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California State Parks
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Dear California State Parks Planning Division and State Parks Commission,

Please accept this letter in response to the recently published Draft EIR for the Big Basin Redwoods State Park General Plan and associated responses to public comments (RTC) particularly as they relate to the conservation of Marbled Murrelets in Big Basin Redwoods State Park. Dr. Zach Peery drafted this letter with input from co-signatories Dr. Bill Henry and Ms. Elena Doucet-Beer. Because of our extensive experience working with murrelets and corvids in the central California, which we describe below, we are in a position to provide a unique perspective on the General Plan and its potential impact to Marbled Murrelets in the region.

Dr. Peery has studied Marbled Murrelets with an emphasis on the central California population since 1999. This work began as his PhD thesis research at the University of California, Berkeley, continued during his post-doctoral tenure at Moss Landing Marine Laboratories, and remains an important part of his research program as an Assistant Professor at the University of Wisconsin-Madison. He has authored or co-authored 22 scientific articles on Marbled Murrelets in top-tier, peer-reviewed journals (e.g., *Conservation Biology*, *Ecology*, *Proceedings of the Royal Society*, *Ecological Applications*); these articles span a range of relevant topics including demography, the diagnosis of causes of population declines, nesting habitat, breeding biology, conservation genetics, foraging ecology, and survey methodology. He has advised one undergraduate student and two Master's students that studied murrelets in central California for their thesis research. He is currently advising Ms Doucet-Beer, a PhD student at UW-Madison, who has been studying the ecology of Steller's Jays in Big Basin since 2010. He also serves on the US Fish and Wildlife Service's Marbled Murrelet Recovery Implementation Team and recently gave a plenary address on murrelet conservation at the Pacific Seabird Group's annual meeting in Portland.

Dr. Henry has worked with seabirds for over 20 years and first studied Marbled Murrelets with Craig Strong and Dr. C.J. Ralph in Northern California in 1996. His PhD thesis at University of California at Santa Cruz focused on at sea tracking, distribution, diet and threats to North Pacific seabirds. He has coauthored 2 journal articles, 5 reports and given several talks

related to Marbled Murrelets and corvids in Central California. Dr. Henry has extensive experience with surveying forest bird populations. In 2009 he began researching on anthropogenic subsidies to corvids predators of the Marbled Murrelet in Central California. He has coauthored conservation plans for lands owned by regional conservation organizations. He has helped mentor Ms Doucet-Ber in her PhD research. He is currently running the Central California at sea monitoring program for Marbled Murrelets, teaching the Marine Vertebrate Ecology at Moss Landing Marine Laboratories, and works with the USGS as a Post-doctoral Research Biologist at Moss Landing Marine Laboratories.

Ms. Doucet-Ber has been studying the ecology of Steller's Jay in central California for her PhD dissertation research at the University of Wisconsin-Madison since 2010. As part of this research she is studying how human food subsidies impact the habitat use, foraging ecology, and population ecology of Steller's jays at multiple spatial scales in Big Basin Redwoods and Butano State Parks. Ms. Doucet-Ber has captured and banded hundreds of Steller's Jays over the last four years to assess breeding and non-breeding season habitat use, characterize juvenile dispersal, and study the demography of this species.

Below we evaluate four aspects of the Draft EIS and the RTC as they relate to murrelet conservation in central California: (1) the assessment of murrelet population status; (2) the characterization of potential threats to murrelets; (3) State Parks' approach to studying and monitoring murrelets and corvids; and (4) recommended mitigation measures in Big Basin. **Based on these evaluations, we conclude that State Parks is overly optimistic about the status of Marbled Murrelets in central California, understates the threat posed by corvids, and could do more to improve murrelet conservation, management, and research in Big Basin.**

❖ *Marbled Murrelet Population Status in Central California*

The RTC misrepresents scientific consensus about the abundance, and by extension the status, of the central California Marbled Murrelet population. The RTC states: "There are many estimates of the numbers of these birds left, and 600 is certainly one of the lowest estimates. Other estimates range from 1400-1700 (OceanlinkInfo/Biodiversity/murrelet.html) to 800 (Metroactive.com)" (page 193, RTC). The estimate of approximately 600 individuals was derived using extensive at-sea surveys conducted adjacent to all nesting habitat in the Santa Cruz Mountains over a 10-year period (Peery et al. 2006, Vasquez-Carrillo et al. *in review*). These surveys were developed using extensive pilot data (Becker et al. 1997) and simulations to assess statistical accuracy/power (Rachowicz et al. 2006). By contrast, the estimates of 1400-1700 and 800 individuals were drawn from unsubstantiated sources on the internet with no description of field or analytical methods, and indeed, it appears that Metroactive.com is a web-based guide for entertainment in the San Jose Area. As such, these estimates are not appropriate for conservation planning.

The RTC incorrectly suggests that the status of the central California murrelet population is improving: "Land and at-sea surveys (the most direct measure of population trends) show a decrease in some years and an increase in other years...However, based on adult/juvenile ratios, the local population may still be in decline, although the same data appears

to indicate some improvement for the central California population.” (Page 20, RTC). A recent synthesis of genetic and at-sea survey data for murrelets in central California indicates that the large apparent decline in 2007 and 2008 was due to murrelets moving out of the survey area, and the “improvement” was due to birds returning to the survey area in 2009 (Vasquez-Carrillo et al. *in review*). However, it is important to recognize that the mean abundance estimate from 2009 to 2011 (503) is 21% lower than the mean estimate in 1999 to 2003 (636), excluding the two years when abundance was low because of dispersal. In addition, even though juvenile ratios in 2010 and 2011 were numerically higher than in previous years (0.074 and 0.091, respectively), they are not significantly greater when sampling variation is taken into account (Table 1; Henry et al. 2012). More importantly, they remain far too low to support a viable population as Beissinger (1995) estimated that juvenile ratios of 0.15 to 0.22 were needed to achieve stable population growth. **Thus, the best available data suggests that the central California represents the smallest and most isolated murrelet population in the threatened portion of the species’ range, does not receive sufficient permanent immigration to be rescued by larger populations to the north, is experiencing very low reproductive success, and is likely to become extirpated in the near to intermediate future (Peery et al. 2004, 2007, 2010; Peery and Henry 2010; Henry et al. 2012).**

❖ *Level of Threat Posed to Marbled Murrelets by Corvids*

The weight of scientific evidence indicates that corvid nest predation is the primary factor responsible for low reproductive success and that a reduction in nest predation is the most effective means for improving population viability. State Parks acknowledged this point in the DEIR with the statement: “A factor in the decline in marbled murrelet detections and nesting success within the park’s historic core area is related to the nest/nestling predation by various corvid species (e.g. Steller’s jay, common raven) and other predators.” However, State Parks modified this assessment in the RTC: “It is unclear what is causing the decline in numbers, whether disturbance of habitat, predation, or loss of other habitat in other areas. Conversely, it cannot be said with certainty that the activity of Parks visitors in the old-grove redwoods is the reason for the dwindling numbers. This lack of definitive information leads State Parks to make the required overriding findings for a significant unavoidable impact.” (Page 19, RTC). It is important to recognize that very rarely is there “definitive” proof that a putative threatening factor is causing the decline of a particular endangered species. Instead, managers and researchers are confronted with the task of weighing the best available information, and targeting the putative factors that are both likely causes of declines and that are amenable to management actions. In the case of murrelets, the balance of the evidence points to corvid predation as the culprit and corvid predation is more amenable to management than habitat loss (most is already in reserves) and prey availability in the marine environment (a portion of which is in reserves as well). Corvid surveys and capture work indicate that (1) corvids remain extremely abundant in State Park campgrounds (see below), (2) about half of murrelet nests occur within 1 km of campgrounds (Baker et al. 2006), (3) corvid predation is the most important cause of murrelet nest failure (Peery et al. 2004), and (4) murrelet reproductive success is extremely low (Henry et al. 2012). In concert, these lines of evidence strongly indicate that corvid predation is causing murrelet population declines and that the RTC has overemphasized the uncertainty. Moreover, a recent PVA indicates that moderate reductions in corvid predation could result in a viable murrelet population (Peery and Henry 2010). **Without strong and immediate actions by**

State Parks to reduce corvid predation, we believe that it is likely that murrelets will become extirpated in central California.

❖ *Abundance and Population Trend of Steller's Jays in Big Basin Redwoods State Park*

Steller's Jay abundances remain very high in Big Basin campgrounds, despite implementation of trash management and public education programs by State Parks. As part of Ms. Doucet-Beer's PhD research, we have banded 215 adult Steller's Jays in Sempervirens, Blooms Creek, and Huckleberry Campgrounds from 2010 to 2012. This number represents only a fraction of the total number of jays present in these campgrounds given that a large proportion of adult jays remain unbanded. We have not yet completed our mark-recapture analyses to estimate abundance, but in our professional opinion, there are at least 500 adult jays resident in these three campgrounds alone.

The RTC's assessment that Steller's Jays have declined as a direct result of management efforts is too strong: "There are, however, data that show that jay numbers within the park have significantly declined as a direct result of park management (Suddjian 2010)" (Page 203, RTC). Suddjian (2010) suggested that disease could also have caused the decline; and more importantly, management actions were initiated in 2005, whereas the largest declines in Steller's Jays in Big Basin campgrounds occurred from 2003 to 2004. It is not clear the decline would have been statistically significant had the analysis been limited to 2005-2009.

Research conducted by Ms Doucet-Beer suggests that Big Basin campgrounds are source habitats that supplement jay populations on a larger scale in murrelet habitat. Jays sampled in campgrounds are enriched for the heavy isotope of carbon (high $\delta^{13}\text{C}$) compared to jays sampled in the forest (Fig 1). Because corn-based foods are high in $\delta^{13}\text{C}$, this finding indicates that campground jays are still relying on human-derived foods, despite management efforts. Moreover, lipid analyses indicate that campground jays foraging on human foods have greater fat stores than campground birds (Fig 2), which studies of many other bird species have linked to increases in fitness parameters such as reproductive success. Indeed, the abundance of juvenile jays in campgrounds is extremely high at the end of the summer, and radio-tracking we have conducted over the non-breeding season in 2012-2013 indicates that many juveniles born in campgrounds remain within Big Basin and murrelet habitat. Thus, our research suggests that campgrounds may be source habitats for Steller's Jays, where adults are in good physiological condition because of access to human foods, and produce many young that remain in murrelet habitat. This work was recently presented at the Pacific Seabird Group's 2013 annual conference.

Fig 1. Stable isotope signatures for Steller's Jays occurring in interior forests and in campgrounds in Big Basin Redwoods State Park, Butano State Park, and Redwood National Park. Campground birds have higher $\delta^{13}\text{C}$ ratios than forest birds indicating a greater reliance on human-derived foods.

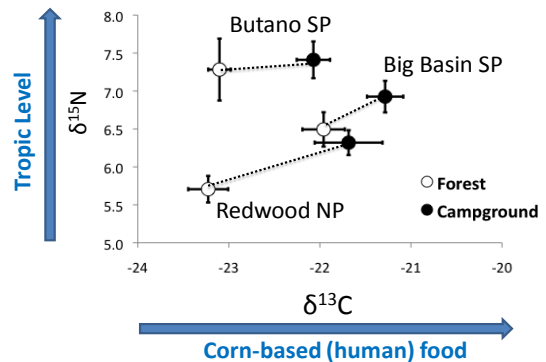
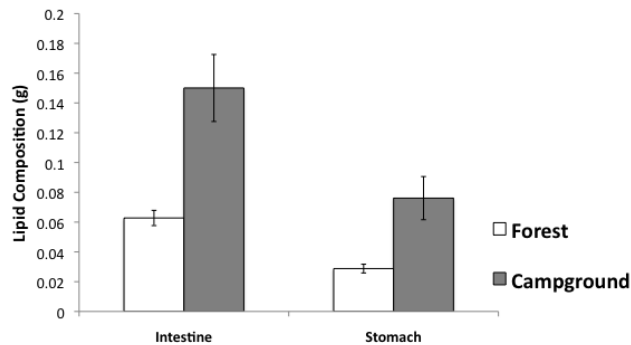


Fig 2. Intestine and stomach lipid composition in campground and forest jays in Butano and Big Basin State Parks.



❖ *Support for Steller’s Jay Research in Big Basin*

State Parks should provide greater support for murrelet-related research, particularly studies of corvid ecology. The RTC states, “...State Parks continues its support for predator control and directed studies aimed at reducing the rate of nest predation. Towards this goal, State Parks is working with DFG and USFWS to promote and support methodologies that in addition to

controlling the numbers of predators, would directly address the rate of predation. One such measure is the experimental egg aversion treatments proffered by Gabriel and Golightly (2011).” It is true State Parks has supported some efforts to study and monitor murrelet-corvid interactions, but they have missed a golden opportunity to support the above Steller’s Jay research described in the previous section. Knowledge of jay densities, within- and among-season movements, and foraging ecology is essential baseline information for designing effective management strategies that will reduce corvid predation and recover murrelets in central California. Such information is also valuable for the ongoing taste aversion project in Butano (and soon Big Basin), which was designed and implemented without estimates of jay densities and movement behavior in these parks. Our research project was designed to address those questions specifically and to inform corvid management programs more generally. Nevertheless, all four proposals we submitted to oil spill trustee councils, on which State Parks is represented, were not funded. Moreover, these proposals involved quite modest requests, some with budgets as low as \$10,000, that would have complemented significant out of state funding from the University of Wisconsin. As a result, our research has been conducted “on a shoestring” and we believe that murrelet/jay management has suffered as a result. Aside from funding from oil spill trustee councils and California State Parks, there is a need to tap Federal and State funds appropriated for threatened and endangered species.

❖ *Mitigation Options for Marbled Murrelets in Big Basin*

We believe that the central California population is highly imperiled based on estimates of low reproductive success, small population size, and geographic/demographic isolation. Moreover, we believe that corvid predation in California state parks is currently the most significant threatening factor. Fortunately, corvid predation is also the most amenable to management. Nevertheless, we do not believe that current management efforts in state parks are sufficient to reduce corvid predation to the level needed to maintain a viable murrelet population for the reasons articulated in previous sections. Also, while preliminary data indicates that taste aversion may be an effective way to reduce jay predation on eggs, it is clearly a “proximate” (temporary) solution. (It is also still unclear whether taste aversion can be “scaled up” and will reduce predation sufficiently to improve murrelet viability). Needed are “ultimate” (long-term) solutions that reduce corvid abundances in murrelet habitat to a greater extent than can be achieved with visitor education and trash management. The revised DEIR added a potential management action to relocate/remove or rotate use of recreation facilities in the old-growth

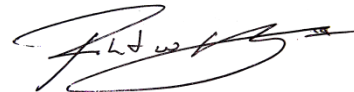
(RTC, Page 217). **We support such actions and believe that relocating campgrounds and picnic areas out of areas with high concentrations of murrelet nests, combined with other strategies to reduce predator abundances, would be the most effective long-term strategy for conserving murrelets in the region.**

We certify that the information provided above is true to the best of our knowledge.

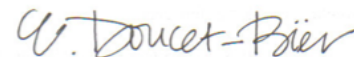
Sincerely



Zach Peery



Bill Henry



Elena Doucet-Beer

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