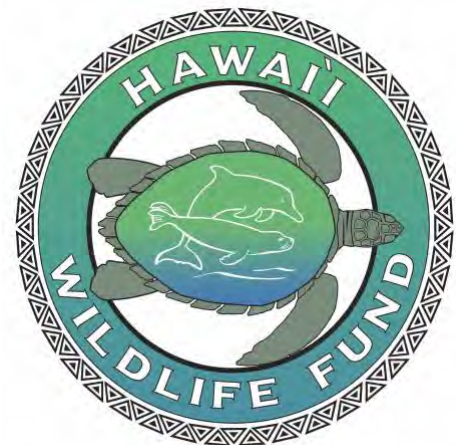




Annual Activities Report for 2019

Native Endangered and Threatened Species Recovery
Surveys, Monitoring, and Research on the Hawksbill Sea Turtle (*Eretmochelys imbricata*), Green
Sea Turtle (*Chelonia mydas*), and Olive Ridley Sea Turtle (*Lepidochelys olivacea*)

Federal Fish and Wildlife Permit **TE829250-9**
Hawai'i Department of Land & Natural Resources Permit **SAP 2018(56)/2019(68)**



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Introduction

The Hawaiian Islands contain one of the smallest and most isolated populations of hawksbill sea turtles (*Eretmochelys imbricata*) in the world. Little was known of this critically endangered population before the nesting conservation program began on Hawai'i Island in 1989. Although most hawksbill nesting in the archipelago occurs there, a nesting hawksbill was first documented at Kealia Beach on Maui in 1991. Two nesting hawksbills were killed on the nearby highway in following years, leading to the involvement of Hawai'i Wildlife Fund (HWF) in the Hawksbill Recovery Project in 1996, in collaboration with the National Marine Fisheries Service (NMFS) and Hawai'i Department of Land and Natural Resources Division of Aquatic Resources (DLNR/DAR) with the U. S. Fish and Wildlife Service (USFWS). This project aligns with the NMFS/USFWS Hawksbill Recovery Plan of 1998 to continue efforts to monitor, research, and protect hawksbill sea turtles in their nesting and marine habitats, involve and educate the community about the threats and status of sea turtles, and collect and share data for informed management decisions. While HWF monitoring activities originally focused on hawksbills, they can also include occasional green sea turtle (*Chelonia mydas*) nests on the North Shore of Maui and the possibility of olive ridley (*Lepidochelys olivacea*) nesting.

Since HWF began monitoring in 1996, 11 nesting hawksbills have been tagged on Maui and 104 nests have been protected, resulting in approximately 10,000 hatchlings successfully reaching the ocean. Although only a few hawksbills may nest on Maui each year, this contribution is still critical for the isolated Hawaiian population of hawksbills, with an average of 15–25 known nesting females per year in the state. HWF has also collaborated with NMFS in satellite tracking nesting females to their foraging grounds around Hawai'i Island, Maui, O'ahu, Moloka'i, Kaua'i, and off Johnston Atoll. In addition to satellite tracking, in-water surveys and photo-identification have contributed to the database of over 200 hawksbills across the state (<http://www.hihawksbills.org>), identifying movement patterns and important foraging grounds. HWF involves and educates thousands of individuals around Maui each year, from local residents to international tourists, removing threats to sea turtles and preventing harmful human behavior, while building public understanding and hawksbill and environmental conservation. HWF has built invaluable connections with agencies and communities, refined research protocols, collected data and knowledge of individual turtles and their locations, and proved the value of their experience and the work of the Hawksbill Recovery Project for years to come. Green sea turtle nests are much less frequently laid on Maui, and were monitored by HWF under the direction of DLNR/DAR in 2007, 2012, 2014 and 2019, and officially added under the terms of this permit in 2016.

Methods

Nest Monitoring: HWF monitors most sea turtle nesting activity that occurs on Maui, including possible hawksbill, green (on Maui's North Shore only), and olive ridley sea turtle nests. Green turtles that nest in west Maui are monitored by DLNR/DAR and hawksbills nesting in east Maui are not actively monitored, although HWF responds to opportunistic reports from this area. Olive ridleys do not typically nest on Maui, but may be monitored by HWF under the terms of this permit. Although USFWS had coordinated dawn patrol volunteers in the past, HWF assumed this role in 2018 since USFWS reprioritized funding and

personnel for this aspect of the partnership. When tracks or signs of nesting are found by volunteers or reported by the public in any location, HWF staff confirms and protects the nest in consultation with our agency contacts and under the terms of our research permits. This can include taping off the nest in areas with human traffic, screening nests in areas of possible predation, spreading pepper powder to deter predators, or relocating nests that are in danger of being inundated by high tide.

After the first nest of the season is confirmed, HWF staff and volunteers monitor the beach at nesting intervals when the female may return. This allows the team to directly observe nesting activity, tag, measure, and identify females, and mitigate disturbance or endangerment of nesting females by monitoring human activity on the beach at night. Nests are checked regularly during incubation for disturbance or erosion and monitored around the clock as the expected emergence date approaches. This creates opportunities to educate the public around the nests while preventing threats to the hatchlings including predation by invasive species, entanglement in vegetation and marine debris, disorientation, and desiccation. Following the main emergence, nest excavation is planned and carried out with Hawai'i DLNR/DAR biologist Skippy Hau, with notification of USFWS representatives Suzanne Conlon (in absence of Courtney Brown who was on leave in summer 2019), Eldridge Naboa and Michelle Bogardus. All nesting and hatching activities are monitored and documented according to established protocols and in active consultation with DNLR and USFWS. Throughout the season, all participating volunteers are trained for possible scenarios and proper behavior at the nest and provided with brochures and information to distribute to the public.

Personnel and Agency Coordination: HWF staff involved this season included authorized individual Hannah Bernard with Diana Sciambi involved in coordinating dawn patrol. HWF consulted and partnered with Skippy Hau and Eldridge Naboa, while also notifying Suzanne Conlon of nesting, hatching, and excavating activity. Nesting female handling and observation, which only included measurements, was carried out by Hannah Bernard, after nesting or as the female returned to the water, using red light only when necessary. Hatchlings were observed and protected during their emergence and crawl, and while they can be transported to the high tide line if necessary, none became stranded during emergence and were only transported to the high tide line using gloves or buckets during excavations. Excavations were carried out in collaboration with Skippy Hau, who collected and sent samples of dead hatchlings, empty shells, and unhatched eggs to NOAA/NMFS/PISC in Honolulu. Live hatchlings found during excavations were allowed to acclimate in a bucket after rescue then released at the high tide line. All data including carapace measurements, nest locations, hatchling numbers, times of activity, and behavior notes were collected in the field notebook, then checked, stored, and shared with the team via email and Google Drive. HWF staff notified and consulted with DNLR and USFWS representatives regarding nesting and monitoring activities via email, text, and phone calls as needed. Human interaction with sea turtles was minimized as effectively as possible throughout the season.

The County of Maui's Parks and Recreation Department was added into the network of agencies that HWF coordinated with this season, since the only nesting beach identified was inside Ho'okipa Beach Park.

Volunteer Involvement: HWF staff held volunteer training and orientation events before dawn patrol began, with protocol refreshers at the nest later in the season. HWF staff were present with volunteers every night of camping when activity was expected. Volunteers

were trained and managed by staff to stay dark and quiet on the beach and maintain appropriate distance from nesting females and hatchlings during any activity. Volunteers were also prepared for emergencies during the day watches, and in ready contact with HWF staff if this occurred. All volunteers received protocols for nesting patrols and nest watch and had access to additional sea turtle information to share with the public. Volunteers and members of the public present at excavations and emergencies received explanations of sea turtle life histories and our responsibilities and practices. They were also instructed in the context of our work, to maintain space from the hatchlings especially as they reached the water, to turn off any lights and flash photography, and to not post the locations of nests to social media.

Additional Activity: Beyond monitoring of nesting and hatching activity, the nesting project includes continuous protection of nesting habitat, once nesting begins, including beach cleanups, fence repair, and dune restoration as necessary (Fig. 1). During the offseason, HWF checks beach habitats, trains volunteers, and prepares the necessary permits and gear for each nesting season.

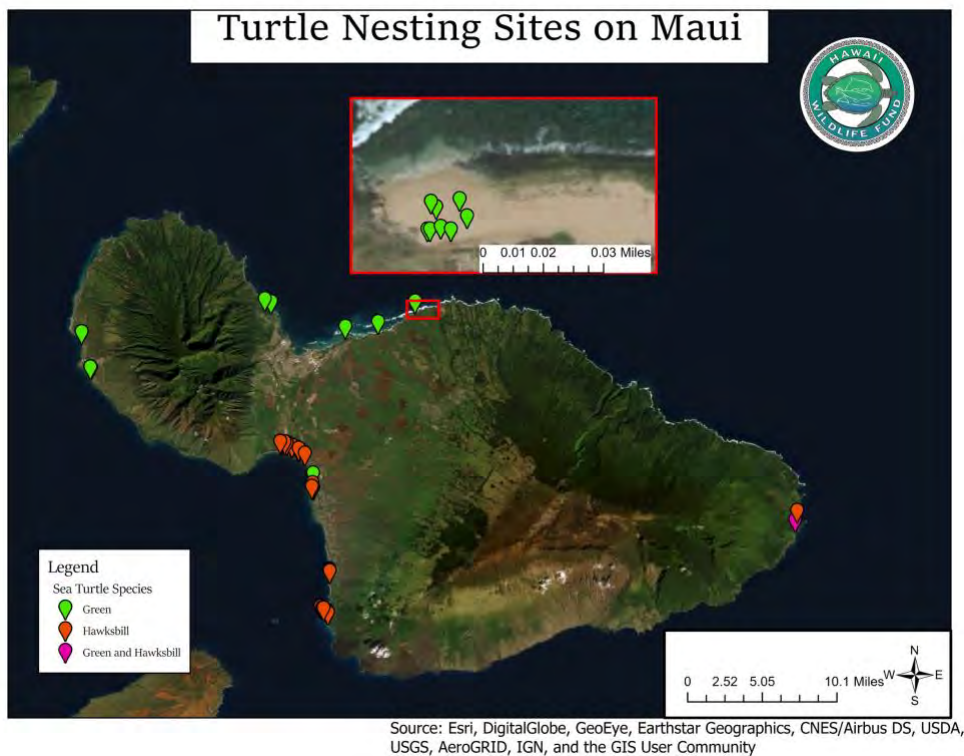


Figure 1. Nesting sites of green turtles (green symbols) and hawksbill sea turtles (red symbols) and area of overlap (pink symbols) on Maui 1996 – 2019. Inset focuses on Ho'okipa Beach Park nesting in 2014 and 2019. Map by Rebecca King.

Results

Nesting: No nesting hawksbill sea turtles or olive ridley sea turtles were reported or observed by HWF in 2019. HWF conducted outreach and training in collaboration with USFWS, and initiated the season with a list of >566 volunteers. More than 100 Dawn Patrol volunteers patrolled the six known hawksbill nesting beaches of south Maui throughout the season, but no

evidence of hawksbill nesting was detected on these beaches, nor reported from other beaches of Maui in 2019. Ho'okipa Beach, on Maui's North Shore, the one **known** turtle nesting beach in 2019, was patrolled after a green turtle nest was found by a surfer and lifeguards on the morning of June 1 (Fig. 2). HWF staff responded to all subsequent crawls, nesting, and hatchling reports. Over 125 volunteers participated in dawn patrol (including north and south Maui), completing 959 daily patrols. Five green turtle nests were confirmed on Ho'okipa Beach from one untagged female (Figure 1, Table 1). Tracks from nest 1 were reported by the lifeguards to HWF on the morning of June 1. After HWF marked the nest and began watching over the site, a surfer identified himself to us and reported that he had seen this green turtle as she was burying her nest the morning of June 1 at approximately 05:45am.



Figure 2. All turtle nesting activity in 2019 conducted by unidentified green turtle at Ho'okipa Beach Park. Five nests were laid but only four were located and nest remains examined.

Table 1. Nesting data for 2019, all nests laid by Unidentified Green Turtle on Ho'okipa Beach.

Date	Nest	GPS points	Observed activity	Time	Returned to water
6.1.19	Nest 1	20.93320 , -156.35933	Burying	05:45	06:00
6.15.19	Nest 2	Not recovered/observed Nest located between nests 3 and 5	N/a	N/a	N/a
6.30.19	Nest 3	20.93320, -156.35933	N/a	N/a	N/a
7.12.19	Nest 4	20.93320, -156.35942	N/a	N/a	N/a
7.27.19	Nest 5	20.93320, -156.35941	Laying Burying	22:20 22:40	23:40

Table 2. Measurements of Green Turtle after fifth nest on Ho'okipa Beach 7.26.2019.

Measurement	cm
SCL	94.0
SCW	67.0

Hatching: All five nests were marked and taped off within the first day of nesting to protect them from trampling (as they were laid very close to a surfer access trail, Fig. 3), but no nest screening or pepper powder application were deemed necessary in consultation with Skippy Hau (HWF would not apply these to green turtle nests per the terms of our permit, but would assist if S. Hau requested).



Figure 3. All five turtle nests were laid in close proximity, with nest 4 laid nearly on top of the assumed location of nest 2. Numbers indicate nest position.

No mongoose have been sighted in this park, nor is there a history of nest depredation from the last known nesting event in 2014. All nests in 2019 were monitored

throughout the day (from ~05:30am until at least 21:00hrs) as the expected emergence date approached, with approximately 2 – 7 volunteers camping in close proximity to the nests during the evening, until prevented by the County of Maui from accessing Ho'okipa Beach Park. HWF was unable to observe the female turtle nesting during 3 out of 5 nesting events due to Maui County Dept. of Parks and Recreation's restrictions on camping at county beach parks. The first nest was observed as the female was burying it by a surfer, and HWF staff observed the fifth nest and obtained measurements of the female after she finished laying her nest. Although we were able to obtain a "camping" permit after the first nest was discovered, it was rescinded due to the County's professed inability to manage beach camping (Appendix I.). Thus, we were unable to observe several of the nest emergences, and most nesting events, since they occurred within the hour of the park's closing and our expulsion.

The first emergence of nest 1 was observed by the same surfer who observed the female burying this nest, as he had joined dawn patrol as a volunteer. All hatchlings from nest 1 made it into the water before the excavation (53/53).

No hatchlings were observed emerging from Nest 2, but a surfer reported observing "hundreds of tracks" on the morning of August 20th. A photo was obtained from the surfer (Fig. 4) and it did appear that a mass emergence had occurred. This mass emergence likely occurred between 6:30 – 8:00am on the morning of August 20th, during the time when there was a gap in nest watch.



Figure 4. Apparent tracks from mass eruption of nest 2, August 20 2019, photo taken by a surfer.

There was a gap in nest watch at this nest, with volunteers leaving at 06:30am and the next watch not arriving until close to 08:00am that morning. The volunteers did not notice any tracks, nor did the lifeguards, who checked the nests every day when they arrived

at 08:00am as well; however, it was an exceptionally windy morning, and tracks may have been obscured after main emergence. No hatchlings were observed emerging from this nest, and the nest was never located. HWF staff and Skippy Hau agreed not to try and search for this nest by digging it up after 70 days of incubation since three other nests were laid on either side of it (nests 3, 4 and 5), and searching for the nest remains would have resulted in disruption of these nests (Fig 3.).

Nest 2 remains were searched for after excavation of nests 4 and 5, but no remains were ever found. Nest 3 is presumed to have erupted between 22:00 and 05:30am, but exact time of emergence is unknown. For that nest and nests, 4 and 5, HWF staff were not allowed to spend the night in the park, but did observe nests 4 and 5 erupting since the main emergences occurred within 15 – 30 minutes of the park closing.

34 volunteers spent over 396 hours monitoring the nests and patrolling at Ho'okipa, and more than 100 volunteers spent over 3000 hours patrolling beaches in south Maui. Ho'okipa nests were *not* disturbed by predators, but an occasional off-leash dog was observed walking over nest sites. Ghost crabs were the only predator for hatchlings as they made their way to the water and required some minor intervention and protection for hatchlings. There is no vegetation in this zone of Ho'okipa Beach and we therefore did not need to expend any time clearing native or introduced vegetation from the nests. In addition, even though this beach is impacted by very large surf in the winter, there is little impact from high surf in the summer and no storm events or swells that caused high surf to threaten nests.

As hatchlings emerged, holes and crab burrows were filled in and any people and obstructions on the beach were moved to create an open path from the nest to the water. Staff and volunteers also prevented human disturbance at the nest by educating fishermen and recreational beach users about threats to sea turtles, especially the impacts of noise and light at night. Hatchlings were only assisted when necessary in the event of disorientation, entanglement, or other imminent threats to their survival. Emergences at night or during early morning did not require much intervention, only following and watching to ensure the hatchlings crawled safely to the water.

Excavations: All excavations were completed with HWF staff and Skippy Hau between 07:00 and 09:30 in the morning in order to minimize the heat and crowds on the beach during the excavation and release. With the exception of nest 2, all nests were excavated 2–4 days after first emergence and at least 24 hours after the main emergence, with discussion on a case-by-case basis according to the nest conditions, pace of nest activity, and number of hatchlings emerged or expected in the nest. This allowed the majority of hatchlings to emerge naturally on their own and rescued those that couldn't make it out in order to increase the success of each nest due to their threatened status. Hatchling emergences, excavation results, and overall success (defined as live hatchlings in the ocean/total eggs) were some of the highest rates of success ever recorded for Maui nesting turtles: \bar{x} = 96% (Tables 4, 5). Nest 1 was the most successful and all hatchlings made it into the water before the excavation (53/53) with a total success of 100% (Table 5).

Nests 3, 4 and 5 contained small numbers of unhatched eggs (6 total) and a few dead hatchlings, but only 5 dead hatchlings overall. Very few of these dead hatchlings looked viable or had come close to emergence, as excavations were conducted before hatchlings would be likely to die of desiccation or dehydration in the nest. No hatchlings were pipped and live but not fully emerged or with fully absorbed yolk sacs. Five live hatchlings were

discovered during excavation (Nest 3 = 3 hatchlings; Nest 5 = 5 hatchlings). None of the nests contained trapped hatchlings due to vegetation, as often happens in other nest sites with plant growth on the borders of the nests.

Overall, nest location (far above high tide), lack of vegetation, and substrate (deep sand: depth of nest \bar{x} = 77cm), seemed to have a large effect on high hatchling success, while nest protection, monitoring, and excavation contributed to the survival of hatchlings that might not have made it into the ocean. No sea turtles were harmed or killed by activities conducted under this permit.

Table 4. Emergence data for 2019, all nests from Green Turtle on Ho'okipa Beach.

Date laid	Date of first Activity	Time of Depression	Time of First Emergence	# in First Emergence	Other emergences
Nest 1 6.1.19	8.2.19	6:00	6:10	53	0
Nest 2 6.15.19	8.20.19	N/a Not observed	N/a	N/a	N/a
Nest 3 6.30.19	8.27.19	22:30	Tracks observed at 05:30	59	N/a
Nest 4 7.11.19	9.12.19	08:33	21:20	63	0
Nest 5 7.27.19	9.25.19	12:34	21:15	80	19:13 – 2 hatchling heads at surface

Table 5. Excavation data and final hatchling success for 2019.

Excavation	total eggs	empty shells	undeveloped	dead in nest	live in nest	hatchlings to water	success %
Nest 1 8.4.19 7:07	53	53	0	0	0	53	1.000000000
Nest 3 8.29.19 9:17	63	59	3	1	3	59	0.93650794
Nest 4 9.27.19 8:16	68	63	2	3	0	63	0.92647059
Nest 5 9.27.19 7:28	82	81	1	1	5	80	0.97560976
TOTALS	266	256	6	5	8	264	0.98876404

Photo Documentation of Permitted Activities



Figure 5. Nest 1 in center of staked area on Ho'okipa Beach, June 1 2019 (blue triangle). Blue arrow points to surfer access trail behind nest that was re-routed to protect nest.



Figure 6. Preparing to excavate Nest 1, with data collectors on left and public viewers on right. Emergence site visible in center of photo. August 4 2019 Photo by Skippy Hau



Figure 7 . Excavation, measurements of nest depth and sorting of samples at Nest 5, September 27 2019, with Skippy Hau, Hannah Bernard, and HWF volunteers.



Figure 8. Hatchling release with HWF team member Magdalena Carey and onlookers after excavation of Nest 3, August 30 2019.



Figure 9. Green turtle nest remains collected during excavation of Nest 5. Photo by J. Rodarte.



Figure 10. Five live hatchlings were discovered during excavation of Nest 5, September 27 2019. Photo by J. Rodarte.

Conclusion

The primary reason HWF initiated this research project was to help in recovery efforts for the endangered hawksbill sea turtles of Hawai'i, but over the years have also assisted in monitoring of green turtle nests on Maui's North Shore.

Green turtle nests on the North Shore are very infrequent, with 3 nesting seasons observed since 1996 and 6 nesting beaches identified: Ho'okipa, Baldwin, Waihe'e, Ka'ehu, Spreckelsville, and Kanaha beach (Fig. 1.). Green turtle nesting activity is highly variable on the North Shore, ranging from 0–3 females and 0–5 nests per year. During the nesting season of 2019, no hawksbill sea turtle nests were discovered, but 5 green turtle nests from one female were observed and monitored at Ho'okipa Beach Park.

Hawksbill nesting numbers on Maui have remained low since monitoring began in 1996. Each year is extremely variable, ranging from 0–4 females and 0–12 nests per year. Nesting activity has been observed on six different nesting beaches on the south coast of Maui, including the first recorded identification of nests on Palau'ea Beach in 2015. The summer of 2019 marked the fourth nesting season in 23 years that no hawksbill turtles nested since HWF began this long-term hawksbill recovery project (2003, 2007 and 2013 were the previous years with no nesting hawksbills). While nesting numbers remain low each year, averaging just over one female and five nests per year, some of the 11 tagged females have remigrated and two new females were observed and tagged during the summers of 2017 and 2018. Although nesting numbers for both green and hawksbill turtles are low on Maui, this legacy project has protected more than 10,200 hatchlings as they made their way from the nest into the water over the past 23 years.

The south Maui nesting beaches are spread along nearly 15 miles of coastline, with each nest posing unique challenges to volunteers and threats to nesting females and hatchlings. At the northern end, Kealia Beach has had the lowest average success, with some females and years yielding 0% success and no live hatchlings from nests there. This beach has severe erosion, runoff, and pollution, as well as heavy human and vehicle traffic. Kealia was also the site where two females were killed on the adjacent highway in the 90s, before monitoring began and the turtle fence was built. At the southern end of this 15-mile stretch is Oneloa Beach, also known as Big Beach at Makena State Park, one of the best-maintained and protected nesting habitats on the island. The beach is wide, largely undeveloped, and closed to the public at night. However, Oneloa nesting success is still threatened with invasive predators and vegetation, human use and beach modification, lights and debris, and natural processes like erosion and storms. HWF holds membership in the Oneloa Coalition, a group of nearby property owners, state DLNR and Park managers and conservation groups, working to assist in the management plan for this State Beach Park. We continue to advise the Coalition on the actions that may impact this important nesting beach and work to mitigate these actions.

Each beach on Maui experiences some level of human impacts in addition to the natural challenges that nesting hawksbill females and hatchlings must overcome. While south Maui beaches are challenged with erosion, sea level rise exacerbated by king tides and seasonal south swells generated by storms, the nesting site in Ho'okipa Beach Park is still robust, with nests laid at least 100m from the surf and tidal effects. The highest nesting success (100%) for a Maui beach was recorded at this site in 2019, with a mean success of $\bar{x} = 96\%$ for all four (examined) nests.

The main physical challenge at this nest site was its location in the pathway of a surfers access trail to one of Maui's most famous surfing beaches (Figs. 3 and 5). The markers and tape that HWF and Skippy Hau posted around the nests did re-direct the foot traffic; however, and we do not believe there was any significant impact from beach access issues. Another challenge with conducting research and monitoring at this beach was the inability of the County of Maui to manage a camping permit for HWF, and staff were expelled from the park each night by ~21:30hrs. This prevented HWF staff from being present throughout the night per the terms of our permits in order to conduct research and conservation measures. Skippy Hau and Eldridge Naboa both attempted to assist in working this issue out with the county, and hosted a meeting between HWF, Maui County representative Makale'a Ane and themselves to conceive ways to work with the county for next nesting season (Appendix I.).

HWF has been able to manage this program for 23 years through the committed staff, countless volunteers, and supportive partners that make it happen. This season over 200 volunteers participated in dawn patrol and nest watch for over 3000 hours, enabling the close observation and protection of all five green turtle nests. Along with the collaboration with Skippy Hau and the DLNR, the support of Eldridge Naboa, Michelle Bogardus and the USFWS team, and our local partners and donors, the Hawksbill Recovery Project continues to make a difference and contribution in the survival of this species on Maui.

We advise to continue the ongoing communication and collaboration between Hawai'i Wildlife Fund, Hawai'i Department of Land and Natural Resources Division of Aquatic Resources, U.S. Fish and Wildlife Service, and our community of volunteers but we must add the County of Maui into the conversation about county beach park usage after hours. HWF has requested that DLNR and USFWS assist us in obtaining permission to camp at Ho'okipa Beach Park, and other county beach parks in future years, should nesting occur in them. We will continue to share our data and plans, collaborating with our partners and communicating as nesting events occur through text and email. These ongoing conversations will allow HWF staff and volunteers to be readily prepared for each threat and contingency that may be encountered during the nesting season.

When necessary, each nest should be marked, peppered, and screened against predation as needed soon as possible due to the extensive presence of mongoose and other mammalian predators along the coast. Screens are removed when round-the-clock watch begins before the expected emergence date. Since these are low density nesting populations in a highly developed area, other threats may continue to arise as beaches change through natural processes and human use and development. Specific nests and areas may require short-term or long-term solutions, including monitoring foot or vehicle traffic, erecting barriers between nests and roads or potentially hazardous areas, and dimming or covering lights close to nests on a case- by-case basis. For example, the dunes and fence along Kealia Beach require regular attention and annual repairs before nesting season begins and increased monitoring during the season, especially if a female is nesting on Kealia.

HWF will also continue its sea turtle education programming through social media, special events, Ho'okipa Honu Watch, distributing information, and answering questions during excavations and nest watches. This allows us to address potential anthropogenic threats, build the understanding of sea turtles and awareness of their recovery program in the community, and sign up new volunteers. HWF continues to recruit interns and volunteers and pursue additional funding sources for next season in order to prepare, monitor, and preserve habitat and hatchlings for the critically endangered hawksbill and green sea turtle populations. With community awareness, new and remigrating females, and increased hatching success, the hawksbill population is at least holding ground on Maui. Hawksbills' high age at maturity and low survival rate necessitate continual research and protection for their gradual recovery. These continued efforts will hopefully protect these females and their nests for years to come and see an increase in successful hatchlings and newly mature females coming to nest.

Hawai'i Wildlife Fund and all the Hawksbill Recovery Project Partners around Hawai'i must continue their work for the survival of the species; and in HWF's case, the protection of other sea turtle species as well.