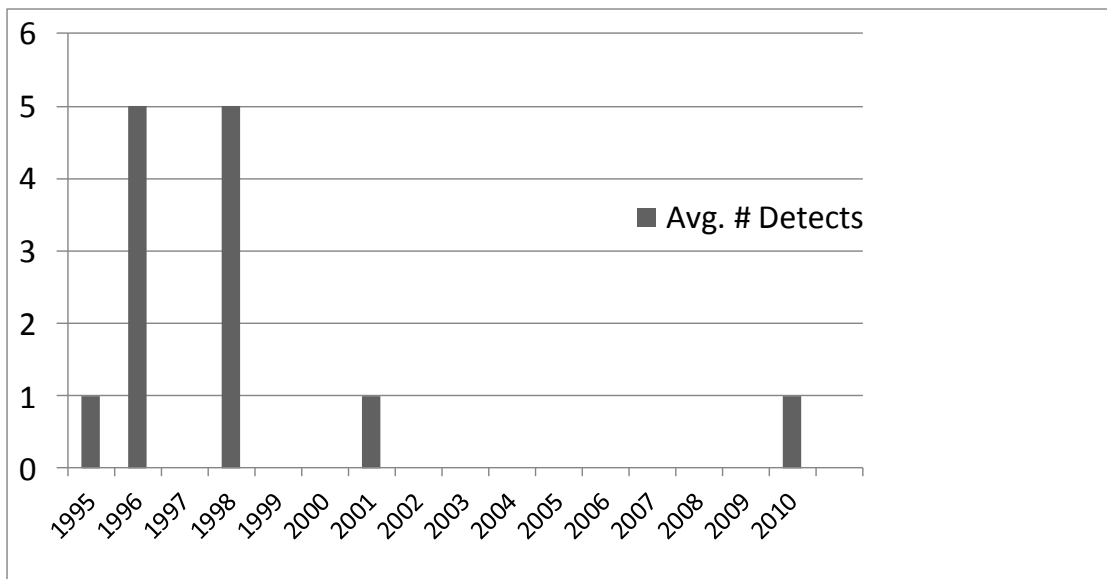


Figure 12: Portola State Park– **Peters Creek** Survey Station Average Number of Total and Occupied Detects Murrelet Detections 1992-2010

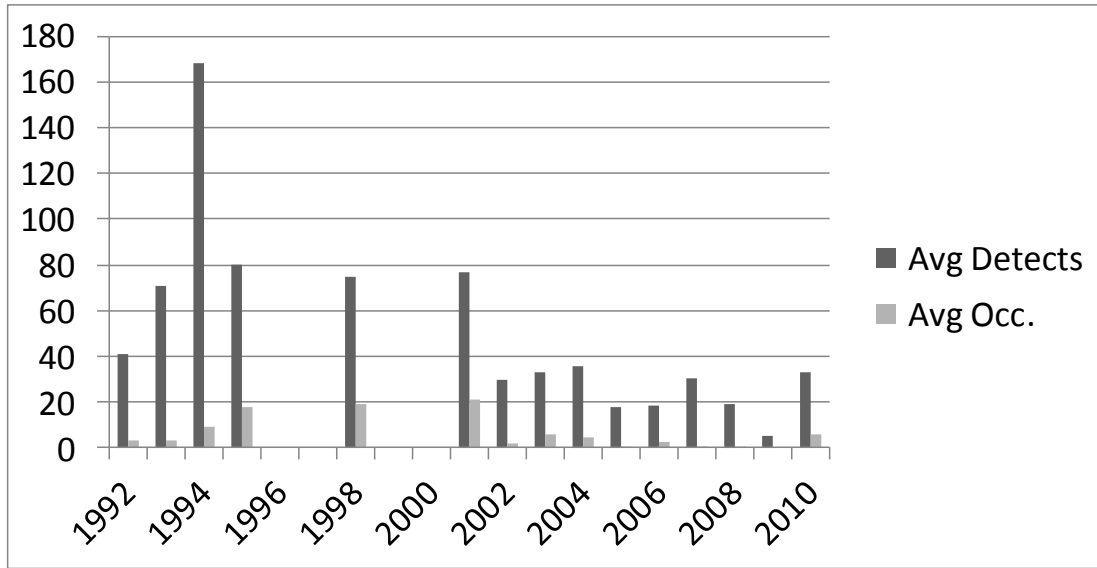


Figure 13: Portola Redwoods State Park **Iverson** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2010

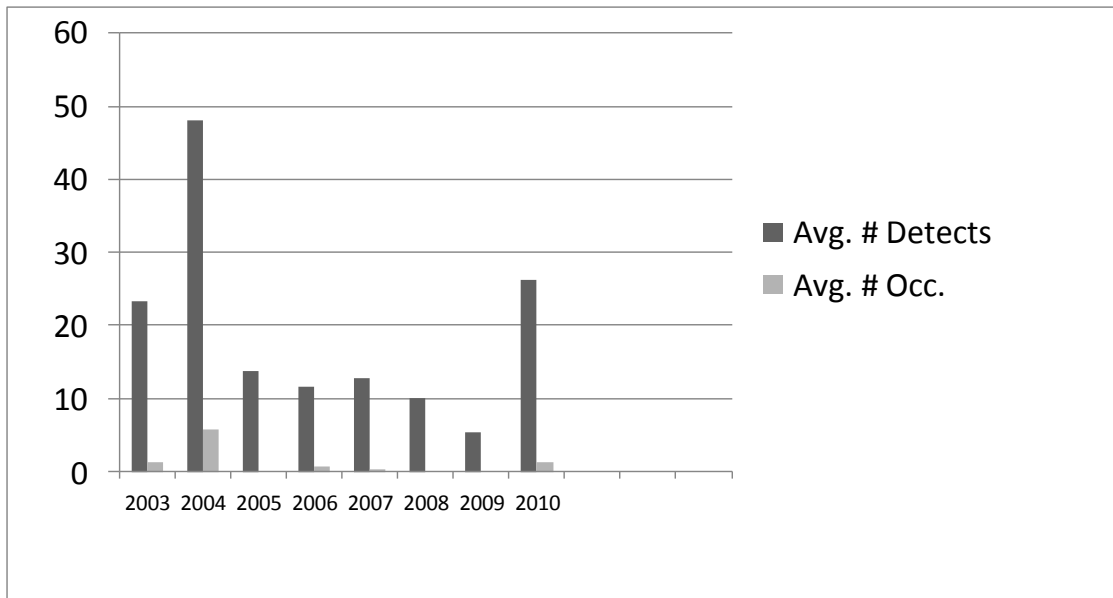


Figure 14: Butano State Park **Ben Reis** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2010

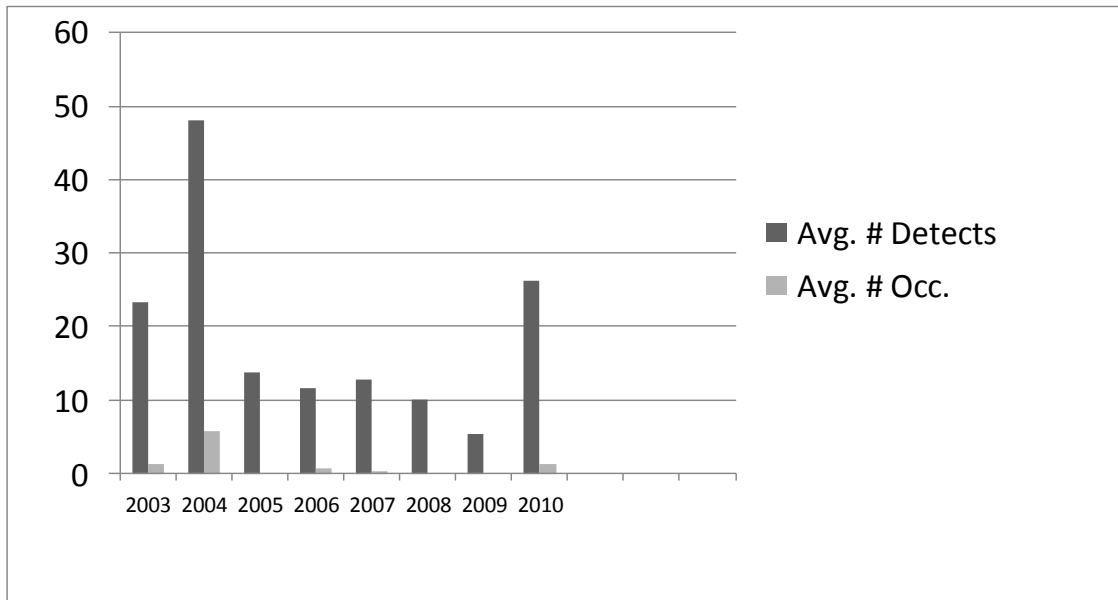


Figure 15: Butano State Park **Little Butano Creek** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2010

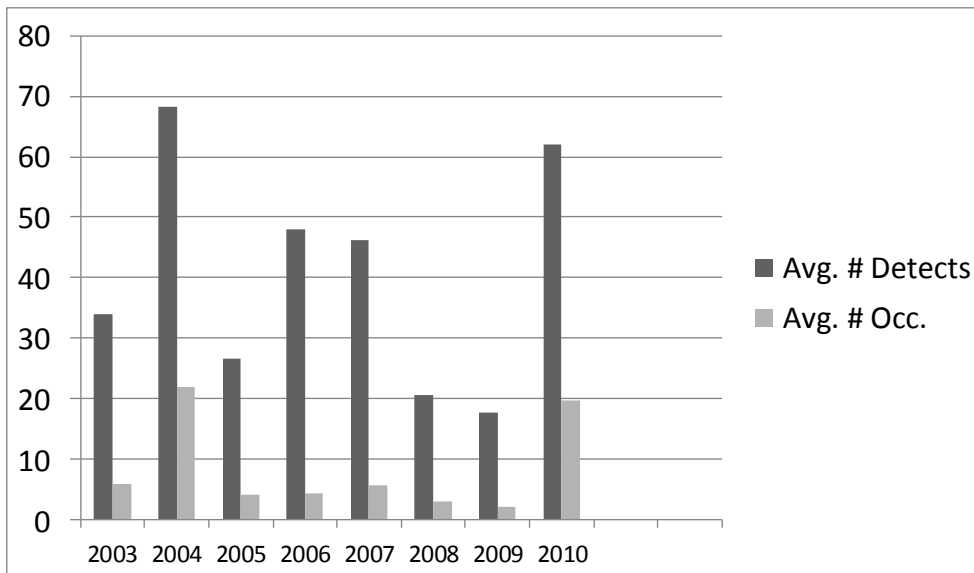


Figure 16: Memorial County Park **Memorial** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2010

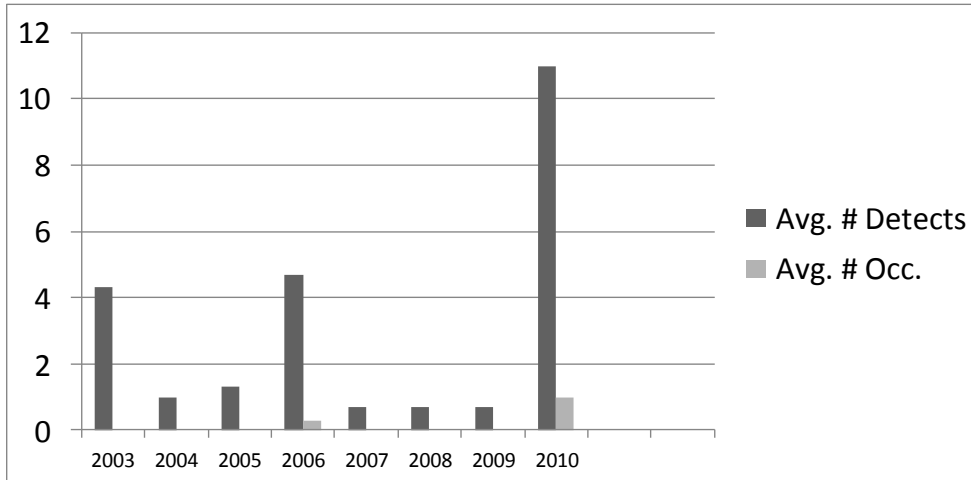


Figure 17: Memorial County Park **Sequoia** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2010

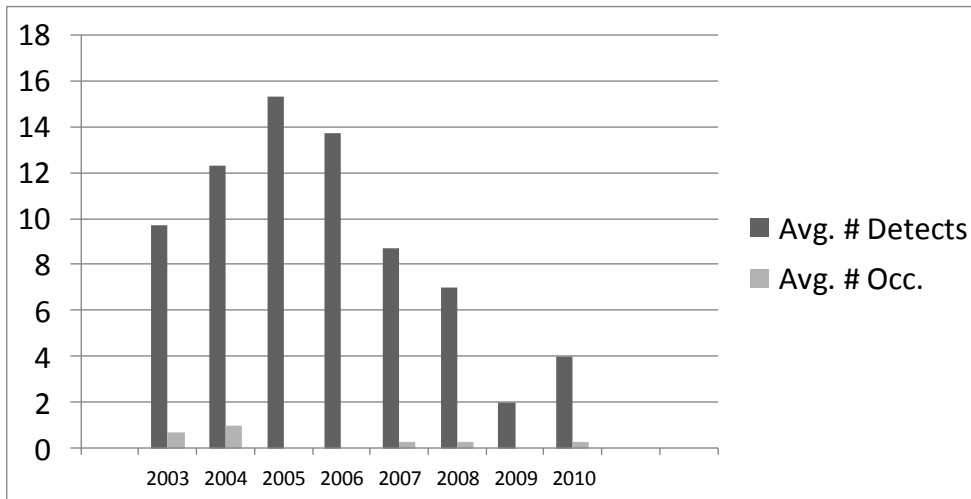


Figure 18: Average Number of STJA per station at each park 2001-2009 (Big Basin) or 2003-2010 (all other parks)

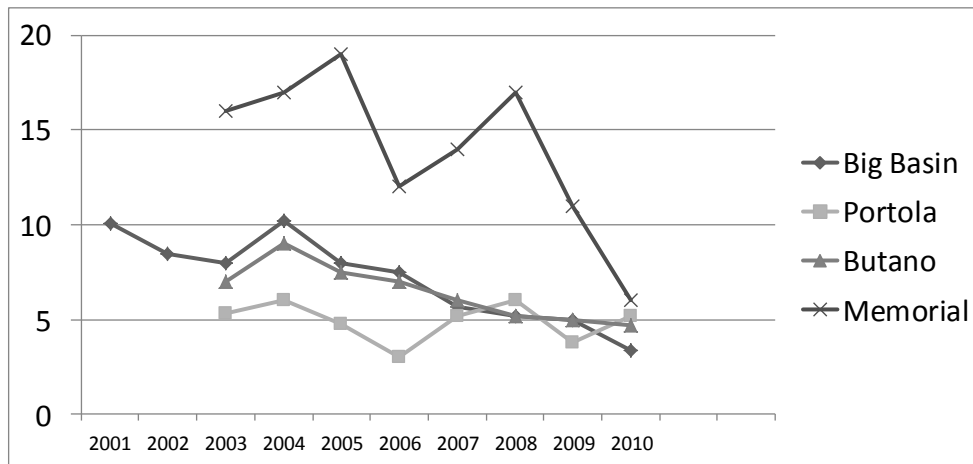


Figure 19: Average Number of CORA per station at each park 2001-2009 (Big Basin) or 2003-2010 (all other parks)

