

Applied Studies Question #16: Will increases in boating access significantly affect birds, harbor seals or other target species on short or long timescales?

Background

Project Objective #3 states that the South Bay Salt Pond Restoration Project will provide public access opportunities compatible with wildlife and habitat goals. The Project plans boating oriented features such as kayak and small boat launches, which are expected to increase recreational boating traffic. In addition, the Water Trail, a designated water route for recreational boaters, is being developed and sites within the Project will be destination points along this route. Personal watercraft, such as jet skis and wave runners, with their shallow drafts, can access “wilderness areas” previously inaccessible to motorboats (National Park Service 1998). Boating generated by the Project has the potential to negatively affect waterbirds and harbor seals.

There is a very large body of literature on the effects of human disturbance on species. Researchers agree that breeding birds are very sensitive to human disturbance, whether the disturbance is from trail use, boats, or research (Carney and Sydeman 1999, Burger and Gochfeld 1993, Keller 1991, Burger 1981). Studies of watercraft effect found that disturbances from boats can result in nest abandonment and reproduction failure of breeding adult waterbirds (Burger 1998; Erwin, et al. 1995). In general, nesting birds exhibit abnormal behavioral, growth, or reproductive effects (Mikola et al. 1994; Rodgers and Smith 1997), while foraging birds move away from areas of high boating activity with varying degrees of habituation (Burger 1998; Kaiser and Fritzell 1984). Due to high-density nesting habits, colonial breeding birds are particularly susceptible to boating disturbances. Rodgers and Smith (1995, 1997) studied the impacts of outboard boating, canoeing, and walking on several species of colonial waterbirds in Florida. The distance at which the birds flushed depended on the species, disturbance source, habituation, and colony type.

As with breeding birds, researchers found watercraft type affects non-breeding birds in different ways. Rodgers and Schwikert (2002, 2003) showed that waterbirds flushed at significantly longer distances when approached by faster and noisier propeller-driven airboats compared to slower, quieter outboard motorboats. In addition, larger birds flushed sooner than smaller species, no matter what the boat type, probably due to their slower take-off times. In general, the faster and louder the approach, the sooner birds will flush and the larger the waterbird the sooner it will flush. A study at Aquatic Park in Berkeley, CA found ducks, flushed in response to a kayak in the 30-70 m range, depending on species and size of group (Avocet Research Associates 2005). Rodgers and Schwikert (2003) also found that there was high variation in flushing distances within species; habituation may be one reason for this variation.

In San Francisco Bay, recreational boating is a major source of behavioral changes, particularly haul-out patterns, in the Pacific harbor seal (Farallones Marine Sanctuary Association 2000). The effects of disturbance range from mild to severe, from a hauled-out seal raising its head at the sound of a disturbance to being struck and killed by boats. Harbor seals are vulnerable to “harassment by persons on shore and boaters and kayakers

from [San Francisco] Bay” and “will flush from haul-out sites at 300 meters” (Lidicker and Ainley 2000). Kayakers can cause greater disturbance to resting seals than powerboat operators because of their tendency to travel close to the shoreline. Kayakers also create disturbances at a greater distance from the seals than do powerboat operators (Suryan and Harvey 1999). Subsequent disturbances, however, have a greater rate of recovery. Suryan and Harvey (1999) suggest two possible explanations: 1) seals become more tolerant of boating disturbances; or 2) seals that are most affected by the initial harassment have already moved on to another haul-out site. Females will remain in the water until the danger passes before returning to their pups. This is important where haul-out sites, and particularly pupping sites, are few in number (Suryan and Harvey 1999). Because harassment increases seals’ energy expenditure by decreasing haul-out period, harassment has the greatest impact on nursing pups and molting adults, when haul-out is most critical (Suryan and Harvey 1999).

The literature indicates the need for two studies of boating effects on wildlife:

1. What is the effect of boating generated by the Project on waterbirds, especially nonnesting birds?
2. What is the effect of boating generated by the Project on harbor seals during pupping and non-pupping seasons? (This research should be coordinated with research on harbor seals connected with Applied Studies Question #10.)

Study Design Concepts

At this point in the Project, we recommend specific hypotheses or research questions be designed to address these two questions. These two studies are very different from each other and will require different research methods.

1. What is the effect of boating generated by the Project on waterbirds, especially non-nesting birds?

- Study Population: Study boaters both within and near the Project area. Study waterbirds, especially migratory species—both shorebirds and waterfowl—found in the Project area.
- Study Sites: Compare areas frequented by boaters to control sites, where boaters are absent or rare. Study both open bay and slough sites.
- Parameters Measured: Flight initiation distance in response to boaters; species richness and abundance in boater and non-boater areas; effects on nesting birds, such as nest success rates (if boaters are approaching nesting areas).
- Study Design: Choose at least 3 boater-use and 3 control sites within or near the Project area, south of the San Mateo Bridge, in each habitat type (open Bay, slough). Collect data 2 or more times per month for two full years. Some control data should be taken at area planned for facilities before the facilities are put in, to do a Before-After-Control-Impact (BACI) study. Analyze data by species, bird group size, season, etc. in response to boater group size and activity.
- Time Frame for Study: Baseline data collection should begin before boating facilities are constructed and before the Water Trail is officially designated. Some or all of this data may have been collected by USGS. Then, begin the two-year boater site-Control study approximately a year after boating features are installed.

- Estimated Study Cost: Study will require a team effort by experienced researchers. Tentative cost estimate: \$100,000 for entire study.

2. What is the effect of boating generated by the Project on harbor seals during pupping and non-pupping seasons?

- Study Population: Study harbor seal population south of the San Mateo Bridge, which is typically divided into groups that haul at known locations, including Bair Island, Alviso Slough and Mowry Slough. Study boaters and seals using these areas.
- Study Sites: Harbor seal haul-out and pupping sites in the South Bay.
- Parameters Measured: Immediate behavioral responses to boaters; number of seals in boat-use versus Control areas; movement of seals around the South Bay in response to boaters; tidal cycle and seasonal responses to boaters.
- Study Design: Some parameters, such as immediate behavioral responses, can be achieved with an observational study of unmarked animals. Capturing, marking and using radio-telemetry will be needed for other studies, such as movements around the South Bay.
- Time Frame for Study: Study can begin now to provide basic locational and behavioral information; study for 2-3 years. Repeat this work after boating facilities are completed. Conduct marking/radio-telemetry after boating facilities completed; study for 1-2 years.
- Estimated Study Cost: Observational study of immediate behavioral responses has been initiated by Kathy Fox, Master of Science student, Department of Environmental Study, San Jose State University. Tentative cost estimate: \$20,000. Radio-telemetry study tentative estimated cost: \$100,000.

Management Options

The effect of public access on wildlife is one of the most contentious aspects of the Project. Providing high-quality public access and recreation is critical to the goals of the Project and also for general public support. But, managers must be sure access is designed and provided in such a way that species are protected. Research is needed to give managers relevant information to achieve both goals.

Both studies will give managers information on the extent of boating effects on sensitive species. Information on flush/response distances will allow managers to estimate the amount of habitat that is compromised by boating activities. Managers may seek to limit the area of impact and/or ensure that enough undisturbed habitat is provided. Information on seasonal sensitivities will allow managers to protect wildlife at sensitive times of the year, through education and seasonal area closures.

The waterbird study will give managers valuable information on different responses of species and guilds in roosting and foraging habitat, which can be used to protect specific areas and in educational materials. Harbor seal telemetry will fill a major data gap—How do seals move about and use the Bay and do they move in response to human disturbance? This critical information will give managers insight into the overall habitat

needs of the harbor seal population, once again for protecting habitat, directing boating to minimize impact and educating the public.

Findings will be used to design public access so that it does not have significant impacts on the target species. Design may include keeping public at an appropriate distance from wildlife, permitting only certain recreational activities, excluding public access with significant impacts altogether, or allowing public access with significant impacts in certain proscribed areas while maintaining large refuges with no public access.

Citations

- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation* 21:231-241.
- Burger, J. and M. Gochfeld. 1993. Tourism and short-term behavioral responses of nesting masked, red-footed and blue-footed boobies in the Galapagos. *Environmental Conservation* 20:255-259.
- Carney, K.M. and W.J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. *Waterbirds* 22:68-79.
- Farallones Marine Sanctuary Association. 2000. SEALS Program Annual Report: 1999. San Francisco: National Oceanic and Atmospheric Administration.
- Kaiser, M.S. and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. *Journal of Wildlife Management* 48:561-567.
- Keller, V.E. 1991. Effects of human disturbance on eider ducklings *Somateria mollissima* in an estuarine habitat in Scotland. *Biological Conservation* 58: 213-228.
- Mikola, J., M. Miettinen, E. Lehtinen and K. Lehtila. 1994. The effects of disturbance caused by boating on survival and behavior of velvet scoter *Melanitta fusca* ducklings. *Biological Conservation* 67: 119-124.
- Rodgers, J.A., Jr. and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J.A., Jr. and S.T. Schwikert. 2002. Buffer zone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. *Conservation Biology* 16:216-224.
- Rodgers, J.A., Jr. and S.T. Schwikert. 2003. Buffer zone distances to protect foraging and loafing waterbirds from disturbance by airboats in Florida. *Waterbirds* 26:437-443.
- Suryan, R.M., and J.T. Harvey. 1999. Variability in reactions of Pacific harbor seals, *Phoca vitulina richardsi*, to disturbance. *Fishery Bulletin* 97:332-9.