Assessment of Four Potential Common Murre Restoration Projects in Northern California

A Report to the *Stuyvesant* Trustee Council
and
U.S Department of the Interior, Bureau of Land Management,
Arcata Field Office, Arcata, California

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EXECUTIVE SUMMARY

In response to difficulties with implementing a Common Murre (*Uria aalge*) restoration project at Redding (or Reading) Rock, Humboldt County, the *Stuyvesant* Trustee Council commissioned an assessment of the general feasibility of implementing four other potential murre restoration projects in northern California that were included in the *Stuyvesant* Restoration Plan, including: (1) land acquisition at the Vizcaino Colony Complex in northern Mendocino County; (2) habitat enhancement at Whaler Island/Crescent City Harbor in Del Norte County; (3) recolonization at Sea Lion Rock in Humboldt County; and (4) a seabird colony protection program for Humboldt and Del Norte Counties. As appropriate for each potential restoration project, this report provides a brief summary of historical information, current status of the site including murre and other populations of seabirds, a determination of the current need for restoration actions, rough budgets for suitable projects, and information on potential implementers for the most feasible projects.

The potential restoration projects at Whaler Island and Sea Lion Rock were considered to have low to moderate long-term benefits to Common Murres. At Whaler Island, murres and some other seabird species likely were extirpated in the 1930s -1940s when the island was quarried and a breakwater was constructed as part of Crescent City Harbor, connecting the island to the mainland. At Sea Lion Rock, a small colony of murres was extirpated shortly before 1960 when part of the rock collapsed, presumably from natural causes. These two potential projects are logistically feasible but likely have social, environmental and/or budgetary obstacles that would make these projects difficult or impossible to implement successfully.

The potential project at Vizcaino Colony Complex would have long-term benefits for murres, appears logistically feasible and appears to be within budgetary constraints. This colony complex, consisting of the seabird colonies known as Rockport Rocks and Cape Vizcaino, currently hosts the largest seabird breeding aggregation in Mendocino County (mostly murres and Brandt's Cormorants). In 2005-2010, murre breeding population sizes averaged 4,060 breeding birds at Rockport Rocks and 13,726 breeding birds at Cape Vizcaino, or a colony complex mean of 17,786 breeding birds over the six year period. Restoration at this site should focus on acquisition and long-term protection of the colony complex so that numbers of murres can grow and potential habitat enhancement could occur more easily. Acquisition should focus on two nearshore rocks within Rockport Rocks that are owned by the Mendocino Redwood Company. Based on interviews with a company representative, the Mendocino Redwood Company is willing to discuss the purchase of these rocks, which have a current tax assessment value of $12,172. Potential purchase of adjacent mainland parcels does not appear feasible at this time. Prior to purchase of the rocks, further discussion with the owner, appraisals and other documentation will need to be completed that could delay or even prevent this restoration option from being implemented. This project would aid in protecting the last murre colony located on privately owned property in northern California.

Development of a seabird colony protection (disturbance reduction) program in Humboldt and Del Norte Counties would also have high long-term benefits for murres and appears logistically feasible and within budget constraints. In 2004, these two counties held an estimated 293,080 breeding Common Murres, with major concentrations at Castle Rock, False Klamath Rock, Trinidad Colony Complex and colonies near Cape Mendocino. Disturbance to murre colonies by watercraft, aircraft and people on foot has been documented at several colonies in northern California and may be increasing. Given earlier implementation of such a program in central California and a similar program proposed for south-central California, implementation throughout Humboldt and Del Norte Counties could be conducted quickly and with few obstacles. By better protecting colonies from human disturbance, reproductive success and ultimately population sizes of Common Murres can be increased.

INTRODUCTION

On September 6, 1999, the dredge M/V *Stuyvesant* spilled approximately 2,000 gallons of Intermediate Fuel Oil 180 at the mouth of Humboldt Bay in northern California. The spill affected coastal beaches along the Humboldt County coast and killed approximately 2,405 birds including 1,600 Common Murres (*Uria aalge*; hereafter murres) (*Stuyvesant* Trustee Council 2007). As part of the natural resources damage assessment, the *Stuyvesant* Trustee Council (STC), including representatives of the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG), developed a plan to restore natural resources damaged by the spill. Murres were identified as the focal species for the restoration of "Alcids (except Marbled Murrelets [*Brachyramphus marmoratus]*) and Procellarids" due to their relatively high mortality from the spill (STC 2007). The preferred restoration action for these species was to restore the murre nesting colony at Redding (or Reading) Rock, located off the northern coast of Humboldt County (STC 2007).

An extensive assessment of the Redding Rock murre colony and feasibility of restoration actions was conducted in 2009-2010 (Thibault et al. 2010). Although the study identified restoration options that could benefit this declining murre breeding colony, concerns regarding project implementation have been identified by the Bureau of Land Management (BLM), who owns and manages the rock as part of the California Coastal National Monument (CCNM; BLM 2005). In brief, the potential restoration options for murres would conflict with other natural and cultural resource issues. To date, these concerns have prevented the implementation of this restoration action.

In 2010, the STC commissioned this brief assessment by Humboldt State University (HSU), USFWS and Carter Biological Consulting (CBC) of the four other potential murre (e.g. Alcids, except Marbled Murrelets and Procellarids) restoration projects identified earlier during restoration planning (STC 2007), including: 1) Trinidad Seabird Colonies - re-colonization of Common Murres at Sea Lion Rock; 2) Whaler Island Restoration (Crescent City Harbor) - reestablish Whaler Island as a seabird colony; 3) Cape Vizcaino Area seabird colonies – acquisition and management; and 4) Human Disturbance Reduction Program for Humboldt and Del Norte County seabird colonies. All four potential restoration projects and the Redding Rock project had been preliminarily developed by CBC for CDFG in 1999-2002 as part of earlier restoration planning (Appendix 1), although acquisition of Cape Vizcaino Area seabird colonies had first been proposed by CBC as a potential murre restoration project for the *Apex Houston* oil spill (Carter et al. 2003)(Appendix 2).

In this report, we briefly assess each of the four potential restoration projects by: 1) collating and summarizing historical and recent seabird data at the colony and known past anthropogenic impacts; 2) collating past restoration concepts, 3) determining the current need for restoration actions; 4) examining the current feasibility of conducting various restoration actions; 5) developing preliminary budgets for suitable potential projects; and 6) identifying considerations for implementation of suitable potential projects.

PROJECT ASSESSMENTS

Trinidad Seabird Colonies – Re-colonization of Common Murres at Sea Lion Rock

Brief Colony History

Sea Lion Rock occurs near the northern end of a collection of seabird colonies known as the Trinidad Colony Complex (Figure 1). The rock is owned and managed by BLM within the CCNM, Sub-unit 4 (BLM 2005). Five active murre colonies (i.e., White, Green, Flatiron, Blank, and Pilot rocks) are located just 0.9 to 5.6 km south of Sea Lion Rock. Within the entire Trinidad Colony Complex, an estimated population of about 76,500 breeding murres were documented in 2004 (based on raw counts in Capitolo et al. 2006 adjusted with a correction factor of 1.5; see Nur and Sydeman 2002).

Osborne (1972:79) reported that Clay and Hallmark had reported murres nesting on the flat top of the rock until "around 1960 the entire south half fell into the water". Loss of a portion of Sea Lion Rock was likely a result of erosion combined with seismic activity which is frequent in this coastal region and is associated with the Mendocino and Gorda plates (Ellsworth 1990). On 9 August 1960, a magnitude 6.2 earthquake occurred west of Cape Mendocino that may have caused collapse of the rock. However, the exact reason for the collapse remains poorly understood.

Murre breeding has not been reported at Sea Lion Rock since at least 1960 (Osborne 1972; Sowls et al. 1980; Carter et al. 1992, 2001; Capitolo et al. 2006; USFWS unpubl. data). Currently, the northeast side of the rock is a vertical cliff and the southwest side slopes at about a 45° angle into the ocean (Osborne 1972; Figure 2). One murre was observed on Sea Lion Rock on 4 June 1998 amongst Double-crested Cormorant (*Phalacrocorax auritus*) nests (Capitolo et al. 2005). This is the only known observation of murres on this colony since those reported by Clay and Hallmark circa 1960. Double-crested Cormorants, Pelagic Cormorants (*P. pelagicus*), and Western Gulls (*Larus occidentalis*) have bred in small numbers on Sea Lion Rock since 1970 (Osborne 1972; Carter et al. 1992; Capitolo et al. 2004; USFWS unpubl. data). The lower portion of the rock is used, at least occasionally, as a haul-out for California (*Zalophus californianus*) and Steller (*Eumatopius jubatus*) sea lions (Thibault et al. 2010).

We were not successful in locating photographs of Sea Lion Rock taken prior to 1960 that were adequate for assessing the amount and type of historical habitat used by murres and sea lions prior to the collapse.

Restoration Considerations

Sea Lion Rock Social Attraction Project

A void exists when considering historical sites that murres used for breeding in northern California because murres are not currently breeding on Sea Lion Rock. A potential restoration project would be to re-establish this murre colony. Recolonization was successfully conducted at Devil's Slide Rock near San Francisco in 1996 with much subsequent colony growth (Parker et al. 2007; McChesney et al. 2008). There is a moderate to high likelihood of success using this technique based on: 1) close proximity to several active murre colonies within the Trinidad Colony Complex and 2) accessibility of Sea Lion Rock by boat (for installing and maintaining social attraction equipment). Based on observations from the mainland, boat landing and climbing conditions on the rock appear feasible and close proximity to boat launching at Trinidad greatly facilitates access. In addition, a majority of Sea Lion Rock can be viewed from shore which is valuable for monitoring bird activity and determining adaptive management associated with the social attraction technique.

Prior to moving forward on a social attraction restoration project, an on-site visit must be conducted to determine suitable habitat. In particular, potential murre habitat would need to be assessed to determine if suitable natural habitat still exists and to determine if sea lions can also access available murre habitat. Although observations from the mainland and assessments from aerial photographs suggest that suitable habitat for breeding murres still exists, the former collapse of part of the rock may have rendered much of the habitat unsuitable for murre breeding, especially in terms of forming dense breeding aggregations favored by murres. Three main factors that may delay recolonization or prevent it within a decade are: 1) the long length of time (about 50 years) since murre breeding occurred; 2) habitat use by Brandt's Cormorants (*P. penicillatus*) or Double-crested Cormorants; and 3) possible impacts from sea lions. Given that murres rarely survive more than 20-30 years, no murres from the former colony are likely to be alive and thus all murres attracted to Sea Lion Rock would derive from other colonies. Given high philopatry in murres, only a few subadults might initially attend the rock and several years, possibly more than a decade, might be required prior to murres breeding again.

In California, Brandt's Cormorants are an important, maybe essential, natural social facilitator in murre colonization events (Capitolo et al. 2005). Their presence at Devil's Slide Rock likely assisted rapid re-colonization by murres when social attraction techniques were employed in 1996 (Parker et al. 2007). Brandt's Cormorants do not currently breed on Sea Lion Rock although small numbers of closely related Double-crested Cormorants do breed there. If social attraction techniques are employed on Sea Lion Rock, attraction of nesting Brandt's Cormorants may improve chances of success.

Sea lions can cause abandonment of murre colonies when they access breeding habitats. The murre colony at Redding Rock was largely abandoned after California sea lions began regularly climbing to the top of the rock where most murres bred (Thibault et al. 2010). Although sea lions are not currently known to climb to the upper reaches of Sea Lion Rock (USFWS, unpubl. data; J. Thibault and D. Goley, pers. comm.), the potential for this impact should be considered and further assessed through examination of aerial photographs, literature, and observations throughout the year. If significant sea lion impacts occur, barriers would need to be constructed to prevent sea lion access to potential murre habitat. Alternatively, artificial ledges could be constructed on cliffs without sea lion access (as suggested for Redding Rock; Thibault et al. 2010). On-island recolonization work would need to be scheduled to avoid impacts to sea lions and nesting cormorants.

Potential Benefits

Recolonization of Sea Lion Rock (and with subsequent colony growth) by murres would have several benefits to the Trinidad Colony Complex, including: 1) historic breeding habitat would be restored; 2) the population size of murres would be expanded by hundreds to low thousands of birds; and 3) murres would be restored in an area where many likely were killed by the *Stuyvesant* and *Kure* oil spills that occurred nearby. This restoration action would assist long-term recovery and help sustain this colony complex over time. Public viewing and education could complement restoration work and provide added value to the public. By developing protection ethics for seabirds, public viewing or education may assist long-term recovery and survival of the northern California murre population. The restoration project would attract attention of the general public and provide a unique opportunity in the Trinidad area of Humboldt County to enhance public knowledge concerning seabirds, seabird conservation, and the marine environment. Emphasis could be placed on a greater awareness of seabird resources in the area, the problems caused by oil pollution and oil spills, and other anthropogenic factors (e.g. human-caused disturbances by boats and aircraft) that are harmful to seabirds.

Potential Concerns
Although restoration utilizing social attraction techniques appears logistically feasible, some concerns would need to be discussed and addressed prior to implementing this potential project. Specifically, Steller and California sea lions regularly haul out on this rock. There may be issues with California sea lions hauling out high on the rock in areas where murres would potentially breed. It may not be prudent to encourage a murre colony where sea lions regularly access the seabird breeding habitat. However, the upper parts of Sea Lion Rock do not currently appear to be used regularly, if at all, by sea lions. Permanent sea lion barriers or artificial breeding ledges to prevent impacts by sea lions might be visible to the public on the adjacent mainland or at sea but likely these could be constructed to address this concern. The construction of barriers or artificial ledges to prevent impacts by sea lions likely would require occasional long-term maintenance and might not be an acceptable management action. In addition, social attraction techniques would require some small modifications to the rock such as drilling holes to anchor decoys, sound systems and climbing protection for workers. Finally, similar concerns expressed by the Yurok Tribe at Redding Rock likely exist at Sea Lion Rock in regards to cultural and spiritual significance. Thus, potential concerns about modification to the rock will need to be addressed.

Potential for Success
The probability of successfully restoring murres to Sea Lion Rock utilizing social attraction is moderate to high depending on the actual condition of the habitat, whether or not the lack of nesting Brandt's Cormorants deters murres from recruiting to the rock (or whether or not these cormorants can be attracted to breed at this site), whether or not sea lions can access potential murre breeding habitat, and whether or not habitat alterations are needed and implemented. These factors and concerns need further consideration before implementation. However, given the amount of habitat that appears to be available, we roughly estimate that Sea Lion Rock could potentially support 250 to 1000 breeding pairs of murres.

Prior to implementation of this potential restoration project, more information is needed: 1) an on-site visit is needed to assess potential murre breeding habitats and refine social attraction techniques; and 2) a study of sea lion use of the rock to determine if sea lions inhabit potential murre breeding habitats and if on-island restoration actions can be conducted without significant impacts to sea lions.

Whaler Island Restoration (Crescent City Harbor)
Reestablish Whaler Island as a seabird colony

Brief Colony History
Whaler Island has been a well known locale within the Crescent City coastal area since at least 1875 (United States Coast Survey – Plate No. 16, 1875) (Figure 3). Although early naturalists noted thousands of nesting Leach's and Fork-tailed Storm-petrels (*Oceanodroma leucorhoa* and *O. furcata*), only one record documented murres breeding on this island. The record consists of the collection of one murre egg by F.J. Smith on 23 June 1928 (BMVZ No. 13,290; Carter et al. 2001). This island may have had a larger murre colony at some point prior to 1916 when naturalists first documented other breeding seabirds but egg collection for human consumption and boat activity near Crescent City could have extirpated murres from this site soon after this city was founded in 1854 (Smith 1989; also see Carter et al. 2001). Alternatively, the single egg record may not have indicated regular breeding and instead reflected an unusual event (e.g. egg dumping by an adult female).

During the late 19th and early 20th centuries, construction of breakwaters began in order to establish a protected harbor at Crescent City (United States Coast Survey – Plate No. 16, 1875). By 1930, at least 3 breakwaters had been constructed within the Crescent City area to form a protected harbor. Proposals to build a breakwater that extended from the mainland to Whaler Island had been developed prior to 1916 (Anonymous c1916) but it wasn't until 1939 that a small sandy breakwater was constructed (Crescent City Harbor Chart, Plate No. 20, 1939) (Figure 4). In that same year, C.I. Clay visited Whaler Island on 11 June 1939 after the breakwater was completed and "walked ½ mile out to sea on new revetment to Whaler Island…" (Osborne 1972:91). Beginning about 1945, Whaler Island was quarried in order to extend the breakwater off the north/northwest side of the island and re-enforce the sand-based breakwater that extended to the east/northeast to the mainland. Between 1924 and 1949 several nearshore rocks, including Whaler Island, were quarried or "removed" in order to construct the breakwaters which now form the Crescent City Harbor (Del Norte County Historical Society Bulletin 1970). These included: Hall Bluff (1922-1924); Preston Island (1924-1948); Whaler Island (1945 or 1946-1950s); Sunken rock located along shoreline north of Castle Rock (1949) and "Sugar Loaf" rock located north of Castle Rock and near the site of the *Queen Christina* wreck (1949). Although Osborne (1972) reports that the Army Corps of Engineers quarried the island in the early 1950s in order to strengthen the breakwater, the quarrying actually began in either 1945 or 1946 (Del Norte County Historical Society – Crescent City Harbor files photographic records). It is unclear when the last quarrying of the island took place. However, over the years, the breakwater connecting Whaler Island to the mainland has been widened and reinforced substantially (see below).

Howell (1920) stated that the island was about 2.4 hectares (6 acres), although Osborne (1972) described it as only about 1.6 hectares (4 acres). Based on a 1911 map (Anonymous c1916), H.R. Carter estimated that the basal dimensions of the rock were about 130 m by 200 m and that the rock was located about 550 m from shore (Appendix 1). Using historic charts, we suggest that the island was about 2.8 hectares (7 acres) based on rough measurements taken on-site and from aerial photographs (M. Parker, pers. obs.). Approximately 1.6 hectares (4 acres) was leveled, paved and developed. This is the area where the breakwaters, one that extends northeast and the other extends northwest, connect at Whaler Island. Approximately 1.2 hectares (3 acres) of the original island remains but appears partially quarried. Today, the breakwater that extends from the mainland to the historic Whaler Island is the southern barrier creating and protecting the Crescent City Harbor. The breakwater is over 50 m wide and is used regularly by vehicles. There is a public boat launch and several buildings placed on it, including a U.S. Coast Guard (USCG) duty station (Figure 5). No recent history was available from the Del Norte County Historical Society or the Crescent City Harbor Master detailing more recent development of the breakwater.

During his visit to Whaler Island on 18 July 1969, Osborne (1972) did not find any crevice-breeding seabirds (i.e., storm-petrels, auklets, or Pigeon Guillemots [*Cepphus columba*]). However, Osborne (1972) did note holes in the ground which he attributed to "Rattus sp." On 20 June 1980, Sowls et al. (1980; unpubl. field notes) visited Crescent City harbor area but detailed field notes were not found for this visit to identify if any breeding birds were specifically at Whaler Island itself. In 1989, 8-12 Pigeon Guillemots were noted on the water off Whaler Island on 24 April, 28 April and 22 May but no nest sites were found; two Black Oystercatchers (*Haemotopus bachmani*) also were noted but no nest found on 28 April (Carter et al. 1992; unpubl. data). On 9 July 2010, M. Parker made a field visit to Whaler Island between 14:45 and 17:00 hours. He did not find any actively breeding seabirds on the island but did find a broken/depredated Western Gull egg on the northern end of the island. It is unclear if this egg was from the island or brought to the island by an avian predator or by some other means. No other signs of gull nesting were found on the island. Four Pigeon Guillemots were noted on the water around the "island" but none were observed flying up to the island that would more

strongly indicate breeding. Several Pelagic Cormorants and one murre were observed foraging in the water adjacent to Whaler Island. Pelagic Cormorants were observed flying up to the rock but the cliff face was on the west-northwest portion of Whaler Island and was out of view.

California ground squirrels (S*permophilus beecheyi*) occur on the remnant portion of the island (M. Parker, pers. obs.). The presence of California ground squirrels raises some questions as to whether the burrows that Osborne documented on the island in 1969 belonged to "*Rattus* sp." or ground squirrels. Perhaps both rats and ground squirrels inhabit this area. Regardless, both are known egg predators and would require removal prior to seabird restoration efforts.

Whaler Island is visited frequently by many people (evidenced by much garbage) and has numerous hiking trails throughout the island. Over 20 people were observed hiking on the remnant island during 2.25 hours of observation on 9 July 2010 (M. Parker, pers. obs.). Dogs and cats were not observed on the island but this area likely provides a location for dog walking and feral cats could be using the area.

Restoration Considerations
Restoration of murres to Whaler Island would require: 1) removal of all mammalian predators, 2) a method to preclude predators from re-occupying the island; 3) closure to public access; 4) use of social attraction techniques to attract murres to the outer exposed part of the island and 5) prevent human disturbance via a boat closure zone on the outer exposed part of the island where social attraction efforts would be conducted. To prevent access from the mainland, construction of a strong fence-type barrier or excavation of a channel between the breakwater and the island would be necessary.

Potential Benefits
By recolonizing a small portion of the historic Whaler Island and with subsequent colony growth, a murre colony of hundreds to perhaps thousands of murres could breed there which would: 1) reintroduce murres to a site where they were likely extirpated by anthropogenic factors; and 2) expand the size of the northern California population and help restore numbers of murres lost by the *Stuyvesant* and *Kure* oil spills. The close proximity of the very large Castle Rock and False Klamath Rock colonies to Whaler Island may reduce the amount of time necessary for recolonization to occur with social attraction because of a large number of potential recruits.

Public viewing and education would complement restoration work and provide added value to the public, as noted under the Sea Lion Rock potential project. In particular, the proximity of the site to Crescent City would provide a great opportunity to conduct an outreach and education program in Del Norte County in conjunction with this restoration project.

Potential Concerns
Several major concerns would require significant negotiations to find solutions acceptable to all interested parties and permitting agencies, including: 1) construction of a channel and/or a predator-proof barrier between the main breakwaters and the island; 2) loss of public access to the island; 3) boat closure zone around part of the island close to the Crescent City Harbor entrance; 4) high cost for removal of mammalian predators and maintenance of a mammalian predator-free island and 5) high cost of implementing a murre restoration project given the limited knowledge of a historic colony, the long absence of murres and the current degraded natural state of Whaler Island. The longer murres have been absent from a colony the longer it may take for restoration utilizing social attraction to be successful (S. Kress, pers. comm.). Given the length of time murres have been absent from Whaler Island, it should be anticipated that a social attraction project at Whaler Island would take many years to initiate breeding and recruit enough birds to establish a self-sustaining colony. However, the close proximity of Whaler Island to the large murre colonies at Castle and False Klamath rocks may assist in reducing the amount of time necessary for recolonization to occur.

Potential for Success
Whaler Island does not appear to be a prudent location to attempt murre restoration. Although biologically feasible, we believe the project has a low likelihood of success given the social, financial and environmental constraints that would exist, based on the following: 1) removal of breakwater connections was not supported by the Crescent City Harbor Master (R. Young, pers. comm.) who felt that such a project would not be supported by the Crescent City community given the long history of seeking funding to construct breakwaters to protect the harbor and the financial importance of the harbor to Crescent City; 2) the location of Whaler Island in relation to the mouth of Crescent City Harbor makes any murre restoration project highly susceptible to boat disturbance. A boat closure zone at the entrance to the harbor could be controversial; 3) predator removal and barrier construction would require public review and permits from the California Coastal Commission, U.S. Army Corps of Engineers as well as other environmental documentation (e.g. NEPA, CEQA). These activities would incur a substantial time and financial investment and may be cost-prohibitive based on available funds; 4) barriers and predator control/removal would likely require long-term maintenance commitments; and 5) historic information regarding murres breeding on the island is based on one record from 1924.

Cape Vizcaino Area seabird colonies Acquisition and Management

Brief Colony History
The Vizcaino Colony Complex is comprised of two adjacent seabird colonies, Rockport Rocks and Cape Vizcaino (Carter et al. 2001), that extend over 1.5 km of coastline at Rockport Bay and the mouth of Cottaneva Creek (Figures 6 and 7). In 2010, the nearest active murre colonies to the Vizcaino Colony Complex were Steamboat Rock (90 km to the north) and Goat Island Area (47 km to the south). The rocks just off Cape Vizcaino are owned and managed by BLM as part of the CCNM. Land within the Rockport Rocks colony is owned by two separate timber companies. The parcel containing two nearshore rocks is owned by Mendocino Redwood Company (MRC; Ukiah, California). The mainland point just north of the rocks is sub-divided into two parcels, one is owned by MRC and the other by Soper Wheeler Company (SWC; Strawberry Valley, California).

Murres probably bred widely along the Mendocino coast prior to European contact and settlement but documentation is limited to some murre eggs said to have been collected along the Mendocino coast and bought in the San Francisco market in 1900 (Carter et al. 2001). Sowls et al. (1980) first reported breeding at Cape Vizcaino in 1980 (Sowls et al. 1980). Carter et al. (1992) then first reported breeding at Rockport Rocks in 1989. Breeding was not documented at Cape Vizcaino or Rockport Rocks in 1969-70 (Osborne and Reynolds 1971), although the survey date was so late that breeding may have been missed (Carter et al. 2001). By re-examination of unpublished field notes of Sowls et al. (1980), Carter et al. (2001:109) noted that 1,261 murres had also been first noted at Cape Vizcaino on 2 August 1979, although some fledging had probably already occurred.

Rockport Rocks were utilized as a log loading wharf prior to the use of trucks for transporting logs and lumber. The Mendocino coastline has no large natural harbors and various wharfs and chutes were built for loading logs and lumber onto ships from coastal bluffs and creek mouths (Carter et al. 2001). Often the ocean end of the chute or pier was anchored to small nearshore rocks located close to shore (Sullenberger 1980, Hendrickson 1994). At Rockport, near the mouth of Cottaneva Creek, a wharf and bridge were constructed. At this location, the first suspension bridge on the west coast was constructed in 1875 in order to use the rocks as a loading wharf. The bridge extended over 92 m (275 feet) of ocean onto several nearshore rocks.

The most substantial construction occurred on the rock identified by Carter et al. (1992) as Subcolony 02 of Rockport Rocks; however other rocks were also used (see MRC webpage for pictures and a detailed history of the mills operated at Rockport http://www.mrc.com/history_project/stories/rockport.htm). Some of the rocks were cut down to form flat surfaces for constructing the bridge and wharf where lumber was also stored. Various structures on the rocks also were used to load boats. This log loading wharf operated in one form or another until 1940 when the switch was made to hauling lumber by truck. Shortly thereafter in 1942, the mill also burned and was not rebuilt. Rockport Rocks still have remnants from the ship-loading era including large chains, cables, cement piling foundations, and metal rails (Figure 8).

Murres and most other breeding seabirds (except possibly a few Western Gulls) would not have used these rocks during the period that the wharf operated. Given the size and location of these rocks and current use by murres, murres likely bred on them prior to wharf construction and operation. However, the beach at the mouth of Cotteneva Creek also was used by the Coast Yuki people and the rocks may have been visited periodically for food gathering. We assume murres bred at this site prior to the alteration of the rocks, and that breeding habitats were impacted by wharf construction and then operation. Most likely, the colony was prevented at this location from 1876 to 1940 (about 64 years) and Rockport Rocks likely remained unoccupied until sometime between 1980 and 1989. While murres were not physically prevented from breeding at nearby Cape Vizcaino, this colony likely was also extirpated near 1875 due to human disturbance from the lumber operations in Rockport Bay and egg collection for human consumption. Loss of all murre breeding colonies may have occurred throughout the Mendocino coast in the late 19th and early 20th centuries (Carter et al. 2001).

Estimates of population size for all murre colonies in Mendocino County were approximately 7,600 breeding birds in 1989 (Carter et al. 1992) and averaged 17,640 breeding birds from 2000 to 2004 (from raw counts in Capitolo et al. 2006, adjusted with a correction factor of 1.50; see Nur and Sydeman 2002). The Vizcaino Colony Complex comprised 99% (6,188 breeding birds at Cape Vizcaino; 1,378 breeding birds at Rockport Rocks) of the Mendocino County population in 1989. Between 2000 and 2004, this colony complex averaged 76% (14,006 breeding birds) of the Mendocino County population. In 2004, the last year that all colonies in Mendocino County were counted, Rockport Rocks and Cape Vizcaino comprised 14% (3,340 breeding birds) and 61% (14,646 breeding birds) of the Mendocino County population, respectively.

Current Status of Murres and Brandt's Cormorants at Vizcaino Colony Complex

Methods

We summarized counts of breeding seabirds at the Vizcaino Colony Complex. Data were from aerial photographic surveys of northern and central California seabird colonies that have been conducted almost annually since 1979 (Carter et al. 1992, 2001; Capitolo et al. 2006; USFWS unpubl. data). Although photographed, count data were unavailable for recent years (2005-2010). Thus, counts were obtained from uncounted aerial photographs taken during annual surveys conducted in 2005-2010 (USFWS unpubl. data). Counts were conducted on a computer using *Image Pro* Image Processing and Analysis Software (MediaCybernetics, Inc., Bethesda, MD) which allowed the user to zoom in and out, crop images and tag items (e.g. murres) for automatically counting "tagged" items. The images with "tag" totals were then archived at the San Francisco Bay National Wildlife Refuge Complex.

The counting of seabirds from aerial photographs followed standard protocols (see Capitolo et al. 2006 for most recent summary). Totals were determined for each subcolony (following Carter et al. 1992, 1996) at colonies where birds nested on more than one rock. Estimates of breeding population sizes were calculated by multiplying total number of birds counted by a correction

factor of 1.50 (Nur and Sydeman 2002; USFWS unpubl. data). Calculating breeding population size estimates provides a closer approximation of the number of birds using a colony than simply using raw-count totals that do not account for birds away from the colony during the survey (e.g. foraging; Birkhead and Nettleship 1980, Nur and Sydeman 2002).

Murres do not build a nest and only bird counts were determined. For cormorants, nests, territorial sites, and birds were counted. Nest totals reported for cormorants include both well-built nests and poorly-built nests. No nests with chicks, abandoned nests or empty nests were observed between 2005 and 2010. Bird counts were categorized as being within nesting or roosting areas. Western Gulls were categorized as well-built nests, territorial sites or standing birds. All Western Gulls that occurred in images used for counting murres and cormorants were counted; however, this may not include all Western Gulls that were on the colony. This is especially true for Cape Vizcaino subcolony 06 and Rockport Rocks subcolony 02 where incomplete coverage of Western Gull nesting areas occurred in some years. We did not attempt to estimate numbers of Western Gulls from overview photographs if incomplete coverage occurred. All roosting Brown Pelicans (*Pelecanus occidentalis*) present in photographs were also counted. Pelicans were aged as adults or immatures. We report on raw counts of murres and Brandt's Cormorant nests. Comparisons of murre breeding population estimates and Brandt's Cormorant nest totals are made with data from Carter et al. (1992) for 1989 and Capitolo et al. (2006) for 1996 through 2004. All data for each subcolony and each species counted is provided in Appendix 3. These data have been archived with the USFWS-SFBNWRC.

Results

Common Murre

Cape Vizcaino

This is the largest murre colony in Mendocino County. Murre numbers at Cape Vizcaino were relatively stable from 2005 through 2010 with a mean estimate of 13,726 breeding birds (Table 1). Over this time period approximately 78% of murres counted in the Vizcaino Colony Complex were at the Cape Vizcaino colony. Since 1996, counts of murres at Cape Vizcaino have increased substantially. Mean counts were 6,518 breeding birds in 1996-1999 and 11,072 breeding birds in 2000-2004 (Figure 9). This represents a 111% increase from the 1996-2004 mean to the 2005-2010 mean. Since 1996, counts of murres have never declined two years in a row.

For each year 1996 to 2010, murres were counted on 4 different subcolonies; all were on nearshore rocks that are included in the CCNM (Appendix 3). Subcolony 06 was the only subcolony that was attended every year and the only subcolony with murres in the 1996-1999, 2009 and 2010 surveys (Figure 10). Subcolony 10 had murres in 3 years (2006-2008), Subcolony 11 had murres in 6 years (2000, 2001, 2004-2007) and Subcolony 12 had murres in 4 years (2000, 2001, 2006, 2008). Even when additional subcolonies were occupied by murres at Cape Vizcaino from 1996 to 2010, 98.7% of all murres counted were on Subcolony 06.

Rockport Rocks

Between 2005 and 2010, murre numbers at Rockport Rocks fluctuated annually with a low count of 2,342 breeding birds in 2007 and a peak count of 7,130 breeding birds in 2008 (Table 1). The mean over this six-year period was 4,060 breeding birds. Mean counts were 1,692 breeding birds in 1996-1999 and 2,262 breeding birds in 2000-2004. This represents a 102% increase from the 1996-2004 mean of 2,008 breeding birds to the 2005-2010 mean (Figure 9). Despite this increase, counts of murres were lower by over 1,650 breeding birds each year for

the past 2 years. This marks the first time that counts of murres have been lower two years in a row at Rockport Rocks since 1989.

Murres were counted at 3 different subcolonies between 1999 and 2010: the mainland Subcolony 02 (comprised of two separately owned parcels); and nearshore rocks Subcolonies 03 and 04 (owned by MRC; Appendix 3). Subcolony 04 was the only subcolony attended by murres in all years and 95-100% of murres counted at the Rockport Rocks occurred on Subcolony 04, except in 2008 (Figure 11). In 2008, 12% (878 breeding birds), 9% (670 breeding birds) and 78% (5,582 breeding birds) of murres occurred on subcolonies 02, 03, and 04, respectively. Prior to 2008, four murres were recorded on Subcolony 02 in 2006 and two murres were recorded on Subcolony 03 in 1999 and 2007 (Carter et al. 1992; Capitolo et al. 2006; USFWS unpubl. data).

Brandt's Cormorant

Cape Vizcaino
This is one of the largest Brandt's Cormorant colonies in Mendocino County. Nest numbers fluctuated from 2005 through 2010 with a mean of 388 nests (range = 125-828; Table 2). This represents a 33% decrease from 1996-2004 mean of 577 nests (range = 216-931; Figure 12; Appendix 3). Between 2005 and 2010, 73% of all nests counted at the Vizcaino Colony Complex were at the Cape Vizcaino colony. In this same time period, Brandt's Cormorant nests were counted on 4 different subcolonies. Subcolony 06 was the only rock with Brandt's Cormorants nesting on it every year (Appendix 3).

Rockport Rocks
In 2005-2010, the number of Brandt's Cormorant nests fluctuated between a low of 50 nests in 2010 to a high count of 301 nests in 2008 (Table 2). The mean over this six-year period was 147 nests. This represents a 91% increase over the 1996-2004 mean of 77 nests (Figure 10). Between 2005 and 2010, Brandt's Cormorant nests were counted on 3 subcolonies (Appendix 3). However, Subcolony 04 was the only rock attended each year. At least some of the Vizcaino Colony Complex cormorants likely shift nesting sites in certain years between Cape Vizcaino, Rockport Rocks, and possibly other nearby colonies; however it is unclear what influences shifts from one (sub)colony to another (e.g., prey availability, human disturbances, parasites).

Restoration Considerations
STC (2007) identified acquisition and management as the restoration option for the Vizcaino Colony Complex. We considered acquisition and management for the privately owned Rockport Rocks and adjacent peninsula area because: 1) ownership of Cape Vizcaino rocks was recently clarified and these rocks are owned and managed by the BLM as part of the CCNM; and 2) Save-the-Redwoods League recently purchased coastal mainland property just south of Cape Vizcaino for conservation purposes. In order to understand restoration options for the Rockport Rocks and Cape Vizcaino colonies, ownership of each subcolony needs to be clearly understood.

The Rockport Rocks seabird colony (USFWS Colony Number 379-001) was described by Carter et al. (1992) as having 4 subcolonies, including two mainland peninsulas (subcolonies 01 and 02) and two nearshore rocks (Subcolonies 03 and 04). Three of these subcolonies (02, 03 and 04) have been attended by murres during the breeding season in recent years (see above). The Mendocino County Assessor's office identifies the two nearshore rocks owned by MRC as one parcel of land consisting of approximately 0.93 hectares (2.3 acres; Mendocino County Assessor's parcel number 013-400-08-00). Subcolony 02 is a peninsula that is connected to a mainland bluff on the southeastern side by a short and narrow (approx. 30 x 35 m) sandy and boulder-strewn beach. The peninsula is divided into two parcels with separate ownership. The

northern parcel (approximately two-thirds of the peninsula; parcel number 013-400-06-00), where murres and cormorants have bred, is owned by SWC and is part of a 270 acre parcel that extends north along the coastline. The southern portion (parcel number 013-400-09-00) is owned by MRC and is part of a 36 acre parcel that extends inland near the mouth of Cottaneva Creek. Both parcels are zoned as “timber production”. Land access of the mainland peninsula can be difficult but is easier at a low tide. The northern portion of this peninsula is surrounded by water and accessible by boat under low swell and wind conditions. In addition, the north side beach appears easily accessible by boat when swells are low.

Land Acquisition - Option A

We considered the need for and feasibility of purchasing privately owned nearshore rocks and mainland areas in the Rockport Rocks area where murres have been documented (subcolonies 02, 03, and 04). The purchase of intact land parcels (as they are currently identified by Mendocino County) is desirable because: 1) public management of mainland areas would provide for the greatest long-term protection of nearshore rocks and mainland peninsulas; 2) public ownership of mainland areas would provide an opportunity to link up with the land owned by Save-the-Redwoods League to create a larger coastal section of protected land that is adjacent to both Cape Vizcaino and Rockport Rocks; and 3) high costs of dividing parcels can be avoided. However, other land parcels (also owned by MRC but where murres have not been documented) occur between the Cottaneva Creek and Save-the-Redwoods League parcels; these parcels would need to be purchased in the future for complete protection of murre colonies within the Vizcaino Colony Complex (see Appendix 1). Purchasing parcels adjacent to Rockport Rocks would provide the best protection of all mainland and nearshore rock subcolonies where murres have been documented. In addition, public ownership may provide additional protection to other natural and cultural resources that exist on the rocks and mainland coastlines. Overall benefits to murres and other natural resources are relatively high. The largest murre colony complex in Mendocino County, with thousands of breeding murres and their reproductive output, can be protected from human disturbance and provide possible public viewing options. Through public ownership, potential future development and associated human disturbance should be reduced. Furthermore, if “hands-on” management becomes a need in this area (e.g. habitat modification and social attraction), public ownership may more readily facilitate such activity.

On 7 July 2010, M. Parker met on-site with R. Douglas, a biologist and representative for MRC. Discussions regarding the history of these rocks and the potential for them to be purchased with STC and other trustee council funding took place. Douglas stated that MRC was amenable to further discussion regarding the purchase of the two nearshore rocks (subcolonies 03 and 04) but further discussion was also needed about how selling these rocks might impact MRC operations or their use of adjacent mainland areas. However, MRC had no desire to sell the parcel or any portion thereof that includes the peninsula. Most of the concerns about selling the mainland parcels involved impacts on company access to the beach at the mouth of Cottaneva Creek which is used periodically by company employees. Parker also contacted P. Violett of the SWC by telephone. Violett indicated that SWC was not interested in selling any portion of their land in this area mainly because: 1) the potential for increased public access which might increase disturbance to seabird colonies; 2) the lack of a need to protect these colonies since the timber company has no plans for timber harvest in the area anytime in the future; and 3) the difficulty in splitting parcels along the coast that are zoned for “timber production” (i.e., sale and split of the parcel would require at a minimum approval of Mendocino County and the California Coastal Commission as well as written timber management plans for the split parcels). Parker also discussed the potential for purchasing conservation easements that would address concerns with public access and development in order to protect this seabird colony. Neither MRC nor SWC were interested in the concept of conservation easements at this time. However,

both Douglas and Violett said that they would be willing to work with any agency personnel concerned with the protection and management of the seabird colonies in this area.

Land Protection via Acquisition – Option B
We also considered the need, feasibility, and potential management considerations for purchasing only the two nearshore rocks owned by the MRC.

Purchasing these two nearshore rocks would provide protection for: 1) the only subcolony at Rockport Rocks with consistent annual attendance and use by murres (i.e., subcolony 04); and 2) additional habitat that may be colonized in the future (subcolony 03). This purchase would secure the last privately owned land currently supporting breeding murres in northern California. The counts of murres at these two rocks has been lower during the past two years and should be closely monitored to determine if the colony is declining and what factors may be responsible.

We did attempt to obtain "rough" estimates of value for these rocks but the appraiser we spoke with was unwilling to provide actual estimates because of the difficulty of finding comparable property that would allow for "rough" valuation. This appraiser felt that the only appropriate process was a full appraisal. Since the purchase most likely would involve federal funding, an appraisal from the Department of the Interior's Office of Valuation Services (OVS) would be required and any appraisal acquired without the approval of OVS would be unusable for negotiation purposes. It was outside the scope of this report to provide full appraisals for this property. However, the property detail report obtained from Sonoma County has a total tax assessment value of $12,172.00 for these rocks (Mendocino County Assessor's parcel number 013-400-08-00).

The management of these rocks for seabirds would best be accomplished by adding them to either the CCNM managed by BLM or to the Humboldt Bay National Wildlife Refuge Complex (HBNWRC) managed by USFWS. HBNWRC Manager E. Nelson thought that that USFWS would most likely be required to complete numerous land acquisition documents to include these rocks as part of the refuge system. This process could take from a few months up to two years, depending on the documents required to include these rocks into the refuge. He would be interested in adding seabird colonies to the refuge but felt that it might be more appropriate and efficient to incorporate the colony into the CCNM. CCNM Manager R. Hanks confirmed that BLM has identified Rockport Rocks in the CCNM Resource Management Plan as a location needing to be acquired and added to the CCNM (BLM 2005). The process for including these rocks in the CCNM would be done after the purchase of the property. We did not identify any realistic management options by State agencies for these rocks.

Considerations for future management of this colony should include: 1) long-term management of the colony; 2) removal of artificial structures and addition of suitable artificial habitats for murres; and 3) participation in federal and state agency efforts to prevent or reduce human disturbance to seabird colonies. Monitoring should be accomplished by both aerial surveys and ground-based observations. Aerial surveys would provide complete counts of the colony for comparisons to past years and monitoring of colony changes over time, including areas out of view from mainland vantage points, and should include Cape Vizcaino as well. Ground-based monitoring should include at least weekly observations to confirm breeding, document attendance patterns and investigate potential conservation issues. An estimated budget for this work is provided (Table 3).

In addition, the STC and/or the responsible management agency should investigate the need for removal of the concrete support platforms and other debris that remain from the old wharf. It is possible that some of the structures may actually aid in the establishment of a murre colony as the concrete platforms could provide vertical walls for murres to nest against (M. Parker, pers.

obs.). If placed in federal ownership the responsible agency would most likely need to comply with the National Historic Preservation Act prior to removing or modifying any of these vestiges. As such, there may need to be compelling evidence that the vestiges are inhibiting use by murres and other seabirds before beginning the process of Federal Section 106 consultation. Much of this history of Rockport has been recently collated and made available by MRC (see http://www.mrc.com/history_project/stories/rockport.htm). However, a current assessment of cultural resources still present on the rocks has not been conducted and may create additional costs for managing these rocks.

Potential Benefits

The purchase of the nearshore Rockport Rocks will protect murre breeding habitat and guarantee that it remains protected under public ownership in perpetuity. The purchase would place the last known privately owned nearshore rocks in California with a murre colony into public ownership. The public ownership of this colony could enhance management and protection of the colony by limiting public access and removing any potential development that might occur in the distant future. We anticipate that there would be support by the public for the purchase and protection of this colony.

Potential Concerns

With regard to forest management on adjacent parcels by MRC and SWC, we do not anticipate impacts to their forestry operations from the purchase of the two nearshore rocks. We assumed a buffer of trees would remain along the coast (likely including peninsulas at subcolonies 01 and 02) and that noise from timber operations would be limited near the colonies during the breeding season. Through discussion with MRC and SWC, agreements about monitoring activities on adjacent parcels likely can be obtained.

Potential for Success

The potential to successfully acquire and manage the two nearshore rocks within the Rockport Rocks colony (Option B) is high. The current landowner is willing to discuss the potential sale of Rockport Rocks. In addition, BLM should be able to add the Rockport Rocks into the CCNM. This potential restoration project would have high long-term benefits for murres.

Human Disturbance Reduction Program
Del Norte and Humboldt Counties

Brief History of Recent Human Disturbance Reduction Programs in California

Human disturbance has been shown to negatively impact colonial nesting waterbirds, including seabirds (Carney and Sydeman 1999). Until about 1992, efforts to reduce human-caused disturbance events at seabird colonies in California were limited to land acquisition (e.g. national wildlife refuges, national parks, national monuments, national marine sanctuaries, state parks, etc.), associated protective actions, and species listed under the Endangered Species Act (Brown Pelican and Least Tern [*Sterna albifrons*] only). By 1992, almost all seabird colonies along the California coast had received some level of protection and most colonies were in public ownership. In these areas, agencies usually addressed singular instances of human-caused disturbance events (e.g. low over flights or boat close to colony causing disturbance, etc.) at the colonies they were responsible for managing often by contacting the responsible party and requesting voluntary compliance with regulations prohibiting disturbance or take. However, disturbance events at many colonies, especially those within the CCNM, went unnoticed because very few colonies were being monitored (Carter et al. 2001). Only sporadic disturbance events were recorded at these CCNM colonies (e.g., Sowls et al. 1980; Carter et al. 1992, 2001; Thibault et al. 2010).

The need to address human-caused disturbance issues at seabird colonies became more evident after daily observations of seabird colonies during the breeding season were conducted in association with the restoration projected to recolonize Common Murres to Devil's Slide Rock, beginning in 1996. For example, disturbance by low-flying aircraft and close approaching boats were identified as a factor slowing recovery of certain central California murre colonies from Point Reyes south to the Big Sur coastline (Rojek et al. 2007). In addition to disturbance noted between Point Reyes and Big Sur, regular disturbance of breeding Brandt's Cormorants by aircraft had been recorded for many years by U.S. Geological Survey personnel stationed at Point Piedras Blancas, San Luis Obispo County (B. Hatfield, unpubl. data). Carter et al. (1998) also examined seabird colony data which indicated that disturbance events likely were occurring at several Brandt's Cormorant colonies in south-central California in 1989-1995. In 1998, the need to initiate a disturbance reduction program at seabird colonies throughout the California coast was identified by federal and state trustees, with concepts and potential funding identified during various oil spill restoration planning processes (P.R. Kelly, pers. comm.).

To address the issues of disturbance at seabird colonies, efforts were initiated to educate coastal user groups, to better enforce regulations protecting seabirds and evaluate other potential regulatory measures to better protect colonies. In central California, this led to the formation in 2005 of the Seabird Colony Protection Program (SCPP), established with funding from the *T/V Command* Oil Spill Restoration Plan (*Command* Trustee Council 2004). The SCPP has continued to operate with funding from the *S.S. Jacob Luckenbach* Restoration Plan (*Luckenbach* Trustee Council 2006). Renamed the Seabird Protection Network (Network), the Command/Luckenbach central California SCPP operates mainly between Point Reyes (Marin County) and Point Sur (Monterey County).

Importantly, the Network has three major components: outreach and education; enforcement and coordinated management; and surveillance/monitoring. The outreach and education component of the Network is currently conducted by the Gulf of the Farallones National Marine Sanctuary (GFNMS). The law enforcement aspect is coordinated by GFNMS in cooperation with other agencies with seabird protection responsibilities such as USFWS, BLM, CDFG, National Park Service and others. The surveillance and monitoring component for the Network is conducted by the USFWS-SFBNWRC and it collaborators (e.g. HSU). Surveillance and monitoring data are used to identify types and levels of human disturbance and the impacts of that disturbance at central California murre colonies. This information is used to guide outreach and education efforts as well as enforcement and regulatory needs.

Currently the Network has just a central coast chapter. However, they have provided a document that provides guidelines to anyone interested in implementing a human disturbance reduction program in other areas of California (Tezak et al. 2010). BLM is now in the early phases of implementing a second chapter along the south-central California coast with funds as identified in the T*orch/Platform Irene* Oil Spill Restoration Plan (*Torch/Platform Irene* Trustee Council 2007; R. Hanks, pers. comm.).

Restoration Considerations

Human Disturbance Reduction Program

STC (2007) identified a human disturbance reduction program for Del Norte and Humboldt counties as a potential restoration project for murres (see Appendix 1 for original concept). The Stuyvesant final restoration plan identifies this type of program as helping to restore murres, other alcids (except Marbled Murrelets) and storm-petrels that were injured by the spill (STC 2007). A human disturbance reduction program would also aid other seabirds such as cormorants nesting along the northern coast of California (Figure 13).

Murres are highly susceptible to disturbances from aircraft overflights and watercraft approaching too close to colonies (Carney and Sydeman 1999; Rojek et al. 2007). When disturbed by these events, murres often flush from the colony, sometimes causing eggs to be dislodged from breeding sites or leaving eggs and/or chicks exposed to predators. One major disturbance event at a colony can greatly reduce reproductive success for an entire year. Frequent disturbance can also lead to reductions in breeding success and even colony abandonment.

The level of disturbance to murre and other seabird colonies in Humboldt and Del Norte counties has not been measured, although disturbance by USCG helicopters, fishing boats, sea kayaks, and island landings has been documented at Redding Rock, Castle Rock, False Cape Rocks, Green Rock, and possibly Flatiron Rock (Lowe 1993; Jaques and Strong 1998, 1999; Carter et al. 2001; Thibault et al. 2010). In particular, boating activities seem to be increasing in northern California over the past decade (D. Fuller, pers. comm.). The murre colony at Castle Rock National Wildlife Refuge, one of the largest in the contiguous United States, is only about 1 km from the Crescent City Airport runway and is close to the relatively busy Crescent City harbor. The large murre population at the Trinidad Colony Complex is close to the Eureka/Arcata Airport and to Trinidad Harbor. Close proximity to these sources of human activity makes these important colonies more vulnerable to human disturbance. The lack of standardized data on disturbance events reflects the lack of regular surveillance/monitoring during the seabird breeding season. For example, HSU researchers at Castle Rock National Wildlife Refuge have documented boats regularly near this colony during the breeding season (R. Golightly, pers. obs.). In just one hour of observations of Sea Lion Rock on 10 July 2010, 7 recreational fishing boats were observed within 300 m of seabird colonies located in the Trinidad Colony Complex (M. Parker, pers. obs.). These limited observations suggest that human-caused disturbances may be an issue in this region.

Resource managers from BLM and USFWS stated that a human disturbance reduction program was needed in northern California but that funding and staff to carry out such a program was lacking (R. Hanks, pers. comm., E. Nelson, pers. comm.). Both managers felt that if a program was established for several years, then long-term funding could be sought. Discussions with these land managers and HSU staff (currently conducting monitoring at Castle Rock NWR) about implementing a human disturbance reduction program resulted in several consistent viewpoints including: 1) recreational activity has increased in the past decade in northern California; 2) the Trinidad Colony Complex area, with its proximity to Trinidad Harbor, appears to be the location with the greatest increase in the number of recreational boaters; 3) the need for implementing a human disturbance reduction program is overdue; 4) funding to hire staff to lead and implement the program is needed (agencies currently do not have the funding or staff to implement at this time); 5) must be a cooperative venture; 6) the program must be dynamic and respond to disturbance issues as they arise or are anticipated; and 7) such a project would most likely result in the biggest conservation benefits for the money invested by the *Stuyvesant* Trustee Council.

The implementation of a human disturbance reduction program should take into consideration the proposal to establish Special Closures around seabird colonies in northern California under the California Marine Life Protection Act (CMLPA). The following special closures are being proposed at this time: 1) Castle Rock National Wildlife Refuge: a year-round closure of either 300’ or 500’; 2) False Klamath: year-round 300’ closure; 3) False Cape Rock: year-round 300’ closure around entire rock OR 300’ closure leaving the south/southeastern side open; 4) Sugarloaf: year-round 300’ closure; and 5) Steamboat Rock: 300’ seasonal closure March 1 – August 31. At Green and Flatiron rocks, instead of closures BLM has proposed working with Cher-ae Heights Indian Community of the Trinidad Rancheria to implement a co-management, outreach and monitoring program to provide protection of these rocks.

The benefit to murres of reducing human disturbance at seabird colonies under the CMLPA will depend on which options are ultimately selected for implementation and how these closures will be monitored and enforced. Regardless, a human disturbance reduction program implemented by the STC would still be highly beneficial because no budget has been provided to implement the CMLPA program, no monitoring is being proposed under the closures and overflights (which cause disturbance to colonies) are not being addressed by the CMLPA. Furthermore, the proposed action by BLM and Trinidad Rancheria has no allocated funding at this time and would leave the important Trinidad Colony Complex unprotected. Finally, the proposed closures and alternatives would still leave several smaller murre colonies unprotected (e.g. Blank, Pilot and White rocks).

Restoration Actions

The primary objective of this project is to protect murre breeding colonies in Humboldt and Del Norte counties from human disturbance. This should increase the reproductive success and ultimately the population size of murres. Protecting murre colonies from disturbance will have many ancillary benefits of protecting other seabirds and marine mammals from disturbances as well.

To select potential project elements and develop an approximate cost for project implementation, we utilized current colony locations in proximity (straight line distances) to the nearest airports and public harbors/boat launches to determine which colonies had the greatest potential of receiving human-caused disturbances from aircraft and watercraft (Table 4). Based on this approach, Castle Rock and the Trinidad Colony Complex (e.g., Blank, Flatiron, Green, Pilot, and White rocks) were the two murre breeding areas most likely to be impacted by overflights and boat disturbances. We believe that any human disturbance reduction program initiated in Humboldt and Del Norte counties should focus in these areas initially. In addition, due to the lengthy history of documented disturbance by USCG at Redding Rock (Thibault et al. 2010), this program should also work to eliminate unnecessary USCG disturbances during the breeding season at all colonies in Humboldt, Del Norte and possibly Mendocino counties.

Logical partners with local seabird management jurisdiction, strong interest, or expertise for this project include: USFWS – Castle Rock NWR; BLM – CCNM; Yurok Tribe; California Department of Fish and Game; HSU; and USCG. Potential implementers of this project include both USFWS-CRNWRC and BLM-CCNM. These are the agencies with land management responsibilities in the areas most likely to be impacted by human-caused disturbance events. However, other organizations could potentially implement this project. Details for project implementation would be best addressed cooperatively. However, a full-time project coordinator should be identified to oversee all aspects of implementing this program, if the STC decides to implement this restoration option.

While specific measures will be tailored to the needs at each location, project elements should include: 1) annual surveillance/monitoring during the breeding season (at minimum) at key murre colonies such as the Trinidad Colony Complex and Castle Rock to identify locations, frequency and impacts of disturbance events; 2) public outreach and education via signs, educational materials and presentations at airports, harbors/boat launches, flying and boating clubs, USCG and appropriate festivals/events; 3) placement of buoys with signs at highly-sensitive locations (as appropriate and approved by regulatory authorities) and 4) annual aerial surveys to monitor murre population sizes at Del Norte and Humboldt County colonies to evaluate broad-scale effectiveness of the human disturbance reduction program and to provide the most up-to-date data for outreach and educational materials as well as other conservation efforts (e.g. identification of important or at-risk colonies).

An estimated annual budget for the implementation of a seabird disturbance reduction program for the first five years is provided in Table 5.

Potential Benefits

This program would maintain population size and increase murre reproductive success by eliminating human-caused disturbance events at breeding colonies. In the long term, this could lead to an overall increase in the murre population size in Del Norte and Humboldt counties, greater resiliency to future impacts from oil spills and other potential human impacts. The education of both government agencies and the public will lead to a greater awareness regarding human disturbances at these and other colonies. Other project benefits include increased public awareness of potential impacts of other adverse human-seabird interactions (e.g. incidental take in fisheries, artificial lights, etc.) and collateral benefits to other seabirds and marine mammals by reducing disturbance to colonies, roost sites and haul-outs.

Potential Concerns

We believe the adverse impacts associated with this project are minimal. Restriction of watercraft around murre colonies will cause some concerns from local communities, mainly fishermen and recreational boaters. However, efforts already taking place under the CMLPA will have taken into account many concerns expressed by the public and may implement restrictions around seabird colonies in some areas. This process possibly will allow for buoys and other markers to be placed in order to assist boaters in complying with any regulations that are established. Special closures around seabird colonies not implemented during the CMLPA process may be difficult to implement unless additional data are obtained documenting the impacts to colonies. For instance, Sister Rocks was a murre breeding colony in the past (Sowls et al. 1980) but no breeding and infrequent attendance has occurred from 1989 to present (Carter et al. 2001; USFWS unpubl. data; see Appendix 1). Disturbance by boaters may be preventing breeding. Since it is not a large or current colony, it has not been considered for CMLPA protection, yet it likely needs protection from human disturbance for murres and other seabirds to breed there.

Potential for Success

The potential to successfully implement a human disturbance reduction program in Del Norte and Humboldt counties is high. Similar programs in Oregon and central California have been successful at reducing levels of human disturbance. For example, monitoring during the breeding season following implementation of a disturbance reduction program in Oregon (~152 m area closure during the breeding season) resulted in a 39% reduction in disturbance events (Reimer and Brown 1997). In addition, these programs have already developed outreach and educational materials that could be adapted for use in northern California. The adaptation of already existing professional education and outreach programs should ensure more rapid implementation of this project. The implementation of outreach and educational programs will instill in the public new knowledge and appreciation for northern California seabird colonies. Informational signs are likely to reduce human behaviors that are detrimental to nesting seabirds.

CONCLUSIONS

Brief assessments were conducted of four potential restoration projects that are being considered by the STC for implementation. Two of the potential restoration projects (Sea Lion Rock and Whaler Island) have considerable obstacles that may be cost prohibitive, untenable, or otherwise reduce the likelihood of success. In contrast, the restoration of murres at Rockport

Rocks via land acquisition and the restoration of murres via a human disturbance reduction program for Del Norte and Humboldt counties have a high likelihood to succeed.

The acquisition of Rockport Rocks would only entail the purchase of two nearshore rocks. These rocks contain the area that murres have utilized every year that surveys have been conducted since 1989. As such, public ownership will help protect this colony from possible unforeseen future human activities on this habitat. Although this project has a high likelihood of success, purchase of the rocks may fail if funds are found to be insufficient for purchase (i.e. following appraisal) or the landowner decides not to sell.

The human disturbance reduction program would likely focus on the area around Castle Rock (Del Norte County) and Trinidad Colony Complex (Humboldt County). Based on anecdotal observations, it appears that a human disturbance reduction program would benefit the murre colonies in this area. This program would help increase murre reproductive success and population sizes by reducing disturbance events at these colonies. A human disturbance reduction program must include all three components (outreach/education, law enforcement/cooperative management, and colony monitoring) described by the Seabird Protection Network in order to be fully successful. Strong support for implementing the program has been shown by local seabird colony land managers. Progress toward implementing a human disturbance reduction program in northern California could occur rapidly if funding becomes available. Finally, we believe such a program should be implemented for a minimum of 5 years in order to be successful at initiating a long-term human disturbance reduction program in this area.

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MAP 13. Section from U.S.G.S. map "Trinidad".

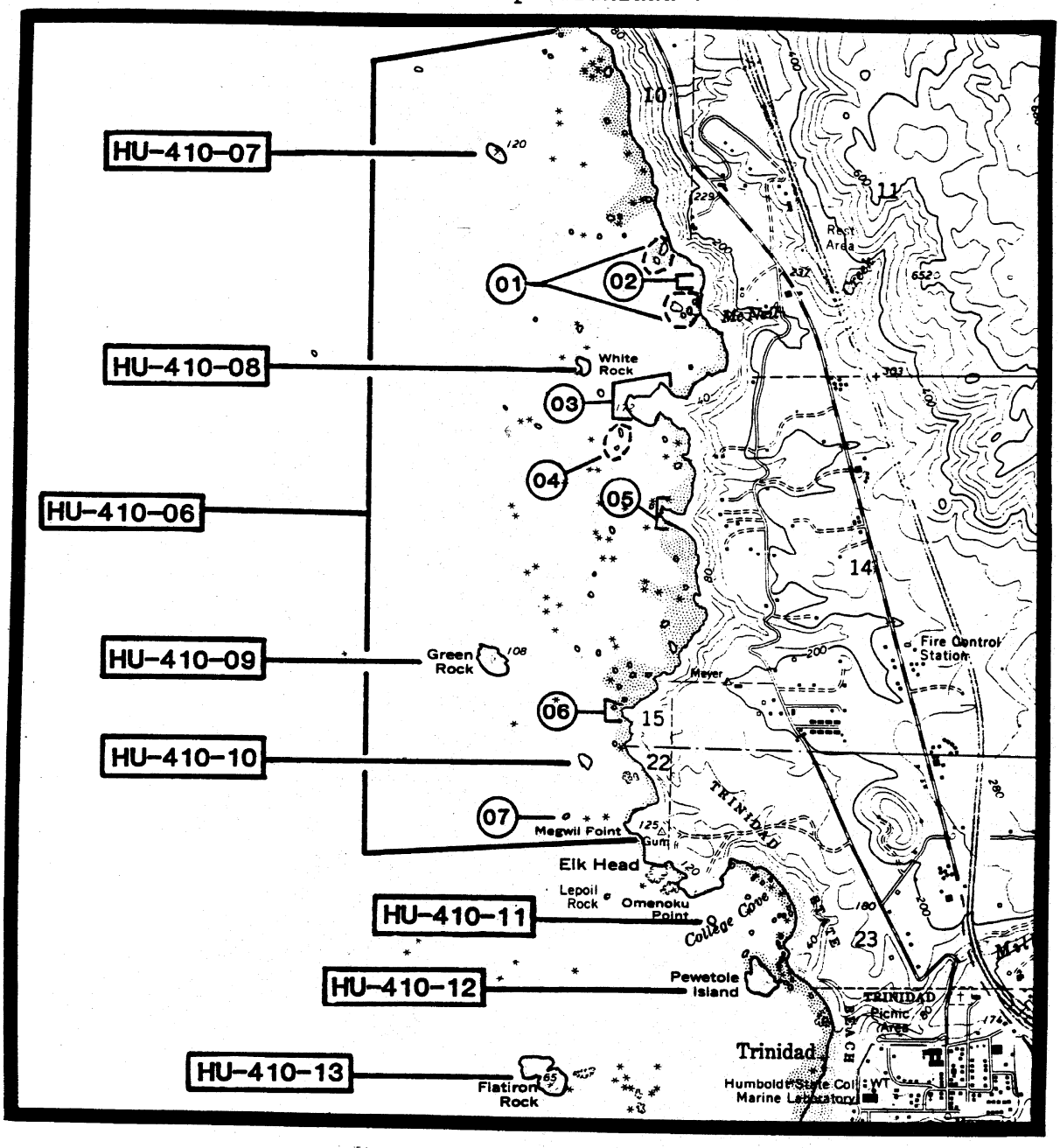

Figure 1. Map showing Sea Lion Rock (California Colony Number HU-410-07). Also includes several other colonies within the Trinidad Colony Complex. Reproduced from Carter et al. (1992).

Figure 2. Photograph of Sea Lion Rock, Humboldt County, California as viewed from the mainland on 10 July 2010. Photo by M. Parker.

MAP 4. Section from U.S.G.S. map "Sister Rocks".

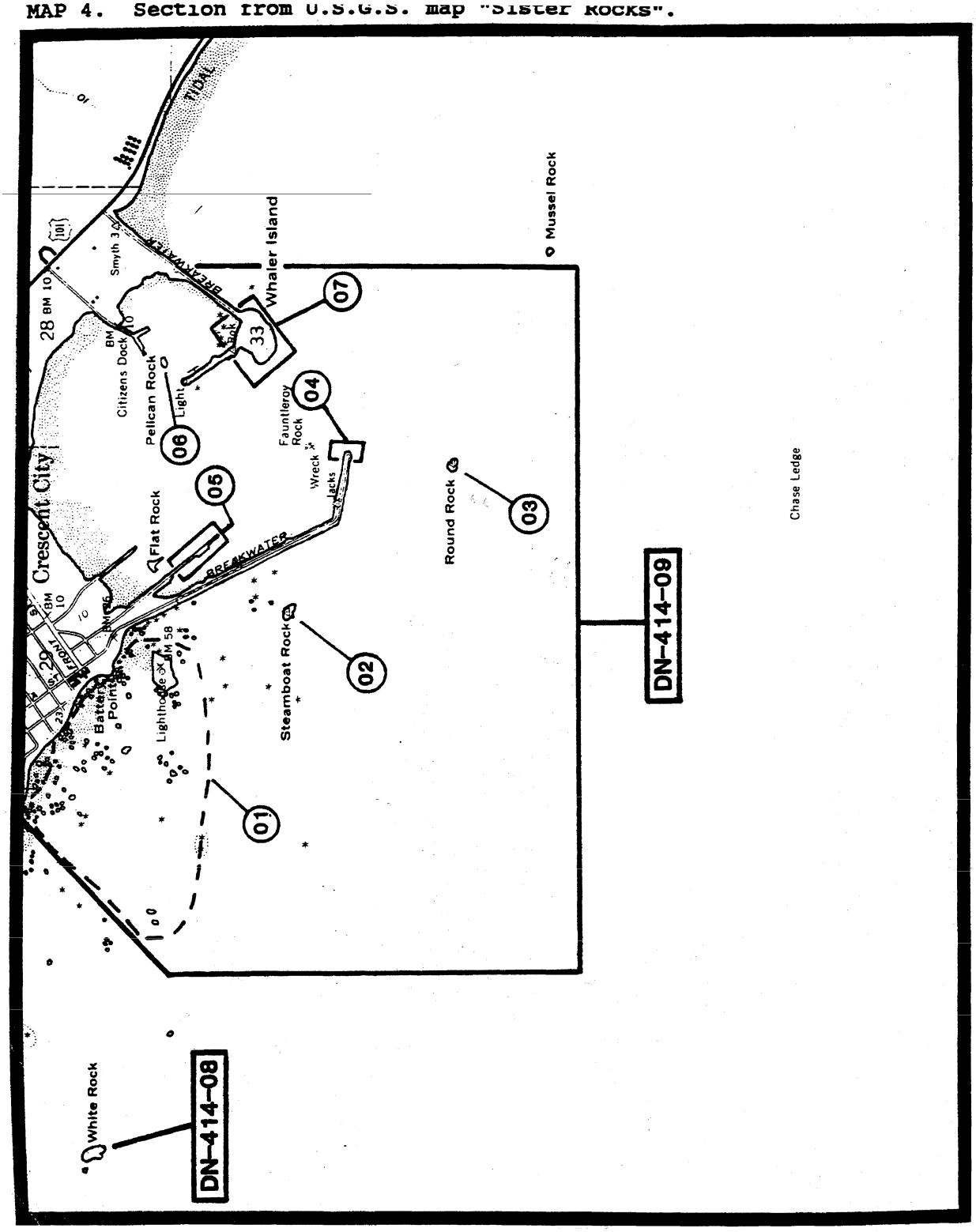

Figure 3. Map showing Whaler Island (Subcolony 07) within the seabird colony “Whaler Island, Crescent City breakwater, Steamboat Rock and Unnamed rocks” (California Colony Number DN-414-09). Circled numbers indicate subcolonies. Reproduced from Carter et al. (1992).

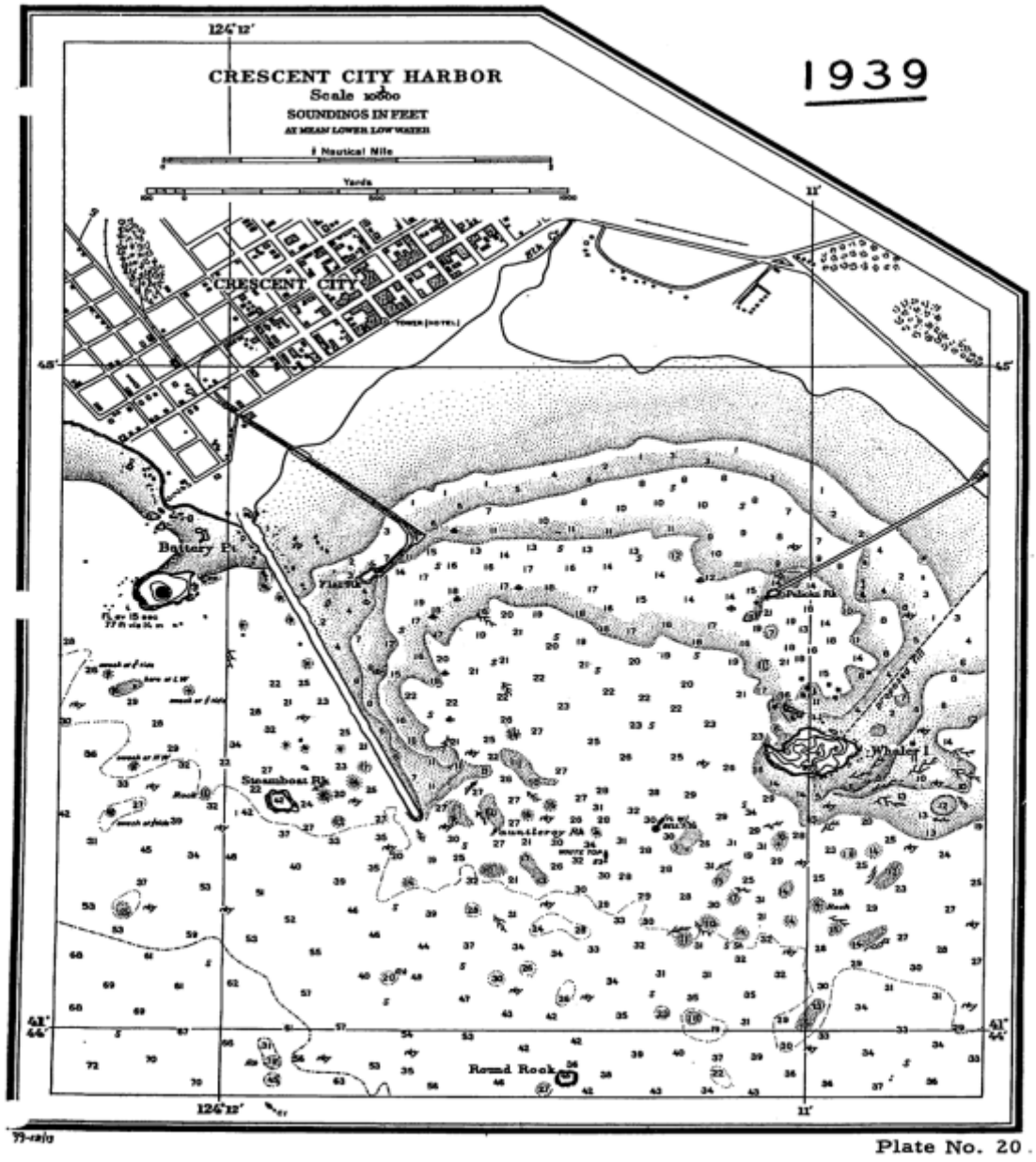

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Figure 4. Crescent City Harbor Chart from 1939 showing proposed breakwater from the mainland to Whaler Island. Based on available records, it appears the breakwater was actually constructed in 1939.

Figure 5a. Photograph from the top of Whaler Island looking east at the breakwater to the mainland of Crescent City. Notice public boat launch with large parking area in center of the photo. Wing jetties (not pictured here) occur off both sides of the island as well.

Figure 5b. Photograph taken from Whaler Island looking north/northeast into Crescent City Harbor. Note the Coast Guard duty station. The storage building in the bottom center of the picture occurs at the base of the cliffs that were created from mining the island to create the breakwaters.

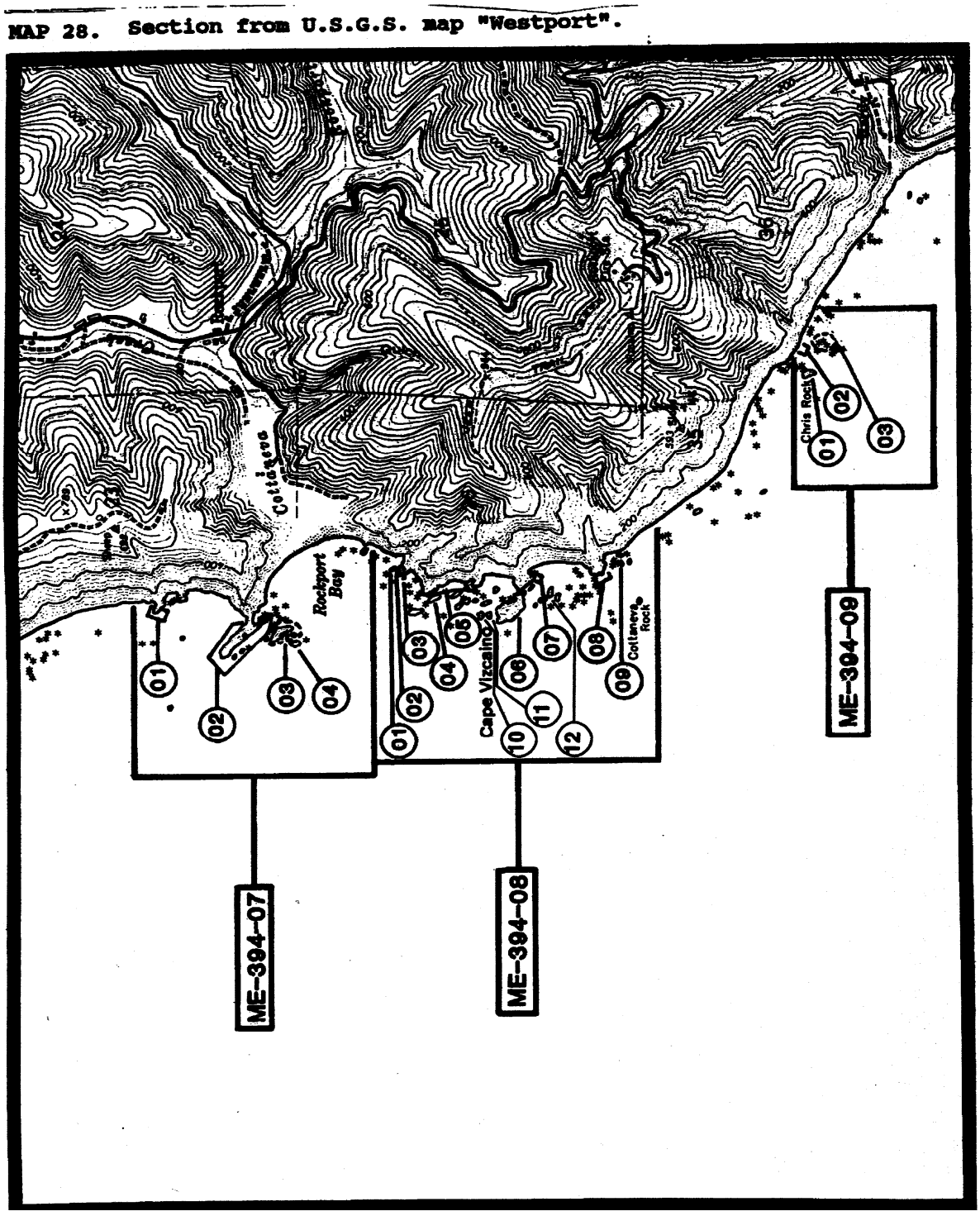

Figure 6. Map showing Rockport Rocks (California Colony Number ME-394-07) and Cape Vizcaino (California Colony Number ME-394-08). Circled numbers indicate subcolonies. Reproduced from Carter et al. (1996).

Figure 7a. Aerial photograph showing Cape Vizcaino located at the south end of Rockport Bay and the mouth of Cottaneva Creek, June 2010. USFWS file photo.

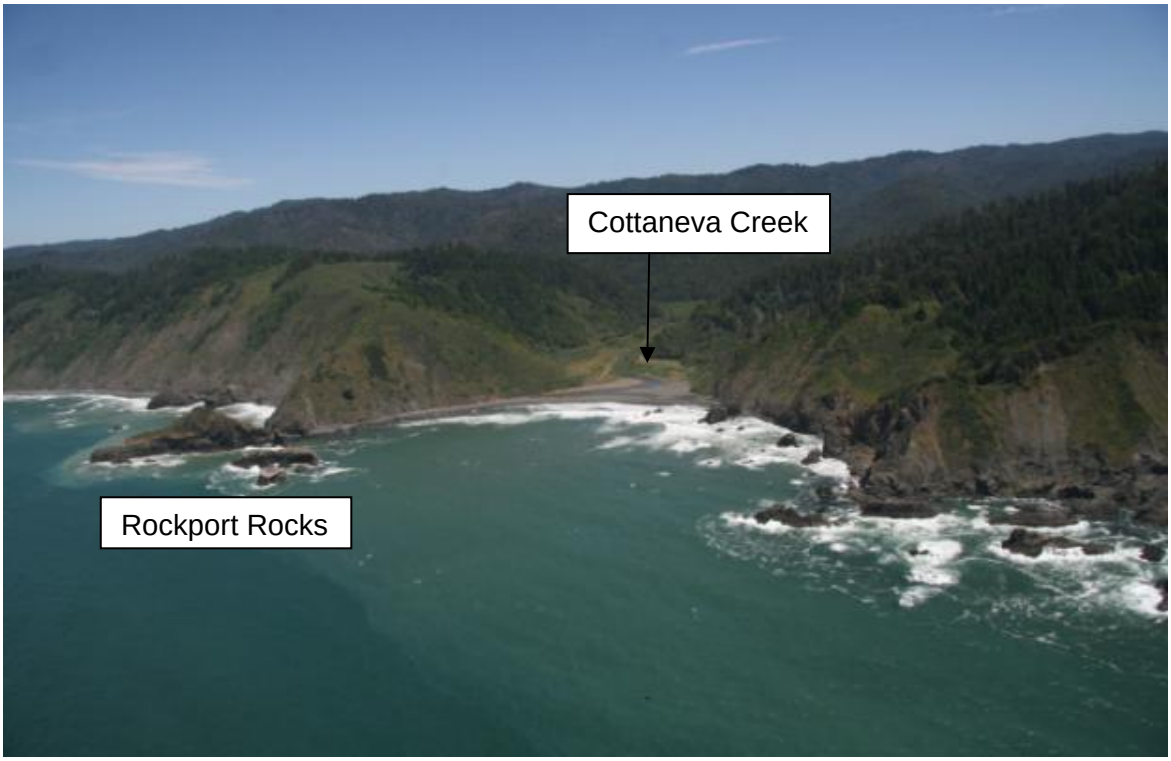

Figure 7b. Aerial photograph showing Rockport Rocks located at the north end of Rockport Bay and the mouth of Cottaneva Creek, June 2010. USFWS file photo.

Figure 8. Aerial photograph of Rockport Rocks subcolony 03, June 2010. Inspection of the photographs shows concrete structures, metal rails and metal chains remaining from logging activities when the rock was utilized to load lumber onto ships anchored in Rockport Bay. USFWS file photo.

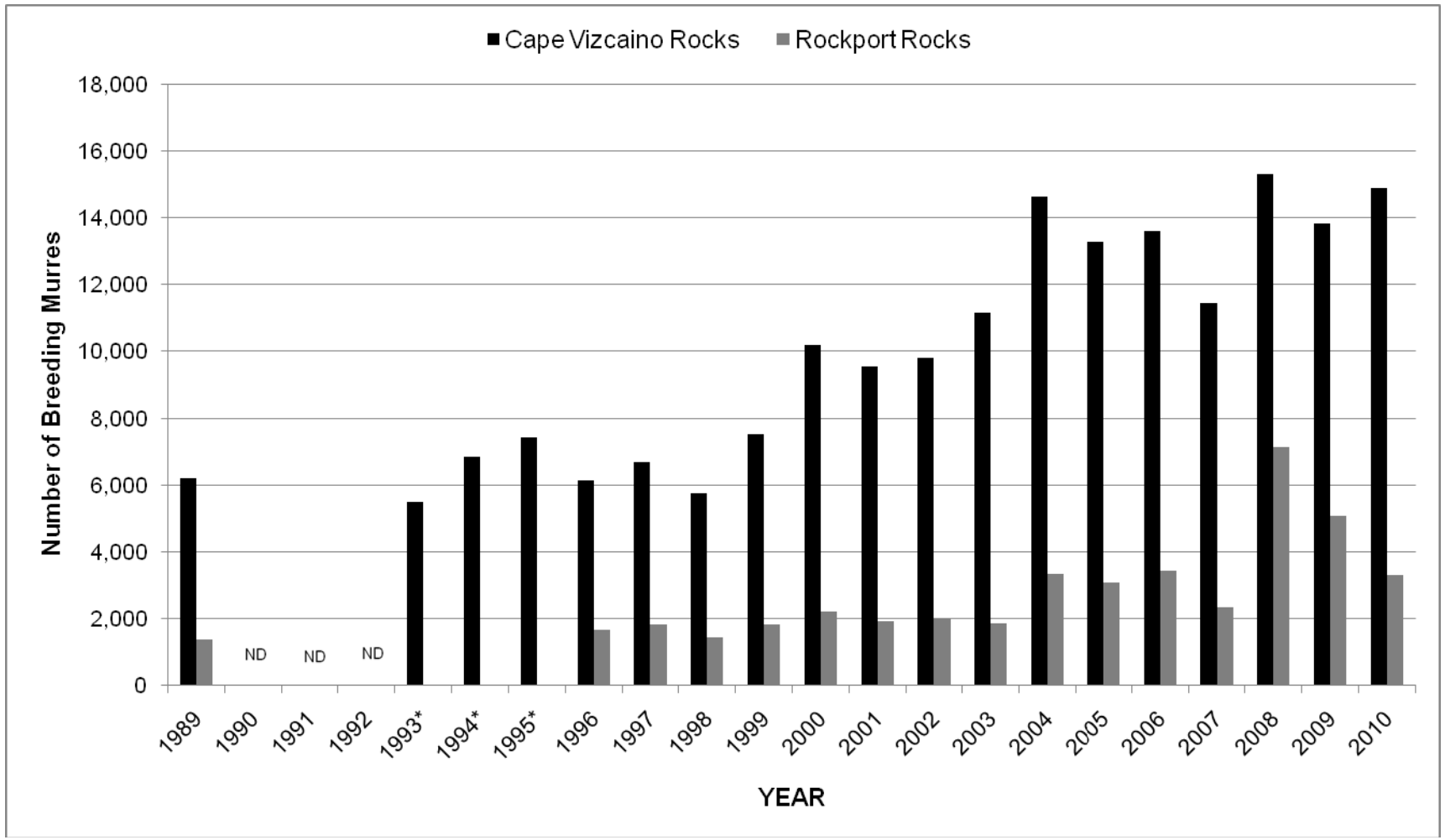

Figure 9. Breeding population estimates of Common Murres at Cape Vizcaino and Rockport Rocks, Mendocino County, California, 1989-2010, based on aerial photographic counts. 1989 data from Carter et al. (1992), 1993-1995 data from Carter et al. (2001), 1996-2004 data from Capitolo et al. (2006), and 2005-2010 data from this study. Estimates were calculated by multiplying whole-colony counts by a correction factor of 1.50. * = Data for 1993-1995 do not include Rockport Rocks as these photos have not been counted. ND = no data.

Figure 10. Aerial Photograph of Cape Vizcaino Subcolony 06, 27 May 2009, showing distribution and density of breeding seabirds (i.e., murres cormorants, gulls). Photo: 27May2009_Camera2_photo079.

Figure 11. Aerial Photograph of Rockport Rocks Subcolony 04, 27 May 2009, showing distribution and density of breeding seabirds (i.e., murres, cormorants, gulls). Photo: 27May2009_Camera2_photo114.

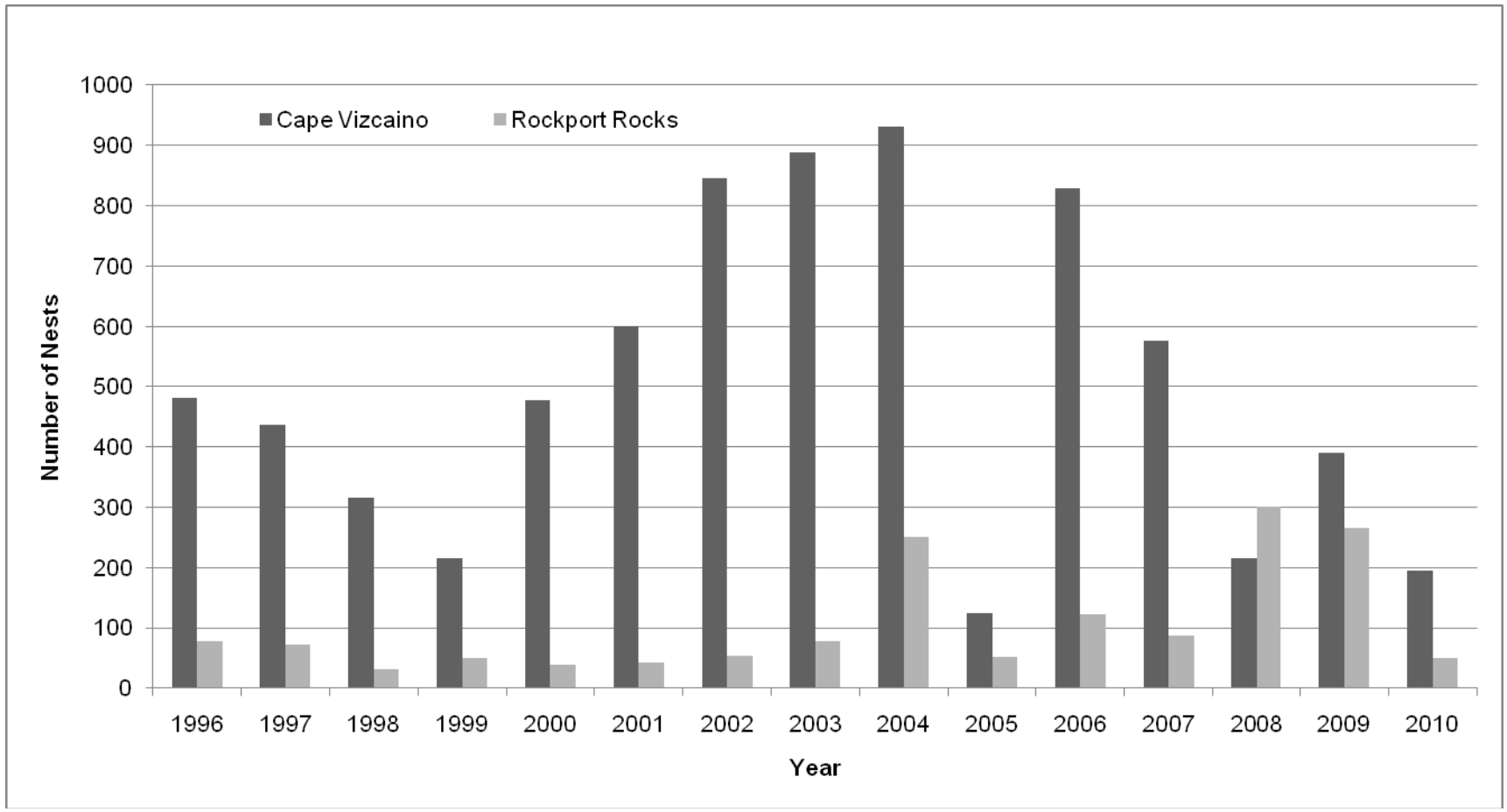

Figure 12. Total number of Brandt's Cormorant nests counted at Cape Vizcaino and Rockport Rocks, Mendocino County, California, 1996 – 2010 based on aerial photographic counts. 1996-2004 data from Capitolo et al. (2006), 2005-2010 data from this study.

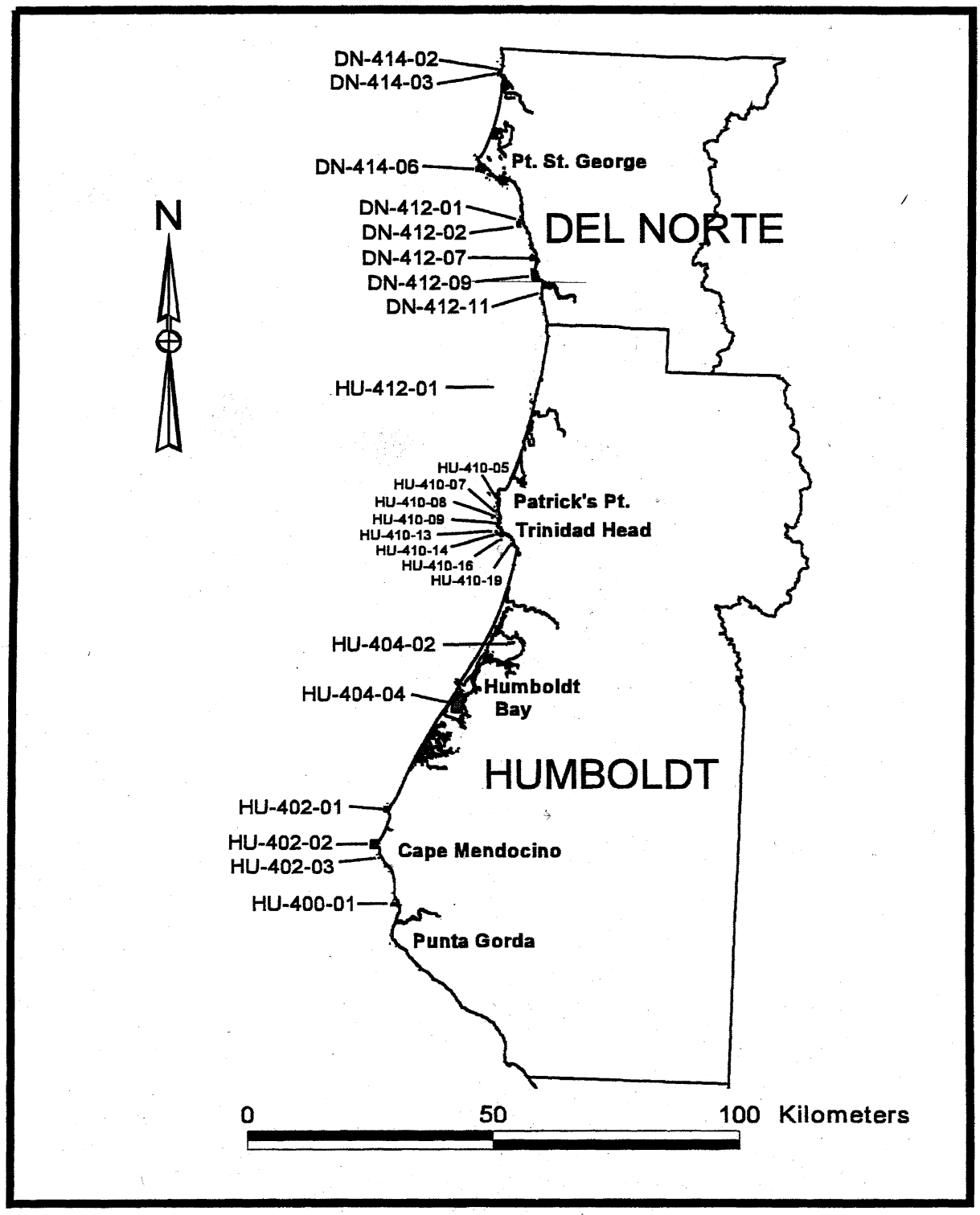

Figure 13. Map of Common Murre, Double-crested Cormorant, and Brandt's Cormorant colonies in Del Norte and Humboldt counties, California. California Colony Numbers are indicated. Reproduced from Carter et al. (1996).

Table 1. Estimates of the number of breeding Common Murres at Vizcaino Colony Complex (Rockport Rocks and Cape Vizcaino), 2005-2010. Estimates were calculated by multiplying whole-colony counts by a correction factor of 1.50.

Year	Vizcaino Colony Complex	Rockport Rocks	Cape Vizcaino
2005	16,366	3,092	13,274
2006	17,020	3,420	13,600
2007	13,782	2,342	11,440
2008	22,268	7,132	15,316
2009	18,908	5,072	13,836
2010	18,198	3,302	14,896

Table 2. Total counts of Brandt's Cormorant nests at Vizcaino Colony Complex (Rockport Rocks and Cape Vizcaino), 2005-2010.

Year	Vizcaino Colony Complex	Rockport Rocks	Cape Vizcaino
2005	177	52	125
2006	950	122	828
2007	663	87	576
2008	516	301	215
2009	655	265	390
2010	244	50	194

Table 3. Estimated budget for monitoring Common Murre colonies at Vizcaino Colony Complex in Mendocino County, California for 3 years.

SALARIES	Estimated Cost
Project Management	$15,000
Colony Monitoring/Surveillance	$60,000
Sub-total Salaries	**$75,000**
OTHER	
Field Supplies	$7,000
Office Equipment/supplies	$2,000
Administrative Support	$1,000
Aerial Photography (incl. salaries, plane and counting)	$15,000
Housing/per diem/transportation	$18,000
Sub-total Other	**$43,000**
Potential Overhead (~11%)	**$13,000**
TOTAL	**$131,000 (~$47,000/year)**

Table 4. Straight line distances from Common Murre colonies in Del Norte and Humboldt counties to nearest airports and public boat launches.

County	Colony	Distance to Airport (km)	Distance to Boat Launch (km)
Del Norte	Castle Rock	2.2	5.9
Del Norte	False Klamath Rock	13.3	17.2
Humboldt	Redding Rock	40.5	31.5
Humboldt	Trinidad Colony Complex*	1.5	10.6
Humboldt	Cape Mendocino Colony Complex*	45.3	35.1

*Colony Complex definitions are taken from Capitolo et al. 2006. We utilized a mid-point between the northern most and southern most active murre colonies within each colony complex to determine the straight line distances, as appropriate. Distance to airports was measured to the center of runways. Distance to boat launches was measured to the base of boat ramps/launches. If a colony complex had only one active murre colony in 2010 (e.g. Castle Rock), distances were determined from the one active colony.

Table 5. Estimated budget for a human-caused disturbance reduction program at murre colonies in Del Norte and Humboldt counties, California for 5 years.

SALARIES	Estimated Cost
Project Management	$240,000
Colony Monitoring/Surveillance	$195,000
Outreach/education	$160,000
Sub-total Salaries	**$595,000**
OTHER	
Field Supplies	$35,000
Office Equipment/supplies	$20,000
Office Space	$75,000
Law Enforcement Assistance	$10,000
Seabird Protection Network Assistance	$30,000
California DFG – plane	$24,000
Administrative Assistance	$50,000
Travel	$72,000
Vehicles (6 GSA; 5 for 6 months; 1 for 1-yr)	$150,000
Publications/ Printing	$30,000
Sub-total Other	**$496,000**
Potential Overhead (~11%)	**$120,000**
TOTAL	**$1,211,000 (~$242,000 per year)**

Appendix 1. Common Murre Restoration Concepts in Northern California, 1999-2002

In this appendix, five restoration concepts for Common Murres (*Uria aalge*) in Northern California are presented for long-term reference. These concepts were prepared under contract by Carter Biological Consulting (CBC) for California Department of Fish and Game – Office of Spill Prevention and Response (CDFG-OSPR) in 1999-2002, with assistance from P.R. Kelly (CDFG-OSPR), K. Verrue-Slater (CDFG-OSPR) and M. Hachenbracht (California Attorney General's Office). These concepts were prepared to form a starting point for further consideration and modification. They do not reflect later assessments of benefits to seabirds and estimated costs determined by CDFG-OSPR and other agencies. L. Henkel (CDFG-OSPR) approved the release of these documents for this appendix.

A. Acquisition, protection, and management of Cape Vizcaino Area seabird colonies (prepared June 1999)

Introduction

In California, almost all rocks and islands used for nesting areas by seabirds are managed by state and federal agencies. In Northern California, only one large seabird colony complex is currently not located on public lands: Cape Vizcaino and Rockport Rocks (herein referred to as ACape Vizcaino Area@) on the coast of northern Mendocino County. Between Cape Mendocino and Point Reyes (i.e., one fifth of the California coastline), the Cape Vizcaino Area (CVA) represents the largest seabird assemblage containing 43% of all breeding seabirds in 1989 surveys. The CVA contains a diverse assemblage of at least 7 of 14 seabird species that breed along the coasts of northern and central California, including: Brandt's and Pelagic cormorants (*Phalacrocorax penicillatus* and *P. pelagicus*), Black Oystercatcher (*Haemotopus bachmani*), Western Gull (*Larus occidentalis*), Common Murre (*Uria aalge*), Pigeon Guillemot (*Cepphus columba*), and Rhinoceros Auklet (*Fratercula monocerata*).

The CVA contains about 7,000-9,000 breeding Common Murres, constituting almost all nesting murres between Cape Mendocino and Point Reyes. Mendocino murre colonies are part of the Northern California murre population and are currently undergoing growth and recolonization, following probable extirpations in the late 19th and early 20th centuries. In fact, the Cape Vizcaino colony was first discovered in 1979 and adjacent Rockport Rock was first discovered in 1989. These colonies probably had been extirpated through the operation of a log loading wharf and suspension bridge onto Rockport Rocks between 1877 and 1942. About 2,500-3,000 Brandt's Cormorants currently breed at CVA, constituting the fourth largest Brandt's Cormorant colony in the world. The CVA also is a major roost site on the northern Mendocino county coast for Brown Pelicans (*Pelecanus occidentalis*).

Threats to Cape Vizcaino Area seabird colonies

The CVA is highly threatened by the current and future boom in development (industrial and urban) and recreation along the Mendocino County coast. Seabirds nest on mainland peninsulas, mainland bluffs, and nearshore rocks in this coastal region. Large colonies occur here because steep bluffs on the adjacent mainland areas have severely limited access by mammalian predators, as well as minimized human disturbance in the recent past. However, these colonies occur so close to and on the mainland shore that they are very susceptible to disturbance from adjacent mainland areas (e.g. logging, home building, camping and hiking, etc.), as well as disturbances from overflights (commercial or recreational) and boats and watercraft (e.g. fishing, abalone and urchin diving, yachting, jet skiing, windsurfing, etc.). Currently, the beach and river mouth area serve as a popular camping spot. Such use encourages access to the surrounding areas on land and at sea where people can unknowingly cause disturbance to breeding seabirds.

In August 1990, I flew over the CVA and noted significant development of hilltops in the general vicinity. Many had houses and ranches perched on them, perhaps to obtain an ocean view and to keep out of the

low fog. There is clear development potential of these hilltops and, in fact, one house is already located on a hilltop overlooking Cape Vizcaino. In addition, the hilltops in this area do not form a single crest paralell to shore and have a corrugated appearance with several different promontories that could be developed. High development potential exists for the beach area located between the two colonies and the adjoining Cottaneva Creek mouth area. This area would be particularly attractive to developers or for a single estate since few beaches with easy road access occur along this part of the coast. The close proximity of the beach area poses a major threat of recreational disturbance to breeding seabirds.

If the CVA is not protected by placing it under the public ownership and stewardship, the seabird colonies in this area are likely to be abandoned over time due to human disturbances. It is difficult to say exactly when or how this will occur but it may occur in the near future if the area is logged or developed. By acquiring the CVA, the trustees will protect these significant colonies from future loss. The CVA also could offer excellent bird viewing benefits to the public if this activity was carefully regulated and supervised.

Acquisition Considerations

To best protect these significant seabird colonies, it would be necessary to acquire all shoreline nesting areas and adjacent mainland areas to provide a well-designed refuge that would be insulated from development and/or activities outside property boundaries. It also would be important to further restrict activities near the colonies by imposing a ceiling limit for aircraft and preventing boat traffic and other activities within a certain distance from shore.

An appropriate inland boundary would occur at the tops of coastal hills and the end of existing roads which would buffer coastal areas by preventing disturbance, rockslides, road access, logging, or houses being built in these prime locations. The beach area is currently used as a popular camping spot and occasional boat launch for timber company employees and the general public. It must be acquired to prevent development of recreational facilities which are not compatible with nesting seabirds. With these considerations, the inland boundary would have to be at least 0.5 miles inland. However, upon previous examination of parcel lines, it was necessary to extend the proposed boundaries a little farther inland to not bisect parcels and thus reduce acquisition cost. It may be wise to obtain all property along Cottaneva Creek that is seaward of Highway 101 to design a protected area that is easier to manage by government agencies, as well as provide opportunities for restoration of creek habitat for salmonid populations. An assessment of the potential purchase price of this property is desirable.

Management Considerations

In addition to acquisition, continuing management of the property would be necessary to prevent human disturbance of seabird colonies and otherwise enhance seabird nesting. For example, a ceiling limit for aircraft would need to be imposed and boat traffic and other activities within a certain distance from shore would need to be prevented. Cement structures should be removed from Rockport Rocks. Cottaneva Creek and the beachfront area should be examined for restoration of salmonid populations. If public viewing was encouraged, a visitor center might be envisioned with associated facilities, such as viewing platforms, boardwalks along steep slopes, paved access roads, parking lots, limited beach use, bathrooms, and ranger quarters. If public viewing was not encouraged, the current dirt road could be gated and placed off limits but would still require a ranger patrolling the region due to past human use. In any case, a seabird monitoring program would need to be instigated to measure changes associated with visitor use or management over time at Cape Vizcaino Area colonies, as well as other colonies in the region.

B. Restoration of Seabird Colonies in the Trinidad Area (prepared January 2000)

From Little River to Patrick's Point (i.e., the Trinidad area), a series of 11 offshore rocks form the Trinidad Colony Complex, including: Little River Rock; Trinidad Bay Rocks; Prisoner Rock; Pilot Rock; Blank Rock;

Flatiron Rock; Puffin Rock; Green Rock; White Rock; Sea Lion Rock; and Sea Gull Rock (see 3 maps attached). These rocks are owned by the U.S. Bureau of Land Management and managed through an agreement with the California Department of Fish and Game. Two types of management action would be conducted at these rocks to restore seabird colonies which have likely been impacted by various anthropogenic impacts (e.g., oil spills, human disturbance, etc.): 1) certain breeding seabird species which have been lost from certain rocks would be recolonized; and 2) nesting habitats which have been altered on these rocks would be restored or enhanced to prevent the future loss of certain breeding seabird species.

The management technique of "social attraction" would be used to attract certain species back to attend and eventually breed at certain rocks with adequate nesting habitats. Two sub-projects would aim to: 1) recolonize Tufted Puffins (*Fratercula cirrhata*) at Green Rock, Puffin Rock, and possibly other historical sites; and 2) recolonize Common Murres (*Uria aalge*) at Sea Lion Rock.

The management technique of "nesting habitat restoration" would be used to maintain small populations of storm-petrels at certain rocks and attempt to prevent their future loss from this colony complex due to changes in nesting habitats and predators. Two sub-projects would aim to: 1) restore nesting habitat for Leach's and Fork-tailed storm-petrels *(Oceanodroma leucorhoa* and *O. furcata*) at Little River Rock and Prisoner Rock; and 2) enhance nesting habitats for Leach's and Fork-tailed storm-petrels at Blank Rock, Flatiron Rock, and Green Rock.

Additional information related to the status of these colonies and application of these management actions to restore them is discussed in more detail below:

1.1 Tufted Puffin Recolonization

Recent brief observations in 1997-1999 have suggested that puffins may no longer nest at Green Rock and Puffin Rock (D.L. Jaques and H.R. Carter, pers. obs.), where 29 and 7 puffins (respectively) had been estimated breeding in 1989 (Carter et al. 1992). Historically, small numbers of puffins also had nested at White Rock in 1970, Flatiron Rock in 1980, Blank Rock in 1916, and Flatiron Rock in 1972 (Sowls et al. 1980). The reasons for potential loss of Tufted Puffins from this colony complex are not clear but may include: low amounts of suitable nesting habitat; loss of suitable habitat (e.g., Flatiron Rock and Little River Rock); poor reproduction; high predation; human disturbance (i.e., low-flying aircraft, boats, or mainland); and/or mortality from oil pollution. Overall, only small numbers of puffins breed in Northern California (192 at 10 active colonies in 1989), with 19% at this colony complex (Carter et al. 1992). Loss of colonies (i.e., 7 inactive colonies with historical nesting known in 1989) and loss of portions of the breeding range should be prevented if possible. If puffins no longer breed at this colony complex, a large gap in the breeding range has been created between Redding Rock and Cape Mendocino. In addition, the best public viewing and mainland monitoring of puffins in California occurs at Puffin Rock and Green Rock from mainland vantage points (e.g., Elk Head) at Trinidad State Beach.

A one-year pilot study (in a non-El Nino year) would better establish if any puffins still nest in this colony complex and identify factors which may be affecting puffins. Some factors might be preventable through management by government agencies. If a major factor was identified that could not be managed and would likely prevent recolonization at this time, social attraction may not be employed at this time. If no major factors preventing recolonization are identified, social attraction techniques would be used to attract puffins back to Green Rock, Puffin Rock, or possibly other rocks. Social attraction has been used successfully to recolonize Atlantic Puffins in Maine. Monitoring over a period of years would determine if the restoration project has been successful and whether additional management actions are needed to assist recolonization. Public viewing facilities for puffins at Elk Head also could be enhanced.

1.2 Common Murre Recolonization

Common Murres bred in the 1950's at Sea Lion Rock, before the entire southern half of the rock fell into the water, but have not been observed breeding there since (Osborne 1972; Sowls et al. 1980; Carter et al. 1992, 2001). While loss of the colony apparently was related to this geologic event, it is unclear why

this colony has not been recolonized since. Suitable habitat appears to exist, although various factors may prevent nesting, including: poor reproduction; high predation; human disturbance (i.e., low-flying aircraft, boats, or mainland); and/or mortality from oil pollution. Numbers of murres nesting in this colony complex are at relatively high levels which should have facilitated natural recolonization of Sea Lion Rock. In fact, this colony complex contains one of the four largest colony complexes of breeding murres in California (~74,000 at 5 active colonies in 1989; Carter et al. 1992). It is desirable for this colony complex to reach its full potential to help offset losses over time from oil pollution and human disturbance. Thousands more murres could breed at Sea Lion Rock (if recolonized) and breeding output for the colony complex could be increased. In addition, Sea Lion Rock provides one of the best public viewing and mainland monitoring locations for this colony complex near Patrick's Point State Park.

A one-year pilot study (in a non-El Nino year) would identify factors which may be affecting murres or other seabirds at Sea Lion Rock, including an assessment of nesting habitats. Some factors might be preventable through management by government agencies. For instance, if nesting habitats can be enhanced in some way, this might facilitate future nesting by murres. If a major factor was identified that could not be managed and would likely prevent recolonization at this time, social attraction may not be employed at this time. If no major factors preventing recolonization are identified, social attraction techniques would be used to attract murres back to Sea Lion Rock. Social attraction has been used successfully to recolonize Common Murres in central California. Monitoring over a period of years would determine if the restoration project has been successful and whether additional management actions are needed to assist recolonization. Public viewing facilities for murres at Sea Lion Rock and White Rock also could be enhanced.

1.3 Storm-petrel Nesting Habitat Restoration

Numbers of Leach's Storm-petrels have declined over several decades at this colony complex: 1) at Little River Rock, breeding birds declined from 10,000 to 4,000 between the 1960s and 1989; 2) at Prisoner Rock, breeding birds declined from 160 to 106 between 1979-1980 and 1989; and 3) petrels may no longer nest at Green Rock, Flatiron Rock, and Blank Rock (Sowls et al. 1980; Carter et al. 1992). At Little River Rock, increased numbers of nesting Double-crested Cormorants has resulted in removal of burrowing substrates over large portions of the rock. At Prisoner Rock, predation by River Otters (which swim to the rock from Trinidad harbor) has impacted the colony. Otters may be attracted to this area by offal and other food obtained in the harbor area. At Button Rock (within Trinidad Bay Rocks), human trampling of burrow-nesting habitats may be occurring. Loss of burrow-nesting habitat for Leach's Storm-petrels also appears to have occurred at Flatiron Rock and Blank Rock. Much less is known of the status and factors affecting Fork-tailed Storm-petrels, although they are likely affected by many of the same factors as Leach's Storm-petrels. Overall, only small numbers of Leach's Storm-petrels breed in California (12,600 at 13 active colonies in 1989), with most (66%) nesting in this colony complex, mainly at Little River Rock and Trinidad Bay Rocks (Carter et al. 1992). Similarly, only small numbers of Fork-tailed Storm-petrels nest in California (410 at 5 active colonies in 1989), with about half nesting in this colony complex, mainly at Little River Rock (Carter et al. 1992). Loss of colonies and portions of the breeding range should be prevented if possible.

A one-year pilot study would determine the current status of storm-petrels, their nesting habitat, and factors affecting storm-petrels and their nesting habitats at all rocks in this colony complex. Some factors might be preventable through management by government agencies. For example, human access to Button Rock could be prevented. At Little River Rock and Prisoner Rock (possibly Button Rock), large numbers of nest boxes (permanent, durable, low maintenance) would be deployed to help maintain small, declining nesting populations where nesting habitat is being removed and predation is high. At Flatiron Rock and Blank Rock, nest boxes might be deployed to provide habitat for recolonization by storm-petrels (if adequate nesting habitat does not occur at present) and broadcast vocalizations would be used to further encourage recolonization. Leach's and Ashy storm-petrels are well known to use nest boxes at the Farallon Islands and elsewhere (Ainley and Boekelheide 1990). Monitoring over a period of years would determine if the restoration project has been successful and whether additional management actions are needed to restore storm-petrel nesting habitat or otherwise address other factors affecting storm-petrels.

C. Restoration of Seabird Colonies at Whaler Island (prepared January 2000)

The loss of breeding colonies of storm-petrels at Whaler Island near Crescent City has been one of the most detrimental anthropogenic events to affect breeding populations of seabirds in California history. In the early 20th century, Whaler Island was the largest storm-petrel colony known in California, possibly hosting about 20,000 breeding Leach=s Storm-petrel (*Oceanodroma leucorhoa*) and Fork-tailed Storm-petrels (*O. furcata*) (Howell 1920; Osborne 1972). Various egg collectors (e.g., Clay, Fraser, Howell, Smith, Talmadge) documented storm-petrel nesting from 1916-1939. Smaller numbers of breeding Western Gulls *Larus occidentalis*, Common Murres *Uria aalge*, Pigeon Guillemots *Cepphus columba*, and Cassin=s Auklets *Ptychoramphus aleuticus* also were recorded. A map of the Crescent City Harbor area in 1911 (Anonymous 1916) showed Whaler Island as being a relatively large island (i.e., with rough basal dimensions of 130 m by 200 m in size) that was located about 550 m from shore (Figure 1).

In 1939, the northwest side of Whaler Island was connected to the mainland with a small breakwater forming part of present-day ACrescent City Harbor@ (see Figures 1 and 2). In the early 1950's, a portion of the island was quarried to provide additional building material to strengthen and widen the breakwater into a causeway. In 1969, Osborne (1972) visited the remaining portion of the island and found signs of rats and no nesting seabirds. Few if any seabirds nested at Whaler Island in 1979-1980 or 1989 (Sowls et al. 1980; Carter et al. 1992). In 1989, only 12,600 Leach=s Storm-petrels and 410 Fork-tailed Storm-Storm-petrels were estimated to breed in California, although numbers of Leach=s Storm-petrels had declined from 1979-1980 (Carter et al. 1992). Overall, it is likely that Whaler Island contained over half of the state=s populations of these storm-petrel species before being connected to the mainland by a breakwater.

To restore breeding seabirds to Whaler Island, it would be necessary to conduct a major restoration program that would: 1) remove all mammalian predators, reduce avian predators, and prevent access to the island by mammalian predators and humans; 2) reduce human disturbance near the island; 3) enhance nesting habitats; and 4) use social attraction techniques to facilitate attendance and encourage eventual breeding by storm-petrels and other seabirds. This program would require a major effort over many years to accomplish.

Ownership of Whaler Island and the Causeway

Ownership of Whaler Island needs to be investigated. Unreserved rocks and islands along the coasts of Del Norte and Humboldt counties were withdrawn from Asettlement, location, sale, or entry@ in 1930 under Executive Order 5326 by President Herbert Hoover (CDFG 1984). However, Whaler Island was later reserved for planned breakwater construction in 1936 (Executive Orders 4573 and 4582). It is not clear if the island is owned by the U.S. Bureau of Land Management or the City of Crescent City. The causeway is probably owned by the City of Crescent City. Trustee agencies may need to discuss purchase of the island, establishment of an easement, and develop an overall agreement before seabird restoration activities are attempted. Discussions with the City of Crescent City would be needed to identify all possible concerns that would need to be considered.

Predator Removal and Access Barrier

Removal of mammalian predators would not be difficult for an island of this size, once access to the island had been halted with a barrier (see below). Predator removal could involve: 1) live capture and translocation to the mainland; or 2) lethal capture in traps or killing with poisons (e.g., rats).

Reduction of avian predation could be achieved through various techniques, including: 1) installation of nest boxes for storm-petrels and other burrow-nesting species; 2) garbage, offal, and light control program in the harbor area; and 3) removal or modification of possible nest and roost sites for certain avian predators on the island and adjacent mainland.

Installation of a special barrier would prevent further access by predators and humans to Whaler Island. At minimum, this barrier might be a specialized fence. At maximum, this barrier might be an excavated channel and fence. Various specialized fences and excavated channels could be envisioned and require a detailed investigation and cost budgeting by an engineer, assisted by biologists and agencies. At present, Whaler Island is connected to the mainland by a causeway that is about 100-150 m wide, with a road along its entire length serving wharves, businesses, and a boat launch that extend into the inner harbor from the breakwater. However, Whaler Island itself does not have any facilities built on it, except for one small building erected in 1999 on the edge of island and causeway. The barrier (i.e., fence or channel and fence) could be placed at the end of the causeway where it meets the island without affecting other uses of the causeway, except that the one small building would need to be removed. In addition, smaller barrier fences could be placed at the bases of two smaller breakwaters that extend out from the north and east sides of Whaler Island. Even with a barrier, it would be necessary to post signs and educate the public to prevent human trespass. Also, mammalian predators may still find a way to swim to the island from the mainland or from the breakwater on the west side of the harbor. The island would need to be periodically monitored to detect and remove any mammalian predators which might make it to the island after the major removal effort was completed.

It is possible that all or part of the causeway might be removed as part of a future expansion of Crescent City Harbor. If so, Whaler Island=s natural water barrier would be restored. In the past, a larger harbor has been envisioned which would involve the construction of a new breakwater farther east which would expand the harbor from its current size of 350-460 acres to 1100 acres; see Figure 1). It is not known if such an expansion is envisioned. However, given the current development of the causeway, it may be unlikely that the causeway would be removed during harbor expansion. It is not known if the City of Crescent City is thinking about expansion of the harbor at this time.

Pilot Study, Additional Seabird Restoration Actions, and Long-term Management

Insufficient information is currently available to fully design and implement a seabird restoration program at Whaler Island, beyond the first step of predator removal, reduction of avian predation, and prevention of future access by predators to the island. A one-year pilot study would be needed to conduct a detailed assessment of current potential nesting habitats and consider all methods and the cost of enhancing nesting habitats, including installation of nest boxes and application of social attraction techniques. Several years of effort will be needed to enhance nesting habitats, apply social attraction techniques, and monitor use of Whaler Island and nearby areas by seabirds and other species. Additional management efforts also would include: 1) wardening the island to ensure that humans are not trespassing; 2) conduct monitoring to ensure mammalian predators do not reinvade the island and remove any found; and 3) participate in city and harbor programs to reduce avian predators, reduce human disturbance, and educate the public, possibly including the posting of signs, development of educational materials for schools, and leading island tours.

D. Human Disturbance Reduction Program for Seabird Colonies and Roosts in Humboldt and Del Norte Counties (prepared January 2000)

Human disturbance of seabird colonies and roosts likely occurs widely in Humboldt and Del Norte counties. Various human activities (e.g., close approach by low-flying aircraft, watercraft, or on foot) can disturb seabirds at colonies and cause them to fly away (or “flush”) from their nests or roosts on coastal islands, rocks, or mainland cliffs. Single major disturbances of colonies can cause loss of eggs or chicks (due to predation or trampling) by some individuals and reduced breeding success for the colony. Roost disturbances can cause increases in energy expenditure and changes in foraging areas which can affect survival in certain species (e.g., pelicans and cormorants). Seabird roosts can be used as haul-out or breeding sites for marine mammals as well. Frequent disturbances of colonies and roosts can result in permanent abandonment by seabirds or marine mammals. In addition, human trespass on seabird nesting islands can cause physical destruction of nesting habitats, especially for burrow-nesting species.

While little effort has been expended to document the types and degree of human disturbance of seabird colonies and roosts in Humboldt and Del Norte counties, anecdotal observations by seabird researchers and the great variety of human activities occurring in coastal areas suggest that such disturbance may be moderate at the present time in many regions (Sowls et al. 1980; Carter et al. 1992). Off Cape Mendocino, False Cape Rocks, Sugarloaf Rock, and Steamboat Rock (managed by the California Department of Fish and Game, CDFG) host major colonies of Common Murres *Uria aalge*, Brandt's Cormorants *Phalacrocorax penicillatus*, and Double-crested Cormorants *P. auritus* (plus major roosts of endangered Brown Pelicans *Pelecanus occidentalis* and breeding and haul-out sites for threatened Steller's Sea Lions *Eumatopias jubata*) which are disturbed by low-lying aircraft and occasional landings on rocks (Carter et al. 1992, 2001). Off Trinidad, major colonies of Common Murres, Brandt's Cormorants, Double-crested Cormorants, and Pelagic Cormorants *P. pelagicus* (managed by CDFG) plus Brown Pelican roosts are disturbed by low-flying aircraft and close approach by boats. At False Klamath Rock, a major colony of Common Murres, Brandt's Cormorants, and Double-crested Cormorants in Redwood National Park is likely disturbed by low-flying aircraft. The Castle Rock National Wildlife Refuge (managed by the U.S. Fish and Wildlife Service) near Crescent City hosts the largest colony of Common Murres in California and yet is disturbed on occasion by the close approach of boats and landings (Lowe 1993; Jaques and Strong 1998, 1999). Near the mouth of the Smith River, large colonies of Brandt's and Double-crested cormorants at Prince Island (owned by the Tolowa people) and Hunters Rocks (managed by CDFG) are occasionally disturbed by close approach of boats and occasional landings. However despite some disturbances, impacts at these major colonies do not appear to have been great since large numbers of seabirds still nest there. In fact, disturbance may have been greater at islands and rocks which do not have large seabird colonies at this time, despite much suitable habitat (e.g., several rocks near Crescent City). Disturbance may have been a major factor in the loss of the only colony of Caspian Terns *Sterna caspia* in northern California at the Arcata Bay Sand Islands, although an increase in gull predation also may have been involved (Carter et al. 1992). Terns have not nested there since 1969.

Reduction of human disturbance of colonies and roosts will increase the overall productivity of several species of seabirds in Humboldt and Del Norte counties. A small increase in current annual productivity over time would help to offset the losses of seabirds due to oil spills and other conservation issues. However, a disturbance reduction program for Humboldt and Del Norte counties also would help prevent an increase in future disturbances and possible colony abandonments by highlighting concerns about disturbance and averting potential detrimental impacts. These benefits might eventually far exceed benefits from increases in current productivity. Various management efforts would be taken to prevent or reduce disturbances of colonies and roosts, such as: 1) posting signs and installing fences; 2) deploying buoys around colonies as disturbance buffers; 3) monitoring levels of human disturbance and examining levels of impact; and 4) working with local, state and federal agencies to develop a management plan to protect, monitor, educate, and enhance public viewing of colonies and roosts in the region.

No pilot studies are needed before developing and implementing the human disturbance reduction program.

E. Restoration of severely-reduced Common Murre colonies in northern California (prepared June 2002)

From 1979-95, Common Murres (*Uria aalge*) were recorded breeding at 13 locations in northern California: Del Norte County (Castle Rock, Sisters Rocks, and False Klamath Rock); Humboldt County (Redding Rock, White Rock, Green Rock, Flatiron Rock, Blank Rock, Pilot Rock, False Cape Rocks, and Steamboat Rock); and Mendocino County (Rockport Rocks and Cape Vizcaino) (Carter et al. 2001). In the 1950's, murres also bred at Sea Lion Rock in Humboldt County but they have not been recorded there since. Since 1995, murres also have bred at Newport Rocks, Kibesillah Rock, and Goat Island Area in Mendocino County. At many of these colonies, numbers of murres remained stable or increased since 1979, but two notable exceptions are severely-reduced colonies at Redding Rock and Sisters Rocks.

Redding Rock

Numbers of breeding murres oscillated between 1979-89 (range = 800-2,100; Carter et al. 2001) but have declined since 1995. By 2002, no breeding murres were noted during aerial surveys, although some may have attended prior to surveys. A detailed description of the demise of this colony requires counting several years of archived aerial photographs (1987-2002). Colony extirpation seems imminent from: human disturbance by U.S. Coast Guard (USCG) crews which service the automated light; probable aircraft and boat disturbances; California sealions hauling out high on the rock; and probable mortality from the 1997 *Kure* and 1999 *Stuyvesant* oil spills. Natural recolonization or recovery likely will not occur in the near future without restoration efforts. Restoration actions could include: a) work with USCG, Federal Aviation Administration (FAA), California Department of Fish and Game (CDFG), and other state and federal agencies to prevent human disturbance of murres (including prohibiting landing and low over flights, plus installing buoys to mark boat closures within ~200 m of the rock); b) install small barriers to keep sealions off the top areas of the rock (barriers have been used elsewhere for sealions and topography at Redding Rock would assist their effectiveness); and c) use social attraction techniques (e.g., decoys, recorded vocalizations, and mirrors) to attract murres to Redding Rock (especially recent breeders that are more likely to rapidly recolonize). Monitoring would be achieved by aerial photography because the rock is located 3 miles from shore. By employing several restoration techniques in the next few years, permanent colony extirpation can be avoided and the colony should return to higher levels than seen since 1979, given the amount of suitable available nesting habitat available. The rock may be managed by USCG or may occur within the California Islands National Monument (managed by Bureau of Land Management [BLM] and CDFG).

Sisters Rocks

Murres have not bred at Sisters Rocks since 1980-81 when 40-80 breeding birds were noted (Carter et al. 2001). This colony site has been attended in many years since 1981, with the highest available raw count of 194 birds reported in 1989. In addition, murres also have attended nearby Rock R during aerial surveys in certain years (e.g., 1989 and 1994), although little breeding habitat occurs and breeding was not suspected. Attendance at Rock R may reflect human disturbance at nearby Sisters Rocks and movements of murres to Rock R. In any case, no murres have been noted at Sisters Rocks or Rock R during aerial surveys since the late 1990's. A detailed description of recent attendance at these locations requires counting several years of archived aerial photographs (1996-2002). Colony extirpation in the early 1980's may have resulted from human disturbance from low overflights, boats, or people landing on the colony. These rocks are low lying, very susceptible to close approach by boats or landing, occur close to Crescent City harbor, and relatively large numbers of commercial and recreational boats occur in nearby waters. In 2001-02, boats were noted very close (<25-50 m) to Sisters Rocks during aerial surveys. Human disturbance and probable mortality from the 1997 *Kure* and 1999 *Stuyvesant* oil spills may be preventing natural recolonization or recovery at this colony. Restoration actions could include: a) work with USCG, FAA, CDFG, National Park Service (NPS), and other state and federal agencies to prevent human disturbance of murres (including prohibiting landing and low overflights, plus installing buoys to mark boat closures within ~200 m of Sisters Rocks and Rock R); and c) use social attraction techniques (e.g., decoys, recorded vocalizations and mirrors) to attract murres to Sisters Rocks (especially recent attenders that are more likely to rapidly recolonize). Monitoring of Sisters Rocks and Rock R could include boat and aerial work. By employing a variety of techniques to assist natural recovery at Sisters Rocks in the near future, permanent colony extirpation might be avoided and the colony could return to higher levels than seen in 1980-81, given the amount of suitable nesting habitat available. These rocks may be managed by NPS or may occur within the California Islands National Monument (managed by BLM and CDFG).

Appendix 2. Initial restoration concept for Cape Vizcaino and Rockport Rocks

In this appendix, the initial restoration concept for Common Murres (*Uria aalge*) at Cape Vizcaino in northern California is presented for long-term reference. This initial concept was prepared in 1990 by Carter Biological Consulting (CBC) under contract for the U.S. Department of Justice (USDOJ) during litigation related to the *Apex Houston* oil spill, with assistance from V.A. Lee (USDOJ), J.E. Takekawa (USFWS – San Francisco Bay National Wildlife Refuge Complex, and R.A. Coleman (USFWS – San Francisco Bay National Wildlife Refuge Complex). The concept description was prepared to form a starting point for further consideration and modification as needed. This description does not reflect later assessments of benefits to seabirds and estimated costs by federal and state agencies. This concept was not selected for later implementation by the *Apex Houston* Trustee Council (Carter et al. 2003). R. Klotz (USDOJ) approved the release of this information for this appendix.

Establishment of the Cape Vizcaino National Wildlife Refuge (prepared 1990)

Cape Vizcaino National Wildlife Refuge (CVNWR) is composed of the Cape Vizcaino (USFWS # 379-002) and Rockport Rocks (USFWS # 379-001) seabird colonies and adjacent mainland on the northern coast of Mendocino County, California. CVNWR contains a diverse assemblage of at least 7 of the 14 species seabirds that breed along the coasts of northern and central California, including Brandt's and Pelagic cormorants (*Phalacrocorax penicillatus* and *P. pelagicus*), Black Oystercatcher (*Haematopus bachmani*), Western Gull (*Larus occidentalis*), Common Murre (*Uria aalge*), Pigeon Guillemot (*Cepphus columba*), and Rhinoceros Auklet (*Fratercula monocerata*). Other species also may nest there because only brief aerial (A), boat (B), or mainland (M) surveys have been conducted to date and no biologist has yet set foot on these colonies to search for nesting burrows or crevices.

CVNWR is the largest seabird colony and contains a significant portion of the nesting seabirds between Cape Mendocino and Point Reyes, representing one quarter to one fifth of the length of the California coastline. In 1979-1980, its 9,350 breeding birds represented 28.5% of the seabirds in this area but numbers have climbed to 11,308 breeding birds or 42.9% in 1989. Thus, while numbers have increased there, they were lower at other colonies in this area in 1989. The magnitude of importance of the number of nesting seabirds in CVNWR is similar to other NWR in California. For comparison, Castle Rock NWR contained 48.4% (in 1979-1980) and 42.2% (in 1989) of nesting seabirds between the Oregon border and Cape Mendocino and Farallon Island NWR contained 77.6% (in 1979-1980) and 76.0% (in 1989) of nesting seabirds between Point Reyes and Lopez Point. CVNWR is located about halfway between these other NWR with major seabird colonies.

CVNWR contains about 8500 breeding Common Murres, representing almost all nesting murres between Cape Mendocino and Point Reyes. These isolated colonies are the closest to the depleted central California population (located between Point Reyes and Point Sur). Murre numbers have increased here between 1980 and 1989 as has also occurred at some other colonies in northern California. In 1989, murres were first noted nesting at Rockport Rocks and a small colony of 57 birds was discovered at Goat Island (at the town of Mendocino to the south). This apparent southward expansion at the southern edge of the northern California population may eventually close the gap between the northern and central populations and provide additional recruits to assist recovery or prevent further decline of the depleted central population.

CVNWR contains about 2500 breeding Brandt's Cormorants, representing one of the world's largest Brandt's Cormorant colonies. In 1979-1980, it was the third largest colony, being surpassed only by the Farallon Islands and Bird Island (at Point Lobos State Reserve south of Carmel). In 1989, it was edged out by increased numbers at Bird Rock (off the Monterey peninsula), making CVNWR the fourth largest colony.

CVNWR is one of only a few roost sites used by Brown Pelicans along the northern Mendocino county coast.

CVNWR is highly threatened by the current and future boom in development (industrial and urban) and recreation along the Mendocino County coast. Seabirds nested on the mainland peninsulas, mainland bluffs, and nearshore rocks in 1989. Large colonies occur here because steep bluffs on the adjacent mainland areas have severely limited access by mammalian predators as well as minimized human disturbance in the recent past. However, these colonies occur so close to and on the mainland shore that they are very susceptible to any disturbance from adjacent mainland areas (e.g. logging, home building, camping and hiking, etc.) as well as being susceptible to disturbances from over flights (commercial or recreational) or boats (e.g. fishing, abalone and urchin diving, yachting, jet skiing, windsurfing, etc.).

These colonies probably have been disturbed heavily in the past. The rocks off Rockport Bay are still privately owned and abandoned cement and wooden structures are evident on them. These rocks are referred to as "Old Wharf Rocks at Rockport" by Osborne and Reynolds (1971), apparently indicating their use as a wharf in the old days when Rockport Bay was used as a port for ships to load logs. Recolonization of these rocks is still underway since abandonment of the wharf some 50 years ago. There are still substantial areas available for colony growth on the islands and the mainland such that colonies should continue to increase in the future.

Perhaps one of the greatest threats to the continued viability of these colonies would be further commercial and recreational development of the Rockport Bay and Cottaneva Creek area. At present, this beach and creek mouth area is a popular camping spot. Such use encourages access to the surrounding areas and especially to the ocean because this beach probably is the only easily accessible beach for launching boats or other water sports equipment along this generally exposed coastline. Even current use of this area threatens these seabird colonies.

CVNWR should be established to protect and monitor these significant seabird colonies that are threatened by coastal development and recreation. It would be important to acquire all shoreline nesting areas and adjacent mainland areas (up to 0.5 miles from shore including Rockport Bay and the mouth of Cottaneva Creek) to provide a well-designed refuge that would be insulated from or affected little by development and/or recreational activities outside the refuge boundaries. Once a refuge, it would be important to further restrict activities near the colonies by imposing a lower ceiling limit for aircraft and preventing boat traffic and other activities within a certain distance from shore.

Appendix 3. Subcolony counts of Common Murres, Brandt's Cormorants, Brown Pelicans, Western Gulls and Pelagic Cormorants at Cape Vizcaino and Rockport Rocks colonies in Mendocino County, California, 2005-2010.

				Common Murre	Brandt's Cormorant			Brown Pelican		Western Gull			Pelagic Cormorant
Colony	USFWSSCN	SC#	Date	Birds	Nest	Sites	Birds	Adults	Imm.	Nest	Sites	Birds	Nest
Cape Vizcaino	379-002	06	15 June 2005	8,558	125	88	18	0	0	8	0	4	0
Cape Vizcaino	379-002	11	15 June 2005	291	0	0	0	0	0	0	0	0	0
Cape Vizcaino	379-002	06	8 June 2006	8,855	759	196	117	0	0	19	2	20	4
Cape Vizcaino	379-002	10	8 June 2006	59	24	5	4	0	0	0	0	0	0
Cape Vizcaino	379-002	11	8 June 2006	140	0	0	0	0	0	0	0	0	0
Cape Vizcaino	379-002	12	8 June 2006	12	45	24	4	0	0	0	0	0	0
Cape Vizcaino	379-002	06	6 June 2007	7,447	520	607	158	14	6	83	9	31	2
Cape Vizcaino	379-002	10	6 June 2007	30	0	1	0	0	0	0	0	0	0
Cape Vizcaino	379-002	11	6 June 2007	150	43	26	10	0	0	0	0	1	0
Cape Vizcaino	379-002	12	6 June 2007	0	13	4	0	0	0	0	0	0	0

Colony	USFWSSCN	SC#	Date	Common Murre Birds	Brandt's Cormorant Nest	Brandt's Cormorant Sites	Brandt's Cormorant Birds	Brown Pelican Adults	Brown Pelican Imm.	Western Gull Nest	Western Gull Sites	Western Gull Birds	Pelagic Cormorant Nest
Cape Vizcaino	379-002	06	5 June 2008	10,048	228	40	31	0	0	10	1	5	0
Cape Vizcaino	379-002	10	5 June 2008	43	0	0	0	0	0	0	0	1	3
Cape Vizcaino	379-002	12	5 June 2008	120	0	0	0	0	0	0	0	0	0
Cape Vizcaino	379-002	06	27 May 2009	9,224	387	107	47	0	0	9	1	5	1
Cape Vizcaino	379-002	10	27 May 2009	0	3	0	0	0	0	0	0	0	0
Cape Vizcaino	379-002	06	7 June 2010	9,931	184	256	98	0	0	23	7	7	0
Cape Vizcaino	379-002	12	7 June 2010	0	10	25	10	0	0	1	0	0	0
Rockport Rocks	379-001	04	15 June 2005	2,062	52	28	8	12	8	6	0	4	0
Rockport Rocks	379-001	02	8 June 2006	4	0	239	5	18	6	1	0	1	50
Rockport Rocks	379-001	04	8 June 2006	2,280	122	48	51	3	5	8	2	3	0
Rockport Rocks	379-001	03	6 June 2007	2	0	132	0	0	0	7	0	0	0

Colony	USFWSSCN	SC#	Date	Common Murre Birds	Brandt's Cormorant Nest	Brandt's Cormorant Sites	Brandt's Cormorant Birds	Brown Pelican Adults	Brown Pelican Imm.	Western Gull Nest	Western Gull Sites	Western Gull Birds	Pelagic Cormorant Nest
Rockport Rocks	379-001	04	6 June 2007	1,559	874	23	40	5	1	4	0	2	0
Rockport Rocks	379-001	02	5 June 2008	585	124	46	15	0	0	0	0	1	0
Rockport Rocks	379-001	03	5 June 2008	447	31	104	18	0	0	5	0	2	0
Rockport Rocks	379-001	04	5 June 2008	3,722	146	5	20	1	1	6	0	7	0
Rockport Rocks	379-001	02	27 May 2009	172	140	101	27	6	0	0	0	0	0
Rockport Rocks	379-001	04	27 May 2009	3,209	125	36	21	0	0	8	2	1	0
Rockport Rocks	379-001	04	7 June 2010	2,201	50	52	12	0	0	10	1	4	0