

**Summary of 2011
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 2011 for the Santa Cruz District of California State Parks, and is the second of a three-year monitoring effort for the seabird. However, the third year of surveys were cancelled. 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 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 2003-2011 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 and continuing through the 2010-2011 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 some 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. They met the selection criteria, except the Sempervirens and Huckleberry 17, which have only mediocre sky views. Huckleberry 17 is located in the 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 was 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 and Shane Strahs completed all of the surveys during the 2011 survey year. The two 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. 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

2011 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 early to mid-July dates.

Big Basin Redwoods State Park

Murrelet activity during the 2011 survey season overall at the five survey stations (surveyed 3 times each) combined show that the total detections (112) is nearly double from the 2010 survey year and show more total detections and average detections in any single survey year since 2001 (23.7 average detects/morning). See **Table 1** for average detection totals and comparison. The lowest single year average detection number was 0.6 detections per morning in 2009. This is a far cry from the 55 detections per morning that were found per morning in the peak of the 1995 survey year. However, this increase is significant and can mostly be attested to a single survey morning at Redwood Meadow, where 59 detections were received, which is half of the total detections received for all five stations for entire 3-visit survey period. Nevertheless, the 7.5 detects per morning is still a significant number and shows an increase from the 2010 year. There were also 12 occupied flight behaviors during the 2011 survey year, which compares to both the previous 2010 year and is very near the per morning occupied behavior average from 1995-2010, a ten year period. Further, occupied behaviors show a stable trend over that period.

The *Redwood Meadow* station continues to be the center of the highest level of murrelet activity as 66 of the 112 total detections received at all of the five survey stations (59%) took place here. The viewshed is by far better than any of the other four survey stations located within the park. Thus, detection (especially visual) rates would be expected to be better here through any given year based on this fact alone. Detection totals rates ranged from 3 to 59 (average 22/survey), with the peak occurring during the known most-active middle July survey. This average of 22 detections per morning shows a slight increase in average per morning detection numbers when compared to the 1995-2010 survey period, which is at 14.5 detections per morning. Further, this total is the highest total since the 2001 survey year (86 detection average). It should be noted that the 59 detection morning (37 during July visit 2010) was during a nearly perfect survey morning with a nice low cloud layer and nearly no wind, and it was during the peak murrelet activity period. The overall 2011 detection totals would indicate a “moderate” level of murrelet activity.

100 Acre Woods yielded 31 total detections in 2011, an increase of 25 total detections from the previous 2010 year, with one subcanopy flight observed this year. Total detections ranged from 2 to 23 over the three-survey period. The average number of detections over the three

surveys was 10.3 (increase from 2.0 in 2010), with no mornings of zero detections, which has occurred in nearly all previous years. As at most of the other survey stations detection numbers are somewhat higher than the average number of detections that were received during the 1995-2010 survey period, which had an average of 4.0 detections per morning. As was the case for the Redwood Meadow survey station in 2011, the survey was completed on a near perfect survey morning, with no wind, low clouds extending far inland, making for perfect murrelet survey conditions. Nevertheless, this increase in detection numbers is notable.

The *Blooms Creek* survey station yielded a total of 6 (was 8 in 2010) detections with one (was 2 in 2010) observed occupied behavior. This is an average of 3.0 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 2010, which was 2.1 detections per morning. This is also the second year where occupied behaviors were detected. This is significant as there were no occupied behaviors received at any of the eight-year 1995-2010 surveys. The two occupied behaviors were very strong behavior representatives for probable nesting of murrelets very near to this survey station, as the surveyor (Shaw) saw/heard the murrelet swoop down with “jet sound” and land in the tree above the station and ten minutes later take off from the tree, with both entrance and exit detections marked with “keer” vocalizations from the closest range ever heard by the surveyor. The redwood tree where the murrelet was landing/leaving from was significant also as it has many gnarled branches and platforms that are very prominent for murrelet platform nesting locations.

Huckleberry 17 activity was significantly higher than in previous years, with 9 total detections received at the station, and detections received at all three surveys through the 2011 year. The nine total detections were much higher compared to one detection received in 2010 and no detections received during the 2008 and 2009 years. The average detection total per morning was 3.0 detections, which is the highest per morning average detection total since the 2006 survey year (avg. of 6.0 detects/morning). Interestingly, the highest detection morning (7 total) was during the first survey which was in June, rather than during the typical high July activity time.

Sempervirens received 0 detections in 2011. This is typical of the 15-year average from 1995-2010. It was hoped that the 2010 survey yielding of 2 detections would be a sign of a possible detection trend upwards. However, zero detections were received, which fits the ten-year trend.

Big Basin 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 morning of 7/13 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 mornings of 7/11 and 7/13 (59 total at Redwood Meadow and 23 at 100 Acre Wood), detection rates were far higher than during the other two visits. 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 assessing marbled murrelet population trends.

Overall within the park, the peak survey time again was during the typical high-detection mid-late July period. All but one of the five survey stations received their highest detections during this time. The survey morning of 6/16/12 date was also a cloudy, “good” murrelet survey morning, which yielded the highest detection total at the Huckleberry survey station since the 2007 survey year.

The 2011 overall and single station trends as far as murrelet detection totals is concerned, compares higher than the 1995-2010 survey years at Big Basin State Park. 2011 numbers increased by 44% (7.5 detects per morning) over the 2010 survey year (4.2 detects per morning), and 41% over the 2002-2010 average (4.0 detects per morning).

Thus, it appears that the decline in numbers during the 1990’s in to the early 2000’s trend may have flattened out if not increasing based on these results. Detection numbers increased at all survey stations except the scant numbers received at the *Sempervirens* station.

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

Portola Redwoods State Park

Murrelet activity during the 2011 surveys at Portola Redwoods State Park is summarized in **Table 2**.

In a reversal of the 2010 survey year, activity at *Peters Creek* survey station was the highest and ranged from 19 to 81 detections (4 to 35 occupied). With an average of 55 detections per morning and with 17 occupied detections per morning. This survey station had many detections that were below 0.5 canopy.

Activity at *Iverson Creek* ranged from 2 to 52 detections (average of 19) with 6 average occupied behaviors. As was stated in early versions of this report, the Iverson Creek 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 murrelet detections observed 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

Totals at the two stations flip flopped from 2010, with Peters Creek having far more detections per morning than Iverson Creek. However, during most years of the continual surveying conducted since 2003, detection totals at Peters Creek have been lower than those at Iverson Creek.

The 2011 year showed similar trends in numbers to the overall 2003-2010 survey year totals. In 2011 however, Peters Creek survey point had by far the highest average number of detection totals (55) received since the inception of surveys at this location in 2003. The nearest high detection total was 35.6 detections per morning average in the 2004 survey year. Additionally, the 17 occupied behaviors per morning are more than double any of these type of detections of any previous year (highest previously 6.0 in 2003). At the Iverson survey point, the 19 detections per morning falls very near the eight-year average (23.3) detections received at the survey station. The occupied behaviors at this location of 2.0 per morning in

2011 is at the average in comparison to previous year data (2.0 occupied per morning). However, there are four other years over the eight previous years that had a lower total than that of the 2011 year.

For the Peters Creek station, detection totals have remained somewhat constant through the nine-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, five 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 and a downturn in detections from 2005-2009, and a 2010 upturn year with 40 detections, which matches more similarly to detections in years past (2003-2004).

Overall totals for both stations combined match in a near identical fashion to the 2010 survey year (36.6 detects/morning), but with the two survey stations flip flopping upwards at Peters Creek and downwards at Iverson Creek to create that two-station Portola Redwoods SP total of 37.0 detects/morning. This is a very interesting piece of information, possibly showing MAMU change in habitat use or areas of the park that they are choosing to use between given survey years. The 37 detects per morning in 2011 is tied (2004 equal number) for the second most detects in a year to the high total average of 43 detects/morning overall in 2003. Thus the total of 37 detects per year show a good trend towards stability and continued strong use of the area by MAMU, when compared to the 2010 equal detection year as well as when compared to the overall nine-year survey period average (25.4 detects/morning).

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 2011 surveys at Butano Redwoods State Park is summarized in **Table 3**.

Murrelet activity at both survey stations decreased in 2011 when compared to the 2010 survey year, with 14 detects/morning at Ben Reis station and 32 detects/morning at Little Butano station, respectively.

Detection totals at *Ben Reis* ranged from 3 to 28, with a total of only 3 occupied behaviors detected. The 14 detections at Ben Reis is not far below the average of 18.9 average detections received per morning over the 2003-2010 survey period. The low number of 1.0 subcanopy detections received at Ben Reis in 2011 closely mirrors the nine-year average subcanopy detection total at the station (1.3/morning). These numbers are at least partly a result of the small visual window above the survey station. 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. Furthering this point, there have been three survey years where zero subcanopy detections have been received at the Ben Reis survey station.

At *Little Butano*, detection totals ranged from 11 to 45 with 20 total occupied behaviors detected. In contrast to Ben Reis the Little Butano station is located with a nice viewshed out and above the creek bottom as well as straight overhead. Thus, the occupied behavior numbers show the easily viewable sky conditions, with far higher numbers of year to year occupied behavior detections at this location. The 6.7 average occupied detections in 2011 are very close to the nine-year average of 8.3 occupied detects per morning. The 32 detections per morning at Little Butano Creek are somewhat below the eight-year prior year average of 40.5 detections per morning, however there are two other years with far lower totals than in those of the 2011 year (2008 – 21, 2009 – 18, respectively).

Trends

Overall at Butano State Park, totals (23 average detects and 3.9 occupied) were also slightly lower than the eight-year averages of 30 average detects and 5 occupied. However, the occupied total of 3.9 per morning are third highest, with many of this type of behavior received at the Little Butano survey station creating most of this average detection type total. Three other years previously had fewer average detection totals also. Thus the average detection total falls right near the average number of detections received for a given year over the now nine-year survey period. It is important to note that the first set of surveys in June at all of the parks showed very scant numbers of MAMU detections. This could be a result of the very late wet season occurring throughout all of California during a 2010-2011 “El Nino” winter, which created the 3rd highest rainfall and snowfall totals in recorded history at most locations throughout California, with much of it falling from March through May, which is very late for a typical California wet season. These conditions could have pushed back “normal” behavioral (including nesting) periodicity for many species of birds and mammals in many areas of California, which could have impacted the marbled murrelet.

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

Memorial Park – San Mateo County

Murrelet activity during the 2011 surveys at San Mateo County Memorial Park is summarized on **Table 4**. The lowest overall numbers of murrelets were found in Memorial Park.

Average detections at the *Memorial* survey station of 4.7 per morning, averaging 2.3/morning are still the second highest of the now nine years of surveys conducted annually since 2003. Subcanopy detections also were very low, with 0.3 average detections. The 2011 detection total is lower however than the highest detection total ever received during the 2010 survey year of 11 detections/morning. The 4.7 detections per morning received at Memorial are somewhat higher than the eight-year average of 3.2 detections per morning. The occupied detection average total of 0.3 is also the second highest total (2010 being highest), and is only the 3rd year where occupied detections have been received at all out of all nine survey years at the survey point.

Average detections at the *Sequoia* survey station of 2.3 are the second lowest detection total received over the nine-year survey period (2.0 lowest in 2009). The zero occupied detections in 2011 matches three other previous years with no occupied detections, thus is not an uncommon detection trend at this station.

Trends

Overall detections at Memorial State Park show an average of 3.5 detection per morning and 0.2 occupied detections per morning, respectively. The 3.5 average detections overall rates as the second least detection total average over the nine-years of surveys conducted here. This also holds true for occupied average detections, as the 0.2 detection per morning is a common low number that has also been the average on three other years previous to the 2011 survey year. This shows that there are very few overall occupied detections received at these two station combined at Memorial State Park. Numbers through the eight-year 2003-2011 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 2008-2011 (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 again increased significantly from the average 2003-2009 years (3.0 detects/morning) to 4.7 detects/morning.

The main reason for the two highest detection totals received since 2003 at the Memorial station during the 2010 and 2011 survey years 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 creating unnecessary noise, which is disruptive to possible detections. 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 the surveyor 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 over the past two years at the Memorial survey station.

There is no clear reason for the continued low numbers of detections at the Sequoia station. One possible explanation is the large number of Steller’s Jays at the station. 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, including murrelet “keer calls”.

See Table 4, Figures 5, 16-17 for representations of data for.

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, surveys 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 2003-2010 years, numbers were greatest at the Huckleberry and Blooms campgrounds, with average numbers during murrelet surveys of 9 and 4.3 detections respectively, and several ravens also detected during the morning survey on average. In 2011 numbers of corvids increased at 100 Acre woods, although this may be due to the first morning of surveys where 12 STJA were heard with some individuals possibly being counted several times. Thus the average total of 5.3 STJA per morning at the survey station could have been skewed as a result of this.

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 12 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 and a high number of only 3 found at the non-campground survey locations.

Steller's Jay

Overall numbers of STJA increased from 2010 totals, but decreased somewhat from previous years, with an average of 5.3 jays per morning, where the average of the previous years (2003-2010) was near 8 jays per station.

Common Raven

Overall numbers of CORA increased negligibly from 2010, with an average of 1.5 ravens per morning, but was still below the nine-year average from previous year surveys (2003-2009) where the average was at 2 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 don't quite reflect this as prominently in the 2011 totals as they did in 2010 (average of over 5 jays per morning), with numbers ranging from 2 to 4 jays (average of 3.3) at Peters Creek and exactly the same (3.3) found at the Iverson Creek. The 3 number at Iverson Creek would be considered "normal" and "typical" for jays found in a forest setting. The lower totals found at Peters Creek when compared to previous years is a good sign, as there has been a consistent trend of high numbers of STJA at this location over the past survey years. For instance, in 2010, individual STJA totals at Peters Creek were 5, 6, and 9 respectively, which is indicative of the campground and human use setting. Thus the lower numbers found in 2011 here is a good sign.

The numbers of ravens found at each station are not as similar to each other as in 2010. In 2010, numbers were nearly identical between stations, but in 2011 the numbers are somewhat different with 1.67 CORA the average at Peters Creek and only .33 CORA per

morning found at Iversen station. These numbers more closely resemble what would be expected for the Peters Creek Campground setting, where more corvids are typically found than in a comparative non-campground (thus people and food/trash) setting.

Steller's Jay

Overall numbers of STJA decreased from previous year totals (exception of 2010 with 1.2 detects/morning), with an still an average of 3.3 jays per morning, where the average of the previous years (2003-2010) was near 4.5 jays per station. Thus the abundance of STJA still shows a downward trend over the nine-year period.

Common Raven

Overall numbers of CORA remained the same from in previous years, with an average of 1 raven per morning, where the average of the previous years (2003-2010) was around 1.4 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 5.3 jays per morning, with a top out total of near 7 jays (Little Butano was 4 and 0.67 STJA/CORA, respectively, topping out with 5 STJA). Raven numbers were significantly higher at Ben Reis with 1.3 per morning being the average, while 1 raven per morning was the average at Little Butano.

Again, two to 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 5.3 jays found at the Ben Reis near-campground station is likely related to the human use found at the campground, where corvids “hang-out” waiting and searching for easy food scraps. The STJA average of 4 per morning at Little Butano in 2011 is a bit high for its non-human influenced setting, but is still near what would be considered normal for the the setting.

Stellars Jay

In 2011 overall numbers of STJA per morning averaged 4.65 STJA per station, nearly equaling the 2010 total (4.7/morning), but still decreased somewhat from previous year (2003-2010) average of 6.2 STJA per morning.

Common Raven

Overall numbers of 1 CORA per morning in 2011, this was a decrease from 2010 totals (2.3 CORA/morning) as well as the from previous year (2003-2010) totals (2.5/morning). This is a further good sign of an overall decrease in CORA numbers to what would be considered normal levels for non-human use areas.

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 9 STJA per morning found at Sequoia, which is down from 2010 (12 STJA/morning), but is still a very high number and is similar to the nine-year total average for the station. Only 2.33 STJA were found at the Memorial survey station, which is similar to last years (a bit lower, 2010 totals were 4 STJA/morning) and lower than the overall numbers for the nine-year survey period.

CORA numbers were higher also at Sequoia with 1.67 found per morning, with Memorial CORA numbers similar at 1.33 per morning. These numbers are what would be considered average or normal for any natural setting and low for this particular high human use campground area.

The high number at Sequoia shows a large population of jays found here and certainly subsidized by human presence in this campground.

Steller's Jay

Overall numbers of STJA stayed similar to the data from 2010 (5.8 STJA/morning) but decreased significantly from previous years, with an average of 5.3 jays per morning, where the average of the previous years (2003-2010) was near 14 jays per station. This is a good sign as it appears that overall STJA numbers are declining.

Common Raven

Overall numbers of CORA decreased somewhat from in previous years, with an average of 1.35 per morning (was 2.2 CORA/morning in 2010) where the average of the previous years (2003-2010) is 5.1 CORA per station. This is a good sign as it appears that overall CORA numbers are declining.

See Tables 5 & 6 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 bird activity is 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 (*Sempervirens 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: western screech owl, barn owl, northern pygmy owl, 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. Notable other birds that were only scantily represented are: varied thrush, pine siskin, and western wood pee-wee.

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

RAPTORS

One Red-tailed Hawk was detected during one of the murrelet surveys (Big Basin). There were also nine separate morning detections of western screech owl through the surveys, with six of these detection received within Big Basin SP. Also heard were one northern pygmy owl and one barn owl. This is the extent of the raptor activity detected during the 2011 murrelet, avian and corvid surveys.

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Appendix 1: Tables and Graphs

Table 1. Summary of protocol murrelet surveys conducted at the Big Basin Redwoods State Park in 2011.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Redwood Meadow	6/16/11	BKS	0	4	1
Redwood Meadow	7/11/11	BKS	100	59	8
Redwood Meadow	7/28/11	SS	0	3	0
100 Acre Woods	6/18/11	SS	100	6	0
100 Acre Woods	7/13/11	SS	100	23	1
100 Acre Woods	7/29/11	SS	0	2	0
Blooms Creek	6/17/11	SS	100	0	0
Blooms Creek	7/12/11	SS	100	1	0
Blooms Creek	7/28/11	BKS	0	5	2
Huckleberry #17	6/16/11	SS	50	7	0
Huckleberry #17	7/11/11	SS	100	1	0
Huckleberry #17	7/28/11	SS	0	1	0
Sempervirens	6/17/11	BKS	100	0	0
Sempervirens	7/12/11	BKS	100	0	0
Sempervirens	7/29/11	BKS	0	0	0

Table 2. Summary of protocol marbled murrelet surveys conducted at the Portola Redwoods State Park in 2011.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Iverson	6/20/10	SS	25	2	0
Iverson	7/20/10	SS	25	3	0
Iverson	7/31/10	SS	100	52	18
Peters Creek Bridge	6/20/11	BKS	0	19	4
Peters Creek Bridge	7/19/11	SS	100	65	11
Peters Creek Bridge	7/31/11	BKS	100	81	35

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

Table 3. Summary of protocol marbled murrelet surveys conducted at the Butano State Park in 2011.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Little Butano Creek	6/21/11	SS	0	11	1
Little Butano Creek	7/18/11	SS	100	45	11
Little Butano Creek	8/1/11	BKS	100	40	8
Ben Reis	6/19/11	BKS	100	11	0
Ben Reis	7/17/11	SS	75	28	3
Ben Reis	8/1/11	SS	100	3	0

Table 4. Summary of protocol marbled murrelet surveys conducted at the San Mateo County Memorial Park in 2011.

Station	Date	Observer	Cloud Cover	Total Detects	Occupied Detects
Memorial	6/18/11	BKS	100	0	0
Memorial	7/14/11	SS	100	5	0
Memorial	7/30/11	BKS	25	9	1
Sequoia	6/19/11	SS	25	0	0
Sequoia	7/15/11	SS	100	7	0
Sequoia	7/30/11	SS	100	0	0

Table 5. Comparison of murrelet activity levels between years at each park from 1995-2011.¹

<u>Station</u>	<u>Year</u>	<u>N</u>	<u>All Detections</u> <u>Avg Detects</u>	<u>Occupied Site Detections</u> <u>Average Detects</u>
<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
	2009	3	1.7	0.0
100 Acre Woods	2010	3	15.3	3.0
	2011	3	22.0	3.0
	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	
2009	3	0.0	0.0	
2010	3	2.0	0.0	
2011	3	10.3	0.3	
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	
2011	3	3.0	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
2011	3	3.0	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
2011	3	0.0	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	
2011	15	7.5	0.8	

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
	2011	5	55.0	16.7
	Iverson	2003	3	59.3
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
2011		5	19.0	2.0
<i>All Portola Stations Combined</i>		2003	8	43.0
	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
	2011	10	37.0	11.4
	<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
	2011	3	14.0	1.0
	Little Butano Creek	2003	3	34.0
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
2011	3	32.0	6.7

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
	2011	6	23.0	3.9
	<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
	2011	3	4.7	0.3
	Sequoia	2003	3	9.7
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
2011		3	2.3	0.0
<i>All Memorial Stations Combined</i>		2003	6	7.0
	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
	2011	6	3.5	0.2

Table 6: High counts for Steller’s Jay and Common Raven from 2-hour dawn surveys at each park in 2011.

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

Table 7: Average numbers for Steller’s Jay and Common Raven from 2-hour dawn surveys at each park in 2011.

Station	<u>Stellars</u> 2-Hour Survey	<u>Jay</u>	<u>Common</u> 2-Hour Survey	<u>Raven</u>
Big Basin				
Redwood Meadow	2.3		2.3	
100 Acre Woods	5.3		1	
Blooms Creek	4.3		1.3	
Huckleberry #17	9		2	
Sempevirons	3		1	
Portola				
Peters Creek	3.33		1.67	
Iverson	3.33		.33	
Butano				
Ben Reis	5.3		1.33	
Little Butano Ck.	4		.67	
Memorial				
Memorial	2.33		1.33	
Sequoia	9.67		1.67	

Table 8: 2011 Avian species list by park – 2 Hour morning murrelet survey avian count.

Big Basin	Portola	Butano	Memorial
Stellars Jay	Common Raven	Stellars Jay	Stellars Jay
Common Raven	Stellars Jay	Common Raven	Common Raven
C. B. Chickadee	Pac Slope Flycatcher	Wilson's Warbler	CB Chickadee
Pac Slope Flycatcher	C. B. Chickadee	Western Screech Owl	Downy Woodpecker
Wilson's Warbler	Mourning Dove	American Robin	Northern Flicker
Western Screech Owl	Wilson's Warbler	California Quail	Dark-Eyed Junco
American Robin	Dark-Eyed Junco	Brown Creeper	Pine Siskin
Pileated Woodpecker	American Robin	Stellars Jay	Hermit Thrush
Western Wood Peewee	Brown Creeper	Mourning Dove	Wilson's Warbler
Acorn Woodpecker	Acorn Woodpecker	Hermit Thrush	Brown Creeper
Spotted Towhee	Downy Woodpecker	Downy Woodpecker	Varied Thrush
Vaux's Swift	Mallard	Winter Wren	Western Screech Owl
Northern Flicker	Wilson's Warbler	Barn Owl	Mourning Dove
Brown Creeper	Pileated Woodpecker	Pileated Woodpecker	Pacific Slope Flycatcher
Hermit Thrush	Vaux's Swift	Acorn Woodpecker	
Mourning Dove	Hermit Thrush	Dark-Eyed Junco	
Dark-Eyed Junco	Northern Pygmy Owl		
Red-Tailed Hawk			

Figure 1: California State/County Parks Overview Map: Murrelet Surveys 2003-2010 and Previous Years

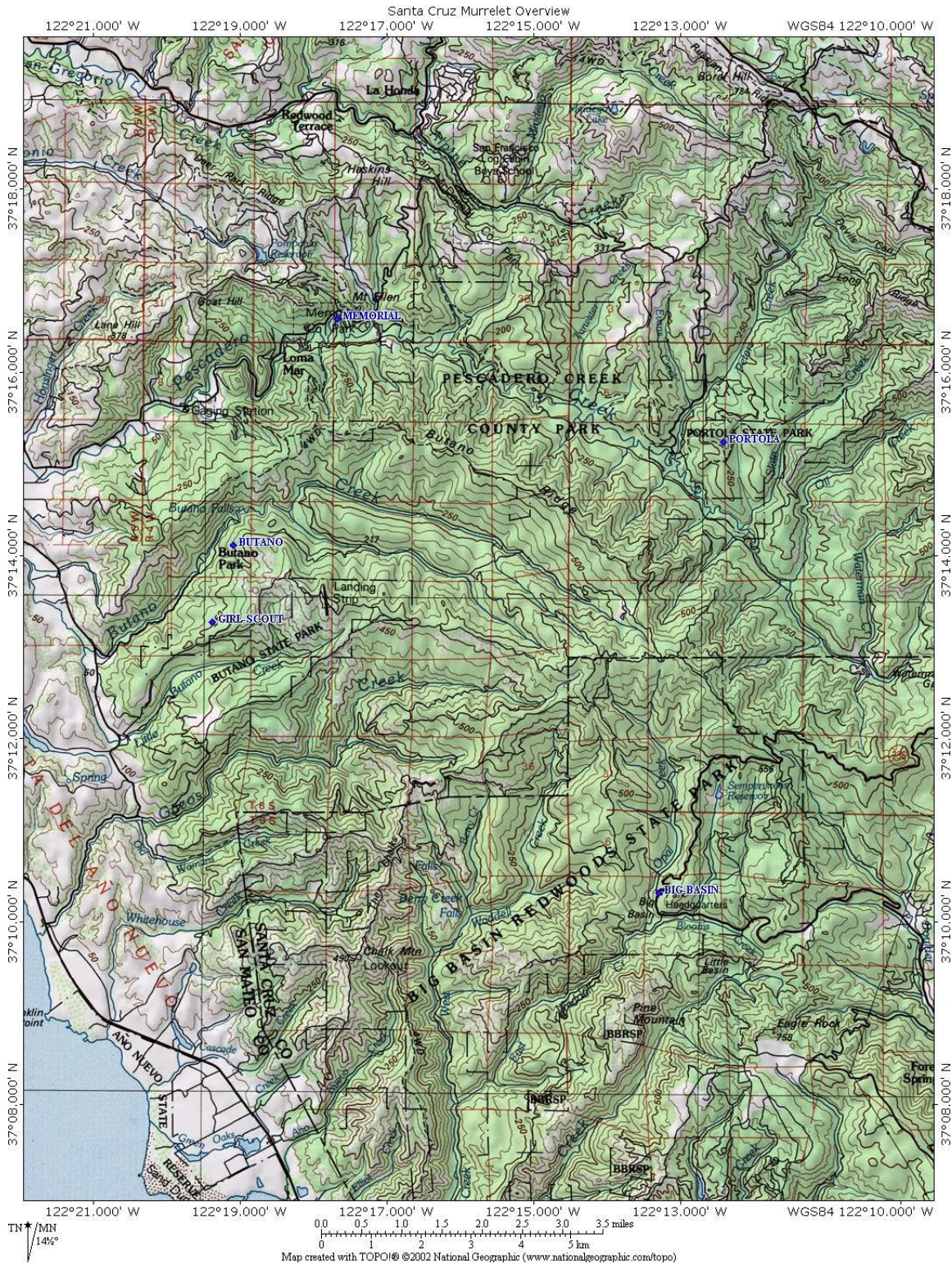


Figure 2: Big Basin Murrelet Survey Station Locations

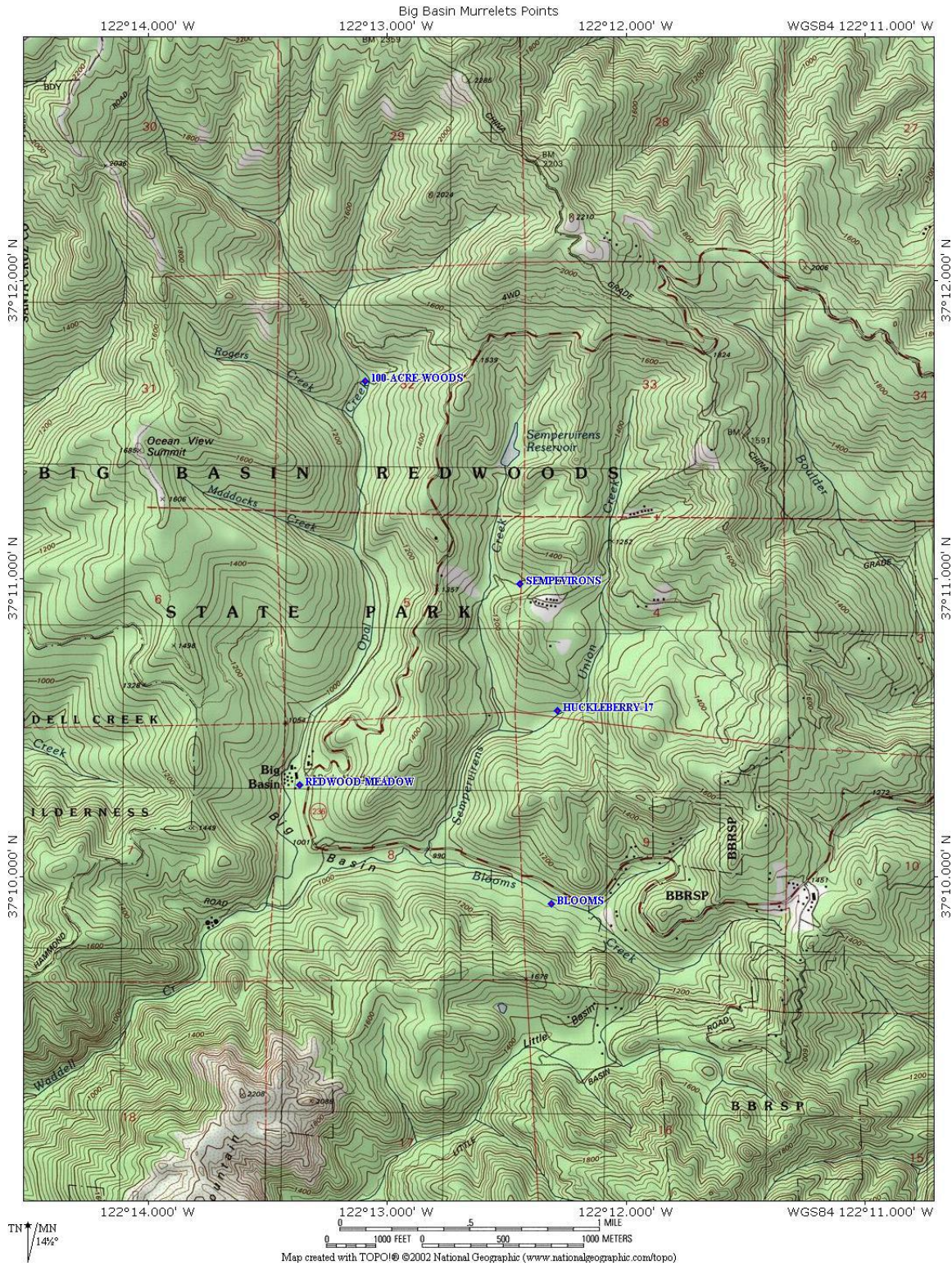


Figure 3: Portola Murrelet Survey Station Locations

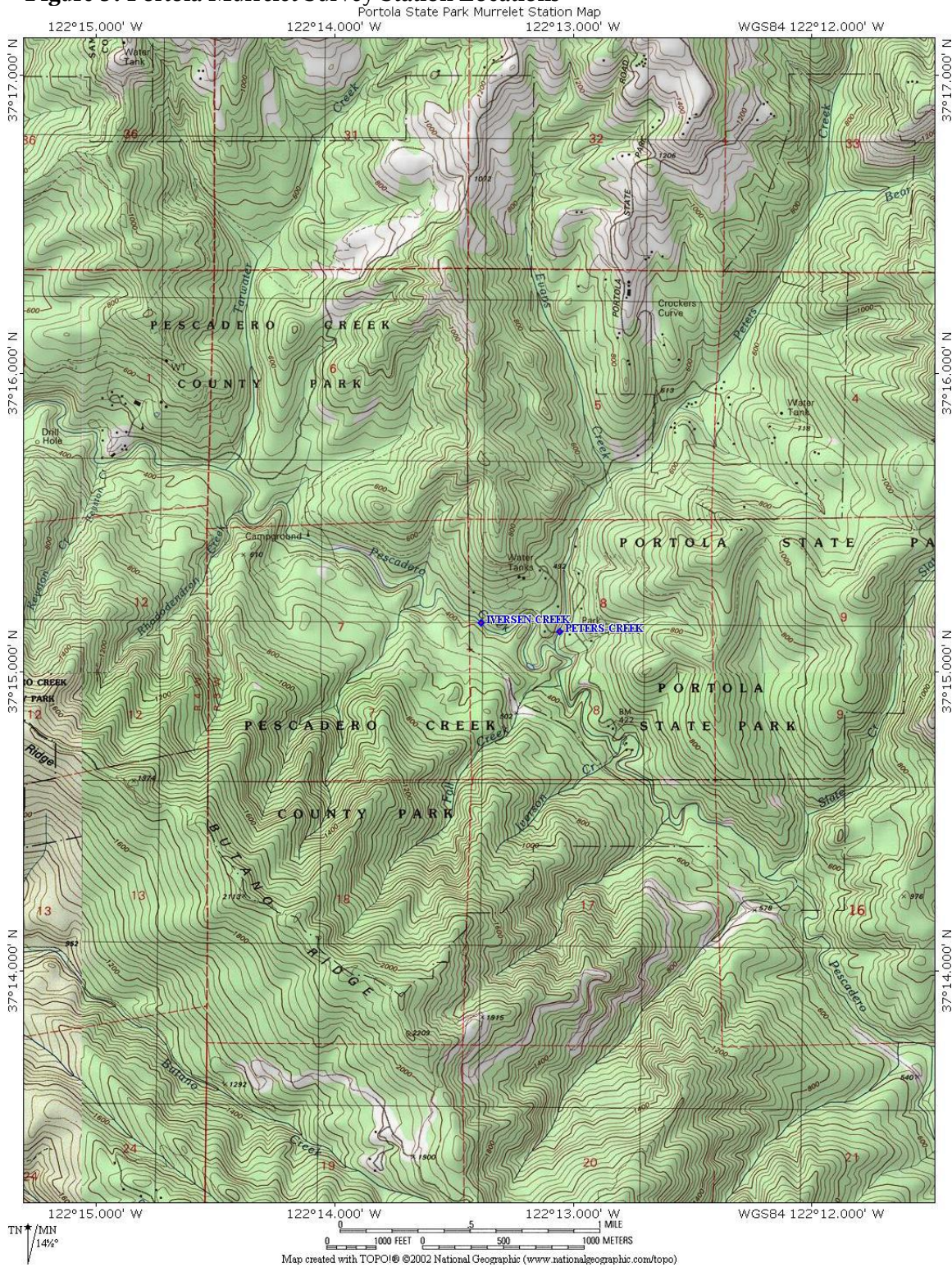


Figure 4: Butano State Park Murrelet Survey Station Locations

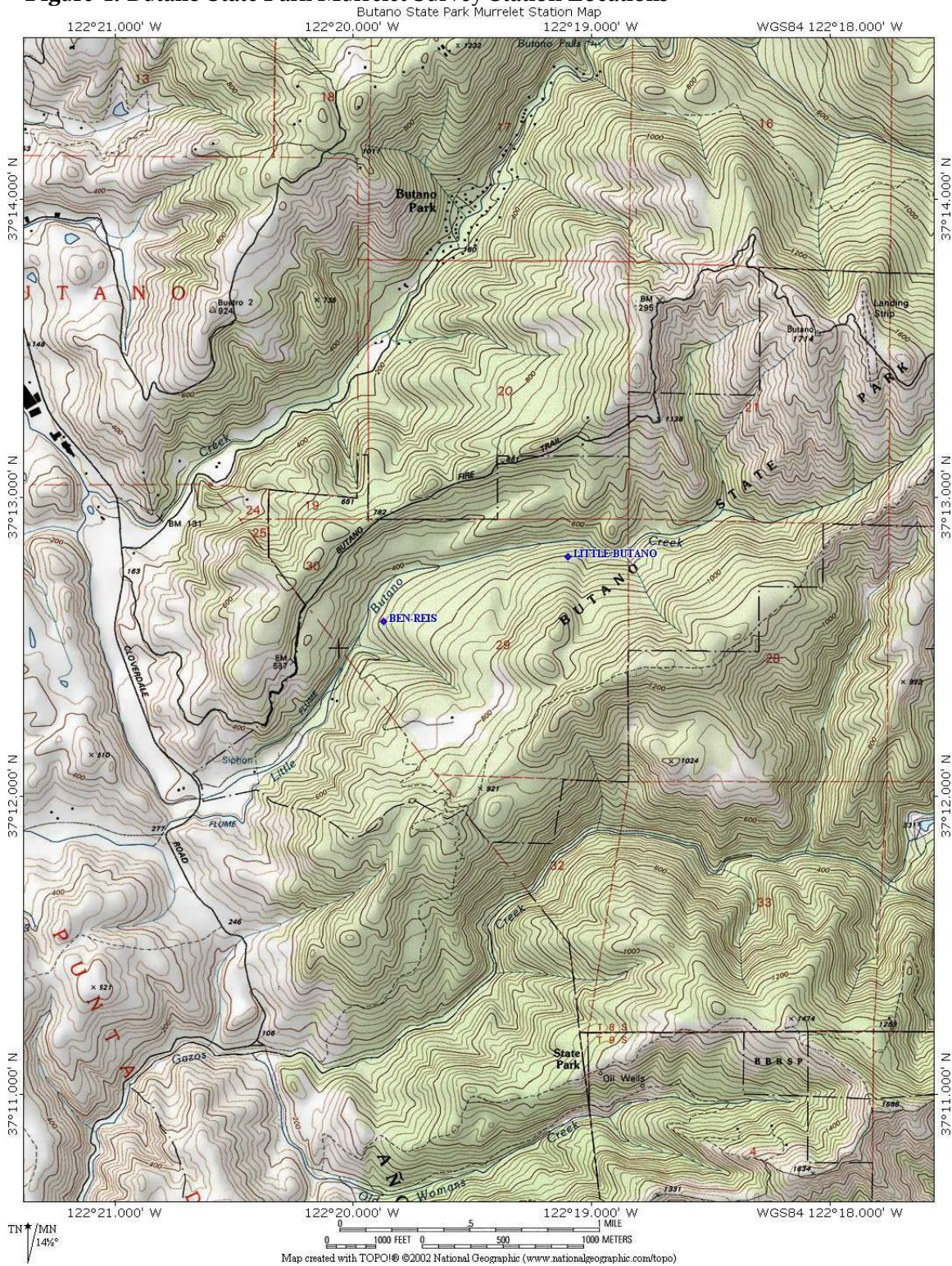


Figure 5: San Mateo County Park Murrelet Survey Station Locations

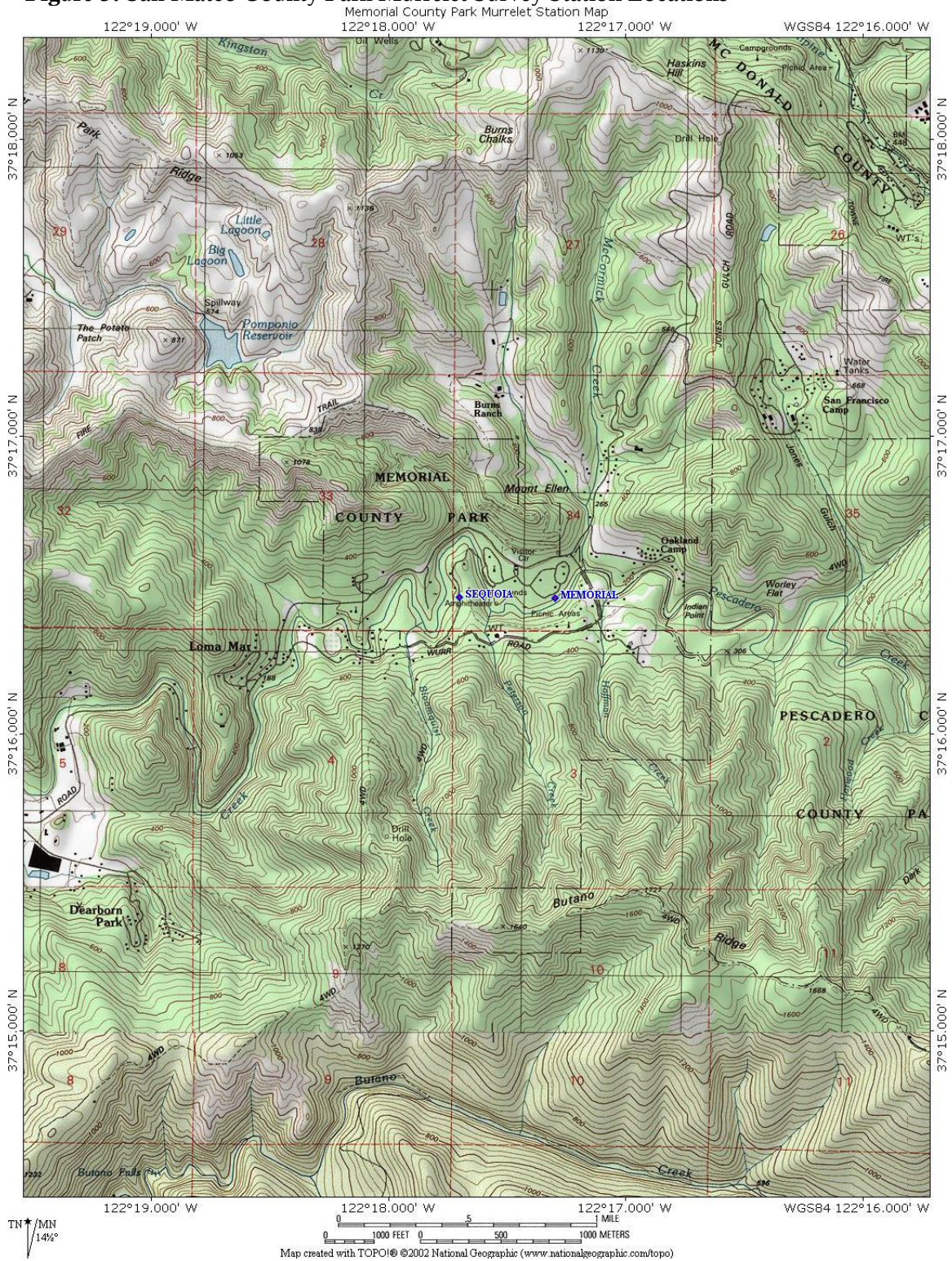


Figure 6: Murrelet Average Detections and Occupied Behavior Averages Per Area – 2011
 Three Redwoods State Parks and San Mateo Memorial Park

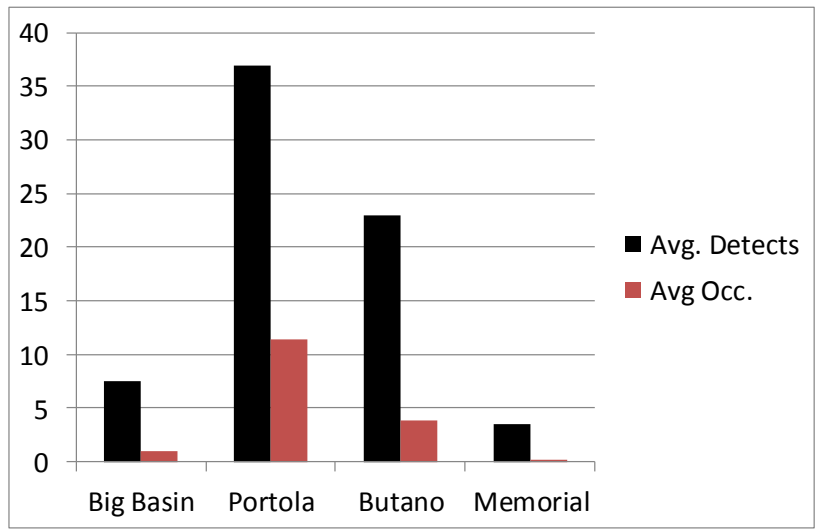


Figure 7: Big Basin State Park - Redwood Meadow Average Number of Total Detections 1993-2011

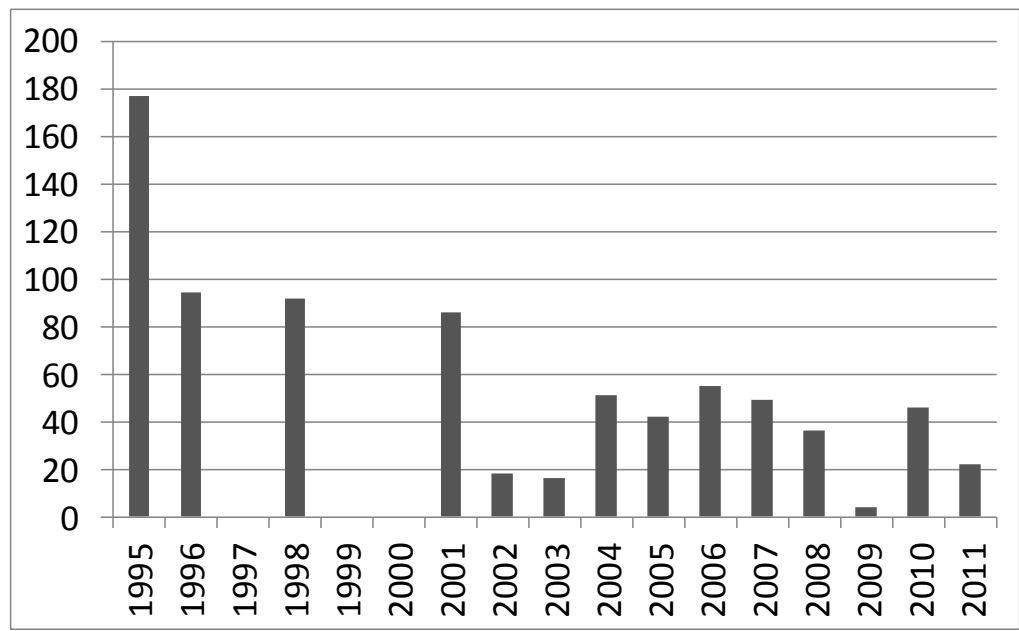


Figure 8: Big Basin State Park – **100 Acre Woods** Survey Station Average Number of Murrelet Detections 1995-2011

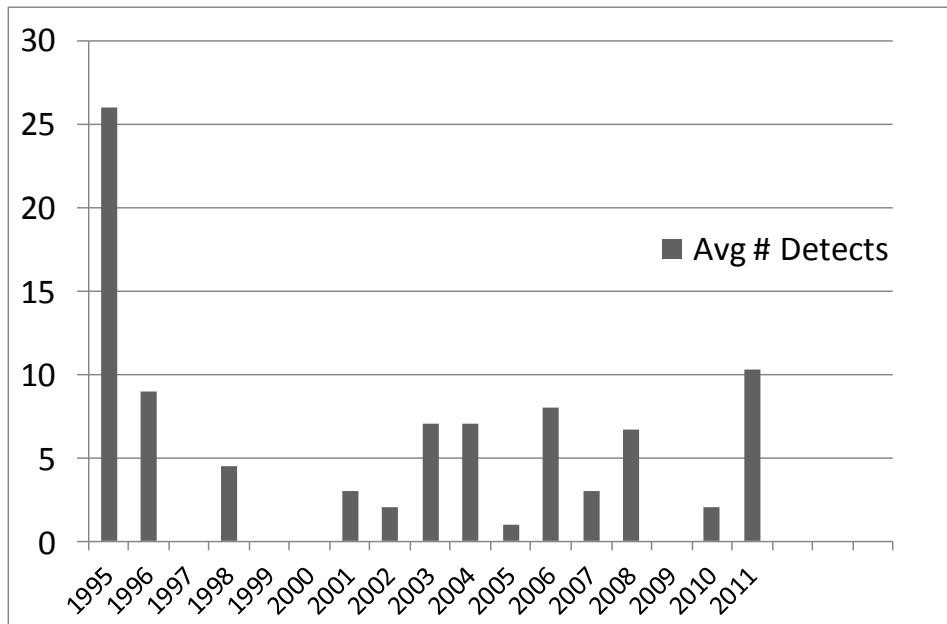


Figure 9: Big Basin State Park – **Blooms** Survey Station Average Number of Murrelet Detections 1995-2011

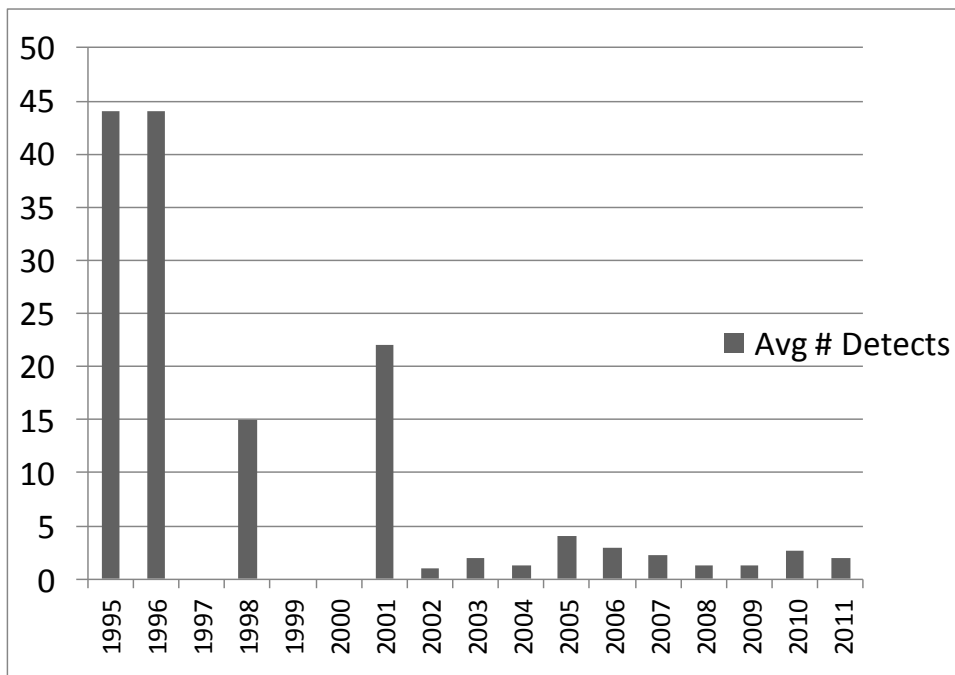


Figure 10: Big Basin State Park –**Huckleberry 17** Survey Station Average Number of Murrelet Detections 1995-2011

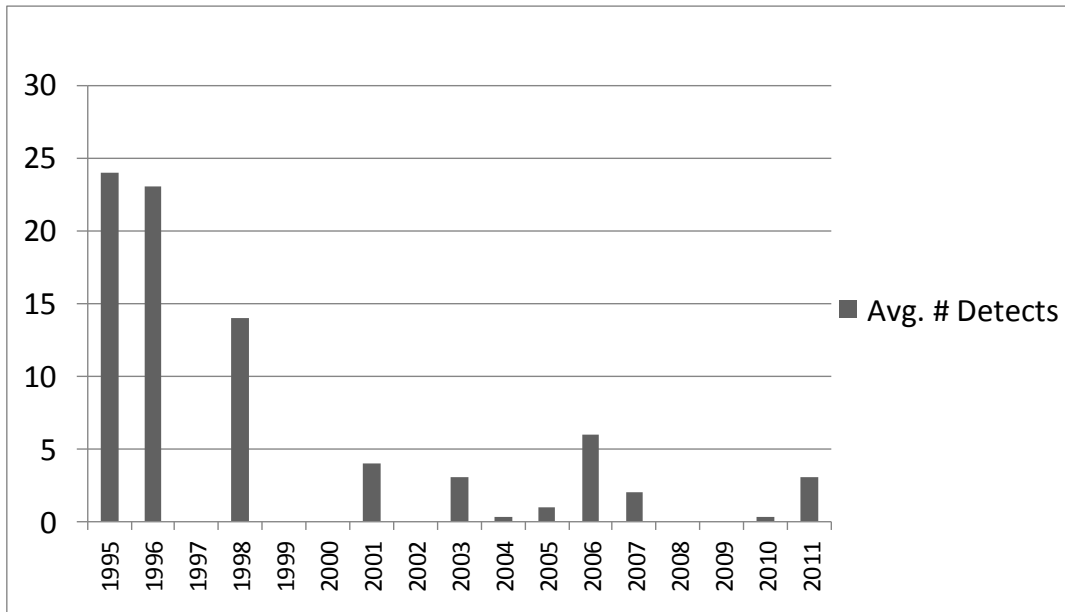


Figure 11: Big Basin State Park –**Sempevirons** Survey Station Average Number of Murrelet Detections 1995-2011

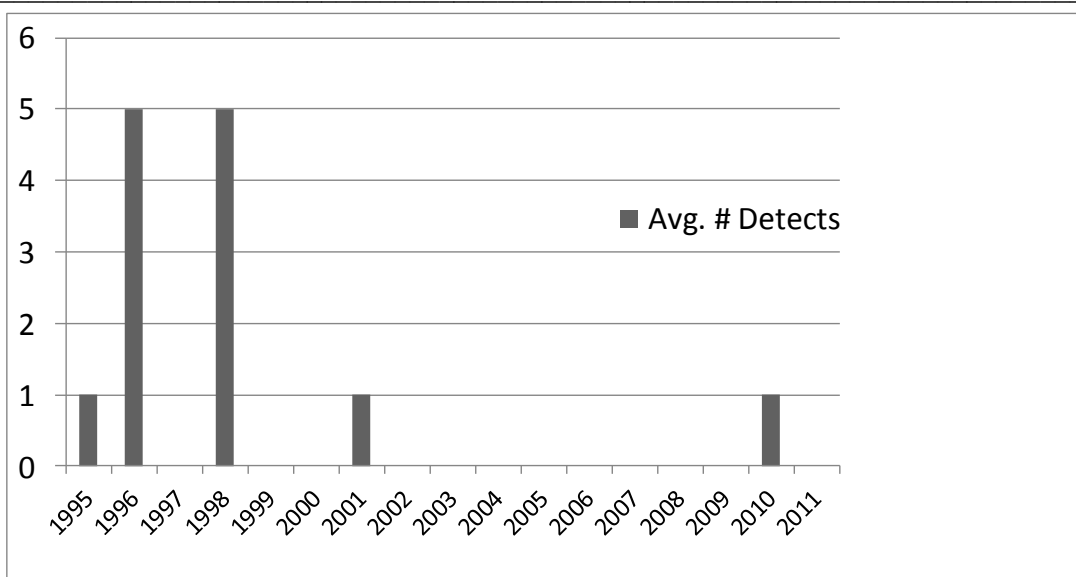


Figure 12: Portola State Park– **Peters Creek** Survey Station Average Number of Total and Occupied Detects Murrelet Detections 1992-2011

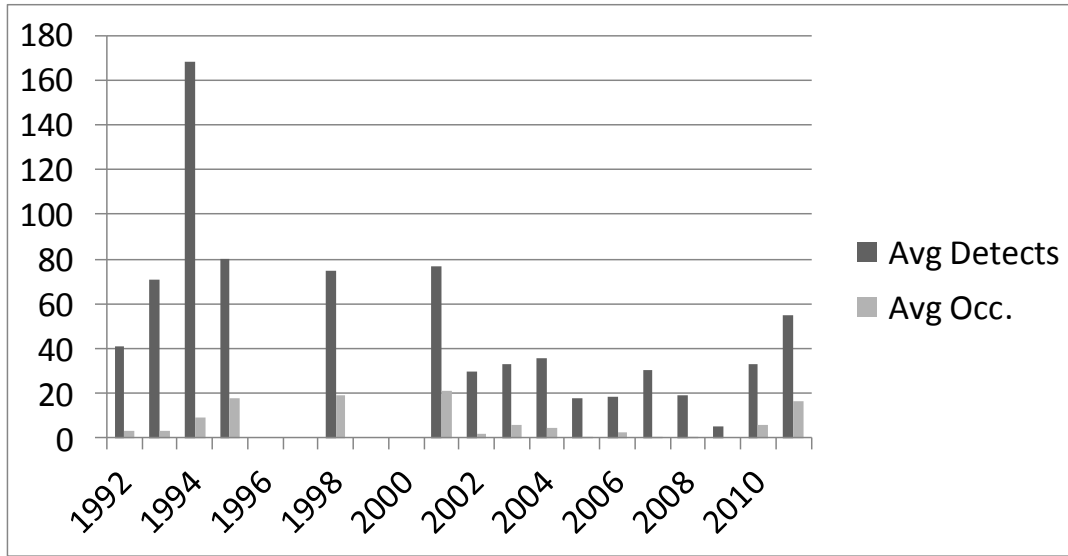


Figure 13: Portola Redwoods State Park **Iverson** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2011

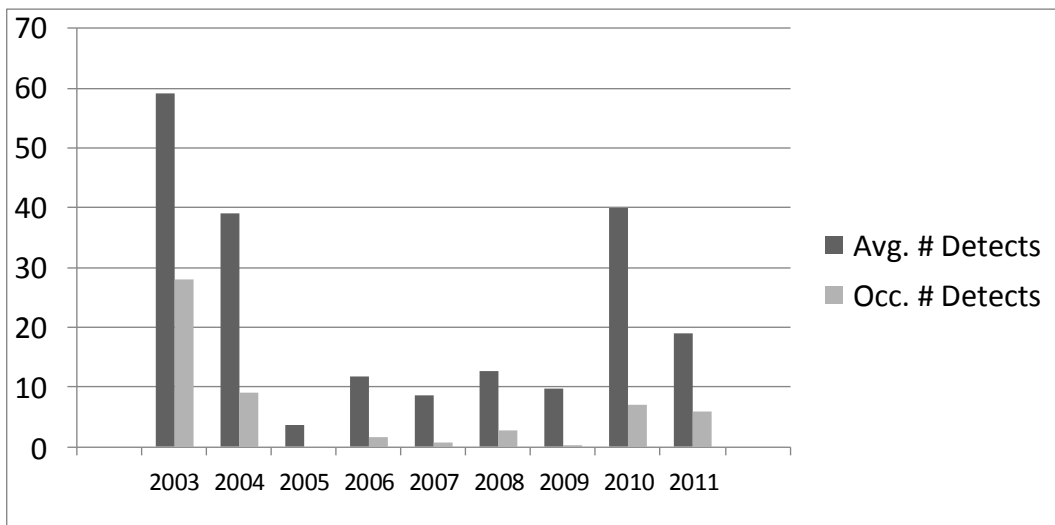


Figure 14: Butano State Park **Ben Reis** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2011

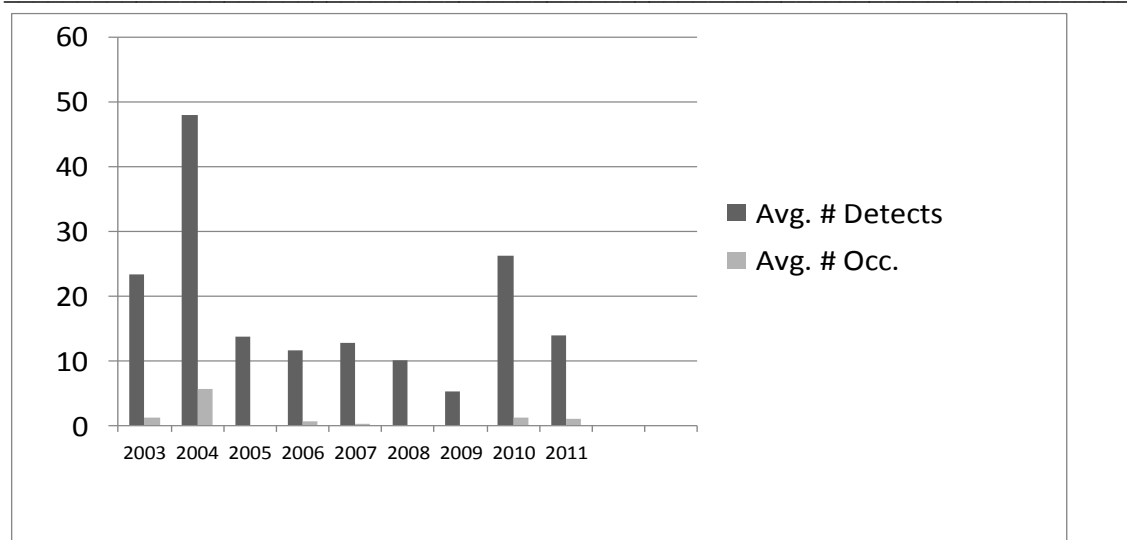


Figure 15: Butano State Park **Little Butano Creek** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2011

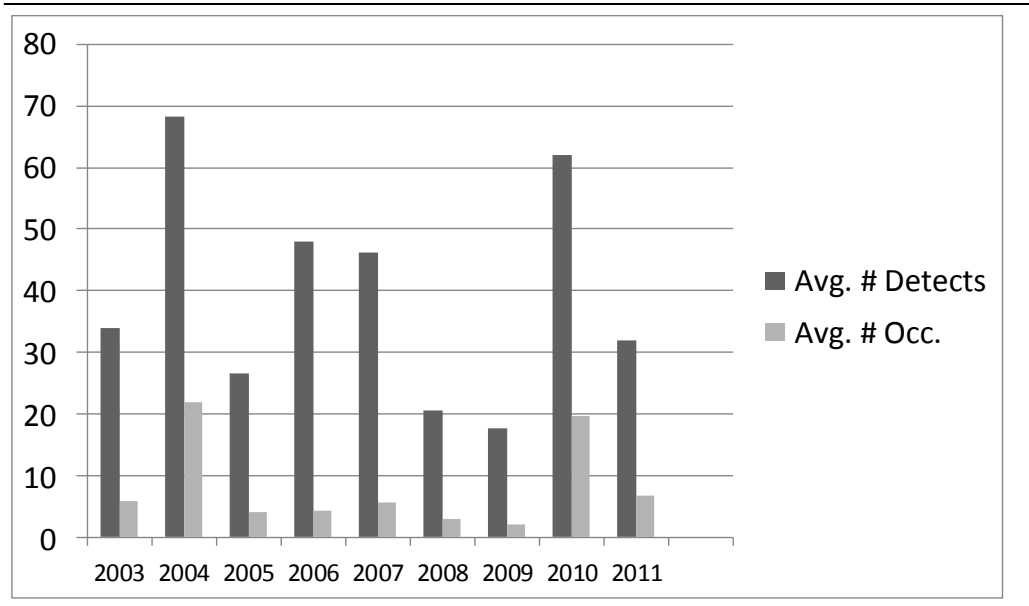


Figure 16: Memorial County Park **Memorial** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2011

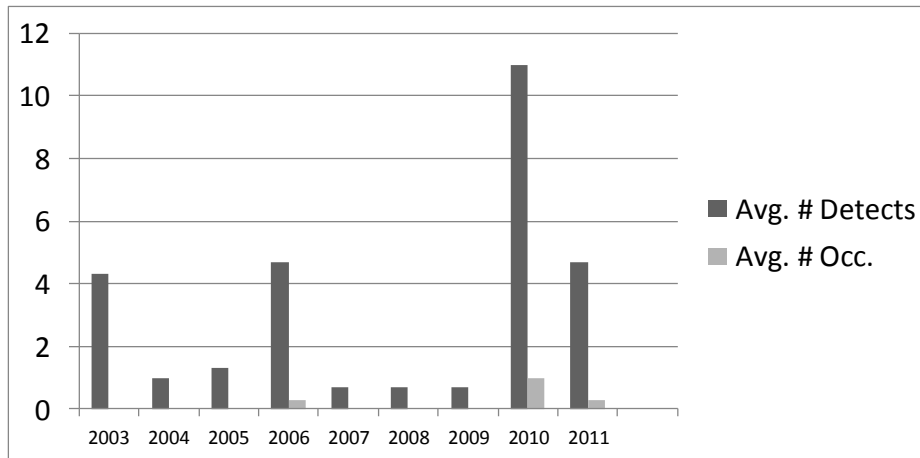


Figure 17: Memorial County Park **Sequoia** Survey Station Average Number Murrelet Detections and Occupied Behaviors 2003-2011

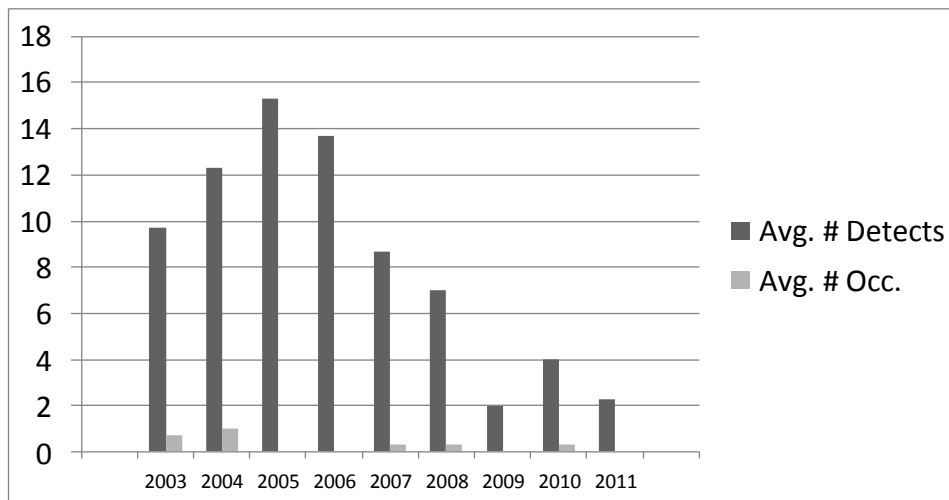


Figure 18: Average Number of STJA per station at each park 2001-2011 (Big Basin) or 2003-2011 (all other parks)

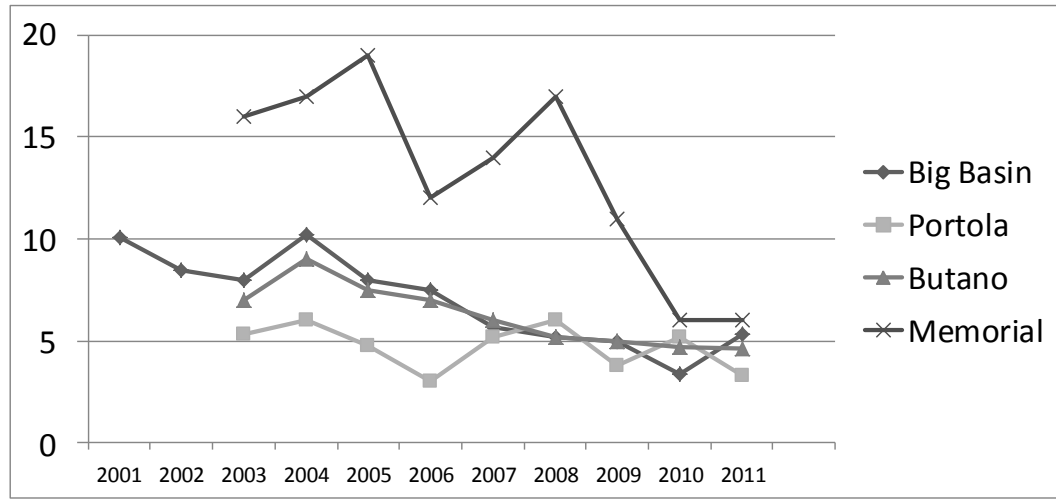


Figure 19: Average Number of CORA per station at each park 2001-2011 (Big Basin) or 2003-2011 (all other parks)

