Notes

Monitoring Western Snowy Plover Nests with Remote Surveillance Systems in San Francisco Bay, California

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Abstract

The western snowy plover *Charadrius nivosus nivosus* is listed as threatened under the U.S. Endangered Species Act of 1973 due to long-term population declines related, in part, to nest predation and human disturbance. In San Francisco Bay, California, numbers of predators of western snowy plovers and the potential for recreation-based human disturbances have increased during the past few decades and will likely increase for the foreseeable future. In an attempt to increase the reproductive success of western snowy plovers, managers have dedicated considerable resources to management practices including predator removal and habitat enhancement projects in San Francisco Bay. The unequivocal identification of western snowy plover nest predators and information regarding the behavioral responses of nesting plovers to human disturbance would inform management practices for this species. Therefore, we examined the efficacy of using a digital video surveillance system to identify nest predators of western snowy plovers in former salt evaporation ponds in San Francisco Bay and to assess its potential for use in behavioral studies. This system was designed to minimize disturbance to nesting plovers and limit predator bias at breeding sites that had little or no cover to camouflage or protect the equipment. The system included a small camera with infrared lights placed approximately 20 m from nests and a continuously operating recording unit and power supply that was positioned up to 300 m from nests. The system could be deployed within 20 min, run continuously for up to 5 d, and data could be retrieved without disturbing nesting birds. During a 2-y study period, we recorded six species depredating plover eggs and chicks: red-tailed hawk *Buteo jamaicensis*, common raven *Corvus corax*, California gull *Larus californicus*, northern harrier *Circus cyaneus*, ruddy turnstone *Arenaria interpres*, and gray fox *Urocyon cinereoargenteus*. Our results suggest that this surveillance system was effective for identifying western snowy plover nest predators, and the presence of the camera did not influence nesting success of monitored nests. This system could be integrated into conservation programs intended to improve reproductive success of this species and could be useful for conducting behavioral studies of western snowy plovers and other species.

Keywords: camera; *Charadrius nivosus nivosus*; nest predators; remote monitoring; San Francisco Bay; video surveillance; western snowy plover

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Introduction

In 1993, the U.S. Fish and Wildlife Service (Service) listed the coastal population of the western snowy plover *Charadrius nivosus nivosus* as threatened under the U.S. Endangered Species Act (ESA 1973, as amended; Service 1993), due to long-term population declines (Page and Stenzel 1981; Page et al. 1991). The Service subsequently identified factors that potentially limit population levels of western snowy plovers, including predation of eggs and chicks by gulls *Larus* spp. and other species (Service 1993, 2007). In San Francisco Bay, California, the California gull *Larus californicus* population is 230 times that of only three decades ago; it has increased from less than 200 breeding birds in 1982 to over 46,000 in 2010 (Strong et al. 2004; Tokatlian et al. 2010). This increase is probably human caused, based on the habit of gulls to eat food and garbage left by people and the lack of such increases in areas with small human populations such as Mono Lake (Wrege et al. 2006). California gulls are an important nest predator of western snowy plovers in Mono Lake (Page et al. 1983); however, there has been no quantification of western snowy plover nest predator types in San Francisco Bay, and it is unknown if California gulls are significant nest predators in this region. The unequivocal identification of western snowy plover nest predators would allow managers to focus limited resources on appropriate predator control efforts and could inform targeted abatement practices for predatory species at landfills and other foraging locations. In addition to nest predators, the Service also identified human disturbance as a potential limiting factor in western snowy plover populations (Service 1993, 2007). In San Francisco Bay, recreational access adjacent to wetland habitats, including western snowy plover nesting sites, is increasing because of trail development related to ongoing wetland restoration projects (Service and California Department of Fish and Game [CDFG] 2007) and the expansion of the San Francisco Bay Trail Project. Understanding western snowy plover behavioral responses to human disturbance and the subsequent effects on reproductive success would inform the management of nesting sites and planning of trail development projects.

Camera systems have proven to be the most reliable source for identification of nest predators (MacDonald and Bolton 2008) and they have recently been used to record nesting behaviors of avian species in response to recreational trail use (Davis et al. 2010; Smith-Castro et al. 2010). However, there has been concern that the presence of a camera near a nest may attract certain predators because they may investigate novel objects in their environment (Buler and Hamilton 2000; Pietz and Granfors 2000), could learn to associate cameras with food (Farnsworth and Simons 2000), and may subsequently increase search activity in areas where they find food (Sugden and Beyersbergen 1986). Conversely, there is growing evidence that the presence of uncamouflaged or otherwise conspicuous cameras can reduce predation rates (Thompson et al. 1999; Pietz and Granfors 2000; Herranz et al. 2002; Richardson et al. 2009), partly because certain predators can be neophobic, especially when objects do not resemble natural food (Heinrich et al. 1995). Also, the placement of cameras near nests can cause nest abandonment (Renfrew and Ribic 2003; Staller et al. 2005), which would be problematic, especially when monitoring threatened or endangered species. Abandonment is a concern when monitoring western snowy plover nests in San Francisco Bay because they nest on dry former salt evaporation ponds (hereafter ponds) with little or no cover to conceal cameras or prevent plovers from flushing when observers enter the ponds to access the cameras. Plover nest abandonment could be particularly problematic in these ponds if using a camera system that requires a camera be positioned within a few meters of the nest and requires frequent visits to change batteries and/or VHS tapes (see Liebezeit and George 2003; Stake et al. 2004; Sabine et al. 2005). However, recently developed systems with high magnification cameras, digital recording devices, and relatively low energy requirements (see Pierce and Pobprasert 2007) may allow for the monitoring of western snowy plover nests while reducing the potential for predator bias and nest abandonment.

We examined the efficacy of using a digital video surveillance system (hereafter system) to identify nest predators of western snowy plovers in San Francisco Bay and to assess its potential for use in subsequent behavioral studies. The system was originally designed to continuously monitor passerine nests in wet forests (Pierce and Pobprasert 2007), and a modified version has been used to monitor plover nests in coastal beach habitats (Colwell et al. 2009). Our system required further modification to function properly in San Francisco Bay pond habitats. Our requirements for the system included a fast setup time (i.e., $<$20 min), a camera that could be deployed approximately 15–20 m from a nest, and a recording unit and power supply that could be positioned adjacent to access roads, such that disturbance to nesting plovers was minimized during setup and data could be retrieved without entering breeding habitat on subsequent visits.

Methods

Study area

We monitored western snowy plover nests at Eden Landing Ecological Reserve (Eden Landing) in San Francisco Bay, California. Eden Landing is a former commercial salt evaporation pond complex located on the east side of South San Francisco Bay that is owned and managed by the CDFG. Eden Landing is comprised of approximately 5,500 acres of former salt ponds, tidal marsh, and tidal channel habitats that are largely closed to public access. Most of the ponds have water control structures that allow the CDFG managers to adjust water levels for specific management purposes including maintenance of dry plover nesting habitat. For the time period that the cameras were deployed (March through August in 2009 and 2010), temperatures at Eden Landing ranged from an average monthly minimum air temperature of 5.4°C to an average monthly maximum air temperature of 23.2°C. During the same time period, average monthly relative humidity ranged from 44% to 89% (CIMIS 2011).

System components

We used two 12-V sealed, absorbed glass mat, deep-cycle batteries (MK 8A27, 92 AH/20 h) to power the systems because they are suitable for adverse field conditions. Absorbent glass mat batteries are easy to store because of a low self-discharge rate and are less likely to sulfate, degrade, or leak hydrogen gas than traditional wet cell batteries. Batteries were approximately 30 by 18 by 25 cm and weighed about 29 kg.

For recording video, we used portable digital video recorders (DVRs) because they do not require daily tape changing (like analog recording units used in many nest monitoring studies) and digital data can be transferred and shared relatively easily. Also, they are compact (approximately 13 by 8 by 2 cm), lightweight (approximately 300 g), use less power (approximately 250 mA/h), and emit less heat compared to most DVR models, particularly those used for security applications. We used two portable DVRs for this project—the Archos 605 and the COBRA IV. We initially chose the Archos DVRs because they have been used in similar applications (Pierce and Pobprasert 2007). However, we determined recent Archos DVRs models (e.g., 605) are unreliable for field use due to a variety of malfunctions potentially resulting from overheating and/or operating system failures, so we switched to the COBRA IV models, which were reliable for field use (see Results and Discussion). Potential recording time of the DVRs depended on resolution and available memory space. The Archos 605 with 160 GB of memory could record for approximately 5 d with a 640×480 resolution. However recording time could be extended to 6 d by reducing recording resolution, with little discernable difference in video quality. The COBRA IV, with 40 GB of memory, could record for approximately 2 d at a 640×240 resolution, but these DVRs have the capacity to support larger memory drives. Both units come with a high-resolution color screen, which is useful to verify the system is functioning properly when in the field. To use Archos DVRs for recording, it is necessary to purchase a DVR docking station (Archos Generation 5 model) to connect to external audio and video sources including the cameras. The COBRA IV does not require a docking station because the external audio and video sources can be connected directly into the DVR.

We placed DVRs, batteries, and associated wiring and connectors (hereafter the recording unit) in camouflaged plastic storage bins to protect them from moisture and other elements during the rainy months. We used vented wooden storage boxes during dry summer months to prevent overheating of electronics (Figure 1). We mounted small exhaust fans on the top of each wooden storage box to facilitate ventilation and fitted the boxes with filtered vents to minimize dust intake. We also installed electrical and video outlets directly into each box, allowing for fast field deployment and easy transport. For additional protection against electrical shock and short-circuiting of equipment from water exposure, we included surge protectors in the system (Belkin BZ103050vTVL; Figure 1).

We chose waterproof indoor/outdoor security cameras (Q-See CCD QSB550SR) because they have an adjustable lens (5–50 mm), high resolution, and night vision. Because we placed cameras approximately 20 m from nests, we required cameras with 850-nm infrared light-emitting diodes (LEDs) because they provide superior illumination than 940-nm LEDs. The 850-nm LEDs do not emit visible light but have a dull red glow that is visible to humans at close range in the dark, as opposed to 940-nm LEDs that are invisible. However, we assume that the dim glow did not influence predation of nests because there is no evidence of differences in predation rates at nests illuminated with these two infrared light types (Sanders and Maloney 2002). We modified Army surplus ammunition canisters to house the cameras and associated wiring (Figure 1). We camouflaged the canisters with spray-paint and glued soils collected from the study site onto the canisters. We used small stakes to stabilize the camera canisters from high winds.

Because the cameras often needed to be deployed far from the recording unit (75–300 m), the systems required durable power and coaxial cables with low resistance over long distances (i.e., heavy gauge). We chose 300-m, direct-burial, RG-59 Siamese cable for video data transfer and to power the camera and spray painted it a similar color as the pond substrate. Direct current (DC) generated by the batteries was insufficient to power the camera due to voltage drop and increased battery drain from long cable length. Therefore, we used a DC to alternating current (AC) power inverter (Radioshack 75W power inverter) to send power through the cable and used the AC-to-DC converter to power the camera (Figure 1). With this method, a single battery could power the system continuously for approximately 3 d and two batteries (wired in series) could power the system for approximately 6 d.

The cost of the system as shown in Figure 1 was approximately US $1500 (as of 2009) plus the several hand tools, battery charger, and data storage necessary to build and maintain the system. Cable connectors, adapters, and power inverters required periodic replacement due to salt corrosion, thus additional budget for system maintenance was necessary. The cost of producing a similar system could vary considerably, depending on the application and configuration. System costs could be reduced by using only one battery, if more frequent battery changes are acceptable or if less wire is needed between the recording unit and the camera. Including a solar panel in the system would reduce or eliminate the need for battery changes, but could make the system more conspicuous to predators or more susceptible to theft and vandalism.

Field deployment

We used the systems to monitor western snowy plover nests March through August in 2009 and 2010. We deployed the systems on a subset of nests located during surveys associated with ongoing Western Snowy Plover Recovery Unit 3 monitoring activities (see *Nest Monitoring Program*). We chose the youngest nest available that was at least 100 m from other known active nests so that nearby nesting plovers were not disturbed by camera-monitoring activities. We positioned the recording units adjacent to access roads (Figure 2) for fast deployment and data retrieval, which also minimized disturbance to nesting birds because observers did not enter ponds on subsequent visits. We typically positioned cameras 20 m from nests facing north and away from artificial light sources (i.e., developed

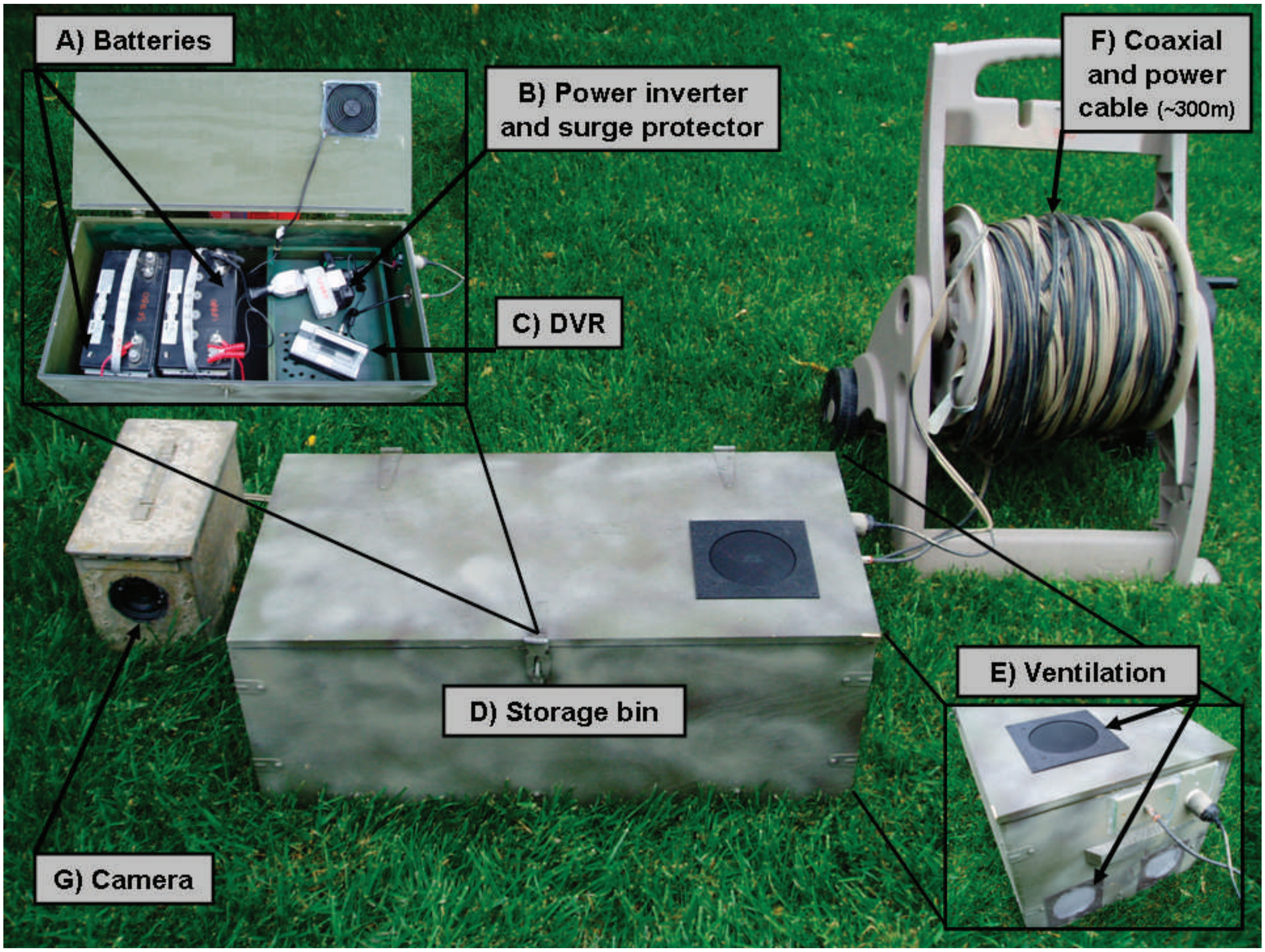

Figure 1. The components of a digital video surveillance system used to monitor western snowy plover *Charadrius nivosus nivosus* nests in San Francisco Bay, California, between March and August in 2009 and 2010, included deep-cycle batteries (**A**); power inverter (**B**); portable digital video recorder (DVR) (**C**); storage locker (**D**); exhaust fan, filtered vents, and hard-wired power and coaxial cable outlets (**E**); 300-m RG-59 Siamese cable (**F**); and waterproof indoor/outdoor security camera housed in a surplus ammunition canister (**G**).

areas) to reduce glare at night. When positioning the camera, we temporarily connected the camera to a portable color monitor (Insignia NS-PDVD8A) to aid in focusing and positioning the camera. This allowed us to adjust the positioning and focus of the camera at the nest site without returning to the recording unit, thus reducing the time spent in close proximity to the nests and the overall setup time.

To retrieve video data and maintain the batteries, we simultaneously replaced DVRs and batteries prior to filling the memory capacity of the DVR. We transferred video files from DVRs onto external storage devices and cleared the memory after every transfer. We used DivX author (www.divx.com) to view, manage, and edit video files.

Nest monitoring program

As part of Western Snowy Plover Recovery Unit 3 research and monitoring activities, western snowy plover nest fates have been monitored at Eden Landing since 2003 (Robinson-Nilsen et al. 2010). To determine the fate of western snowy plover nests, we located nests by visually searching ponds for incubating females during weekly surveys and recorded their positions with a GPS unit (Garmin GPS 60). We conducted surveys from surrounding levees at a minimum distance of 100 m from observed plovers. We visited the nests once per week thereafter and recorded whether the nest was still active (i.e., eggs present and adults incubating) and the number of eggs or chicks in the nest. We floated the eggs (Hays and LeCroy 1971) to estimate their age. Snowy plover nests are active for an average of 33 d from initiation, as defined by the date the first egg was laid to hatching (Warriner et al. 1986). Using the estimated egg age, we calculated the nest initiation date and predicted hatch date for the nests. When eggs were no longer in the nest, we assigned each nest a fate based on evidence observed at the nest (Mabee 1997). Nest fates were hatched, depredated, flooded, abandoned, lost at hatch, or unknown. We defined a "hatched" nest as a nest that hatched at least one egg and "lost at hatch" as a nest

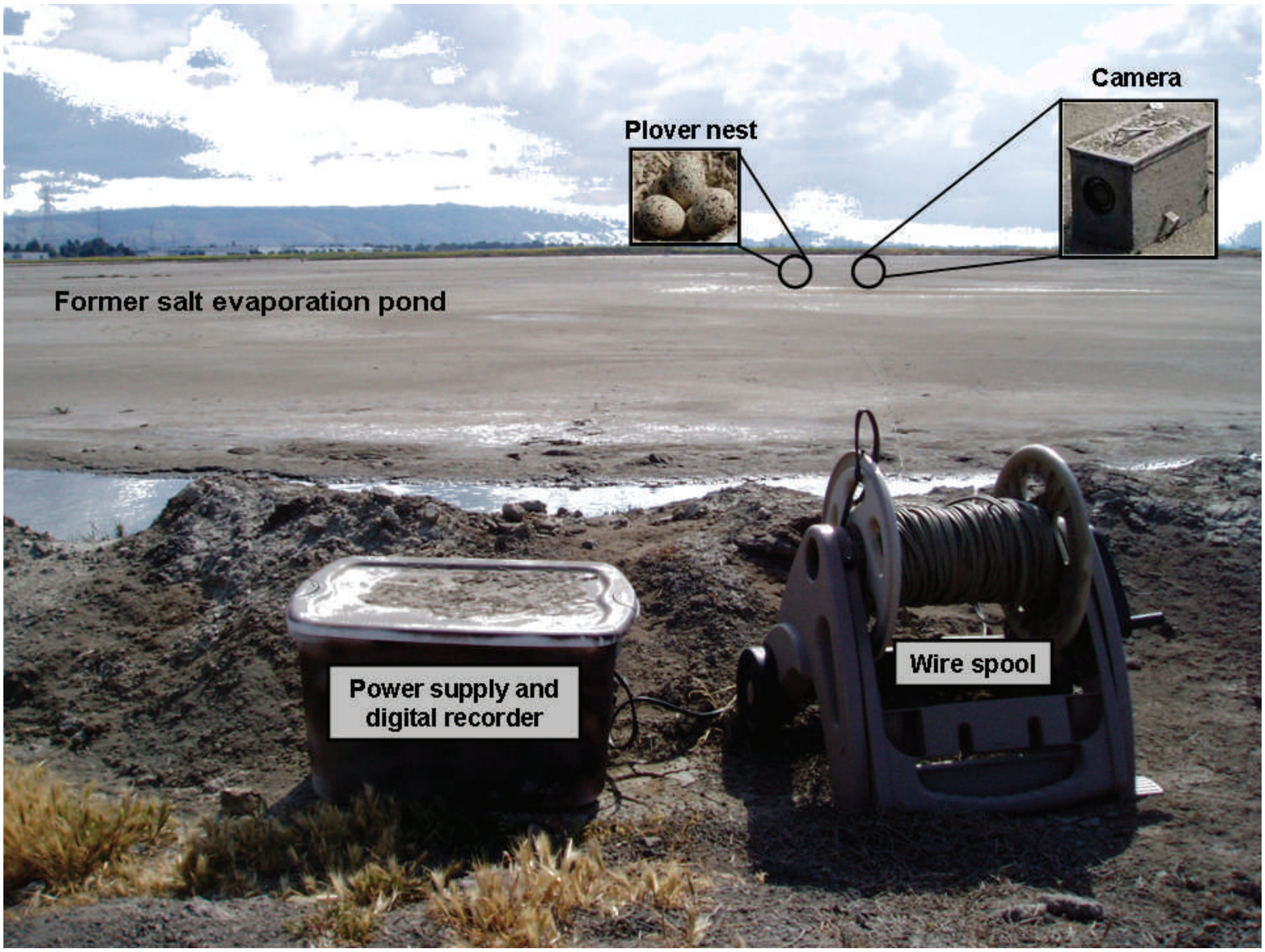

Figure 2. A digital video surveillance system deployed from a levee road to monitor a western snowy plover *Charadrius nivosus nivosus* nest in a former salt evaporation pond in Eden Landing Ecological Reserve, San Francisco Bay, California. The system was used to monitor nests between March and August in 2009 and 2010.

that was depredated, although it was unclear whether the predation event occurred on eggs or recently hatched chicks still in the nest.

Statistical analysis

To determine if the presence of video cameras near nests (i.e., 20 m) influenced the fate of western snowy plover nests, we used logistic exposure models to estimate daily nest survival (Shaffer 2004) in R (R Development Core Team 2004) of all nests monitored in Eden Landing during the study period (Table S1, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S1). We modeled daily survival as a function of camera status (present or absent), year, and nest initiation date (i.e., Julian date). We used model results to produce estimates of daily survival, using the weighted mean nest initiation date to calculate the daily nest survival for each year and camera status.

Results

During the 2009 breeding season, we monitored 24 western snowy plover nests using five systems. Of these, 12 successfully hatched chicks, 10 (41.7%) were depredated, and two nests were abandoned during late-season storm events. We identified four species of predators at 7 of the 10 depredated nests. Predators of eggs were a California gull (Figure 3A, Video S1, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S2), a common raven (Figure 3B, Video S2, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S3), two red-tailed hawks *Buteo jamaicensis* (Figure 3C, Video S3, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S4), and two northern harriers *Circus cyaneus* (Figure 3D, Video S4, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S5). In addition, a California gull ate newly hatched chicks in the nest. Our systems failed to record three nest failures due to a malfunction with the Archos DVRs, although one nest predator was identified as a northern harrier by an opportunistic direct observation. In 2009, we monitored 73 nests at Eden Landing without camera systems. Of these, 41 successfully hatched chicks, 22 (30.1%) were depredated, three were abandoned, four were flooded, two were lost at hatch, and one had an unknown fate.

Figure 3. Six species recorded depredating western snowy plover *Charadrius nivosus nivosus* eggs and chicks in Eden Landing Ecological Reserve, San Francisco Bay, California, in 2009 and 2010. The predators were (**A**) California gull *Larus californicus*, (**B**) common raven *Corvus corax*, (**C**) red-tailed hawk *Buteo jamaicensis*, (**D**) northern harrier *Circus cyaneus*, (**E**) ruddy turnstone *Arenaria interpres*, and (**F**) gray fox *Urocyon cinereoargenteus*.

In 2010, we monitored 20 western snowy plover nests with the systems, of which 12 were successful, seven (35.0%) were depredated, and one was abandoned likely due to a late-season storm. The systems captured four depredation events, but failed to record two events due to malfunctioning of Archos DVRs, despite replacing the DVRs used in 2009 with new units. While testing a newly acquired COBRA IV DVR, we missed a predation event by exceeding its memory capacity while recording at the highest resolution. We switched to the COBRA IV DVRs midseason, used a reduced recording resolution, and they performed reliably for the remainder of the season. Recorded predators included two California gulls, a ruddy turnstone *Arenaria interpres* (Figure 3E, Video S5, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S6), and a gray fox *Urocyon cinereoargenteus*

(Figure 3F, Video S6, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S7), which was the only mammalian and nocturnal predator recorded during the study period. During the 2010 breeding season, we monitored 122 nests at Eden Landing without camera systems. Of these monitored nests, 33 hatched, 84 (68.8%) were depredated, one was abandoned, two were flooded, one was lost at hatch, and one had an unknown fate.

In 2009, there was no difference in the daily survival rates of nests with cameras (0.983; 95% CI 0.863–0.998) and without (0.963; 95% CI 0.832–0.993) video cameras. In 2010, there was no difference in the daily survival rates of nests with (0.971; 95% CI 0.844–0.998) and without (0.933; 95% CI 0.797–0.992) video cameras.

Discussion

Our results suggest that the digital video surveillance system described here is an effective tool for identifying nest predators of western snowy plovers and could be used effectively for behavioral studies on this and other ground-nesting species. Two or three researchers could set up the system in under 20 min and incubating plovers were not disturbed on subsequent visits to retrieve data and change batteries. The placement of cameras approximately 20 m from nests did not appear to influence the behavior of incubating plovers because plovers typically would quickly return to their nests and resume incubating after researchers left the breeding site and entered a vehicle. Also, our results suggest the presence of cameras did not affect the nesting success of monitored nests because predators did not appear to be significantly deterred or attracted by cameras and daily survival rates were not affected. Despite reliability issues with the first DVR model we used, the system performed reliably under adverse field conditions (e.g., high temperatures, dust, salinity). Because of the constant advancement in digital recording technology, we recommend that researchers investigate all available digital recording options prior to project initiation and thoroughly testing equipment prior to field deployment.

We easily identified each species recorded depredating eggs and chicks. This would not have been possible without continuously recording nest activity because nest predators often do not leave clear tracks on the substrate in our study area and it is difficult to identify nest predators using nest remains (see Larivière 1999). Also, nest predators often move quickly; we recorded California gulls landing, completely swallowing eggs or chicks, and flying away in less than 4 s (Video S1, *Supplemental Material*, http://dx.doi.org/10.3996/062011-JFWM-036.S2). Other systems using infrared-triggered cameras can miss fast predation events (Swann et al. 2004); therefore, we recommend continuously recording nest activity for reliable identification of predators.

The identification of California gulls as western snowy plover nest predators in San Francisco Bay is significant in that their population has dramatically increased in the region (Strong et al. 2004; Tokatlian et al. 2010), likely due to the availability of anthropogenic food resources at landfills. Gull populations can become dependent on landfills for food (Belant et al. 1998), and landfill foraging has been associated with an increase in reproductive success in gulls (Pons 1992; Weisler and Powell 2010) and, in some cases, population increases (Belant et al. 1998; Duhem et al. 2008). The availability of anthropogenic food resources is also considered to be the principal reason common ravens have increased in western North America (Boarman and Heinrich 1999) and likely subsidizes their populations (Boarman 1993; Marzluff et al. 2001). In San Francisco Bay, predation by subsidized California gulls, common ravens, and other species that benefit from anthropogenic food resources could be particularly detrimental to the recovery of western snowy plovers and other endangered species because predators are more likely to cause the extinction of a less common species when anthropogenic subsidies allow predator populations to remain high even as prey populations decline (Sinclair et al. 1988; Andren 1992; Courchamp et al. 2000; Kristan et al. 2004). In response to landfill foraging, particularly by California gulls, a local landfill is attempting an abatement program targeted at gulls and other potential western snowy plover nest predators. Long-term monitoring of western snowy nests may provide insight into the effectiveness of management practices on and off managed resource areas.

This camera system described here also will be useful for monitoring the behavior of nesting western snowy plovers in relation to human disturbance. For instance, this system was used to monitor behavioral responses of nesting western snowy plovers to nearby construction activities at wetland restoration sites. By using this continuously recording camera system, it is possible to quantify the frequency and duration of incubating adults being flushed from nests. These data can be correlated with nesting success and compared with data from nesting sites without human disturbance. In some cases, it is possible to position the camera such that the nest and construction activities are monitored simultaneously, so that observers can identify the source of anthropogenic disruption in nest attendance. Using this system, information can be relayed to managers quickly after researchers review recordings, providing them with current information that can be directly applied to management practices. Additionally, recordings of western snowy plover nest activities are being used by researchers in San Francisco Bay to conduct behavioral studies, examining aspects of parental care such as diurnal and nocturnal nest attendance and incubation bouts. This camera system would be useful for other applications, including behavioral studies on avian species at nesting, roosting, and foraging sites. This system could easily be modified to record foraging behavior (Kalam and Urfi 2008), diet composition (Gilby et al. 2011), nestling behavior (Cestari et al. 2010), causes of nestling mortality (Lee et al. 2011), and host–parasite interactions (O'Connor et al. 2010).

Supplemental Material

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Table S1. Results of western snowy plover *Charadrius nivosus nivosus* nest monitoring at Eden Landing Ecological Reserve in 2009 and 2010.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S1 (95 KB XLS).

Video S1. A California gull *Larus californicus* depredating western snowy plover *Charadrius nivosus nivosus* eggs in Eden Landing Ecological Reserve, San Francisco Bay, California. Four California gulls were recorded depredating western snowy plover eggs and chicks in 2009 and 2010.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S2 (1.44 MB WMV).

Video S2. A common raven *Corvus corax* depredating western snowy plover *Charadrius nivosus nivosus* eggs in Eden Landing Ecological Reserve, San Francisco Bay, California in 2009.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S3 (36.85 MB WMV).

Video S3. A red-tailed hawk *Buteo jamaicensis* depredating western snowy plover *Charadrius nivosus nivosus* eggs in Eden Landing Ecological Reserve, San Francisco Bay, California. This species was recorded depredating two western snowy plover nests in 2009.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S4 (5.12 MB WMV).

Video S4. A northern harrier *Circus cyaneus* depredating western snowy plover *Charadrius nivosus nivosus* eggs in San Francisco Bay, California. This species was recorded depredating two western snowy plover nests in 2009.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S5 (4.3 MB WMV).

Video S5. A ruddy turnstone *Arenaria interpres* depredating western snowy plover *Charadrius nivosus nivosus* eggs in Eden Landing Ecological Reserve, San Francisco Bay, California in 2010. Prior to finding the nest, the ruddy turnstone was searching for prey under oyster shells on the pond substrate.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S6 (14.58 MB WMV).

Video S6. A gray fox *Urocyon cinereoargenteus* depredating western snowy plover *Charadrius nivosus nivosus* eggs in Eden Landing Ecological Reserve, San Francisco Bay, California in 2010. The gray fox was the only nocturnal animal and mammalian species recorded depredating a western snowy plover nest during the study period.

Found at DOI: http://dx.doi.org/10.3996/062011-JFWM-036.S7 (2.22 MB WMV).

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