Reply to Jones and Peery memo regarding Hanson et al. (2018)

Chad T. Hanson, Monica L. Bond, and Derek E. Lee

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Below we reply to the 1/19/18 memo from Gavin Jones and Zach Peery in response to Hanson et al. (2018), "Effects of post-fire logging on California spotted owl occupancy", which found a significant adverse impact on spotted owl occupancy when 5% or more of the area in spotted owl sites (within a 1500-meter radius around site centers) was subjected to post-fire logging.

Summary of Problem #1: Jones and Peery admit that they used spotted owl sites that were not occupied before the King fire for their analysis of the King fire's impacts on owl populations. Of the five King fire spotted owl sites from Jones et al. (2016), with ≥50% high-severity fire and less than 5% post-fire logging, 60% of these were occupied after the King fire—an occupancy level that slightly exceeds the pre-fire occupancy of the study area.

Jones et al. (2016) report in their Results that the spotted owl site "extinction rate" increased "sevenfold", to an 88% probability, in spotted owl sites with ≥50% high-severity fire in their study area in the northern half of the King fire of 2014 on the Eldorado National Forest. A total of 15 spotted owl sites used in the spotted owl occupancy analyses in the Jones et al. (2016) study had ≥50% high-severity fire, as defined in Jones et al. (2016), within their study area in the King fire (see Figure 2 of Jones et al. 2016). In their 1/19/18 memo, however, ***Jones and Peery admit that 7 of these 15 sites were not occupied prior to the King fire***. They claim that site PLA065 was occupied in 2014 when the King fire occurred, but records provided to us by the U.S. Forest Service show that this is incorrect (**see Attachment 1**), and that the most recent occupancy of this site prior to the fire was in 2013 (further, PLA065 was extensively post-fire logged in the months following the King fire). Therefore, there were 7 sites that were occupied prior to the King fire, and which had ≥50% high-severity fire. Jones and Peery claim that 2 of these 7 sites, PLA050 and PLA067, had less than 5% post-fire logging, but they use a radius (1100 meters around site centers) that only corresponds to a portion of spotted owl territory sizes and, therefore, omit much of the impact of post-fire logging. Within a 1500-meter radius, both of these sites have ≥5% post-fire logging and, therefore, it is not scientifically sound to attribute changes in occupancy at such sites to the fire itself, given the confounding effect of post-fire logging (the satellite imagery that we used to determine the percent post-fire logging dated to mid-spring of 2015, so even more post-fire logging would likely have occurred before the middle of 2015, June 30th).

Nowhere in the Jones et al. (2016) study do the authors divulge the fact that about half of the 15 owl sites in question were not occupied before the King fire occurred. The term "extinction rate", as applied to spotted owls, is a technical term that pertains to the percentage of sites that were occupied in the year before the year in question (i.e., year t - 1), but are not occupied in the year in question (year t) (see, e.g., Lee et al. 2012). By including many sites that were not occupied before the fire, and by failing to mention that fact, Jones et al. (2015) created a misleading impression for readers—i.e., the impression that nearly all of the 15 owl sites with ≥50% high-severity fire were rendered "extinct" because of the King fire, which Jones and Peery now belatedly admit is not true.

Of the remaining 5 of the 15 owl sites in the Jones et al. study area in the King fire, which were occupied before the King fire, and which had ≥50% high-severity fire and less than 5% post-fire logging (ELD085, PLA039, ELD051, ELD057, and ELD058), 60% of these (ELD085, PLA039, and ELD051) were occupied after the King fire. That is slightly higher than the 57% occupancy that Jones et al. (2016) report for their study area just before the fire occurred. Jones and Peery imply that ELD085 and PLA039 were not occupied after the King fire, but this is directly contradicted by the data provided to us by the Forest Service, which shows that there were spotted owl detections at both of these sites in 2015 (in both Jones et al. 2016, and Hanson et al. 2018, occupancy is defined as one or more detections at a site in a given breeding season), at one year after the King fire (**see Attachment 2**). We note that we have requested copies of the original 2015 spotted owl field survey data sheets from the King fire, but Jones and Peery have refused to provide those copies. We do not understand this. The University of Wisconsin (UW) spotted owl survey team was hired by the U.S. Forest Service to conduct spotted owl surveys in the Eldorado Study Area, where the northern half of the King fire occurred. Under this contract, the Forest Service pays half of the salaries and expenses of the UW researchers. As such, the UW researchers are operating as contract employees of the Forest Service, and any and all data resulting from such a federal agency contract are public records.

Based upon a mere two (n = 2) spotted owl sites, ELD057 and ELD058, which were occupied before the King fire but not after the fire, and which had ≥50% high-severity fire and <5% post-fire logging, Jones and Peery claim that this "clearly indicate[s] that extensive severe fire—not salvage logging—was associated with local extinction events…" However, scientists do not draw conclusions from a sample size of two and, as we mention above, there were five sites (not two) that were occupied before the King fire, and had <5% post-fire logging and ≥50% high-severity fire, and most of them remained occupied after the King fire. Further, while ELD057 and ELD058 had <5% post-fire logging within a 1500-meter radius, as applied in Hanson et al. (2018), both sites had ≥5% post-fire logging within a 2000-meter radius of site centers. It is possible that there are impacts to spotted owls from post-fire logging beyond 1500 meters from site centers. While it may be that the owls left one or both of these sites because of the King fire, it is also possible that the non-occupancy in 2015 was more related to the steep population decline that has been occurring in this area for more than two decades, associated with intensive logging prior to the King fire, including in sites ELD057 and ELD058.

In light of the foregoing, the statement by Mr. Jones in the 1/19/18 E&E News story—that it is "entirely unambiguous" from the results of Jones et al. (2016) that higher levels of high-severity fire severely reduced spotted owl populations in the King fire—is simply not scientifically credible.

<u>Summary of Problem #2</u>: Jones and Peery claim that we had an analytical flaw in our study, based on two owl sites, but the mistake is their own.

In Hanson et al. (2018), we did not include owl sites with >80% high-severity fire in our analysis because, as we explained, we did not have enough sites with >80% high-severity fire and <5% post-fire logging to compare to those with >80% high-severity fire and >5% post-fire logging (Jones and Peery are correct that there was a typographical error in one sentence in our study--and the journal has corrected this in the online version). In other words, nearly all of the sites with >80% high-severity fire had been post-fire logged. We also explained in Hanson et al. (2018) that spotted owl sites with >80% high-severity fire are relatively rare, and comprise only a small percentage of all owl sites that experience wildland fire.

Jones and Peery claim that this is an analytical flaw of our study, asserting that 2 of the 4 owl sites with >80% high-severity fire, in the King fire, had <5% post-fire logging. However, as we explained above, these two sites (PLA050 and PLA067) actually had >5% post-fire logging within a 1500-meter radius of site centers. Therefore, all four of the sites with >80% high-severity fire in the King fire had >5% post-fire logging, and there was no basis for comparison to unlogged sites with >80% high-severity fire. In Hanson et al. (2018), we specifically identify this as an important future research need, and note that sites with >80% high-severity fire in future wildland fires should be a high priority for protection so that we can compare them to post-fire logged sites with >80% high-severity fire in previous fires.

<u>Summary of Problem #3</u>: Jones and Peery admit that Hanson et al. (2018) were correct in stating tat Jones et al. (2016) included high-severity fire areas that had been clearcut (logged) in their post-fire foraging habitat selection analysis of avoidance/selection of high-severity fire patches. However, they then misleadingly select a single, non-representative site to promote their original conclusion of avoidance of high-severity patches, while omitting mention of the other sites that show active spotted owl foraging in high-severity fire areas that had not been clearcut.

Hanson et al. (2018) pointed out that the conclusion of Jones et al. (2018)—that spotted owls avoided high-severity fire patches for foraging—was invalid because many of these areas had been clearcut before or after the King fire. In their 1/19/18 memo, Jones and Peery now admit that they did in fact fail to exclude clearcuts in their analysis, and that their analysis in Jones et al. (2016) did not represent how spotted owl respond to unlogged patches of mature forest that experienced high-severity fire (also known as "snag forest habitat"). Despite this, Jones and Peery offer a single, selectively-chosen owl site (see Appendix 3 of the Jones and Peery memo) in an attempt to rehabilitate their original conclusion, which we now know was flawed and invalid. However, their example is also invalid for at least three reasons.

First, they claim that it shows avoidance of the high-severity fire patch, but it shows nothing of the sort. The edge of the high-severity fire patch is, on average, about 1500 meters or more from the site center—*i.e.*, it is located at the far edge of the owl's territory in the first place. Applying the logic used by Jones and Peery here, we could similarly conclude that the owl almost completely avoided unburned forest at the same distance in the opposite direction (north/northwest) from the site center. In reality, neither conclusion is valid, the habitat in question is simply not within the area most used by the owl. Second, the high-severity fire patch in question is flanked on two sides by large private industrial timberlands, where extensive post-fire clearcutting was occurring, along with the noise and disruption that is inherent in such logging. It is not hard to imagine that the owl would not wish to get too close to such activities. Third, Jones and Peery sidestep the fact that their own foraging data show that the owls actively foraging in unlogged high-severity fire patches, and are actually avoiding high-severity fire areas that were clearcut before or after the King fire (see Figure 1 below).

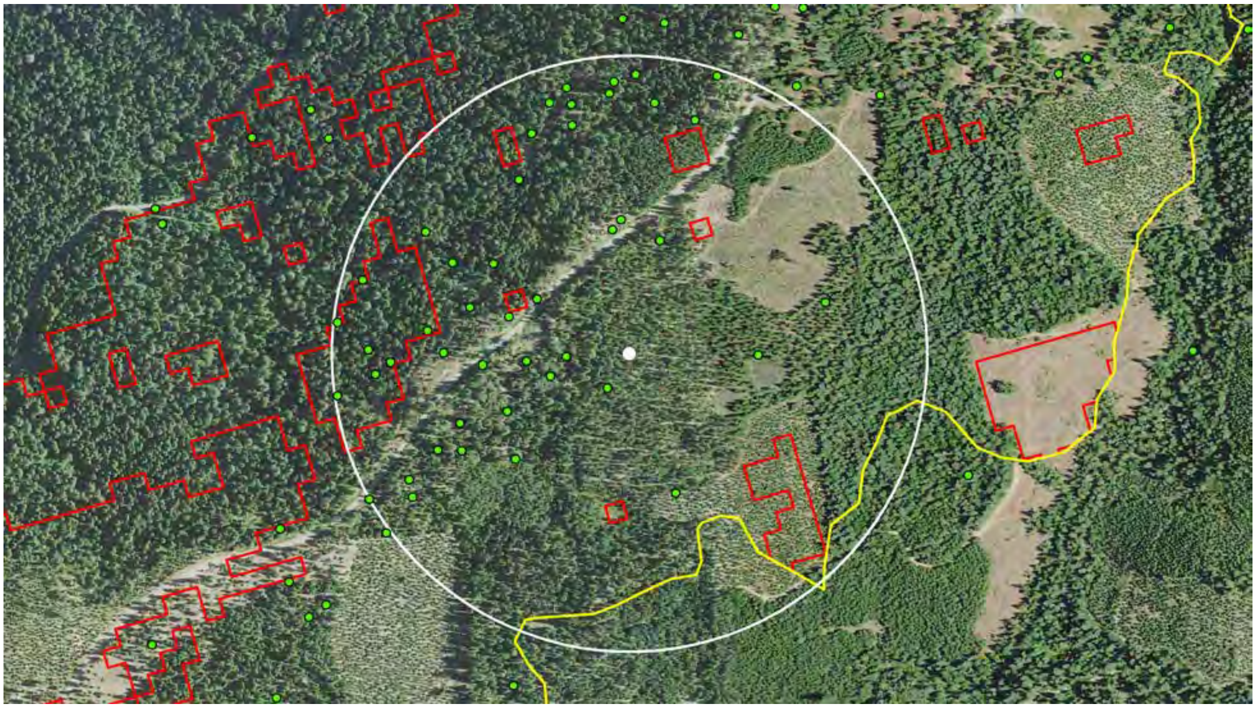


Figure 1. *Pre-fire (May 2014) image superimposed with one-year post-fire (2015) Spotted Owl foraging locations (green dots) for a representative owl from Jones et al. (2016: WebFigure 3), with high-severity fire patches (open red polygons) that occurred in the 2014 King fire in both pre-fire clearcuts/plantations (e.g., right side and lower center of image) and in mature forest (left side of image—i.e., complex early seral forest, or "snag forest habitat"). The owls were foraging in snag forest, but not in clearcuts/plantations that burned at high-severity.*

In response to another criticism mentioned in Hanson et al. (2018), Jones and Peery inaccurately claim that Jones et al. (2016) analyzed distance from the site center in their foraging habitat selection analysis. Not so. As Jones and Peery state in their memo, Jones et al. (2016) merely imposed a maximum distance on their foraging analysis, which is not at all the same thing as analyzing distance-from-site-center as a variable in the habitat selection assessment. This matters because, in many of the sites that Jones et al. (2016) chose to analyze for foraging habitat selection, the high-severity fire patches were at the outer edges of the owl territories, far from site centers. Naturally, central-place foragers like spotted owls will focus relatively more of their foraging activity near the site centers, so distance from site centers must be explicitly taken into account in the analysis, which Jones et al. (2016) did not do.

<u>Summary of Problem #4:</u> Jones and Peery claim that Hanson et al. (2018) failed to discuss three recent scientific studies, which they claim show that spotted owls avoid high-severity fire areas: Comfort et al. (2016); Rockweit et al. (2017); and Eyes et al. (2017). However, Jones and Peery misrepresent these studies, as we discuss below.

Comfort et al. (2016) explicitly found that Northern spotted owls avoid post-fire logged areas, which is entirely consistent with our findings in Hanson et al. (2018) (in addition, we cited Comfort et al. 2016 in our Discussion section in Hanson et al. 2018). Therefore, the suggestion by Jones and Peery that Comfort et al. (2016) provides support for the view that the owls avoid high-severity fire areas—in the absence of post-fire logging—is highly misleading and scientifically inaccurate.

Rockweit et al. (2017) claimed that high levels of high-severity fire reduced occupancy of Northern spotted owls. However, this was based on only three spotted owl sites in a single fire, the Sims fire of 2004. Further, Jones and Peery, in their memo, fail to disclose the fact that these spotted owl sites had been post-fire logged. Below, we reproduce Figure 1c from Rockweit et al. (2017), which shows the three spotted owl sites in question in the Sims fire, as well as September 2006 satellite imagery showing post-fire logging in these sites at two years post-fire. Additional post-fire logging would have occurred after September 2006, since the U.S. Forest Service post-fire logging project was not yet complete at that time. Therefore, these images likely do not show all of the post-fire logging that ultimately occurred.

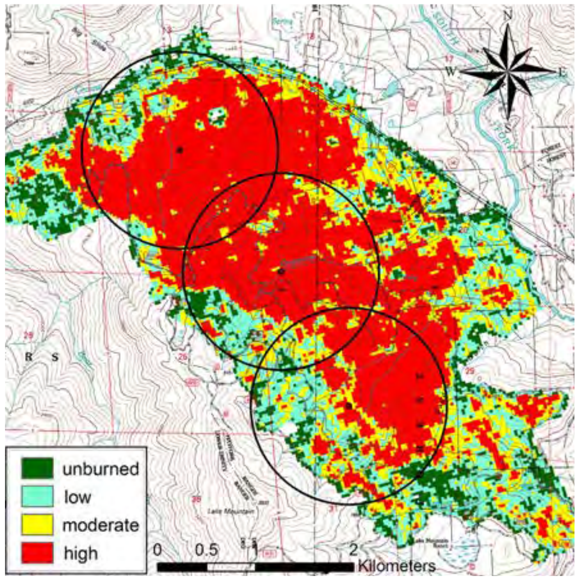
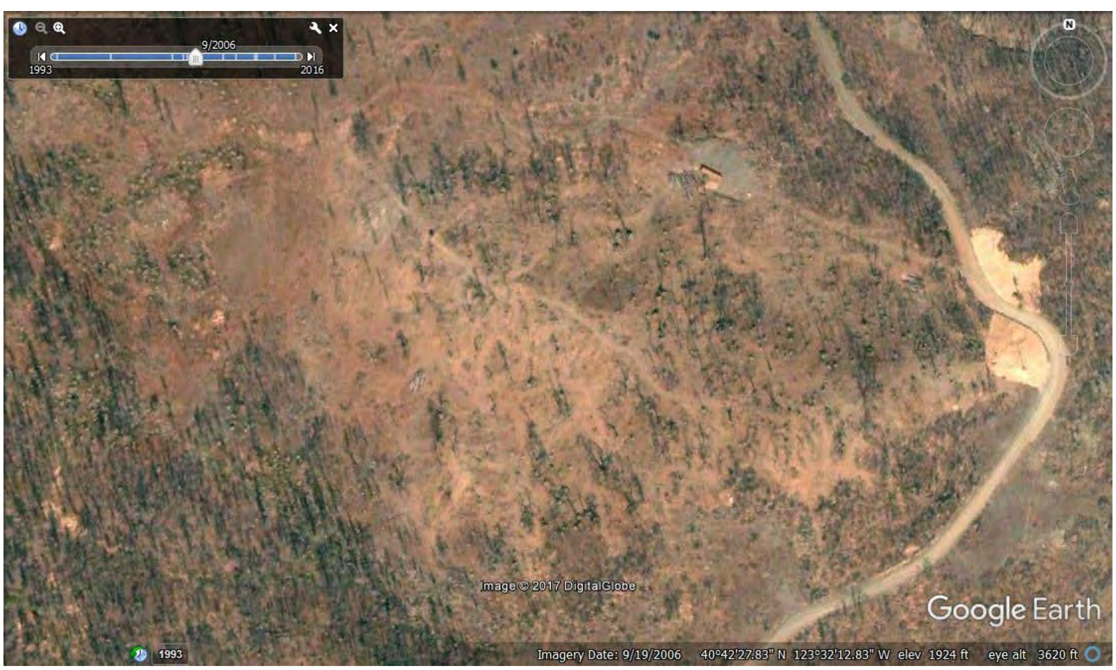


Figure 1c from Rockweit et al. (2017), showing the three spotted owl sites, Sims fire of 2004.

September 2006 satellite imagery showing an overview of the Sims fire, two years post-fire.

September 2006 satellite imagery showing post-fire logging in the northernmost of the three spotted owl sites in the Sims fire.



September 2006 satellite imagery showing post-fire logging in the central owl site, Sims fire.

September 2006 satellite imagery showing post-fire logging in the central and southern spotted owl sites, Sims fire.

Finally, Jones and Peery do not accurately reference Eyes et al. (2017). That study did not find a statistically significant pattern of selection or avoidance of high-severity fire patches by California spotted owls, especially when the effect of distance from roost sites was taken into account. Eyes et al. (2017) defined "locations that contained patches burned at high fire severity" as "high contrast edges", and found that spotted owls foraged in such areas about three times *more* than in areas of lower-severity fire, or unburned forest, though there was high variability in the data and the effect was not statistically significant. Further, Bond and Hanson (2014: Appendix A) found that much of the area in which the owls were found foraging, and which Eyes et al. had classified as low/moderate-severity, were in fact high-severity fire areas occurring in mature conifer forest that more recently re-burned at low/moderate-severity (which did not change the fact that this was complex early seral forest habitat, a.k.a., "snag forest habitat") and, when this error was corrected, there was a significant selection in favor of high-severity fire areas (there was no post-fire logging in the study area). Also, as with Comfort et al. (2016), we cited Eyes et al. (2017) in our Discussion section and summarized the findings. We are perplexed as to how Jones and Peery could have missed this.

References

References

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Summary of pre-fire King Fire spotted owl PAC status and territory occupancy.

Attachment 1

CSO PAC (territories in bold font are surveyed annually)	**Best Status/ Year Pre-Fire**	**Pre-fire Territory Occupancy – Latest Year Occupied**	**Post-Fire PAC Nesting Habitat Acres**	**Post-Fire Territory Occupancy Status**
ELD0001	R / 2010	2010	291	
ELD0009	S / 2014	2014	353	
ELD0012	R / 2014	2014	181	
ELD0015	R / 2010	2012	218	
ELD0036	R / 2004	2004	148	
ELD0040	P / 2012	2013	50	
ELD0042	S / 2009	2009	214	
ELD0051	R / 2014	2014	197	
ELD0052	P / 2010	2010	149	
ELD0057	R / 2014	2014	39	
ELD0058	P / 2013	2014	71	
ELD0060	P / 2010	2010	106	
ELD0067	R / 2010	2013	150	
ELD0068	R / 2014	2014	3	
ELD0081	S / 2012	2012	13	
ELD0085	P / 2014	2014	17	
ELD0086	R / 2012	2014	108	
ELD0140	P / 2012	2013	16	
ELD0206	S / 2009	2009	5	
ELD0213	S / 2001	2001	367	
ELD0216	S / 2009	2009	174	
ELD0217	S / 2002	2002	243	
ELD0219	P / 2008	2008	264	
ELD0300	P / 2005	2005	113	
ELD0303	S / 2006	2006	231	
PLA0007	S / 2013	2013	10	
PLA0011	P / 2011	2014	293	
PLA0012	S / 2011	2011	0	
PLA0013	S / 2011	2013	264	
PLA0015	P / 2012	2013	0	
PLA0016	P / 2014	2014	301	
PLA0038	P / 2008	2008	305	
PLA0039	R / 2014	2014	130	
PLA0040	R / 2014	2014	290	
PLA0043	S / 2011	2011	0	
PLA0049	S / 2011	2011	0	
PLA0050	R / 2014	2014	0	
PLA0051	P / 2013	2013	95	
PLA0065	R / 2013	2013	0	
PLA0067	P / 2014	2014	0	
PLA0080	S / 2014	2014	174	
PLA0098	S / 2014	2014	283	
PLA0101	R / 2002	2002	39	
PLA0109	S / 2013	2013	0	
PLA0113	P / 2014	2014	7	
PLA0122	S / 2010	2010	185	
Grand Total				

Attachment 2

Preliminary CSO PAC Status in the King Fire Reported to the Forest Service as of 7/15/2015 (Note: information in this table is preliminary and will undergo further review prior to Final Reporting).

Owl PAC	**7/15/15 Survey Status**	**Activity Center Status**	Activity Center UTM	
ELD0001	in progress	Pair - Nesting Unknown		
ELD0009	in progress			
ELD0012	complete	Pair - Nesting Confirmed	722074	4315729
ELD0014	in progress	Pair - Nesting Unknown	701229	4300734
ELD0015	in progress	2 birds, pair status unknown		
ELD0034	in progress	2 birds, pair status unknown	705373	4296012
ELD0036	in progress			
ELD0040	complete	Verified unoccupied		
ELD0042	in progress	Resident Single	717709	4301968
ELD0043	in progress	Status Unknown (Single Owl)		
ELD0051	complete	Pair -- Non-nesting Confirmed	717904	4298526
ELD0052	in progress			
ELD0054	in progress	Status Unknown (Single Owl)		
ELD0057	complete	Verified unoccupied		
ELD0058	complete	Verified unoccupied		
ELD0060	complete	Verified unoccupied		
ELD0067	in progress	Pair - Nesting Unknown	708220	4301553
ELD0068	complete	Verified unoccupied		
ELD0071	in progress	Pair - Nesting Unknown		
ELD0081	complete	Verified unoccupied		
ELD0085	complete	Pair -- Non-nesting Confirmed	716876	4311761
ELD0086	complete	Pair - Nesting Confirmed	723908	4320474
ELD0097	in progress	Pair - Nesting Confirmed	706020	4311355
ELD0140	complete	Verified unoccupied		
ELD0206	in progress	Status Unknown (Single Owl)	717984	4294463
ELD0213	in progress			
ELD0216	in progress	Status Unknown (Single Owl)		
ELD0217	in progress	Status Unknown (Single Owl)		
ELD0219	in progress	Status Unknown (Single Owl)		
ELD0300	in progress			
ELD0303	in progress			
ELD0315	in progress	Pair - Nesting Confirmed	704137	4294901
ELD0320	in progress	Pair -- Non-nesting Confirmed	718688	4302401

PLA0007	complete	Verified unoccupied		
PLA0011	complete	Verified unoccupied		
PLA0012	complete	Verified unoccupied		
PLA0013	complete	Verified unoccupied		
PLA0015	complete	Verified unoccupied		
PLA0016	complete	Pair - Nesting Confirmed	717549	4323246
PLA0038	in progress	Pair - Nesting Unknown	713847	4319734
PLA0039	in progress	Status Unknown (Single Owl)		
PLA0040	complete	Pair - Nesting Confirmed	710927	4314999
PLA0043	complete	Verified unoccupied		
PLA0049	complete	Verified unoccupied		
PLA0050	complete	Verified unoccupied		
PLA0051	complete	Pair -- Non-nesting Confirmed	719885	4326661
PLA0065	complete	Verified unoccupied		
PLA0067	complete	Verified unoccupied		
PLA0080	in progress	Status Unknown (Single Owl)		
PLA0098	complete	Verified unoccupied		
PLA0101	in progress	Status Unknown (Single Owl)		
PLA0109	complete	Verified unoccupied		
PLA0113	complete	Verified unoccupied		
PLA0122	in progress	Status Unknown (Single Owl)		