



Mono Lake Phalarope and Osprey Disturbance Study 2023 Report

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Summary

2023 marks the second year of monitoring phalarope and osprey disturbance at the western half of South Tufa at Mono Lake. The impact of human disturbance on phalaropes and osprey at South Tufa had not been previously studied and was uncertain due to the lack of data. Our goal was to evaluate the frequency, magnitude, and types of human-caused disturbance to phalaropes and osprey. We conducted observations on a total of 13 days, 7 weekdays and 6 weekend days, from the end of June to Labor Day, totaling 39 hours of observation in 2023. We aimed to do observations on one weekday and one weekend day each week. We recorded a total of 39 human

visitations to the study area, nine of which caused osprey disturbances. We did not observe phalaropes within the study area during the entire 2023 survey period, thus there were no phalarope disturbances from humans. The types of human visitations we observed include kayakers, canoers, pedestrians, and stand-up paddleboarders. Over the past two years, significantly fewer phalaropes were observed in the study area than in 2021. It appears that habitat conditions, especially the lake's elevation level, influence whether large numbers of phalaropes use the South Tufa area. Human disturbance to phalaropes also appears to occur more frequently when larger numbers of phalaropes are present. Our findings indicate that disturbance to phalaropes and osprey at western South Tufa is infrequent, but occasional disturbances sometimes cause substantial behavior changes of both species, such as leaving the study area. Further study is needed to evaluate whether osprey nest success is negatively affected by human disturbances. Boat disturbance to osprey in western South Tufa is sporadic, which may be due to ospreys getting habituated to boats as well as current management practices alerting boaters to maintain distance from nests. Further study focused on the reaction of birds to stand-up paddleboarders, and pedestrians would be useful. If large flocks of phalaropes are present or the lake level drops enough to expose osprey nests to shore, adaptive management strategies, such as short-term closures of areas around nests, could be implemented to prevent harmful levels of disturbance.

Introduction

Wilson's and red-necked phalaropes (*Phalaropus tricolor* and *P. lobatus*, respectively) visit Mono Lake during their post-breeding "staging" period, during which they feed on the abundant invertebrates in the lake in preparation for migration to South America (Jehl 1988). Wilson's phalaropes double their body weight and undergo a complete body feather molt during a stay of only 1-2 months at Mono Lake, meaning their time spent there is critical to their survival (Jehl 1988). Phalaropes congregate in near-shore locations with submerged tufa at Mono Lake, likely because of the abundance of alkali fly prey in those locations (Jehl 1988, Rubega & Inouye 1994). During this time, phalaropes often stand on the shoreline, actively preening as they molt feathers, or swim and feed in shallow nearshore waters. Recreational use at the popular South Tufa recreation area of Mono Lake overlaps with areas sometimes used by large aggregations of phalaropes (e.g., approximately 40,000 Wilson's Phalaropes at South Tufa during July 2021, Carle et al. 2022). Phalaropes can be disturbed by watercraft, pedestrians, dogs walking the shoreline, drones, and other aircraft that appear similar to aerial predators. Given the high energetic needs of staging phalaropes during the few weeks they are at Mono Lake, frequent human disturbance could harm their survival, as has been shown in other shorebird species (e.g., West 2002, Gibson et al. 2018).

Osprey (*Pandion haliaetus*) are fish-eating raptors that nest in open nests on top of tufas at Mono Lake from May to September. Ospreys began nesting at Mono Lake in the 1980s and the nesting population has grown to dozens of nests in the present day (Fields & Pagel 2016). Because they nest on tufa towers, osprey nesting habitat overlaps with recreation boating areas at Mono Lake, especially at South Tufa. For many years, Mono Lake Tufa State Reserve regulations have stipulated that boaters stay 400 m from osprey nests, and signage at the boat launch advertises these rules. Despite these management concerns, there are no data on the frequency or impact of osprey nest disturbance occurring at South Tufa.

Given the importance of the South Tufa area to both birds and recreating humans, we also collected data on the recreational use of the western South Tufa area by boaters, pedestrians, and drones. This western South Tufa area is frequently visited by boaters and is accessible by foot, but does not have a formal pedestrian trail and is not advertised to the public as a shore-based destination. Most pedestrians instead visit the official South Tufa interpretive trail on the eastern side of the tufa grove. Boaters usually launch boats at Navy Beach, located approximately 1 km by boat from the western part of South Tufa. Boaters often reach the western South Tufa grove and then turn around to return to Navy Beach (Fig. 1). We sought to provide baseline information on how often the western South Tufa area is visited by people, what types of recreation are occurring there, and the frequency and responses of wildlife disturbance from people there, to inform management decisions about wildlife disturbance.

Methods

We made observations from June 29th– September 4th, 2023, from Test Station Road, which overlooks the western shore of South Tufa (Fig. 1). The observations were conducted from 09:00–12:00 twice a week, once on a weekday and once on a weekend. Observations and data collection were carried out by ecologist Kiki Tarr. Additional help was provided by Mono Lake Committee project specialist Mara Krista-Plato.

We collected data on the type, frequency, and magnitude of human visitations. For each human visitation in the study area, we recorded the date, time of entry and exit, type of visitation (i.e., kayak, canoe, paddleboard, pedestrian, pedestrian with dog, drone), number of watercraft and humans in each group, and whether the visitation caused a disturbance to phalaropes or osprey. If a group of boaters were together, they were classified as a single “visitation event.” We considered boaters that entered the study area >2 minutes apart to be separate groups and separate visitation events. If a group entered the study area, left it, and returned, we considered that a new visitation event. We counted disturbances by the same visiting group as separate disturbance events if they were separated by >1 min.

If a disturbance was caused, the time, cause of the disturbance, number of birds flushed, distance from the disturbing object to the birds, and birds’ response to the disturbance were recorded. Phalarope and osprey response to disturbance was measured using the following codes: 1) birds vocalized, 2) birds returned to their pre-disturbance location, 3) birds landed in a different location within the study area, and 4) birds left the study area completely. We made hourly counts of phalaropes and osprey present in the study area. During the hourly counts, we recorded the location of each osprey within the study area using the State Park’s osprey nest map as a reference (Fig. 3). Errors are reported as ± 1 standard deviation.



Figure 1. Map of the study area at western South Tufa, Mono Lake. The observer was stationed on Test Station Road with a scope and binoculars.

Results and discussion

Phalaropes

We did not observe any phalaropes at western South Tufa during our 2023 observation period. This contrasted with our results from 2022, when phalaropes were present in relatively small numbers in the study area (average daily high counts were 128 ± 281 Wilson's phalaropes, and zero red-necked phalaropes). Few phalarope disturbances occurred in 2022, suggesting that the magnitude of this issue varies depending on how many phalaropes are present at South Tufa. Only five phalarope disturbances by humans were observed, with an average number of phalaropes disturbed of 127 ± 149 , and a maximum of 380 per disturbance event. All disturbances were of Wilson's phalaropes, all were by kayakers, and all occurred during July. The largest phalarope disturbances occurred on the day with the largest phalarope flock present (890 birds), suggesting that larger flock sizes make it harder for birds to avoid being approached by boats. See [Tarr & Carle 2022](#) for the full 2022 report.

Osprey use of South Tufa

The average weekday maximum of osprey observed was 6.6 ± 1.9 and the average weekend maximum was 6.6 ± 1.8 (Fig. 2). Most ospreys observed in the study area were adults attending nests or chicks in nests; accordingly, osprey numbers were consistent throughout the observation period, with 5-6 individuals observed each day. Using the State Park's map of osprey nests, we identified the nests that were most often attended by osprey, which were: ST07, ST13, ST04, ST12, and ST05 (Fig. 3).

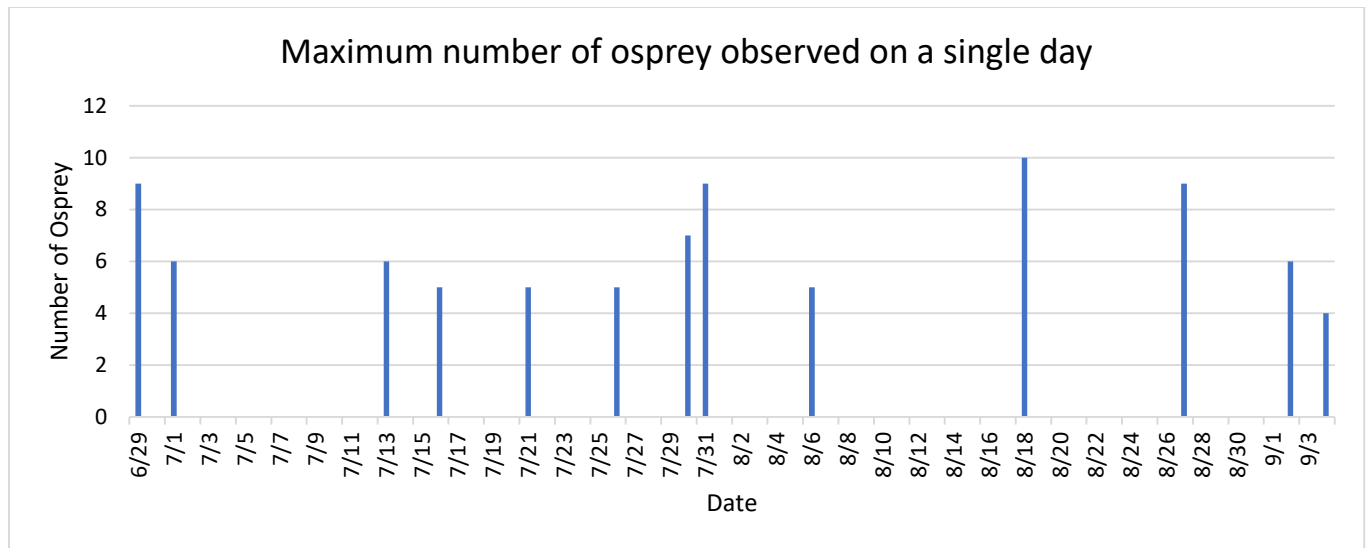


Fig. 2. The maximum daily number of osprey observed during the 2023 observation period. Dates with no bars were not monitored.



Fig. 3. Map of most frequently attended osprey nests at western South Tufa. Red points indicate nests that experienced the most disturbance during observations.

Types and frequencies of visitation events

There were 39 human visitation events observed during the 2023 study period. Human visitation types observed included: kayak, stand-up paddleboard (SUP), canoe, and pedestrian (Fig. 4).

Ninety percent of human visitations were made by watercraft, and only four pedestrian visits were observed. Kayaks were the most frequent watercraft observed (57% of watercraft visits). The average number of boats in each party was 3.2 ± 2.5 ($n = 33$ separate boating parties). Seventy-one percent of visitations occurred between 09:00 and 11:00. There were on average 2.9 ± 2.2 human visitation events on weekday days ($n = 7$ days) and 3.1 ± 2.4 human visitation events on weekend days ($n = 6$ days). Visitation during July 4th weekend and Labor Day weekends (average of 5 visitation events per day) did not differ greatly from visitation during non-holiday weekend (average of 4 visitation events per day). Overall visitation in 2023 was less than in 2022, when daily averages were 7.2 ± 3.7 boats visits to the study area on weekend days, and 5.4 ± 3.9 on weekdays.

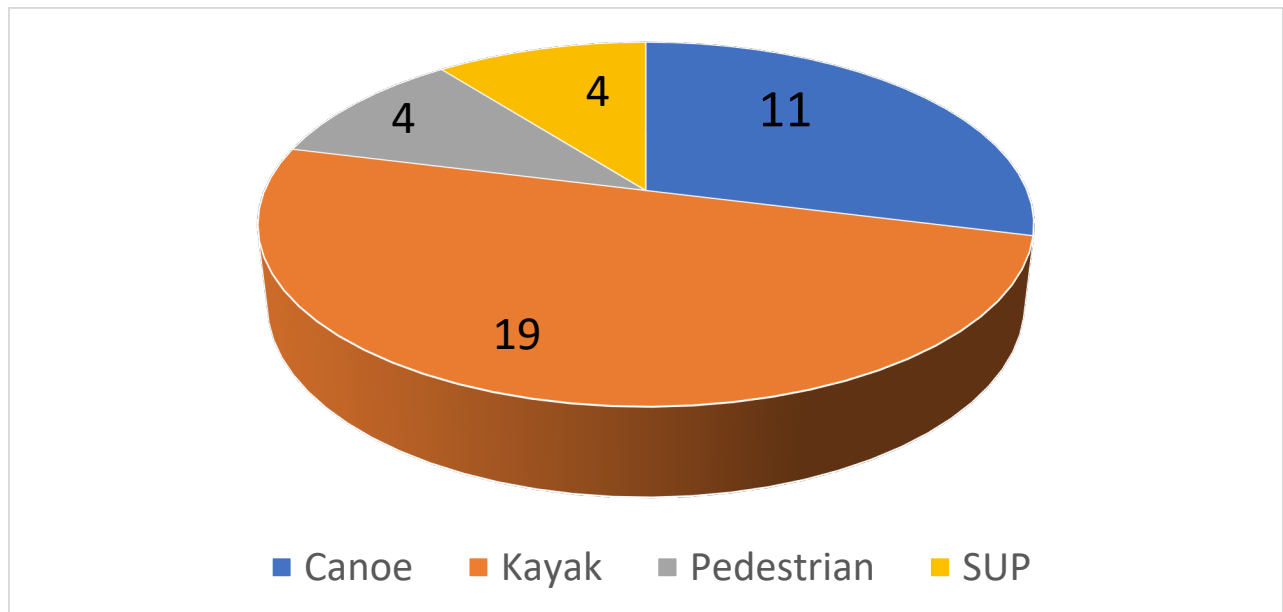


Fig. 4. Number of human visitation events by category at western South Tufa, June-September 2023. Total number of events of each type is shown as numbers within each category.

Osprey disturbances

There were 9 osprey disturbances observed during the 2023 study period. Disturbances occurred during four of the 13 days we made observations. 24% of human visitation events caused a disturbance, with 78% of disturbances caused by watercraft. Disturbances were caused by kayakers, canoers, stand-up paddleboarders (SUP), and pedestrians (Fig. 5). Pedestrian visitation events caused a disturbance 50% of the time, SUP 75%, kayak 15%, and canoe 10% (Fig. 5). All disturbances occurred between 09:00 and 11:00. All disturbances occurred to birds that were attending nests. Proportionally, SUP interactions caused a greater disturbance than other watercraft, and usually caused ospreys to fly away. Behavioral responses to disturbances were variable, with occasions in which ospreys left the area entirely, moved to another location within South Tufa, returned to the nest, vocalized at the nest, or a combination of these behaviors (Fig. 6). Pedestrian disturbance appeared to cause the strongest response from osprey, with the bird

leaving the study area entirely during each observed disturbance (Fig. 6). Seventy-eight percent of disturbances caused ospreys to vocalize. On average, ospreys that flushed did so when a boat approached within 9.2 ± 8.5 meters from the bird. The nests that were disturbed the most were ST15 and ST04, with three recorded disturbances to ST15 and two recorded disturbances to ST04 (Fig. 3). ST13, ST12, ST11, and ST10 were all disturbed once during the 2023 observation period.

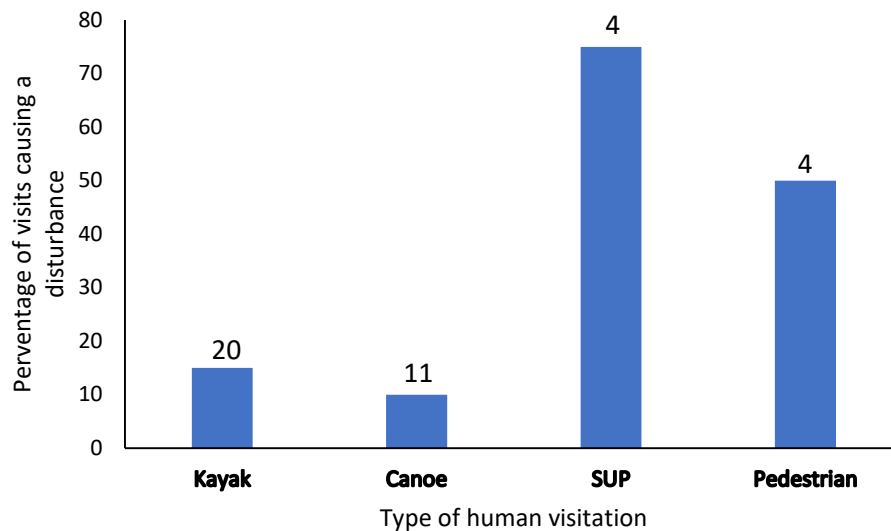


Fig. 5. The proportion of each human visitation type that caused a disturbance to osprey. The sample size (number of total disturbances of each type) is above each bar.

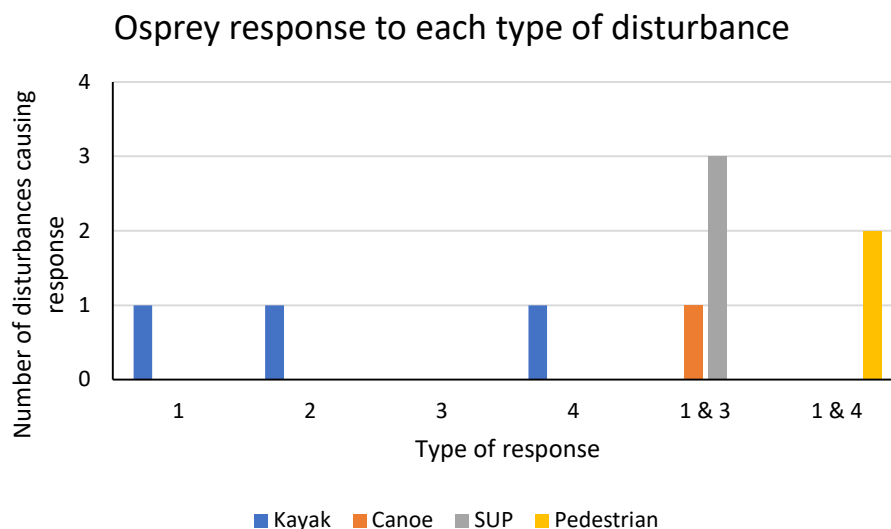


Figure 6. Osprey response to human disturbance. Reactions to disturbance were measured using the following codes: 1) birds vocalized, 2) birds returned to their pre-disturbance location, 3) birds landed in a different location within the study area, and 4) birds left the study area completely.

Discussion

Human disturbance to phalaropes and Osprey at western South Tufa was infrequent during our study in 2023. Results from 2022 were similar, with nine total human-caused disturbances all occurring during four of the ten days of observation. Boating was both the most frequent recreational activity at South Tufa and the one that disturbed ospreys most often. We did not observe a substantial difference between human recreational use of western South Tufa during weekdays and weekends.

Phalarope disturbances

Based on our results of seeing varying numbers of phalaropes from year to year at South Tufa, it appears that the amount of human disturbance to phalaropes depends greatly on annual habitat conditions and lake levels. During one day of opportunistic observations in July 2021, there were approximately 40,000 phalaropes present in the study area (Fig. 7; Carle et al. 2022), with groups of >100 birds flushed by boaters or walkers approximately every 10 minutes over a two-hour period (Tarr & Carle 2022). Additionally, the spectacle of huge numbers of phalaropes attracted many visitors in 2021, who specifically approached the phalaropes to observe them, creating a cycle of more disturbance. There was a maximum of 890 phalaropes present in our study area in 2022 and zero in 2023. The difference in phalarope use of the area from 2021 to 2022 was likely driven by a decline in the lake level of Mono Lake in 2022 that resulted in less shallowly submerged tufa and sandbar habitat at South Tufa. In 2023, the lake rose approximately five feet from 6,379' in September 2022 to 6,383.2' in September 2023 (MLC unpublished data), deeply submerging the previously shallow tufa and sandbars and again creating unfavorable habitat for phalaropes. The biggest flocks of Wilson's phalaropes observed at Mono Lake in 2023 were at Lee Vining Tufa, where kayaking recreation occurs but is not as popular as at South Tufa.

Possibilities for future phalarope disturbance studies at western South Tufa include monitoring the area more opportunistically when larger numbers of phalaropes are present. We did not see any phalaropes at western South Tufa from June to Labor Day in 2023 but flocks of several hundred red-necked phalaropes were reported in the area during mid-September. Extending the observation period to the end of September could capture the period when red-necked phalaropes more often visit the area.



Fig. 7. Thousands of Wilson's phalaropes roosting on the shore and in shallow nearshore waters at western South Tufa during July 2021. Photo by Andrew Youssef.

Osprey disturbances

Osprey disturbance was unexpectedly infrequent within the study area. The distance at which osprey were disturbed varied, with instances of boaters getting within 5–10 m of the nest and not causing a disturbance. Overall, based on visual observations of behavior, ospreys did not appear extremely sensitive to the approach of certain types of boats to their nests at South Tufa. However, SUP visits caused a higher rate of disturbance than other watercraft, with 75% of SUP visits resulting in disturbances. We speculate that this could be because other watercraft ride low on the water and do not appear like a person standing up, whereas people standing on SUP boards appear similar to pedestrians as they approach nests, perhaps appearing more threatening. However, our sample size is low (4 SUP visits in 2023) so the impacts of SUP need further evaluation.

Osprey generally breed from late May to early September at Mono Lake. They lay eggs in April to May and raise chicks from June through August (Bierregaard et al. 2020). The average age of chicks was 4.5 weeks on July 20th, 2023 (Ashli Lewis, California State Parks, personal communication). Nesting phenology may influence reactions to disturbance, given all the observed instances of disturbance happened in late July–early September when the chicks were more mature. We did not observe any chicks jump out of the nest into the water in response to human disturbance, though this has been documented before at South Tufa (Lisa Fields, California State Parks, personal communication). Previous studies show that ospreys nesting in areas with high human traffic will develop a tolerance to human presence and will not be as easily disturbed as osprey nesting in less human-dense areas (Swenson 1979). Given the overlap of the osprey nesting season with the summer tourist season at South Tufa, it was notable that we observed only 9 total osprey disturbances. This could be due to the osprey at South Tufa becoming accustomed to frequent human interactions, especially with kayaks and canoes that

visit most frequently. The stronger reactions of ospreys to SUP and pedestrians would seem to support the idea that birds find these visits more threatening than kayak and canoe visits.

In another osprey disturbance study, even the most invasive forms of disturbance, such as researchers entering the nest, did not impact reproductive success (Poole 1981). However, the impacts and severity of human disturbance can be situational, and we did not directly measure how disturbances impacted osprey nesting success at South Tufa. With data from State Parks nest monitoring, we were however able to connect specific nest outcomes with disturbance history for some nests. ST05, a nest at western South Tufa outside our study area, was fully exposed to the shore in 2023 because of low lake levels. The nest was occupied by a pair of osprey but failed to hatch chicks. That nest likely encountered high levels of human disturbance from pedestrians due to its accessibility on the main South Tufa trail. A fence that was built around the nest to prevent people from approaching but its construction may have been too late to prevent nest failure (Ashli Lewis, California State Parks, personal communication). The two nests in our study area that experienced the most disturbances, ST04 and ST15, had differing nest successes. ST04 had eggs but none of them successfully hatched, whereas ST15 successfully fledged 3 chicks. Previous nest sites that did not experience as much disturbance, such as ST13, ST12, ST11, and ST10, did not have active nests in 2023.

Anecdotally, locals have reported seeing osprey disturbances at South Tufa outside of this study during the summer of 2023. These accounts include visitors actively approaching osprey nests and flying drones near to osprey. In one instance, six osprey were disturbed by a single human visitation event, and those birds were observed flying in circles around the boat that disturbed them. This observation differed from our observations of disturbances, in that more birds were disturbed and their reaction was more extreme than in disturbances we observed. In disturbances we observed, the most common response to disturbance was osprey vocalizing then leaving the nest for a brief period before returning. Many of the anecdotal disturbances described to us occurred outside of the study area, at the main South Tufa area where there is more foot traffic. Changing lake level conditions make some nests vulnerable to pedestrian disturbance when the lake drops, and they are no longer islands and they become accessible from shore. We did not observe any drones or drone disturbances during 2022 or 2023 observations.

Our results indicate that frequency, type, and severity of phalarope and osprey disturbance is in part related to annual lake-level conditions that influence phalarope use of South Tufa and the possibilities for spatial overlap between people and osprey nests. Adaptive management could help mitigate disturbance during times when lake conditions result in greater levels of bird disturbance. These management solutions can be implemented when large numbers of phalaropes are present or during low lake levels where boating or pedestrian access may be inappropriate near specific osprey nests. Temporary, seasonal closures of the South Tufa overflow lot could help limit pedestrian disturbances during periods with large numbers of phalaropes present, and temporary seasonal closures specific nearshore lagoons to boaters could reduce disturbances to ospreys and phalaropes. Osprey nests that have been marooned on shore by dropping lake levels could be protected by fencing and/or signage to prevent people from disturbing the nest. Active outreach to boaters before they launch at Navy Beach is another management approach that can be helpful. Signage or outreach volunteers can provide information about disturbance and the importance of maintaining distance from osprey nests as

well as the importance of phalaropes' time at Mono Lake. The limited number of disturbances we observed over the past two years suggests that the current management of boating at South Tufa is working to allow both recreation and successful osprey nesting. Currently, management includes signage indicating regulations about keeping distance from ospreys, and occasional outreach on weekends by Mono Lake volunteers, and signage and enforcement of the ban on drones at Mono Lake. It is also beneficial to keep the trail at the South Tufa overflow parking lot unadvertised to the public to reduce the possibility of more pedestrian disturbance.

The scope of our study was relatively limited in space and effort but has highlighted several areas where further monitoring would be useful. For example, the disproportionately large impacts of pedestrians and SUP disturbance to nesting osprey warrants further investigation and evaluation of management strategies. To better evaluate the overall impacts of disturbance on osprey, a study pairing monitoring of osprey nest timing and success with human disturbance levels throughout the entire South Tufa area would be helpful. Inclusion in such a study of "control" nests experiencing little human disturbance in other parts of the lake would be valuable. Overall, it appears that the recreational impacts on phalaropes and ospreys at western South Tufa are infrequent, that some ospreys have become habituated to kayaks and canoes, and that dynamic lake levels play an important role in levels of human disturbance to both phalaropes and ospreys.

Permits:

This study was conducted in the Mono Basin National Forest Scenic Area with permission from the U.S. Forest Service.

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