

Oil Spills as a Threat in the San Francisco NWR Complex

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Within the San Francisco NWR Complex, oil spill events have been identified as a very high threat. Spills are a threat to the following targets: the marine island ecosystem at Farallon Islands NWR, waterbirds and tidal marsh at San Pablo Bay NWR and Don Edwards NWR, and the coastal dune ecosystem at Salinas River NWR. Previous events affecting the complex have typically resulted from ship collisions. Although major oil spills are unlikely occur more than once in a decade, the effects are likely to be disastrous when one occurs. Spills directly stress birds when feathers are contaminated or oil is ingested, leading to mortality (Leighton 1993, Moore & Dwyer 1974). Large rehabilitation efforts are required to treat birds with oiled feathers. Oil poses further dangers, such as lethality to bird embryos from egg shell contamination (Leighton 1993, Macko & King 1980). Stress through decline in food, water, or habitat quality may drive birds away from a breeding location, affecting breeding patterns (Parker et al. 2007). Marine environments are expected to recover 2-10 years after an oil spill (Kingston 2002).

At Farallon Islands NWR, historical events demonstrate that oil spills are a medium threat on breeding populations of seabirds, including the common murre which is under greater threat. In the winter of 1986, the *Apex Houston* tank barge lost a hatch cover and spilled nearly 26,000 gallons of oil. This event resulted in an estimated 9,000 deaths of seabirds, of which 6,300 were murre (Carter et al. 2003). Murre suffered a decline in the statewide breeding population between 1982 and 1989 from 541,900 to 351,600 from the combined effects of oil spills and gill net fishing, and populations later recovered when these effects were addressed (Carter et al. 2001). More recently, oiled seabirds were recorded by refuge personnel at the Farallons after the *Luckenbach* and *Cosco Busan* spills in 2002 and 2007 respectively. The *Luckenbach* spill resulted from sunken ship which collided with its sister ship, while the *Cosco Busan* spill resulted from a collision with a Bay Bridge support tower.

Oil spills are a threat at San Pablo Bay NWR and Don Edwards NWR as well, where large spills in the San Francisco Bay are a danger to waterbirds, including grebes, least tern, waterfowl, shorebirds, and potentially others. Two Standard Oil tankers collided and spilled 800,000 gallons under the Golden Gate Bridge in 1971, which affected approximately 7,000 birds (Lassen 1972). Of the 4,686 birds that were treated, 53% were western grebes, showing that spills are a very high threat to grebes. The Alameda least tern colony is under very high threat with their proximity to the bridges in the bay, where a spill could be more likely. Spills would have a varying threat to other bird species in San Pablo Bay NWR or Don Edwards NWR depending on the proximity of oil to the shore and species' tendency to rest on water (Smail et al. 1972). Less than 5% of the 4,686 treated birds were estimated to survive despite the heavy financial costs dedicated to rehabilitation. (Lassen 1972). This low survival rate demonstrates the difficulty of bird rehabilitation. Lastly, spills are considered as a low threat to Ridgway's rail in tidal marsh, where it is less likely that spills will occur close to these areas.

Oil spills are a low threat to the western snowy plover in the Salinas River NWR. An impact assessment on the snowy plover in Oregon revealed there were no large impacts from the 1999 New Carissa oil spill near breeding sites along the coast. Population sizes and breeding productivity remained at similar levels following the oil spill (Stern et al. 2000). However, individual plovers are still susceptible to oil, and rehabilitation would be necessary to prevent mortality in the event of an oil spill.

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