

**DEPARTMENT OF THE INTERIOR****Fish and Wildlife Service****50 CFR Part 17****[FWS-R8-ES-2010-0035; MO 92210-0-0008-B2]****Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List Van Rossem's Gull-billed Tern as Endangered or Threatened****AGENCY:** Fish and Wildlife Service, Interior.**ACTION:** Notice of 12-month petition finding.

**SUMMARY:** We, the U.S. Fish and Wildlife Service, announce a 12-month finding on a petition to list van Rossem's gull-billed tern (*Gelochelidon nilotica vanrossemi*) as endangered or threatened and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After review of the best available scientific and commercial information, we find that listing van Rossem's gull-billed tern is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to van Rossem's gull-billed tern or its habitat at any time.

**DATES:** The finding announced in this document was made on September 21, 2011.

**ADDRESSES:** This finding is available on the Internet at <http://www.regulations.gov> at Docket Number FWS-R8-ES-2010-0035. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 6010 Hidden Valley Road, Suite 101, Carlsbad, California 92011. Please submit any new information, materials, comments, or questions concerning this finding to the above street address.

**FOR FURTHER INFORMATION CONTACT:** Jim Bartel, Field Supervisor, Carlsbad Fish and Wildlife Office, 6010 Hidden Valley Road, Suite 101, Carlsbad, California 92011; by telephone at 760-431-9440; or by facsimile to 760-431-9624. If you use a telecommunications device for the deaf (TDD), you may call the Federal Information Relay Service (FIRS) at 800-877-8339.

**SUPPLEMENTARY INFORMATION:****Background**

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act)

(16 U.S.C. 1531 *et seq.*) requires that, for any petition to revise the Federal Lists of Endangered and Threatened Species that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Species. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**.

**Previous Federal Actions**

In our November 15, 1994, Candidate Notice of Review (59 FR 58982), we included van Rossem's gull-billed tern as a Category 2 candidate. Category 2 taxa were defined as those taxa for which information in the possession of the Service, at that time, indicated that proposing to list as endangered or threatened was possibly appropriate but for which persuasive data on biological vulnerability and threats were not available to support proposed rules. In our February 28, 1996, Candidate Notice of Review (61 FR 7596), we announced our decision to discontinue recognition of Category 2 candidates, including van Rossem's gull-billed tern. This decision was finalized on December 5, 1996 (61 FR 64481). Since that time, van Rossem's gull-billed tern has not been treated as a candidate for Federal listing under the Act.

On June 8, 2009, we received a petition from the Center for Biological Diversity dated June 3, 2009, requesting that we list the "western" or "van Rossem's" subspecies of gull-billed tern (*Gelochelidon nilotica vanrossemi*) as endangered or threatened under the Act, and that we designate critical habitat concurrent with listing (CBD 2009, pp. 1-40). Included in the petition was supporting information regarding the subspecies' taxonomy, ecology, distribution, status, and potential threats. Although not expressly stated in the petition, we assumed the petition was a request to list van Rossem's gull-

billed tern as endangered or threatened throughout the subspecies' entire range.

In response to the Center for Biological Diversity's June 3, 2009, petition to list van Rossem's gull-billed tern as endangered or threatened throughout its range, we sent a letter to Center for Biological Diversity, dated August 18, 2009, acknowledging receipt of the petition and informing the petitioner that we concluded the petition did not indicate that an emergency situation existed for this subspecies and that emergency listing was not warranted. We also stated that we were addressing a significant number of listing and critical habitat actions in Fiscal Year 2009 (October 1, 2008, through September 30, 2009) pursuant to court orders, judicially approved settlement agreements, or other statutory deadlines; however, we noted that we had secured funding to begin reviewing the petition in that fiscal year. Further, we said we anticipated publishing our 90-day finding in Fiscal Year 2010.

We published our 90-day finding on the petition to list van Rossem's gull-billed tern as endangered or threatened in the **Federal Register** on June 9, 2010 (75 FR 32728). In that finding we determined that the petition presented substantial scientific or commercial information, per section 4(b)(3)(A) of the Act, indicating that listing the van Rossem's gull-billed tern throughout its range may be warranted. The current notice constitutes the 12-month finding on the June 3, 2009, petition to list the van Rossem's gull-billed tern throughout its range as endangered or threatened under the Act.

**Species Information****Species Description and Taxonomy**

Van Rossem's gull-billed tern (*Gelochelidon nilotica vanrossemi*) is medium-sized compared to other tern species (Parnell *et al.* 1995, p. 2). Like most tern species, its plumage is generally pale gray above (dorsally), white below (ventrally), with breeding (alternate) plumage adults having black on the top of the head (Parnell *et al.* 1995, p. 2). Gull-billed terns, including van Rossem's gull-billed tern, differ from other species of terns by having a proportionately stouter bill that is black throughout the year (Bent 1921, p. 201; Parnell *et al.* 1995, p. 2; Pyle 2008, p. 706). Gull-billed terns are powerful flyers, and despite appearing heavier bodied than most tern species, they exhibit a buoyant agility, especially while foraging (Audubon 1840, p. 1; Bent 1921, p. 201; Molina and Marschalek 2003, p. 3).

Van Rossem's gull-billed tern is a seabird in the avian order Charadriiformes (shorebirds, gulls and terns, auks, and allies) and family Laridae (skuas, gulls, terns, and skimmers) (AOU 1998, pp. 141 and 181), although terns are sometimes considered a separate family, Sternidae (e.g., Ridgeway 1919, p. 458; Gochfeld and Burger 1996, pp. 572 and 624; Ericson *et al.* 2003, pp. 1–14).

*Gelocheidon* is a monotypic genus (a genus with only one species, *Gelocheidon nilotica*, the gull-billed tern). *Gelocheidon* has historically been placed in synonymy with *Sterna* (e.g., Saunders 1876, p. 644). However, a more recent analysis using mitochondrial DNA and morphological features concluded that the gull-billed tern is sufficiently differentiated from other tern species to resurrect *Gelocheidon* as a genus separate from *Sterna* (Bridge *et al.* 2005, pp. 459–469; see also Banks *et al.* 2006, p. 930).

The gull-billed tern (the species as a whole) has a worldwide distribution, albeit discontinuous, and may comprise up to six subspecies (Parnell *et al.* 1995, p. 3; Gochfeld and Burger 1996, p. 645). Of those, two subspecies are described in North America (Molina 2008, p. 188), with *Gelocheidon nilotica aranea* breeding along the Atlantic and Gulf of Mexico coasts of the United States and northeastern Mexico, and with *G. n. vanrossemi* breeding along the Pacific and Gulf of California coasts, primarily in Mexico (see “Range and Distribution” section below) (Molina and Erwin 2006, pp. 271–272).

Bancroft (1929, pp. 283–286) described *Gelocheidon nilotica vanrossemi* from specimens collected at the Salton Sea, Imperial County, California. According to Bancroft (1929, p. 284), van Rossem's gull-billed tern differs from the nominate subspecies of the Old World (*G. n. nilotica*) by its shorter tail and bill shape (less angular gonys), and from the subspecies of eastern North America, *G. n. aranea*, by its “decidedly larger size.” However, in contrast to the petitioner's assertion that the validity of the subspecies (*i.e.*, its distinctiveness) has not been questioned (CBD 2009, p. 4), information in the scientific literature indicates that some authors have questioned the distinctiveness of van Rossem's gull-billed tern. For example, Murphy (1936, p. 1093) noted the paucity of specimens from the New World and concluded “existing subspecific names have been created far in advance of any adequate study of the facts.” Murphy's published statements of dissatisfaction over the available information, in turn, caused Grinnell and Miller (1944, p. 172) to

“not recognize a western race” (*i.e.*, subspecies) of gull-billed tern in their authoritative review of the birds of California. Although additional specimens are now available, providing larger sample sizes in mensural (measurement) data, geographic representation of specimens from western North America, especially from Mexico and Central America, are still limited (Molina and Erwin 2006, pp. 273, 283, and 294–295).

Individual gull-billed terns are typically not identifiable to subspecies under field conditions, and because the two North American subspecies are distinguished on the basis of *average* morphometric differences that show substantial overlap, even individual specimens are not necessarily distinguishable in the hand (Molina and Erwin 2006, p. 283). This suggested to Unitt (2004, p. 249) that the distinctiveness of the *G. n. vanrossemi* as a subspecies remains not entirely conclusive (see also Patten and Unitt (2002, pp. 26–35) regarding the pitfalls of differentiating subspecies based on average differences). Moreover, Pyle (2008, p. 706) stated that the morphological differences of the western North American gull-billed terns are “too slight for subspecific recognition.”

In contrast, other authors have not questioned the distinctiveness of *Gelocheidon nilotica vanrossemi* as a subspecies. For example, the American Ornithologists' Union (AOU) Committee on Classification and Nomenclature (AOU Committee), the long-standing scientific body responsible for standardizing North American avian taxonomy, recognized *G. n. vanrossemi* in its 1957 (fifth) edition of its checklist of North American birds (AOU 1957, p. 233), which was the last time the AOU Committee explicitly addressed subspecies (AOU 1998, p. xii). More recently, Patten *et al.* (2003, pp. 1–363), who critically reviewed the taxonomy of subspecies in their book on the birds of the Salton Sea region (Patten *et al.* 2003, p. 71), also recognized *G. n. vanrossemi* as valid (distinctive) (Patten *et al.* 2003, p. 188). Additionally, *G. n. vanrossemi* is recognized by many other authors (such as Parnell *et al.* 1995, p. 3; Gochfeld and Burger 1996, p. 645; Patten *et al.* 2001, p. 45; Dickinson 2003, p. 149; Molina and Erwin 2006, p. 273, but see p. 283; and Molina *et al.* 2010, p. 1). However, the authors of this latter group of works may not have conducted taxonomic assessments of their own and may instead have relied upon other publications. Thus, in total, the available scientific literature is not

consistent regarding the distinctiveness of van Rossem's gull-billed tern.

The Service is currently funding the U.S. Geological Survey to conduct a genetics-based study that may yield additional information regarding the distinctiveness between the eastern and western North American subspecies of the gull-billed tern, but only those two subspecies. As of the preparation of this status review and 12-month finding, the results of this work are not yet available. Although we anticipate the information from this study will be helpful in understanding the relationship between the eastern and western subspecies of gull-billed terns in North America, a comprehensive, rangewide review is needed to address fully the distinctiveness of all of the subspecies, including *Gelocheidon nilotica vanrossemi*, that compose the gull-billed tern species. We are not aware of any modern, rangewide treatments that evaluate the taxonomic distinctiveness of gull-billed tern subspecies.

In summary, the available scientific information presents differing opinions regarding the distinctiveness of *Gelocheidon nilotica vanrossemi* as a subspecies. Although this contradicts the petitioner's assertion that the subspecies' distinctiveness has never been questioned (CBD 2009, p. 4), the available information does not conclusively support the abandonment of a long-standing, established taxon that is accepted by the AOU Committee and is widely used in the literature. Therefore, for the purposes of evaluating the petitioned action, we assume *G. n. vanrossemi*, van Rossem's gull-billed tern, is a subspecies per section 3(16) of the Act.

#### Range and Distribution

Van Rossem's gull-billed terns are migratory (Molina *et al.* 2010, p. 5), which means they breed in one area during the spring and summer and then move (migrate) to a different area for the winter. Like most birds in the Northern Hemisphere, they nest in northerly locations during the summer and overwinter farther south, presumably using the Pacific coast of North America as a migratory route (Molina *et al.* 2010, p. 5). In the U.S. portion of the subspecies' breeding range, where monitoring is more intensive and data sets are more complete, van Rossem's gull-billed terns generally arrive in mid-March and leave in late August, although some birds stay until September or October (Patten *et al.* 2003, p. 188; Patton 2009, Table 2). Less is known about the migratory habits of populations in Mexico.

Nesting of what would later be described as the van Rossem's subspecies of gull-billed tern was first noted at the Salton Sea in 1927 (Pemberton 1927, pp. 253–258). Reports of historical observations and museum specimen data suggested van Rossem's gull-billed terns bred in Mexico (van Rossem and Hachisuka 1937, p. 333; Friedmann *et al.* 1950, p. 107; Binford 1989, p. 115; Molina and Erwin 2006, pp. 273–274 and 294–295), but it was not until the 1990s that nesting of the subspecies was actually observed in that country (Palacios and Mellink 2007, p. 214). The majority of nesting locations were discovered in Mexico only after 2000 as a result of focused surveys (Palacios and Mellink 2007, p. 217).

As detailed below, the current breeding range for van Rossem's gull-billed tern is western North America from extreme southern California in the United States to the State of Guerrero in Mexico. Within this general range, the subspecies occurs in discrete nesting locations predominantly along the Pacific coast of Mexico including the Gulf of California (Molina and Erwin 2006, p. 273) (Table 1, Figure 1). An additional coastal nesting colony is located in San Diego Bay, San Diego County, California (Molina 2008, p. 188). Nest colonies are also located at inland localities in northeastern Baja California, Mexico (Molina and Garrett 2001, p. 25; Palacios and Mellink 2007, p. 215), and at the Salton Sea, Imperial County, California (Pemberton 1927, p.

253; Molina 2004, p. 94; Molina 2009b, p. 5). The Salton Sea and San Diego Bay are currently the only locations where the subspecies nests in the United States (Molina and Erwin 2006, p. 273), and together they define the northern extent of the breeding range of van Rossem's gull-billed tern. However, as this document was being finalized, a pair of van Rossem's gull-billed terns attempted to nest at the San Joaquin Marsh and Wildlife Sanctuary in Irvine, Orange County, California (Daniels 2011, *in litt.*), which is roughly 135 kilometers (km) (85 miles (mi)) north of the San Diego Bay nesting location. It is too early to know whether this location will be regularly used by the subspecies in the future.

TABLE 1—LIST OF KNOWN NESTING LOCATIONS OF VAN ROSSEM'S GULL-BILLED TERN (*GELOCHELIDON NILOTICA* VANROSSEMI) IN THE UNITED STATES AND MEXICO (ARRANGED NORTH TO SOUTH)

[Approximate population size over the past decade for coarse-scale comparisons (Large—typically greater than 100 pairs, Medium—typically between 15 and 100 pairs, and Small—typically less than 15 pairs)]

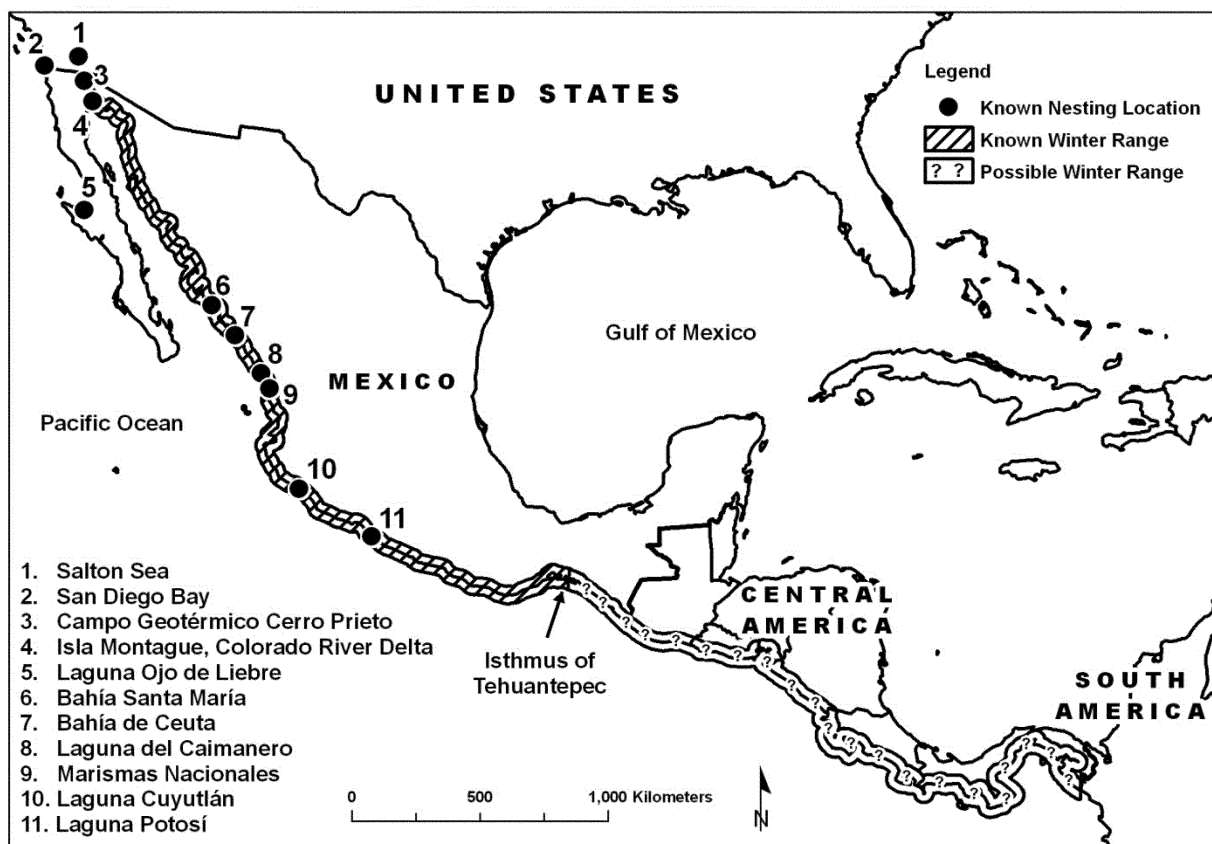
Country	State	Nesting location <sup>a</sup>	Population size <sup>b</sup>	Citations <sup>c</sup>
U.S. ....	California .....	Salton Sea (multiple nest sites) .....	Large .....	Pemberton 1927, p. 253; Molina 2004, pp. 92–99; Molina 2010b, <i>in litt.</i> , p. 3.
U.S. ....	California .....	San Diego Bay .....	Medium .....	McCaskie 1987, p. 1488; Patton 2009, Table 2.
Mexico ....	Baja California ....	Campo Geotérmico Cerro Prieto (including Las Arenitas).	Large .....	Molina and Garrett 2001, p. 24; Palacios and Mellink 2007, p. 217; Erickson <i>et al.</i> 2009, p. 508; Molina 2010b, <i>in litt.</i> , p. 3; Palacios 2010, p. 11.
Mexico ....	Baja California ....	Isla Montague, Colorado River Delta	Large .....	Palacios and Mellink 1993, p. 259; Peresbarbosa and Mellink 1994, p. 201; Peresbarbosa and Mellink 2001, p. 266; Molina <i>et al.</i> 2006, p. 5; Palacios and Mellink 2007, p. 217; Molina 2010b, <i>in litt.</i> , p. 3; Palacios 2010, p. 11.
Mexico ....	Baja California Sur.	Laguna Ojo de Liebre (Salinas de Guerrero Negro).	Small .....	Danemann and Carmona 2000, pp. 195–199; Palacios and Mellink 2007, p. 217; Palacios 2010, p. 11.
Mexico ....	Sinaloa .....	Bahía Santa María (including Isla El Rancho and Isla Altamura).	Small .....	González-Bernal <i>et al.</i> 2003, p. 176; Muñoz del Viejo <i>et al.</i> 2004, pp. 191–202; Palacios and Mellink 2007, p. 217; Palacios 2010, p. 11.
Mexico ....	Sinaloa .....	Bahía de Ceuta .....	Small .....	González-Medina and Guevara-Medina 2008, p. 6; Palacios 2010, p. 11.
Mexico ....	Sinaloa .....	Laguna del Caimanero (Las Tres Tumbas).	Medium .....	Palacios and Mellink 2007, p. 217; Palacios 2010, p. 11.
Mexico ....	Sinaloa/Nayarit ....	Marismas Nacionales (including Estero Teacapán and Laguna Pericos (Laguna las Garzas), Nayarit).	Large .....	Palacios and Mellink 2007, p. 217; Palacios 2010, p. 11.
Mexico ....	Colima .....	Laguna Cuyutlán .....	Medium .....	Palacios and Mellink 2007, p. 217; Palacios 2010, p. 11.
Mexico ....	Guerrero .....	Laguna Potosí .....	Small .....	Mellink <i>et al.</i> 2009, p. 8.

<sup>a</sup> Nesting locations are general areas that may comprise more than one nest site. Some locations may not be occupied every year.

<sup>b</sup> The population size is for general comparison only; the level of accuracy and precision varies between sources and nesting populations differ from year to year.

<sup>c</sup> Citations include noteworthy sources for the nesting location as well as sources for population ranges.

**Figure 1. Winter range and known nesting locations of van Rossem's gull-billed tern (*Gelochelidon nilotica vanrossemi*).**



Additional nesting locations may occur south of Laguna Potosí, but they have not been confirmed (see text).  
 The winter range may extend south of the Isthmus of Tehuantepec, but firm data are lacking (see text).

The southern limit to the breeding range of van Rossem's gull-billed tern is not precisely known. The southernmost location where van Rossem's gull-billed terns have been observed nesting is Laguna Potosí in the Mexican State of Guerrero (Table 1, Figure 1). Information in the literature shows that gull-billed terns occur during the breeding season in small numbers in Mexico south of Laguna Potosí (Binford 1989, p. 115; Mellink *et al.* 1998, p. 381; Molina and Erwin 2006, pp. 294–295; Palacios and Mellink 2007, p. 220). Although actual nesting has never been observed at any of these southern locations, breeding is suspected at some (for example, Binford 1989, p. 115; Mellink *et al.* 1998, p. 381). These areas are all within the winter range of the subspecies (Figure 1) and nonbreeding birds may remain in this region during the breeding season (Howell and Webb 1995, p. 303), which is a confounding factor in assessing observations that do not include actual detections of nests.

Additionally, Table 1 only includes locations where actual nesting has been

observed, but breeding behavior (such as courtship) has been noted at other locations, suggesting nesting may be more widespread. These other locations with observed breeding behavior but without observation of actual nests include locations in the Mexican States of Sonora (historically) (van Rossem and Hachisuka 1937, p. 333) and Jalisco (Mellink *et al.* 2009, p. 48), both of which are within the range van Rossem's gull-billed terns are known to nest. Additionally, nesting may occur in Mexico near or along the Colorado River, north of the known nesting location of Isla Montague at the delta (Erickson *et al.* 2005, p. 498). Moreover, there are likely smaller ephemeral sites that are not used every year that are probably missed during inconsistent survey efforts. Also, gull-billed terns have been observed nesting at inland locations in Mexico (Gómez de Silva 2005, p. 501; Molina and Erwin 2006, p. 274), which may consist of colonies containing either North American subspecies.

Although some gull-billed tern specimens from south of Guerrero have been identified as van Rossem's gull-billed terns (Hellmayr and Conover 1948, p. 297; Binford 1989, p. 115), the majority of the occurrences reported in the available literature are field observations; thus, these records have not been identified to subspecies. Gull-billed terns also nest farther south along the Pacific coast of South America; however, specimen data suggest that at least some of these birds are the "eastern" subspecies of gull-billed tern, *Gelochelidon nilotica aranea* (Molina and Erwin 2006, p. 283; but see Hellmayr and Conover 1948, p. 297, footnote 1). The northern extent of the range of the Pacific-breeding birds presumed to be *G. n. aranea* is not known and could potentially include Central America, where available data are limited. Thus, the southern limit of the breeding range of van Rossem's gull-billed tern extends at least as far south as Guerrero, and possibly farther south, but survey information from these southern areas is limited and any

conclusions drawn from observational data are confounded by the potential occurrence of birds of the “eastern” subspecies, *G. n. aranea*.

The winter range of the subspecies includes the Gulf of California and the Pacific coast of mainland Mexico, possibly Pacific coastal Central America and coastal northwestern South America (Molina and Erwin 2006, p. 272; Molina *et al.* 2009a, pp. 2–20; Molina *et al.* 2010, p. 1), with the largest concentrations found in the extensive coastal lagoon systems of southern Sonora, Sinaloa, and northern Nayarit (Molina *et al.* 2009a, p. 9). However, similar to the breeding range, the southern part of the winter range is poorly defined (Molina *et al.* 2009a, pp. 9–11). Although at least one specimen collected from Guatemala in winter (Molina and Erwin 2006, p. 294) was thought to be *Gelochelidon nilotica vanrossemi* (Hellmayr and Conover 1948, p. 297), the potential mingling of the “eastern” subspecies of gull-billed terns along the Pacific coast of southern Mexico and Central America complicates our ability to delineate the winter range of van Rossem’s gull-billed tern (Molina *et al.* 2009a, p. 15). Not only are individuals of the *G. n. aranea* subspecies that breed in western South America possible in the region (the available literature is not specific as to the winter range of these South American-nesting birds), individuals that breed in eastern North America (*G. n. aranea*) may also cross from the Gulf of Mexico (such as at the Isthmus of Tehuantepec or Isthmus of Panama) to winter along the Pacific coast (Gochfeld and Burger 1996, p. 645; Molina and Erwin 2006, pp. 283–284).

Such behavior has been documented for other species of terns and gulls (Molina and Erwin 2006, p. 84). As such, “eastern” gull-billed terns potentially intermingle with van Rossem’s gull-billed terns within the southern portion of the latter’s range. However, we do not know how prevalent this is. Moreover, the available literature has evolved through time. Contrary to earlier accounts (for example, AOU 1957, p. 233; Molina and Erwin 2006, p. 282), Molina *et al.* (2009a, p. 15) suggested that the winter range may not extend south of the Isthmus of Tehuantepec; thus, without firm data the subspecies’ range remains equivocal. In addition to coastal locations, small numbers of gull-billed terns, presumably van Rossem’s gull-billed terns, regularly occur at inland sites in western Mexico during the winter, away from Pacific coastal lowlands (Molina *et al.* 2010, p. 12); thus, the winter range likely includes

inland areas of western Mexico and possibly Central America.

The best available information indicates the breeding range of the subspecies has expanded in recent years. The first record for coastal California (and the first record for the Pacific coast north of the southern tip of the Baja California Peninsula) was of an adult detected along San Diego Bay in July 1985 (McCaskie 1985, p. 962). Evidence of nesting was noted there two years later (McCaskie 1987, p. 1488; Unitt 2004, p. 248). Initially, the population grew slowly and sporadically, but after 1999 the population increased much more quickly and steadily, totaling approximately 59 pairs in 2010 (R. Patton, *in litt.*, 2010, spreadsheet summary). Moreover, despite multiple earlier explorations of the avifauna of the Baja California Peninsula, Mexico (Bryant 1889, pp. 237–320; Grinnell 1928, p. 61; Wilbur 1987, pp. 94–95; Massey and Palacios 1994, pp. 45–57), van Rossem’s gull-billed terns were only first noted in 1995 as nonbreeders along the Pacific coast of the Baja California Peninsula (Erickson *et al.* 2001, p. 125) and first found nesting in 1996 at Laguna Ojo de Liebre near Guerrero Negro, Baja California Sur (Danemann and Carmona 2000, p. 197). Laguna Ojo de Liebre is the only known coastal nesting location on either coast of the 1,200-km-long (750-mi-long) peninsula (Molina *et al.* 2010, p. 61). The colonization of these two new coastal nesting locations suggests the breeding range of the subspecies has expanded in recent years.

Such range expansions are not unprecedented; other colonial waterbird species have similarly expanded their range along the Pacific coast and established nesting colonies, such as the elegant tern (*Thalasseus elegans*) (Collins *et al.* 1991, pp. 393–395) and the black skimmer (*Rynchops niger*) (Palacios and Alfaro 1992, pp. 173–176; Collins and Garrett 1996, pp. 127–135; Danemann and Carmona 2000, p. 197). Black skimmers have also moved northward along the Gulf of California coast and even inland at the north end of the Gulf; for example, establishing nesting colonies at the Salton Sea (McCaskie *et al.* 1974, pp. 337–338; Collins and Garrett 1996, pp. 127–135) and Cerro Prieto (Molina and Garrett 2001, p. 25). Van Rossem’s gull-billed terns use similar nesting habitat as black skimmers, often nesting near one another at locations where their ranges overlap (Parnell *et al.* 1995, p. 9). Although the timing of the range expansion of van Rossem’s gull-billed terns has lagged behind the black

skimmer and other species with expanding ranges, it is possible that van Rossem’s gull-billed terns may be following a similar pattern and could start to colonize new nesting locations along the Pacific Coast.

There is some indication that van Rossem’s gull-billed terns may potentially continue to expand their range northward along the California coast. Birds that migrate long distances, such as van Rossem’s gull-billed terns, have the potential to occur outside their expected range (*i.e.*, vagrancy). Other subspecies of gull-billed terns are capable of long-distance flights and we assume van Rossem’s gull-billed terns are similarly capable. For example, an individual of the nominate (European) subspecies was banded as a nestling in Denmark and collected a few months later in Barbados in the Lesser Antilles in the western Atlantic Ocean (Lincoln 1936, p. 331; see also Cooke 1945, p. 128)—roughly 4,500 km (3,000 mi) outside of its expected winter range in western Africa (Gochfeld and Burger 1996, p. 645). Another gull-billed tern, probably of the Asian subspecies *Gelochelidon nilotica affinis* (*G. c. addenda*), was observed on the Hawaiian islands of O’ahu, Moloka’i, and Maui over a span of several months (Pyle and Pyle 2009, no page number), more than 8,000 km (5,000 mi) away from its expected winter range in Southeast Asia (Gochfeld and Burger 1996, p. 645). Although we do not have information on similar long-distance, extralimital movements for van Rossem’s gull-billed tern, birds presumed to be of this subspecies have been observed north of the San Diego Bay region (the northernmost nesting location within the subspecies’ expected range), including multiple detections of single birds along the California coast as far north as the San Francisco Bay area (Patton 2009, Appendix B) and at inland locations along the Colorado River and elsewhere in Arizona (Speich and Witzeman 1973, p. 148; Monson and Phillips 1981, p. 50; Rosenberg *et al.* 1990, p. 193).

Such movements of van Rossem’s gull-billed terns, though not unexpected, occur too infrequently to consider these areas as part of the subspecies’ range. However, the number of detections of van Rossem’s gull-billed terns farther north along the coast of California has increased as the San Diego Bay breeding population has increased (see discussion below in the “Population Size” section). As such, areas where other species of terns nest along the coast north of San Diego should be monitored for nesting gull-billed terns. Confirmation of van

Rossem's gull-billed terns nesting north of San Diego Bay, like the recent nesting attempt detected in Orange County mentioned above, would indicate a continuing northward expansion of the subspecies' breeding range.

In summary, the current breeding range of van Rossem's gull-billed tern extends from San Diego and the Salton Sea along the Pacific and Gulf of California coasts to at least as far south as the State of Guerrero in Mexico. Actual nesting locations are discontinuously distributed within that range (Table 1). However, survey information is limited for most of the Pacific coast of Mexico; additional efforts may yet detect other nesting locations in this region, including south of Guerrero. The current winter range of the subspecies includes the west coast of mainland Mexico, potentially as far south as Central America and coastal northwestern South America, plus a few inland locations.

#### Population Size

Historical data on population sizes are generally lacking for the subspecies, especially in western Mexico and farther south into Central and South America. As noted above, historical information shows that van Rossem's gull-billed terns occurred in Mexico, but these data largely consist of anecdotal observations or museum collections (specimens); there are few data to indicate the size of historical populations of van Rossem's gull-billed terns. Available literature that include information on the historical avifauna of western Mexico, such as Bryant (1889 pp. 237–320), Brewster (1902, pp. 1–241), Salvin and Godman (1904, pp. 1–505), Ridgway (1919 pp. 1–852), Mailliard (1923, pp. 443–456), Huey (1927, pp. 239–243), Grinnell (1928, pp. 1–300), van Rossem and Hachisuka (1937, p. 333), van Rossem (1945, p. 93), Hellmayr and Conover (1948, p. 297), Friedmann *et al.* (1950, pp. 1–204), Schaldach (1963, pp. 1–510), Binford (1989, p. 115), and Russell and Monson (1998, pp. 115–116) (see also summary in Palacios and Mellink 2007, pp. 214–215), present limited or no information on gull-billed terns from the region. Many of the cited historical texts predate the 1929 formal description of *Gelochelidon nilotica vanrossemsi*, the van Rossem's subspecies of gull-billed tern. Regardless of the subspecies or the timing of the historical observations, early observers would have been able to identify the species as a whole—*G. nilotica*, the gull-billed tern. As discussed in the *Species Description and Taxonomy* section, the available information indicates that the

subspecies of the gull-billed tern that breeds in western Mexico (at least north of the Isthmus of Tehuantepec) is *G. n. vanrossemsi*. Thus, the historical observations of gull-billed terns in western Mexico most likely pertained to *G. n. vanrossemsi*. The information that is available from these sources indicates that gull-billed terns were rarely encountered, and when encountered, were in small numbers. By comparison, the information on other species of colonial waterbirds in western Mexico is much more complete. Although this list of references is not a fully exhaustive list of historical resources, it illustrates the contrast between historical information available on gull-billed terns and other species of colonial waterbirds that occurred in western Mexico. This contrast indicates that the historical scientific explorations of the region were adequate to detect many other species of colonial waterbirds, but were inadequate to detect gull-billed terns or their nest sites in western Mexico. It is reasonable to conclude that van Rossem's gull-billed terns were encountered rarely because there were comparatively few van Rossem's gull-billed terns to encounter. Therefore, we conclude based on the available information, the historical population size of van Rossem's gull-billed terns in western Mexico was small—or at least not markedly larger than the population today.

In the United States, when Pemberton first discovered the nesting colony of gull-billed terns at the Salton Sea in 1927, he estimated that there were approximately 500 active nests (Pemberton 1927, p. 256), which would translate into a similar number of pairs. It is not clear when this population became established, but the Salton Sea was created in its present form between 1905 and 1907 when Colorado River floodwaters filled the dry lakebed known as the Salton Sink; however, previous historical and prehistorical floods also periodically filled the Salton Sink from time to time (with intervening dry periods), forming an intermittent body of water within the Salton Sink now referred to as Lake Cahuilla (see Patten *et al.* 2003, pp. 1–6 for a history of Lake Cahuilla and the Salton Sea). Although the Salton Sea population of van Rossem's gull-billed terns was not systematically monitored until the 1990s, anecdotal evidence shows that the population decreased over time to a low somewhere in the range of 15 to 25 pairs in the early 1970s (Grinnell and Miller 1944, p. 172; Pyle and Small 1961, p. 31; McCaskie 1973, p. 919; McCaskie 1974, p. 949; McCaskie 1976,

p. 1004; Garrett and Dunn 1981, p. 189; McCaskie pers. comm. 2010). Over the next few decades, the population at the Salton Sea increased to about 100 to 150 pairs, with more consistent monitoring showing that it has remained fairly constant since the early 1990s (Molina 2004, p. 94; Molina 2009b, p. 5). In San Diego Bay, the nesting population of van Rossem's gull-billed terns has increased from its inception in 1987 to 59 pairs in 2010 (R. Patton, *in litt.*, 2010, spreadsheet summary).

Today in Mexico, in addition to the new, small colony at Laguna Ojo de Liebre, van Rossem's gull-billed terns have colonized the islands in the impoundments associated with the Campo Geotérmico Cerro Prieto (Cerro Prieto geothermal generation facility) in northeast Baja California. The facility started operation in 1973 (Gutiérrez-Galindo *et al.* 1988, p. 201) and van Rossem's gull-billed terns have been observed there since at least 1996 (Molina and Garrett 2001, p. 25). Since 1996, fairly consistent monitoring at this site indicates that it has grown to be one of the largest populations (Table 1). Additionally, the nesting colony at Isla Montague has been fairly well monitored since 1992 (Palacios and Mellink 1993, p. 259; Molina 2010b, *in litt.*). Although nesting at Isla Montague was only just confirmed in 1992 (Palacios and Mellink 1993, p. 259), nesting on the island was suspected decades earlier based on specimens collected there in the spring of 1915 (Friedmann *et al.* 1950, p. 107; Molina and Erwin 2006, p. 294; Molina *et al.* 2010, p. 61).

As mentioned in the “Range and Distribution” section, gull-billed terns have been known to occur in western Mexico for more than a century (see Molina and Erwin 2006, p. 294) and breeding there was likely; however, nesting has only been documented recently. Surveys at nesting locations throughout the remainder of the breeding range of van Rossem's gull-billed tern in Mexico have been sporadic and essentially consist of “snapshots” of nesting efforts over time. During the breeding seasons of 2003 and 2005, Palacios and Mellink (2003, pp. 1–66; 2006, pp. 1–84; 2007, pp. 214–222) surveyed at least 367 potential nesting areas along the Pacific and Gulf of California coasts of Mexico. Additionally, of the nine known nesting locations in Mexico (Table 1), all but Laguna Potosí were resurveyed in June and early July 2010 (Palacios 2010, pp. 1–28). However, the level of survey effort compared with the number of potential nesting locations along the coast of Mexico suggests additional

undetected nesting locations likely exist. For example, one of the largest single colonies of this subspecies (105 to 160 pairs) was only discovered in 2003 at Laguna Las Garzas (Laguna Los Pericos) in Marismas Nacionales, Nayarit (Table 1) (Palacios and Mellink 2003, p. 11; Palacios and Mellink 2007, p. 217). New (but small) populations were also found nesting in 2006 at Bahía de Ceuta, Sinaloa (González-Medina and Guevara-Medina 2008, pp. 6–7) and in 2007 at Laguna Potosí, Guerrero (Mellink *et al.* 2009, p. 8) (Table 1). Thus, although we expect additional nesting locations to be found and population estimates to change, we do not expect refinements in those values to alter substantially our understanding of the subspecies or our analysis.

As summarized by Molina *et al.* (2010, p. 10), 737 to 808 pairs of van Rossem's gull-billed terns appear to have nested in western North America in 2003 and 2005, with approximately 550 of those nesting in Mexico. Because these values generally represent pairs of nesting adults counted at nesting sites, there are additional nonbreeding individuals that are not represented in these totals, underestimating the total population size. Additionally, there may be a limited number of pairs nesting at undetected locations. Thus, these rough estimates represent the *minimum* population size for van Rossem's gull-billed terns in the United States and Mexico.

Population data for most of the subspecies' range are incomplete over time; thus, population trends are difficult to assess. Data from the Salton Sea, which are fairly complete, shows a marked decline in population compared to the historical high in 1927, but this population has remained fairly stable since the 1990s (Molina *et al.* 2010, p. 10). Although preliminary data suggest the numbers of nesting van Rossem's gull-billed terns at the Salton Sea during the 2010 nesting season was substantially smaller (Molina, *in litt.*, 2010, p. 3), it is not clear whether this is a temporary or longer-term change; marked declines have been observed there in the past, but they have been temporary (Molina, *in litt.*, 2010, p. 3). The available information from the nesting locations in Mexico with the most-complete population data (Isla Montague and Cerro Prieto) shows that population sizes at these locations are variable (Palacios and Mellink 2007, p. 217). The populations at these sites also appear to be connected, with individuals moving between these nesting locations and the Salton Sea nesting location and, to a lesser extent, the San Diego Bay nesting location

(Molina and Garrett 2001, p. 26; Molina 2004, p. 98; Palacios 2010, pp. 12 and 15). In combination, the populations of van Rossem's gull-billed terns at Isla Montague, Cerro Prieto, and the Salton Sea are annually variable but, when taken together, appear to have been fairly stable since the 1990s (see Molina *et al.* 2006, p. 5; Molina and Erwin 2006, p. 279; Palacios and Mellink 2007, p. 217; Molina *et al.* 2010, p. 10). Data from central and southern Mexico—the bulk of the subspecies' range geographically but not, as suggested by the data, in numerical terms—are inadequate to define precise trends, but they do not show any precipitous declines (see Molina and Erwin 2006, p. 279; Palacios and Mellink 2007, p. 217). Moreover, as discussed above, the historical size of the van Rossem's gull-billed tern population in the rest of Mexico was likely never large.

### Biology

Van Rossem's gull-billed tern is predominantly a coastal nesting species, but it also nests at, or near, certain inland saline lakes (Parnell *et al.* 1995, p. 5; Molina and Erwin 2006, p. 284; Molina *et al.* 2010, p. vii). During the nonbreeding season, van Rossem's gull-billed terns may occur at either saline or freshwater areas (Molina *et al.* 2010, p. 12), but they are often found foraging over tidal mudflats within large lagoons and estuaries (Molina *et al.* 2009a, p. 12). Like other terns, gull-billed terns (including van Rossem's gull-billed tern) are predators, but they differ from most other tern species in how they forage and in the types of prey they consume. Unlike many other tern species that eat only fish caught by shallow dives into water, gull-billed terns forage on a variety of prey items, which varies by area. For example:

(1) Gull-billed terns capture flying insects during foraging flights (Parnell *et al.* 1995, p. 5);

(2) They swoop down and snatch up terrestrial prey (such as small crabs, lizards, insects, or small chicks of other bird species) and aquatic prey (such as small fish) near the water's surface (Parnell *et al.* 1995, p. 5; Molina and Marschalek 2003, p. i); and

(3) They land to capture small prey items from the water's surface (Parnell *et al.* 1995, p. 5).

Moreover, gull-billed terns—the species as a whole, including van Rossem's gull-billed terns—are opportunistic foragers (Parnell *et al.* 1995, p. 5; Gochfeld and Burger 1996, p. 645; Erwin *et al.* 1998a, p. 323; Molina 2009a, p. 6). Not only do they eat a wide variety of prey items and forage over wide range of areas, they also may

opportunistically focus on certain prey items when those items are abundant or otherwise readily accessible. For instance, gull-billed terns in western Africa were observed preferentially foraging on fiddler crabs (*Uca tangeri*), despite being an energy-poor food source, because the crabs were abundant and easier to capture than other, more energy-rich prey items (Stienen *et al.* 2008, p. 243). The diet and general foraging habits of van Rossem's gull-billed tern is similar to that of other subspecies of gull-billed tern (Molina and Marschalek 2003, p. 9; Molina and Erwin 2006, pp. 286–287; Molina 2009a, pp. 6–8; Molina *et al.* 2009a, p. 12).

Thus, van Rossem's gull-billed terns are generalist predators whose food appears to be determined more by size and availability of prey items rather than strictly by the type of prey. The foraging habitat of van Rossem's gull-billed terns consists of open mudflats in tidal estuaries, river margins, beaches, salt marshes, freshwater marshes, aquacultural impoundments (such as shrimp ponds), and a variety of upland habitats including open scrub, pasturelands and irrigated agricultural fields and associated canals and drains, and the airspace over such areas (Molina and Erwin 2006, p. 284; Parnell *et al.* 1995, pp. 4–5). A university-based study is currently underway in San Diego Bay to evaluate the foraging patterns and relative use of areas within San Diego Bay and the adjacent coastline; the results of this study are not yet available.

Gull-billed terns, including van Rossem's gull-billed terns, nest in colonies of 20 to 50 pairs, although numbers may vary (Parnell *et al.* 1995, p. 9). They display low nest-site fidelity; that is, they are not closely tied to any one nest site from year to year, even moving to new sites and renesting within the same year (*e.g.*, after disturbance or predation events) (Parnell *et al.* 1995, p. 13; Erwin *et al.* 1998b, p. 970). Groups of van Rossem's gull-billed terns have displayed such renesting behavior at the Salton Sea (Molina 2009b, pp. 6–7) and at Bahía Santa María (Palacios and Mellink 2007, p. 218) (Table 1). Van Rossem's gull-billed terns also readily take advantage of new nest sites or sites that are not available every year (for example, Molina 2005, p. 4; Molina 2009b, p. 2). Thus, van Rossem's gull-billed terns appear to be opportunistic and adaptable nesters.

The term “nest colony” may refer to the group of birds or a geographic location. A nesting location (as used in Table 1) may contain more than one colony. In general, a colony consists of



the terns that occupy a nest site during a particular nesting attempt. A nest site is the specific location where a group of terns is nesting. Individual terns within a colony may move between nest sites between nesting attempts within a given breeding season (within-year movements). For example, after nest failure at one nest site, members of a colony may move within the same breeding season to one (or more) nest sites at a different location (or locations) within the general nesting location (Molina *et al.* 2010, p. 17). We also refer to the groups of individuals that collectively use nesting locations as "populations." Even though it appears that van Rossem's gull-billed tern populations return to nesting locations (the general area), groups of individuals may establish colonies at different nest sites within those general areas from year to year (between-year movements). Moreover, these populations are not necessarily fixed over time. Because van Rossem's gull-billed terns can fly long distances, individuals of a population may move between and among other populations, more likely occurring between years but potentially even within years. For example, between-year movements among nest locations (populations) have been observed in the northern portion of the subspecies' range where many individual van Rossem's gull-billed terns are banded, which allows specific birds to be resighted, and thus tracked, over time (Molina and Garrett 2001, p. 26; Patton 2001, p. 8; Molina 2004, p. 98; Palacios 2010, pp. 12 and 15).

Nests of van Rossem's gull-billed terns consist of shallow scrapes with simple adornments, such as rocks, shells, or fish bones (Parnell *et al.* 1995, p. 10). Although some individuals may form pairs during migration, breeding activity reaches its peak when birds arrive at nesting areas (Sears 1981, p. 192; Parnell *et al.* 1995, p. 8). The breeding season generally occurs from mid-March through August, at least within the northern portion of its breeding range (Parnell *et al.* 1995, pp. 4 and 9). The timing of nest initiation varies from place to place and year to year, with some colonies reinitiating nesting after predation or disturbance events and moving to other nearby nest sites (Molina 2009b, pp. 6–7). Such renesting can occur repeatedly in one nesting season or birds may simply abandon nesting at that nesting location for a given year (Molina 2009b, pp. 6–7).

Nesting habitat for van Rossem's gull-billed terns consists of low, open areas on natural and artificial beaches, islands, and levees, usually with no or

sparse vegetation (Parnell *et al.* 1995, pp. 5 and 10; Palacios and Mellink 2007, p. 215). Typically, these areas are located on islands or other remote areas where the risk of predation is low. Barren areas suitable as nest sites are often kept clear by natural or artificial disturbance regimes, especially tidal inundation, that prevent or limit plant growth. Although gull-billed terns typically nest in areas above most high tides (Bent 1921, p. 198; Parnell *et al.* 1995, p. 4), it is not uncommon for active nests to be destroyed by the highest tides (Erwin *et al.* 1998b, p. 976; Peresbarbosa and Mellink 2001, p. 268; Molina and Erwin 2006, p. 286; Patton 2009, p. 9).

At San Diego Bay and the Salton Sea, van Rossem's gull-billed terns typically lay two to three eggs per clutch (Parnell *et al.* 1995, p. 12). The egg incubation period is 22 to 23 days, and the young fledge after 28 to 35 days (Parnell *et al.* 1995, p. 11). Similar to other tern species (see Dunn 1972, pp. 360–366; Buckley and Buckley 1974, pp. 1053–1063; Shealer and Burger 1995, pp. 93–99), juvenile gull-billed terns remain dependent upon their parents for at least 4 weeks after fledging and probably longer, during which time they learn to forage and fend for themselves (Parnell *et al.* 1995, p. 12). Thus, van Rossem's gull-billed terns only raise one brood per year (Parnell *et al.* 1995, p. 9); any subsequent renesting attempts typically follow a disturbance or predation event that occurs early within the breeding season.

Terns that survive to become adults are generally long-lived (Gochfeld and Burger 1996, p. 640) with lifespans of 10 to 20 years or even more (such as Thompson *et al.* 1997, p. 15; Cuthbert and Wires 1999, p. 19; Shealer 1999, pp. 17–18; Buckley and Buckley 2002, p. 18; Hatch 2002, p. 25). Lifespan information on the entire gull-billed tern species is limited, with even less known about van Rossem's gull-billed tern. Other subspecies of gull-billed terns are known to first breed at 5 years old, but can establish territories at nest sites without breeding at 4 years old (Parnell *et al.* 1995, p. 12). A few van Rossem's gull-billed terns of known age have been observed nesting as 3-year-olds (Molina *et al.* 2010, p. 6). Banded gull-billed terns have been recovered in Europe almost 16 years post-banding, and 14 years post-banding in eastern North America (Parnell *et al.* 1995, p. 12). Patton (2009, p. 9) noted a banded van Rossem's gull-billed tern that was at least 9 years old at the San Diego Bay colony (and presumably breeding), and 10-year-old birds have been observed at the Salton Sea (Molina *et al.* 2010, p. 6).

We believe the lifespan of van Rossem's gull-billed tern to be similar to other tern species (*i.e.*, 10 to 20 years, possibly more).

#### Management Actions

Through our Division of Migratory Birds Management, the Service is the lead Federal agency for managing and conserving migratory birds in the United States under the Migratory Bird Treaty Act (MBTA). We provide national and international leadership in the conservation and management of migratory birds by promoting, among the Service and its partners, science-based management of both populations and habitat on and off Service lands in support of national and international bird plans and initiatives.

In 2002 and 2008, pursuant to the Fish and Wildlife Conservation Act of 1980, as amended (16 U.S.C. 2901 *et seq.*), the Service included the gull-billed tern (the species as a whole) in the list of Birds of Conservation Concern (USFWS 2002, pp. 1–99; USFWS 2008, pp. 1–87). The species was included as a Bird of Conservation Concern both nationally and in certain specific Bird Conservation Regions, including the U.S. portions of Bird Conservation Regions 32 (Coastal California) and 33 (Sonoran and Mojave Deserts) (USFWS 2008, pp. 48 and 49). The gull-billed tern subspecies that occurs in Bird Conservation Regions 32 and 33 is the van Rossem's gull-billed tern (*Gelochelidon nilotica vanrossemsi*).

Conservation and management of van Rossem's gull-billed tern is one of the Service's regional priorities and includes the following activities:

(1) *Fall 2008*—We funded a U.S. Geological Survey (USGS) project to clarify taxonomic status of gull-billed terns in North America and define population structure and status of the species throughout its North American range. Results from this work are expected in 2011.

(2) *September 2009*—We held a structured decisionmaking workshop, bringing together interested parties to address potential conflicts between van Rossem's gull-billed terns and species listed under the Endangered Species Act. Results of this workshop are still in development.

(3) *Spring/summer 2010*—We coordinated van Rossem's gull-billed tern population monitoring at Sonny Bono Salton Sea and San Diego Bay National Wildlife Refuges. This work included population monitoring to determine annual productivity, and implementing measures to improve habitat and nesting conditions.



(4) *Spring/summer 2010*—The U.S. Navy along with the Service supported and is continuing to support university-based research on foraging behavior of van Rossem's gull-billed tern within and around San Diego Bay, which will provide insight into main foraging sites and frequency of visits to foraging sites. Data analysis is currently underway and results are not yet available.

Additionally, this work will continue in 2011 and planning is underway to expand this research to include migration and winter ecology using satellite telemetry technology.

(5) *Summer 2010*—We funded surveys for nine breeding colonies in Western Mexico to gain a better understanding of van Rossem's gull-billed tern population size and estimate 2010 productivity (Palacios 2010 draft report).

(6) *Summer 2010*—We have been and continue to work on population models to assess population and meta-population dynamics of the van Rossem's gull-billed tern in California colonies. Modeling will also evaluate interactions of van Rossem's gull-billed terns with other tern and plover populations in San Diego Bay. Further modeling efforts are evaluating effects of management actions on gull-billed tern populations with a goal of maintaining or increasing van Rossem's gull-billed tern numbers in California colonies.

(7) *Fall 2010*—We initiated coordination with Mexican biologists, the Sonoran Joint Venture, and the Cerro Prieto Geothermal Facility to develop a management plan for the facility with an emphasis on best management practices for colonial nesting seabirds, including van Rossem's gull-billed terns. These discussions and actions will also look for additional opportunities for conservation management in Mexico (e.g., Las Arenitas Sewage Treatment ponds).

(8) *Fall 2010 and 2011*—We are participating in several planning efforts for habitat restoration projects at the Salton Sea. Two habitat restoration projects are in the planning stages (one by California Department of Fish and Game (CDFG) and one by Sonny Bono Salton Sea National Wildlife Refuge). These planning efforts will emphasize the development of suitable nesting habitat for van Rossem's gull-billed terns and other colonial nesting birds.

(9) *Fall 2010 and 2011*—We are coordinating the development of long-term conservation strategies for the management of colonial nesting seabirds in San Diego Bay, including efforts to balance management of potentially conflicting species like van Rossem's

gull-billed tern, the California least tern (*Sternula antillarum browni*), and the western snowy plover (*Charadrius alexandrinus nivosus*).

#### Summary of Information Pertaining to the Five Factors

Section 4 of the Act and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In making this 12-month finding, information pertaining to van Rossem's gull-billed tern in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In making our 12-month finding on the petitioned action, we considered and evaluated the best available scientific and commercial information.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat and we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as those terms are defined in the Act.

#### *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*

For this factor, we evaluate the present (current) or threatened (anticipated) impacts that may affect the habitat or range of van Rossem's gull-billed tern. This factor does not address historical or past actions that resulted in destruction, modification, or curtailment of the species' habitat or range. Past actions that destroyed, modified, or curtailed the species' habitat or range are not threats in and

of themselves. Any persisting ramifications of such past actions that may be threats to the species would be addressed under *Factor E* (other natural or manmade threats), below. However, under *Factor A*, we do look to past actions to inform our evaluation of potential future threats affecting the species' habitat or range in that the history of past actions allows us to predict the likelihood of such actions continuing into the foreseeable future.

As used here, habitat (in its general sense) is an area that contains the physical or biological features that are important to the species' biological needs, such as breeding, feeding, or sheltering. As highly mobile, migratory birds, van Rossem's gull-billed terns are not necessarily confined to one particular area that contains those physical or biological features; that is, individuals may move between or among areas of habitat. Moreover, as a subspecies of bird that migrates seasonally, it breeds in certain areas during the Northern Hemisphere spring and summer; it then moves to other areas where it spends the winter (although, in some areas, there may be overlap). Generally, the habitat needs of van Rossem's gull-billed tern can be addressed by grouping its habitat into two habitat types, (1) Foraging habitat, which it needs all year, whether during the breeding season (and within its breeding range) or during the times it is not breeding (within its winter range or while migrating); and (2) nesting habitat, which it needs for laying eggs and raising young during the breeding season.

Van Rossem's gull-billed tern foraging habitat, as discussed in the "Biology" section, comprises upland and aquatic areas, including open mudflats in tidal estuaries, river margins, beaches, salt marshes, freshwater marshes, aquacultural impoundments (such as shrimp ponds), and a variety of upland habitats including open scrub, pasturelands and irrigated agricultural fields and associated canals and drains, and the airspace over such areas. Nesting habitat consists of low, open areas on natural and artificial beaches, islands, and levees, usually with no or sparse vegetation and are typically located on islands or other remote areas where the risk of predation is low.

As highly mobile, migratory birds, van Rossem's gull-billed terns can choose among potential nesting locations and specific nest sites within those locations. For a nest site to be suitable, it must have suitable foraging habitat nearby, among other considerations. Although it is not known how gull-billed terns, including

van Rossem's gull-billed terns, make such assessments of foraging habitat (Biber 1989, p. 89), the available information suggests that nesting gull-billed terns are typically not food limited (Erwin *et al.* 1999, p. 52). In contrast, breeding black skimmers, which often nest near gull-billed terns but eat fish almost exclusively (Gochfeld and Burger 1994, pp. 4, 12–13), may often be food limited (Erwin 1977, p. 715). This suggests that the opportunistic foraging by van Rossem's gull-billed tern over a wide range of foraging habitats allows the subspecies to have a low sensitivity to impacts to foraging habitat, even when confined to smaller geographical areas during the breeding season. This, in turn, suggests that the subspecies will have a low sensitivity to impacts to foraging habitat during migration and on the wintering grounds, when van Rossem's gull-billed terns are even less geographically restricted. Moreover, this low sensitivity to impacts to foraging habitat, as a natural trait of the subspecies, is unlikely to change over the foreseeable future. Because foraging habitat for the subspecies includes a wide range of areas and nesting habitat comprises specific nest sites, nesting habitat for van Rossem's gull-billed tern is likely to be more limited than foraging habitat under most situations.

#### United States

**Salton Sea**—The Salton Sea is a large, inland lake in the Imperial and Coachella Valleys and is within the Sonoran Desert. The Salton Sea, in its present form, was created in the early 1900s by flooding on the Colorado River that followed canals dug for irrigation (see Patten *et al.* 2003, pp. 1–6 for a more detailed summary). The Salton Sea has been maintained since then by waste irrigation water associated with extensive agricultural development in the region. Thus, most of the development of the region occurred in the past. Today, the existing agricultural fields and associated canals serve as foraging habitat for van Rossem's gull-billed terns.

However, the amount of water being used for agriculture has declined because of an agreement to transfer water out of the Imperial Valley and some fields in agricultural production are being intentionally fallowed to reduce the amount of water used in the Imperial Valley (IID 2006, p. 1; IID 2009, p. 71). Which fields are fallowed is determined randomly (IID 2006, p. 1), so we expect fallowed fields to occur over a wide area in the Imperial Valley and not concentrated near areas of van Rossem's gull-billed tern foraging

activity. Moreover, the practice of fallowing as a water conservation measure is temporary; fallowing will end after 2018 (IID 2009, p. 72). Over the time fallowing is to be phased out other water conservation measures will likely be enacted in the Imperial Valley, some of which may affect some areas of foraging habitat for van Rossem's gull-billed terns. For example, to conserve water, there may be increased use of sprinklers or other irrigation techniques rather than the predominant current practice of flooding fields (which makes crickets, an important food source (Molina 2009a, p. 1), and other terrestrial prey items more accessible as they flee the rising water), even where van Rossem's gull-billed terns forage (IID 2007, pp. 17–19; Schoneman 2010, *in litt.* p. 2). However, as noted previously, van Rossem's gull-billed terns are opportunistic foragers—they concentrate their foraging activity on easily available food sources (Stienen *et al.* 2008, p. 243)—yet they forage on a wide variety of prey items (Parnell *et al.* 1995, p. 5). As such, van Rossem's gull-billed tern foraging habitat includes a number of areas. Thus, even if some of the available foraging habitat is destroyed or modified, it will likely not affect a substantial amount of van Rossem's gull-billed tern foraging habitat because the subspecies uses a wide range of areas as foraging habitat and they are capable of flying to those areas.

Van Rossem's gull-billed terns nest at several different sites (primarily islands) in the Salton Sea or nearby water bodies. The subspecies' use of particular nest sites varies between and within years, depending on local conditions. Nest site conditions within the Salton Sea vary because the Salton Sea has no outflow and the elevation of the lake's surface depends upon the amount of water input and loss. Input of water into the Salton Sea is primarily from agricultural runoff from nearby Imperial Valley and, to a lesser extent, Coachella Valley, with some input also from natural precipitation, which is variable and typically scant. Water loss is through evaporation, which is high in the desert environment.

Through recent history, shoreline elevations of the Salton Sea have fluctuated. As water levels rose, which was the case through much of the mid-twentieth century (Cohen *et al.* 1999, p. 10), many existing islands became submerged and were no longer available for nesting, while other small, higher points of land (such as former levees) became new islands. Some of the new islands then became nest sites for birds, including van Rossem's gull-billed terns

(Molina 2004, p. 96). As water levels dropped, which has been the case over the past several years, many of the small islands (islets), such as those at Johnson Street, Elmore Desert Ranch, and Obsidian Butte, have again become part of the mainland and have become vulnerable to terrestrial predators, such as coyotes (*Canis latrans*), feral dogs (*C. familiaris*), or raccoons (*Procyon lotor*) (Molina 2003, p. 2; Molina 2004, p. 96; Molina 2005, p. 5; Molina 2009b, p. 7; Molina 2010b, *in litt.*, p. 3). The larger Mullet Island has remained an island over this time; however, conditions for nesting of van Rossem's gull-billed terns at this site have varied because of other factors (for example, predation, competition, or disturbance) (Molina 2004, p. 96).

We expect water levels of the Salton Sea to continue to drop in the foreseeable future because the amount of water used for irrigation in the Imperial Valley (California) has declined and has been transferred (sold) to urban areas outside the region, thus limiting the amount of agricultural runoff entering the Salton Sea (IID 2006, p. 1). As such, even the large Mullet Island is expected to become attached to the mainland in the near future (Molina 2010a, p. 9). As the water level drops in the foreseeable future, it is likely that most of the historical areas of topographical relief that were once islands will not again reemerge because most of those areas eroded while inundated (see Molina 2001, p. 97). However, the dropping water level of the Salton Sea may allow for new islands to become exposed, allowing for novel nest sites for van Rossem's gull-billed terns, such as one south of Obsidian Butte used by van Rossem's gull-billed terns in 2010 (Molina 2010a, p. 6).

In addition to those nesting islands that are or were isolated because of the waters of the Salton Sea, van Rossem's gull-billed terns opportunistically use nesting habitat on intentionally or accidentally created islands in artificial impoundments along the edge or near the Salton Sea (Molina 2004, p. 93). For example, the creation of the “saline habitat ponds” near Hazard Road at the southeastern corner of the Salton Sea in 2006 (Miles *et al.* 2009, p. 1), provided nesting habitat for the subspecies from 2008 to 2010 (Molina 2009b, p. 2; Molina 2010a, p. 8); the ponds were dewatered and decommissioned following the 2010 bird nesting season (M. Walker, Bureau of Reclamation, pers. comm. 2010). Another example of opportunistic use of nesting habitat is the 2005 nesting of van Rossem's gull-billed terns at a pond some 25 km (15

mi) from the Salton Sea that typically is only full during the winter but had water during the breeding season that year (Molina 2005, p. 4). Although the water levels in such artificial impoundments may be independent of the water levels of the Salton Sea, they are also variable between and within years. These ponds are dependent upon artificial water inputs, and the management of the water levels in some of these ponds may not necessarily take into account the needs of waterbirds that may be nesting, including van Rossem's gull-billed terns. Thus, the literature shows that such ponds have provided, albeit inconsistently, nesting habitat for the subspecies.

Additionally, a few nest sites located on or near the Salton Sea are managed for nesting waterbirds, including van Rossem's gull-billed tern, especially those on the Sonny Bono Salton Sea National Wildlife Refuge (Salton Sea Refuge) (Schoneman 2010, *in litt.*, p. 1). Even so, the status of the nest sites on the Salton Sea Refuge is not assured over the long term because the Refuge must purchase the water to maintain the ponds that allow for the existence of the nesting islands and adequate funding is not guaranteed (C. Schoneman, Sonny Bono Salton Sea National Wildlife Refuge, pers. comm. 2010). Moreover, the availability of the water itself is not guaranteed; for example, during a water shortage emergency, water availability may be limited. Nevertheless, the Salton Sea Refuge has consistently managed its wetlands to support nesting van Rossem's gull-billed terns since 1995 (Molina 2004, p. 97; Schoneman 2010, *in litt.*, p. 1). Additionally, artificial nesting platforms have been used at the Salton Sea Refuge to provide additional nest sites for van Rossem's gull-billed terns and other waterbird species (Molina 2006, p. 3; Molina *et al.* 2009b, p. 267). This or other management actions could potentially be used to provide additional nest site options for van Rossem's gull-billed terns at the Salton Sea, even without the availability of water for artificial ponds.

In summary, at the Salton Sea, even if some of the available foraging habitat is destroyed or modified, it will likely not affect a substantial amount of van Rossem's gull-billed tern foraging habitat because the subspecies uses a wide range of areas as foraging habitat and the birds are capable of flying to those areas. We anticipate some loss of existing nesting habitat at the Salton Sea because the Sea's decreasing water level will reduce the number of nesting islands that the subspecies has traditionally used over the past 10 to 20 years. However, the lowering water

level may result in the exposure of new islands that may serve as nesting habitat, as was shown in 2010.

Additionally, van Rossem's gull-billed terns have opportunistically used suitable nesting habitat in artificial impounds near the Salton Sea, even though such habitat may only occur from time to time. Thus, we expect some reduction in the amount of nesting habitat (*i.e.*, a reduction in the number of nest site options), but we do not expect complete elimination of nesting habitat in the region. The anticipated reduction in the amount of nesting habitat may force van Rossem's gull-billed terns to nest in areas where predation, disturbance, or other threats may be more likely, potentially resulting in lowered productivity of the subspecies at this nesting location. These potential threats are addressed in the other factors, below.

*San Diego Bay*—The region around San Diego Bay is highly urbanized, nearly built-out, as a result of past development, most of which occurred before the subspecies colonized the region in 1987. Much of south San Diego Bay itself was developed for salt production. Such areas of salt production, or "saltworks," comprise a network of dikes that creates a series of ponds from which water evaporates, which leaves an ever-concentrating solution of sea salt that is eventually dried and harvested. The San Diego Bay saltworks area is now part of the greater San Diego Bay National Wildlife Refuge. Many of the areas of foraging habitat for the subspecies, such as the areas around San Diego Bay (including San Diego Bay National Wildlife Refuge, Silver Strand State Beach, and certain lands owned or operated by the U.S. Navy) and the Tijuana River estuary (including Tijuana Slough National Wildlife Refuge and Borderfield State Park) (Patton 2009, pp. 10–11 and Figure 2), are largely protected from future development. As such, substantial destruction or modification of foraging habitat in the San Diego Bay region is not occurring currently nor is it likely to occur in the foreseeable future.

Potential nesting habitat for van Rossem's gull-billed terns occurs in undeveloped areas in and around San Diego Bay; nearly all occupied nest sites are located on the saltworks dikes on San Diego Bay National Wildlife Refuge lands (Patton 2009, p. 8). These nesting sites are protected and managed to benefit several species of colonial waterbirds, including van Rossem's gull-billed terns (USFWS 2006, pp. 1–36). Thus, destruction or modification of nesting habitat by urban development is not a significant threat to the San Diego

Bay colony of van Rossem's gull-billed terns.

#### Mexico

The availability of information on specific nesting locations in Mexico (Table 1; Figure 1) is variable and generally less detailed than what is available for nesting locations in the United States. Using the information available, the following discussion provides our assessment of the status of van Rossem's gull-billed tern foraging and nesting habitat at the locations in Mexico. We are not aware of any van Rossem's gull-billed tern nesting locations south of Mexico in Central America.

*Campo Geotérmico Cerro Prieto*—The setting at this location is very similar to the Salton Sea and has a comparable history of agricultural development (Furnish and Ladman 1975, pp. 84–88; Molina and Garrett 2001, p. 23). Given the similarity to the Salton Sea, foraging by van Rossem's gull-billed terns likely occurs in the agricultural fields, along the canals and drains in the area, and over the neighboring desert (Molina and Garrett 2001, pp. 23, 25, and 27; Erickson *et al.* 2009, p. 508). The area is not subject to the same water agreements as the Imperial Valley. The available literature does not identify any significant threats to van Rossem's gull-billed tern foraging habitat in the region now or in the foreseeable future.

Van Rossem's gull-billed terns nest on islands in artificial ponds created by the dumping of wastewater (brine) from the geothermal electrical generation facility. Since 1996, Cerro Prieto has grown to be one of the larger populations of van Rossem's gull-billed terns (Molina and Garrett 2001, p. 25; Palacios and Mellink 2007, pp. 215–216). Recent information suggests the facility is managing its brine differently, reducing the amount of water in the ponds, thereby reducing the available nesting habitat for van Rossem's gull-billed terns (Molina 2010b, *in litt.*, p. 4; Palacios 2010, pp. 11–14). However, we do not know if this situation is permanent and, as of 2010, the nesting location still had areas of nesting habitat (Palacios 2010, pp. 11–14). Additionally, about 100 van Rossem's gull-billed terns were seen at the "new Las Arenitas sewage ponds, near Cerro Prieto" (Erickson *et al.* 2009, p. 508), but these were likely birds from Cerro Prieto and there was no evidence of nesting observed at this site (R. Erickson, Regional Editor, North American Birds, 2010, pers. comm.).

The conditions at Cerro Prieto illustrate the difficulty in accurately assessing long-term threats to van

Rossem's gull-billed tern related to management of artificial water impoundments because these areas are managed for reasons other than maintaining nesting habitat. Because of the combination of the loss of suitable nesting habitat at Cerro Prieto proper, and the uncertainty over the subspecies' use of the new Las Arenitas ponds, we are unable to predict the future of this population at this nesting location; however, because van Rossem's gull-billed terns can opportunistically use nesting habitat even under changing conditions (see above), it is unlikely that all nesting at this nesting location will cease in the foreseeable future.

*Isla Montague*—Isla Montague, a large, low island in the Colorado River delta at the north end of the Gulf of California in Baja California, is part of the breeding range of the subspecies, although some birds may winter there, too (Molina *et al.* 2009a, p. 9). This area is within the protective core zone of the Alto Golfo de California y Delta del Río Colorado Biosphere Reserve (Peresbarbosa and Mellink 2001, p. 265). Foraging habitat includes the deltaic and coastal areas around the island, including nearby aquacultural shrimp ponds (Palacios and Mellink 2006, p. 60). Conversion of areas to shrimp aquaculture may destroy or modify areas of natural foraging habitat, but it also is likely to result in manmade foraging habitat that can have concentrated prey, especially during periods of shrimp harvest (Molina *et al.* 2009a, p. 12). As such, the development of shrimp aquaculture is likely not a substantial impact to van Rossem's gull-billed tern foraging habitat here or elsewhere in the subspecies' overall range.

Since 1992, when nesting was first confirmed at Isla Montague, incomplete though somewhat consistent data show that the nesting habitat on this island has supported as few as 30 and up to as many as 200 breeding pairs of nesting van Rossem's gull-billed terns (Palacios and Mellink 2007, p. 217; Molina *et al.* 2010, p. 61). This population was larger in 2010, potentially because birds from Cerro Prieto, the Salton Sea, or both, relocated to this nesting location (Palacios 2010, pp. 14–15). Moreover, the nesting habitat at this site is low in elevation and subject to flooding during extreme high tides (Peresbarbosa and Mellink 2001, pp. 267–268). Although such flooding is a potential threat to eggs or young (see Factor E), it does suggest that substantial manmade developments here are unlikely. Therefore, we do not anticipate destruction or modification of nesting

habitat to be a significant threat at this location.

*Laguna Ojo de Liebre*—This site is a large lagoon along the Pacific coast of the Baja California Peninsula in the northwest corner of Baja California Sur. The area is within the El Vizcaíno Biosphere Reserve (Palacios 2010, p. 6). Associated with this lagoon is the salinas de Guerrero Negro (Guerrero Negro saltworks), an extensive system of artificial ponds used in the salt-making process. Foraging habitat in the region is likely within the greater lagoon area, including portions of the saltworks, and the nearby coastal areas and uplands. Small islands within the network of ponds provide potential nesting habitat for colonial waterbirds, including a small number of van Rossem's gull-billed terns (Danemann and Carmona 2000, p. 197; Palacios and Mellink 2006, p. 49; Palacios 2010, p. 16). Although this nesting location is noteworthy because it is the only one on the Baja California Peninsula, the small number (4 to 14 breeding pairs) of van Rossem's gull-billed terns that nest here do not represent a significant number of birds relative to the overall population of the subspecies. The available information does not suggest that this area is used by van Rossem's gull-billed terns during the winter.

Foraging habitat in the region is likely within the greater lagoon area, including portions of the saltworks, and the nearby coastal areas and uplands. Although some future development is possible, especially near the community of Guerrero Negro, we do not anticipate substantial destruction or modification of van Rossem's gull-billed tern foraging habitat in this area because much of the area away from Guerrero Negro and the saltworks is largely uninhabited and the area is designated a biosphere reserve, which may limit any potential future development. Even if some development occurs, it will likely not affect a substantial amount of van Rossem's gull-billed tern foraging habitat because the subspecies uses a wide range of areas as foraging habitat.

As suggested by the ponds at Cerro Prieto, we should not consider the islands associated with the saltworks permanent; however, the available information suggests that significant changes in management are unlikely over the foreseeable future (Palacios and Mellink 2006, p. 54; Palacios 2010, p. 16).

*Bahía Santa María*—This area is a large and extensive coastal lagoon system with long barrier beaches in Sinaloa. Foraging habitat in this area likely includes the greater lagoon, including areas of shrimp aquaculture;

the coastline; and nearby agricultural areas. The nesting habitat for van Rossem's gull-billed terns at Bahía Santa María comprises two low, sandy islands (and associated small islets), Isla El Rancho and Isla Altamura, which are part of the lagoon's barrier islands (Palacios and Mellink 2007, p. 218; Palacios 2010, p. 19). Shrimp aquaculture occurs within the large bay, and agriculture occurs in nearby uplands (Engilis *et al.* 1998, p. 333; DeWalt 2000, pp. 61–62), but the operations appear to be located in areas at some distance from the nesting islands (Robadue and Villalba 2001, p. 2). The Bahía Santa María nesting area is included in the Islas del Golfo de California (Gulf of California Island) Park System and the Santa María Bay Ecosystem Management Program (Molina *et al.* 2010, p. 17; Palacios 2010, p. 7). Areas within this lagoon are being conserved for shorebirds and other wildlife species through efforts of nongovernmental organizations (Robadue and Villalba 2001, p. 2; ABC 2007, p. 1). Together, these protections restrict the destruction of nesting and foraging habitat for van Rossem's gull-billed terns in the lagoon. Loss or modification of van Rossem's gull-billed tern nesting or foraging habitat at Bahía Santa María does not appear to be a significant threat now or in the foreseeable future.

*Bahía de Ceuta*—This site is a large, long, coastal lagoon with barrier beaches in Sinaloa. Foraging habitat in this area likely includes the greater lagoon, including areas of shrimp aquaculture; the coastline; and nearby agricultural areas. The area of van Rossem's gull-billed tern nesting habitat appears to be at the south end of the lagoon near an area of artificial impoundments (González-Medina and Guevara-Medina 2008, p. 7). Muñoz del Viejo *et al.* (2004, p. 197), describing perhaps the same location from a study of other species of nesting terns, identifies the area as “a long-abandoned saltflat” (salt production area or saltworks). The nesting habitat at this site is low in elevation and subject to flooding during extreme high tides, which makes substantial manmade developments here unlikely. González-Medina and Guevara-Medina (2008, p. 7) have stated that there seem to be no direct anthropogenic threats to the nesting habitat at this site. However, the population of van Rossem's gull-billed terns at this nesting location is very small, consisting of less than 10 individuals and only 1 nest was observed in 2006 (González-Medina and Guevara-Medina 2008, p. 6); the nesting

site, although apparently still present, was not occupied in 2010 (Palacios 2010, pp. 20–21). Therefore, the available information suggests that the nesting and foraging habitat for van Rossem's gull-billed tern at this location is currently not likely to be destroyed or modified now or in the foreseeable future; however, this nesting location appears to be only intermittently occupied by a very small population of van Rossem's gull-billed terns.

*Laguna del Caimanero*—This site is a moderate-size lagoon in Sinaloa. Foraging habitat in this area likely includes the greater lagoon, including areas of shrimp aquaculture; the coastline; and nearby agricultural areas. In 2005, the nesting area for van Rossem's gull-billed terns was located on the southeastern part of the lagoon on a large, dry, mudflat-island surrounded by tidal channels (Palacios and Mellink 2006, p. 66). In 2010, the terns used a different mudflat-island, as well as a dredge-spoil island (Palacios 2010, pp. 21–22) for nesting, which indicates that multiple areas of nesting habitat are available in the vicinity. Past agricultural development of the surrounding areas has altered the landscape, vegetation, and surface flows of water around the lagoon, leading to increased siltation within the lagoon (Ruiz-Luna and Berlanga-Robles 1999, p. 37). Additionally, shrimp aquaculture is practiced within the lagoon (Galindo *et al.* 1997, p. 1072), including near the nest sites (Palacios and Mellink 2006, p. 66).

The lagoon is artificially channelized, which has increased siltation in the southeast portion of the lagoon (Hernández-Cornejo and Ruiz-Luna 2000, p. 604), which in turn may have contributed to the formation of the mudflat-island nest sites. Such islands likely flood during high tides in winter (Palacios and Mellink 2006, p. 66), which may increase habitat quality because vegetation growth is inhibited. However, high tides may also inundate the nest sites during the breeding season (Palacios 2010, p. 22), washing away eggs or young chicks. Additionally, fishermen used the 2005 mudflat-island nest site to beach small boats, and they erected a small, palapa-like shade structure in the vicinity (Palacios and Mellink 2006, p. 66). Given the limited information we have regarding the current and future human activities within this nesting location and variability of use by the van Rossem's gull-billed tern, we determine that the destruction or modification of nesting or foraging habitat is not a significant threat at this location now or in the foreseeable future.

*Marismas Nacionales*—A portion of this large, extensive lagoon system in northwestern Nayarit, called Marismas Nacionales Nayarit, has recently been designated a Natural Protected Area, in the Biosphere Reserve category, while the Sinaloa portion of the lagoon has been proposed for protection (E. Palacios, pers. comm. 2010). Foraging habitat in this area likely includes the greater lagoon (including areas of shrimp aquaculture, the coastline, and nearby agricultural areas), and we determine that the destruction or modification of foraging habitat is not a significant threat at this location now or in the foreseeable future. Nesting habitat for van Rossem's gull-billed terns at this large site includes Estero Teacapán, which consists of a barrier beach at the mouth of the lagoon, and some low, small islands in Laguna Pericos. Because the nesting habitat at Estero Teacapán is at the mouth of the lagoon on the barrier beach where natural forces are likely to cause changes in the landscape on a regular basis, it is unlikely to be lost due to large-scale development. However, the nesting area is subject to lesser impacts resulting from smaller human activities that might affect the nesting habitat of van Rossem's gull-billed terns. The nesting colony in 2003 appeared to be in use despite the presence of a palapa-style shade structure used by fishermen (Palacios and Mellink 2006, p. 71).

The Laguna Pericos nesting area is within a portion of the lagoon that has been altered to promote shrimp harvest, including the creation of ponds for shrimp aquaculture (Hernández-Cornejo and Ruiz-Luna 2000, p. 604). Further alteration of the area is possible for development of shrimp fisheries and aquaculture. Although such potential alterations may affect van Rossem's gull-billed tern nesting habitat, individual van Rossem's gull-billed terns readily move between and among specific nest sites, including manmade areas that provide habitat. Because the Marismas Nacionales area is very large with multiple small islands, sand bars, and manmade levees and thus suitable alternative nest sites, we expect this nesting population has the option to move to other available sites to nest, if necessary. Therefore, we determine that destruction or modification of nesting habitat is not a significant threat to the van Rossem's gull-billed tern at this location now or in the foreseeable future.

*Laguna Cuyutlán*—Compared to the extensive lagoons in Sinaloa and Nayarit, Laguna Cuyutlán in the Mexican State of Colima is relatively small, but it is the largest lagoon in a

roughly 1,150-km (700-mi) stretch of coastline (Mellink and Riojas-López 2009, p. 1). Foraging habitat in this area likely includes the greater lagoon (including areas of shrimp aquaculture, the coastline, and nearby agricultural areas), and we determine that the destruction or modification of foraging habitat is not a significant threat at this location now or in the foreseeable future. Nesting habitat for van Rossem's gull-billed terns consists of a number of small natural and artificial islands in the lagoon (Palacios and Mellink 2006, pp. 77–84). The lagoon is divided into several subareas. The northwesternmost portion of the lagoon is dredged regularly to provide shipping access for the industrial port city of Manzanillo and is subject to oil spills and additional development (Mellink and Riojas-López 2009, pp. 5–7). One island used by nesting van Rossem's gull-billed terns in 2005 is located in this portion of the lagoon (Palacios and Mellink 2006, p. 83). This island was created as a byproduct of past dredging (Palacios and Mellink 2006, p. 83). The other islands used for nesting by van Rossem's gull-billed terns in 2005 are located in a shallower portion of the lagoon to the southeast. The nest site near Manzanillo is likely to be destroyed by future dredging or other port-improvement or development projects. The other nesting area used by van Rossem's gull-billed terns is in a portion of the lagoon at some distance from Manzanillo, and we determine that development is not likely to significantly threaten nesting habitat for van Rossem's gull-billed terns in this portion of the lagoon in the foreseeable future.

*Laguna Potosí*—This site is a relatively small lagoon system in Guerrero. Foraging habitat in this area likely includes the greater lagoon (including areas of shrimp aquaculture, the coastline, and nearby agricultural areas), and we determine that the destruction or modification of foraging habitat is not a significant threat at this location now or in the foreseeable future. The nesting habitat for van Rossem's gull-billed terns at this location consists of low areas of salt flats (Mellink *et al.* 2009, p. 44). The nest site is subject to flooding during high rains (which typically occur during the latter part of the nesting season), but the best available information suggests the nest site is located away from human activities and is, therefore, protected from loss or modification (Mellink *et al.* 2009, p. 51); thus, this area does not appear to be significantly

threatened with development now or in the foreseeable future.

#### Other Areas of West Mexico and Central America

We are not aware of any current (confirmed) nesting locations south of Laguna Potosí, Mexico. Although areas of far-southern Mexico and Central America may potentially be within the breeding range of the species, Molina *et al.* (2009a, p. 15) suggest that it is unlikely that “appreciable” breeding populations occur south of the Isthmus of Tehuantepec. Therefore, even if habitat destruction and modification is occurring in this region, it is not a significant threat to van Rossem’s gull-billed tern now or in the foreseeable future.

During the nonbreeding season, when the subspecies is migrating or is within its winter range, van Rossem’s gull-billed terns may use other sites along the Pacific coasts of Mexico and (possibly) Central America. Foraging habitat may include a wide array of areas. As noted in the “Biology” section, above, van Rossem’s gull-billed terns are opportunistic, often focusing on easy-to-catch prey items. For example, in western Mexico, wintering van Rossem’s gull-billed terns were observed foraging at aquacultural shrimp ponds where prey is concentrated (Molina *et al.* 2009a, p. 12). Tidal flats and seasonally flooded flats were also found to be widely used as foraging areas during the winter (Molina *et al.* 2009a, p. 8). Although coastal development is occurring (Molina *et al.* 2009a, p. 14), there are other areas that have been designated or are proposed to become designated as Natural Protected Areas, including biosphere reserves, where development is less likely (see *Factor D*). Additionally, as noted above, the development of shrimp aquaculture does not necessarily result in the elimination of foraging habitat. Moreover, the subspecies is not tied to any one particular geographical area or even to any one type of foraging area within its winter range. Thus, destruction or modification of van Rossem’s gull-billed tern foraging habitat in western Mexico is not likely a significant threat now, nor is it likely to be within the foreseeable future.

It is unclear whether or to what extent van Rossem’s gull-billed terns actually winter in Central America. Even if they do occur there, Molina *et al.* (2009a, p. 15) suggest that it is unlikely that “appreciable” wintering populations occur south of the Isthmus of Tehuantepec, Mexico. Moreover, the subspecies is not tied to any one

particular geographical area or even to any one type of foraging area within its winter range. Thus, it is unlikely that the subspecies would be significantly affected by any destruction or modification of its foraging habitat in Central America now or within the foreseeable future.

#### Summary of Factor A

Van Rossem’s gull-billed tern foraging habitat includes a wide range of areas, including wetlands and uplands, and van Rossem’s gull-billed terns forage opportunistically within these areas. Moreover, van Rossem’s gull-billed terns are highly mobile, capable of locating and utilizing different foraging areas. Loss or modification of foraging habitat does not appear to be a significant threat to van Rossem’s gull-billed tern for the south San Diego Bay population, and a wide range of foraging habitat at Salton Sea will be maintained such that losses or modification of some foraging habitat areas do not constitute a significant threat to the Salton Sea population. The assessment of loss or modification of foraging habitat in Mexico and Central America is more difficult to determine because the quantity and specificity of the available information is variable across the region. It is even questionable whether the subspecies occurs south of the Isthmus of Tehuantepec in southern Mexico. However, because of the subspecies’ ability to forage in a wide range of areas, including areas developed for aquacultural shrimp ponds, the subspecies is less susceptible to destruction and modification of its foraging habitat. Additionally, it is not likely that the foraging areas in Mexico and Central America will be substantially affected by development, in part because many areas have some level of legal protection. Therefore, we conclude that destruction or modification of foraging habitat is not a significant threat to van Rossem’s gull-billed tern throughout its range now or in the foreseeable future.

The amount of nesting habitat for van Rossem’s gull-billed tern is more limited. In the United States, nesting habitat in San Diego Bay is protected and managed by the San Diego Bay National Wildlife Refuge. The population of van Rossem’s gull-billed terns in the San Diego Bay nesting location has increased since the early 1990s and is now expanding to other areas of protected nesting habitat outside of the Refuge. At the Salton Sea, the amount and distribution of nesting habitat has varied through time with nest sites being lost and added with changing conditions (primarily the

water level of the Salton Sea, but also the availability of manmade impoundments that intentionally or accidentally have areas suitable for nesting). Although the continued existence of individual nest sites into the foreseeable future is unknown, the evidence suggests that, even under changing conditions, it is unlikely that all nesting habitat would be lost. Moreover, the Sonny Bono Salton Sea National Wildlife Refuge, which has regularly harbored several colonies of nesting van Rossem’s gull-billed terns, including the consistently productive D pond, has been actively managing for the benefit of van Rossem’s gull-billed tern by creating and maintaining areas of nesting habitat, including artificial nesting platforms. Although we acknowledge that Salton Sea Refuge may not always be able to provide the same type or same level of management every year, its record of accomplishment for more than 15 years suggests that continued beneficial management will likely continue into the foreseeable future. Therefore, we determine that nesting habitat for the Salton Sea population of the van Rossem’s gull-billed tern is not significantly threatened by permanent loss or destruction.

In Mexico, the available information on nesting habitat is not as extensive and is less detailed than U.S. data, but it suggests that many nesting habitat areas are located in protected areas and are not likely to be destroyed or substantially modified, while other areas are subject to loss from habitat destruction or modification. The nest sites at Isla Montague, Marismas Nacionales, and Bahía Santa María are located within protected areas. Moreover, the nest sites at these nesting locations, along with the nest sites at Isla Montague, Laguna Ojo de Liebre, Bahía de Ceuta, Laguna del Caimanero, and Laguna Potosí, are situated on low islands that are subject to flooding during winter storms or high tides; as a result, substantial manmade developments on the islands are unlikely. The nest sites at Cerro Prieto are dependent on the management of waste water at the geothermal generation facility, which is uncertain at this time; some van Rossem’s gull-billed terns from this nesting location may have moved and nested at Isla Montague in 2010 in response to changes in the amount of available habitat at Cerro Prieto. Portions of Laguna Cuyutlán near port operations may be subject to dredging activities, which may destroy existing areas of nesting habitat for van Rossem’s gull-billed terns but may also

result in the creation of dredge-spoil islands that may serve as additional nesting habitat. The portions of Laguna Cuyutlán away from the port are less likely to be destroyed. Thus, most of the van Rossem's gull-billed tern nest sites in Mexico are not likely to be substantially destroyed or modified. Moreover, because van Rossem's gull-billed terns are resilient and can move from one area of nesting habitat to another, the loss of a limited amount of nesting habitat will not likely significantly affect the species.

Based on our review of the best available scientific and commercial information, we conclude that van Rossem's gull-billed tern is not threatened by the present or threatened destruction, modification, or curtailment of its habitat or range now or in the foreseeable future.

#### *Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

Within the context of this factor, overutilization is the capture or collection of individuals of a species, including its eggs or young, to an extent (at a high enough rate) that it affects the conservation status of the species. We are not aware of any information suggesting that adult van Rossem's gull-billed terns are utilized (collected, harvested) or will likely be utilized in the foreseeable future for commercial, recreational, scientific, or educational purposes anywhere in the subspecies' range (but see the "Intentional Killing" section under *Factor E*). The information available to us regarding capture or collection of eggs or chicks of van Rossem's gull-billed terns in the United States indicates that risks to the species from overutilization for commercial, recreational, scientific, or educational purposes is not a significant threat, and we determine that this factor will not become a significant threat to the occurrences of van Rossem's gull-billed tern in the United States in the foreseeable future.

In western Mexico, eggging, the collection of wild bird eggs by people for subsistence or other uses, has occurred historically (for example, see Mailliard 1923, pp. 443–456). More recently, eggging activities at Guerrero Negro in the 1970s, prior to the first known nesting of van Rossem's gull-billed terns at this location, was so severe that nesting waterbirds were extirpated from several islands (Castellanos *et al.* 2001 p. 367). However, the available information on the current impacts of eggging or other utilization activities on van Rossem's gull-billed tern lacks specificity and is

somewhat conflicting. Molina *et al.* (2010, p. 13) stated that this activity is not a threat to van Rossem's gull-billed tern and Palacios (2010, p. 14) states, "Other than tidal flooding, no evident direct threats were documented for this colony." However, Palacios and Mellink (2006, p. 60) noted in a general statement that eggging occurred at Isla Montague at some unspecified time in the past and postulated that it could occur again, but they did not provide specific information on whether eggging activities had affected or were affecting van Rossem's gull-billed tern nests. Thus, the likelihood of this threat affecting the subspecies at this nesting location is not clear, but none of the information available suggests that utilization occurs or is likely to occur with any appreciable frequency.

Mellink *et al.* (2009, p. 51) also considered eggging as a potential threat in Laguna el Potosi, should the colony there be discovered by the human inhabitants of the area, but again, the authors did not provide specifics on the likelihood of it affecting the subspecies. Muñoz del Viejo *et al.* (2004, p. 196) documented egg collection of royal terns (*Sterna maxima*) at Bahía Santa María, and in the same area they noted that blue-footed booby (*Sula nebouxii*) chicks had been taken by fishermen and used for bait (Muñoz del Viejo *et al.* 2004, p. 196). However, at Bahía Santa María, we have no available information indicating that van Rossem's gull-billed terns were targeted for either activity. Additionally at this location, Muñoz del Viejo *et al.* (2004, p. 199) reported that they successfully worked with the local inhabitants to stop this practice, but there are no assurances that such activities could not again occur.

Thus, in Mexico, eggging and other forms of utilization have not been specifically documented to impact van Rossem's gull-billed tern; however, eggging has affected, to varying extents, other species of birds that can and do nest close to where van Rossem's gull-billed terns nest. This suggests eggging and other forms of utilization, regardless of purpose, are a potential threat to van Rossem's gull-billed terns. We expect such utilization—should it occur at a van Rossem's gull-billed tern nest colony—would result in complete reproductive failure for the affected nest colony. However, like a nest depredation event, the adult terns would likely survive to nest again in the future nesting seasons or, potentially, to re-nest that same season (see *Factor C*, below, for more details). The available information does not suggest that such utilization activities are occurring to an extent (at a high enough rate) for it to

affect the conservation status of the species. Thus, we conclude that overutilization for any purpose is not significantly affecting van Rossem's gull-billed tern in Mexico at the present time, nor do we expect it to be a significant threat in the foreseeable future.

Therefore, based on our review of the best scientific and commercial information available, we conclude that van Rossem's gull-billed is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future.

#### *Factor C. Disease or Predation*

##### *Disease*

Diseases occur naturally in wildlife populations. The occurrence of a disease within the range of a species does not necessarily mean that it is deleterious to that species. However, if one or more diseases are virulent enough, the conservation status of a species may be affected. The susceptibility of van Rossem's gull-billed tern to disease has not been well studied, but multiple diseases impacting avian populations are present in the areas where van Rossem's gull-billed terns nest. Avian botulism, avian cholera, and other diseases have impacted thousands of fish-eating birds at the Salton Sea (Friend 2002, pp. 295, 303), including an outbreak of avian botulism that killed more than 14,000 birds in the mid-1990s (Roberts 1997, p. 2). Throughout those and other disease outbreaks at the Salton Sea, the population of van Rossem's gull-billed terns at this location appeared to be unaffected (Molina 2004, p. 98; Molina *et al.* 2010, pp. 14 and 66). This is probably because van Rossem's gull-billed terns do not depend solely upon fish for food and, at the Salton Sea, they primarily forage for crickets (Molina 2009a, p. 1). Because of their diverse foraging habits, van Rossem's gull-billed terns appear less likely to be exposed to diseases like avian botulism and avian cholera.

A serious disease threat to avian populations in North America is West Nile Virus (WNV). WNV has caused significant declines in bird populations since its arrival in the United States in 1999 (LaDeau *et al.* 2007, p. 711). Originally detected in New York, the disease was first detected in California in 2003 in the Imperial Valley, and was present at the Salton Sea in the late summer of 2003 and in the San Diego region by autumn (Reisen *et al.* 2004, p. 1371). The impact of WNV on van Rossem's gull-billed tern, and



charadriiform waterbirds in general, has not been assessed. Charadriiform waterbirds are susceptible to WNV infection, with carcasses confirmed positive for WNV in California (Eidson *et al.* 2001 p. 617; Komar *et al.* 2003, p. 313), including a California least tern (*Sternula antillarum browni*) (Foster *in litt.* 2008). The closest related species to van Rossem's gull-billed tern that researchers have examined for susceptibility to WNV is the ring-billed gull (*Larus delawarensis*). In a laboratory study, ring-billed gulls showed high mortality and viral loads when exposed to WNV (Komar *et al.* 2003, p. 313). However, this may not be a good predictor of how van Rossem's gull-billed tern might be affected by WNV because variance between species in disease response is high (LoGludice *et al.* 2003, pp. 568–569), and lab tests of WNV have proven to be undependable predictors of conditions in the field (Walker *et al.* 2007, p. 694). Thus, if van Rossem's gull-billed terns were particularly susceptible to WNV or other diseases in the wild, we would expect to see a marked decline in populations of van Rossem's gull-billed terns that have been exposed to the disease, as have been observed in other bird species (LaDeau *et al.* 2007, p. 710).

As noted above, WNV has been present at the two U.S. van Rossem's gull-billed tern nesting locations (Salton Sea and San Diego Bay) since 2003. Although van Rossem's gull-billed tern numbers at the Salton Sea have fluctuated over the past decade, their overall population size has remained fairly stable since the arrival of WNV to the region (K. Molina, *in litt.* 2010, p. 3). Meanwhile, the San Diego Bay population increased over that time (Patton 2009, Table 2). Had van Rossem's gull-billed tern been substantially affected by WNV, these two populations would have shown a decline when the disease arrived in their respective regions. The information available shows that these two well-monitored populations did not decline. This indicates that the U.S. population of van Rossem's gull-billed terns is not significantly threatened by WNV now or in the foreseeable future. Further, it suggests that the subspecies as a whole is not likely to be substantially affected by the disease.

The amount of information on the prevalence of WNV in western Mexico is limited, but there is some indication that the disease has been recorded there (Komar and Clark 2006, p. 114). Although the population data for van Rossem's gull-billed terns in Mexico is limited, there is no indication of marked population decline. Nevertheless, as in

the United States where evidence of substantial effects of the disease on van Rossem's gull-billed tern is lacking, we similarly expect no significant effects to populations of the subspecies in western Mexico from WNV.

Unlike other bird species that are sensitive to WNV, such as American crow (*Corvus brachyrhynchos*) and greater sage-grouse (*Centrocercus urophasianus*) that experienced substantial population declines from WNV (Reisen *et al.* 2004, p. 1371; Naugle *et al.* 2004, p. 711), the available information shows that populations of van Rossem's gull-billed tern have not declined upon exposure to WNV throughout the subspecies' range. Moreover, the best available information gives no indication that other diseases are substantially affecting the subspecies in western Mexico or elsewhere in the subspecies' range.

Therefore, we conclude that disease, including WNV, is not a significant threat to van Rossem's gull-billed tern now, and we have no indication that it will be in the foreseeable future.

#### Predation

Predation of eggs or flightless young (nest predation) is frequently observed at monitored van Rossem's gull-billed tern nest sites, but predation of adults is rarely observed (Molina 2000, p. 7; 2001, p. 8; 2004, p. 96; 2006, p. 7; 2007, p. 11; 2008, p. 189; 2009, p. 8; Patton 2002, p. 7; 2006, p. 7; 2008, p. 8; 2009, p. 10; Molina *et al.* 2010, p. 14); thus, we do not consider predation of adults a significant threat to the subspecies. The nests of ground-nesting birds are particularly susceptible to terrestrial predators, primarily mammals (Kruuk 1964, pp. 1–129), although predation from aerial predators also occurs (Sears 1979, pp. 202–203). Once a mammalian predator discovers or gains access to a nest colony, it typically eats all or nearly all eggs or young within the colony, causing that nest attempt by the colony to fail. In contrast, avian nest predators typically eat only a few eggs or young, causing individual nests to fail, but rarely is the entire colony's nesting attempt affected (Molina 2007, p. 11). Thus, some level of nest predation is expected to occur naturally. Behaviors such as nesting colonially and selecting islands and other hard-to-reach places for nesting are, in part, anti-predator strategies that have evolved as life-history traits in ground-nesting species (Gochfeld and Burger 1996, p. 628), including van Rossem's gull-billed terns. A species' behavior of selecting nest sites that would be less likely to be affected by terrestrial predators blurs the lines between the

Act's five listing factors; that is, a species' behavioral strategy to avoid nest predators (which would reduce threat of predation under *Factor C*) is also a consideration in what determines the species' nesting habitat (*Factor A*).

Another adaptation to nest predation is for birds to renest; that is, to nest again in the same breeding season, which typically occurs at a different nest site. Although renesting is energetically demanding on the adults, it increases the likelihood that a colony will have some level of reproduction (productivity) that year. However, the number of birds that renest is typically fewer than the number of birds that initially nested, and the later in the season a nest is lost, the lower the likelihood that a pair will attempt to renest (Thompson *et al.* 1997, p. 13), and the later in the season a nest is started, the lower the likelihood that nest will successfully fledge young (Massey and Atwood 1981, p. 604). Thus, persistent nest predation, despite renesting behavior, typically results in reduced annual productivity of the nesting colony or even reproductive failure for that colony that year. However, as long-lived birds, van Rossem's gull-billed terns do not necessarily need to reproduce successfully every year to maintain population levels over time.

Although we have some information on the level of nest predation at certain van Rossem's gull-billed tern nesting locations, and we expect it to occur at other locations, we do not know how prevalent nest predation is rangewide. Of the two nesting locations that are monitored regularly (Salton Sea and San Diego Bay), nest predation has been noted at nest sites at the Salton Sea, including some that are managed by the Sonny Bono Salton Sea National Wildlife Refuge in an effort to reduce the likelihood of this threat (Molina 2009b, p. 8). The frequency of nest predation by mammalian predators may be increasing at certain nest sites at the Salton Sea because the lowering water level of the Sea is allowing once-isolated nesting islands to become accessible (Molina 2009b, p. 8; Molina *et al.* 2010, p. 13). Of all the van Rossem's gull-billed tern nest sites at the Salton Sea, nest predation by terrestrial predators remains infrequent at only one site, the Sonny Bono Salton Sea National Wildlife Refuge headquarters (Rock Hill) ponds, but there is much inter-specific competition for nesting and loafing space at this site (Molina 2010a, pp. 9–10) (see also the "Inter-specific Nest-site Disturbance" section in *Factor E*). Nevertheless, van Rossem's gull-billed terns are

successfully fledging young at the Salton Sea (Molina 2006, p. 2; Molina 2007, p. 4; Molina 2009b, p. 2) and even in 2010, which had few nesting attempts and high nest abandonment for a variety of reasons, had some (albeit very few) fledging (Molina 2010a, p. 2). Additionally, dropping water levels has allowed other nest sites to become exposed, where van Rossem's successfully nested in 2010 (Molina 2010a, p. 2). It is unclear whether apparent reduction in nest sites with lower likelihoods of being depredated will substantially affect the Salton Sea colony of van Rossem's gull-billed terns, but it may translate into fewer birds attempting to nest at this location; the remaining may potentially move to other nesting locations (e.g., Isla Montague, Cerro Prieto, San Diego Bay) instead.

In contrast, at San Diego Bay, the population of van Rossem's gull-billed terns has steadily increased in part because active anti-predator management has limited the amount of nest predation since 1999 (USFWS 2006, Appendix M, p. 2; Patton 2009, Table 2). The primary nest site for van Rossem's gull-billed terns (and other species of colonial, ground-nesting waterbirds) in San Diego Bay is rarely substantially affected by terrestrial predators because (1) The nests are located on an extensive network of dikes where access by terrestrial predators is limited by barriers and fences that have been intentionally erected; and (2) nonlethal and, if necessary, lethal predator control methods are used against those predators that do venture to the nesting areas (USFWS 2006, Appendix M).

Thus, nest predation is not a significant threat at the San Diego Bay nesting location because predators are managed to benefit nesting colonial waterbirds, including van Rossem's gull-billed terns. Nest predation at the Salton Sea is less clear. The available information suggests the Salton Sea colony of van Rossem's gull-billed terns is being affected by nest predation at some nest sites, but other nest sites are productive, including a recently emerged nest site. The apparent reduction in the total number of nest sites where nest predation is unlikely may mean fewer van Rossem's gull-billed terns nest at the Salton Sea in the foreseeable future, but it is unlikely that the nesting location will be completely abandoned in the foreseeable future. Additionally, even though the Salton Sea is an important nesting location, there are other nesting locations for the subspecies.

Because van Rossem's gull-billed terns are long-lived birds that are not limited to any particular nesting location, the individual adult van Rossem's gull-billed terns that have traditionally nested at sites in the Salton Sea area may move to other nesting locations to nest. However, such shifts in nesting locations would likely result in increased intraspecific competition for nest sites at existing nest colonies, the establishment of new nesting locations, or both. As a result, some birds may be forced to nest in lower quality habitat where they may be subject to increased interspecific competition (*Factor E*) or where the level of nest predation may also be high. It is not clear how much of an impact this would have on the conservation status of the subspecies because the extent to which birds would have to relocate is unclear and reproductive success at existing nesting locations is variable from year to year. Thus, although we acknowledge some level of impact to the subspecies, the portion of the total population that would be affected would be limited, and it would not result in a significant threat to the subspecies now or in the foreseeable future.

In Mexico, nest predation has occurred or was suspected at some nest sites (for example, Peresbarbosa and Mellink 2001, p. 267; Palacios and Mellink 2007, p. 216). Although information from nest sites over multiple years is limited, we have no information to suggest that there are sustained, elevated levels of nest predation occurring at any of the nesting locations. Some nest sites have been found to be inactive in some years (Palacios and Mellink 2007, p. 217). Although not atypical for this subspecies, inactivity in some years may indicate predation events or other disturbances that have caused nest site abandonment, although abandoned or unused nest sites could potentially be used again in other years. In some cases, other nesting locations are found nearby, suggesting the colony successfully relocated. Thus, although nest predation likely occurs in Mexico, it does not appear to be at above-normal levels.

Despite the behaviors that van Rossem's gull-billed terns use to reduce the effects of nest predation (e.g., nesting at remote nest sites, predatory defense behaviors), it is likely that they, like nearly all bird species, suffer some natural level of nest predation. We do not know what the natural level of nest predation is for van Rossem's gull-billed tern because it varies from nest site to nest site and from year to year. Natural

and manmade changes may alter the levels of nest predation. The level of nest predation appears to be increasing at the Salton Sea, and possibly at some sites in Mexico where nest sites have shifted. While the shifting of nest sites may indicate changes in levels of nest predation, the fact that the colony has moved shows that the subspecies can adapt to such changes. Moreover, adult van Rossem's gull-billed terns are generally long-lived, which means that even if an adult fails to successfully reproduce in a given year, it will likely have additional chances to reproduce in the future. Therefore, we determine that nest predation at the Salton Sea is not a significant threat to the subspecies now or in the foreseeable future. Moreover, we determine that this is not a population-limiting factor that presents a significant rangewide threat now or in the foreseeable future.

#### Summary of Factor C

Disease, including avian botulism and WNV, occurs within the range of van Rossem's gull-billed tern. In the well-monitored nesting locations of San Diego Bay and the Salton Sea, the populations of the subspecies are growing or are reasonably stable, despite the presence of WNV. Moreover, the Salton Sea population of van Rossem's gull-billed terns was not significantly affected by substantial outbreaks of avian botulism or avian cholera. Thus, the available information suggests that disease is not a significant threat to the subspecies throughout its range now or within the foreseeable future.

Predation of adults is not a significant threat to the subspecies. Predation of eggs or young at nest sites (nest predation) is a concern for ground-nesting birds such as van Rossem's gull-billed tern. Many colonial waterbirds have adapted to this threat by nesting on islands and remote areas to reduce the risk of predation or by responding to predation events by renesting during the same breeding season. Within the United States, nest predation does not appear to pose a significant threat to the San Diego Bay van Rossem's gull-billed tern population; however, the Salton Sea appears to be experiencing high levels of nest predation, at least in some years. While the Salton Sea is an important nesting location, the adult van Rossem's gull-billed terns that have traditionally nested there are not confined to the Salton Sea and may move to other locations to nest. Although such shifts in nesting may result in increased use of lower quality habitat, which may result in lower reproductive success at those locations, we determine such potential impacts

would not significantly threaten the subspecies because the numbers affected and the level of impact are likely to be limited. The level of nest predation at nesting locations in Mexico is less clear, but the available information suggests that it is not occurring at above-normal levels. Therefore, based on our review of the best scientific and commercial information available, we conclude that van Rossem's gull-billed tern is not threatened by disease or predation now or in the foreseeable future.

#### *Factor D. The Inadequacy of Existing Regulatory Mechanisms*

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to threats that may place van Rossem's gull-billed tern in danger of extinction or likely to become so in the foreseeable future. Existing regulatory mechanisms that may have an effect on potential threats to van Rossem's gull-billed tern can be placed into three general categories: (1) U.S. Federal laws, (2) State laws, and (3) Mexico Federal laws.

#### U.S. Federal Laws

##### Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703–712) states that it is unlawful “to pursue, hunt, take, capture, kill, or attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird, or any product, whether or not manufactured.” Mexico is also a signatory of the MBTA. Van Rossem's gull-billed tern is included in the list of migratory birds internationally protected by the MBTA (50 CFR 10.13). The MBTA makes it unlawful to kill or take eggs or nests of van Rossem's gull-billed terns, but it does not provide protection for habitat.

As described in the “Intentional Killing” section under *Factor E*, below, approximately nine adult van Rossem's gull-billed terns have been killed around San Diego Bay under depredation permits issued by the Service's Migratory Bird Permit Office, including six killed in the early 1990s to protect the federally endangered California least tern and threatened western snowy plover, and three killed between 2004 and 2007 near active

airport runways to protect human health and safety. We have not issued any other depredation permits for the van Rossem's gull-billed tern since the 1990s. The three individual birds intentionally killed between 2003 and 2007 represent an insignificant number when compared to the overall population (average of 42 nesting pairs for this time period, Molina *et al.* 2010, p. 66) of van Rossem's gull-billed terns in San Diego Bay, which increased during that time period and has continued to grow since 2007.

#### National Environmental Policy Act

All Federal agencies are required to adhere to the National Environmental Policy Act (NEPA) of 1970 (42 U.S.C. 4321 *et seq.*) for projects they fund, authorize, or carry out. The Council on Environmental Quality's regulations for implementing NEPA (40 CFR parts 1500–1518) state that agencies shall include a discussion on the environmental impacts of the various project alternatives (including the proposed action), any adverse environmental effects that cannot be avoided, and any irreversible or irretrievable commitments of resources involved (40 CFR part 1502). The NEPA itself is a disclosure law, and does not require subsequent minimization or mitigation measures by the Federal agency involved. Although Federal agencies may include conservation measures for gull-billed terns as a result of the NEPA process, any such measures are typically voluntary in nature and are not required by the statute.

Additionally, activities on non-Federal lands are subject to NEPA if there is a Federal nexus. NEPA does not itself regulate activities that might affect gull-billed terns, but it does require full evaluation and disclosure of information regarding the effects of contemplated Federal actions on sensitive species and their habitats.

#### Fish and Wildlife Conservation Act

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901–2911) encourages States and Federal departments and agencies to conserve and promote conservation of nongame fish and wildlife and their habitats. The 1988 amendment to the Fish and Wildlife Conservation Act mandates the Service to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973.” Our Division of Migratory Bird Management published the Birds of Conservation Concern in 2008 (USFWS

2008, pp. 1–87). We identified the gull-billed tern (the species as a whole) as a Bird of Conservation Concern (see the “Management Actions” section above). The species was included as a Bird of Conservation Concern both nationally and in certain specific Bird Conservation Regions, including the U.S. portions of Bird Conservation Regions 32 (Coastal California) and 33 (Sonoran and Mojave Deserts) (USFWS 2008, pp. 48 and 49). Because we identified the gull-billed tern as a Bird of Conservation Concern, we have denied depredation permit requests under the MBTA (USFWS 2010, p. 1) (see “Intentional Killing” section under *Factor E*).

#### National Wildlife Refuge System Improvement Act

The National Wildlife Refuge System Improvement Act of 1997 (Pub. L. 105–57) establishes the protection of biodiversity as the primary purpose of the national wildlife refuge system. This has led to various management actions that have directly benefited van Rossem's gull-billed tern. For example, at the Sonny Bono Salton Sea National Wildlife Refuge, nesting islands and artificial nesting platforms have been created and maintained (see *Factor A*). At the San Diego Bay National Wildlife Refuge, predator control has resulted in reduced nest predation levels on van Rossem's gull-billed terns (see *Factor C*).

#### U.S. State Laws

Van Rossem's gull-billed tern is not a listed species under the California Endangered Species Act (CESA), the State's primary regulatory mechanism to protect species. However, the van Rossem's gull-billed tern is considered a bird species of special concern in California (Molina 2008, p. 188), an administrative designation that carries no formal legal status. According to Comrack *et al.* (2008, pp. 1–4), the intent of this designation is to focus attention on animal species deemed to be at conservation risk, stimulate research, and improve the species' conservation status before they meet California Endangered Species Act criteria for listing as a State threatened or endangered species. However, impacts to van Rossem's gull-billed tern from any projects would require evaluation and disclosure under the California Environmental Quality Act (CEQA) (see below) due to its consideration as a species of special concern.

Van Rossem's gull-billed tern also receives protection through the State migratory bird provisions of the

California Fish and Game (CFG) Code. The CFG Code prohibits any take or possession of birds that are designated by the MBTA as migratory nongame birds, except as allowed by Federal rules and regulations promulgated pursuant to the MBTA (Division 4, Part 2, Chapter 1, section 3513). Additionally, under the CFG Code, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, including van Rossem's gull-billed tern, except as otherwise provided (Division 4, Part 2, Chapter 1, section 3503). This provides protection to van Rossem's gull-billed terns, including their nests, from any unlawful take.

#### California Environmental Quality Act

The California Environmental Quality Act (CEQA) (Public Resources Code 21000–21177) and the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387) requires State and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA applies to projects in California proposed to be undertaken or requiring approval by State and local government agencies. The lead agency must complete the environmental review process required by CEQA, including conducting an Initial Study to identify the environmental impacts of the project and determine whether the identified impacts are “significant.” If significant impacts are determined, then an Environmental Impact Report must be prepared to provide State and local agencies and the general public with detailed information on the potentially significant environmental effects (California Environmental Resources Evaluation System, 2010).

“Thresholds of Significance” are comprehensive criteria used to define environmentally significant impacts based on quantitative and qualitative standards. They include impacts to biological resources such as candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or the Service; or any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or Service (CEQA Handbook, Appendix G, 2010). Defining these significance thresholds helps ensure a “rational basis for significance determinations” and provides support to the final determination and appropriate revisions or mitigation actions to a project in order to develop a mitigated negative declaration rather than an Environmental Impact Report

(Governor's Office of Planning and Research, 1994, p. 5).

Section 15380 of the CEQA Guidelines indicates that species designated as “Species of Special Concern” should be included in an analysis of project impacts (Comrack *et al.* 2008, p. 2). In assigning “impact significance” to populations of unlisted species, factors such as population-level effects, proportion of the taxon's range affected by a project, regional effects, and impacts to habitat features are analyzed. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

#### Mexico Federal Laws

In Mexico, van Rossem's gull-billed tern is protected by what is known as the Ecology Law (Ley General del Equilibrio Ecológico y la Protección al Ambiente, or LGEEPA). This law, first enacted in 1988 and amended in 1996, is designed to preserve ecosystems and allow for sustainable use of biodiversity and development of working groups to organize management and protection of the environment in designated Natural Protected Areas (Gonzales and Gastelum 2000, p. 50; Bezaury-Creel 2005, p. 1031). Although management of protected areas has typically been inadequate in Mexico, the situation has been greatly improved through the establishment of The National Protected Area Commission (Comisión Nacional de Áreas Naturales Protegidas, or CONANP) (Bezaury-Creel 2005, p. 1034). Many management plans for protected areas are under development, including one for Bahía Santa María (Bezaury-Creel 2005, pp. 1021, 1034), a nesting location for van Rossem's gull-billed terns. However, enforcement continues to be problematic in Mexico due to the lack of collaboration between different Federal agencies, and between Federal and local governments (Fraga and Jesus 2008, p. 21). Furthermore, local reserve managers often lack the legal authority to enforce environmental laws (Fraga and Jesus 2008, p. 21).

LGEEPA does not necessarily preserve lands in protected areas; instead, areas are considered more as “multiple use zones” where thresholds are imposed on sustainable use of natural resources to limit activities (Bezaury-Creel 2005, pp. 1030–1031). One form of Natural Protected Areas, the “biosphere reserve,” includes established core areas

where land alteration is limited (Figuerroa and Sanchez-Cordero 2008, p. 3232). Two of the largest nesting populations of van Rossem's gull-billed terns are within biosphere reserves, including Isla Montague and Marismas Nacionales. Additionally, the small population of van Rossem's gull-billed terns at Laguna Ojo de Liebre, including the Guerrero Negro saltworks, is within the El Vizcaíno Biosphere Reserve (Palacios 2010, pp. 6 and 16), but the level of protection afforded by the reserve is likely limited within the salt production facility. Yet LGEEPA, as implemented with the aid of the CONANP, provides benefits to van Rossem's gull-billed tern and its habitat, benefits the subspecies would not have in the absence of such regulatory mechanisms.

#### Summary of Factor D

In the United States, the National Wildlife Refuge System Improvement Act benefits breeding populations of van Rossem's gull-billed tern at San Diego Bay National Wildlife Refuge and the Sonny Bono Salton Sea National Wildlife Refuge. Additional Federal and State regulations provide benefits to the subspecies, through its migratory bird status (Federal and State), and to its habitat, through its designation as a species of special concern (Federal and State).

In Mexico, two of the largest nesting populations of van Rossem's gull-billed terns are located within biosphere reserves and a third, smaller population is in a biosphere reserve where other uses (salt production) is occurring. Development is somewhat limited by the LGEEPA, especially in core areas of biosphere reserves. The CONANP was established to assist in preserving ecosystems and organizing management and protection of the environment in these Natural Protected Areas. While enforcement continues to be a concern regarding regulatory mechanisms in Mexico and active management is lacking in many areas, these regulatory mechanisms provide benefits to the van Rossem's gull-billed tern, benefits that the subspecies would not have otherwise.

Based on our review of the best scientific and commercial information available, we conclude that van Rossem's gull-billed tern is not threatened by inadequate regulatory mechanisms now, nor is it likely to become so in the foreseeable future.

*Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*

**Inter-Specific Nest-Site Disturbance**

Van Rossem's gull-billed terns generally nest on small, low islands with little or no vegetation. Many other species also use these islands for nesting and loafing, where they compete with van Rossem's gull-billed terns, especially eggs and young, may be inadvertently crushed, injured, or affected by agonistic behavior from other species. These interactions, discussed below, may affect the productivity of nesting van Rossem's gull-billed terns, but such competition is primarily natural, and many colonial, ground-nesting species are able to adapt to colonial nesting dynamics.

Van Rossem's gull-billed terns are known to compete for nesting sites with other shorebirds and waterbirds (Molina 2004, p. 98). At San Diego Bay and the Salton Sea, territorial behavior between van Rossem's gull-billed tern and species such as black skimmer and elegant tern result in the loss of van Rossem's gull-billed tern nests on a near-yearly basis (e.g., see Patton 2009, p. 9). Extent of the damage to the colony varies, with approximately 5 to 15 nests (7 to 25 percent of total nests) in a colony destroyed (e.g., see Patton 2003, p. 8; 2009, p. 9). Territorial disputes between other species in close proximity to van Rossem's gull-billed tern colonies can result in temporary displacement of adult gull-billed terns from nests. This disturbance could result in predation of eggs by gulls and mortality of eggs due to high temperatures (Molina 2000, p. 8). Van Rossem's gull-billed terns also compete for nesting space at colonies in Mexico, where they share most of their breeding sites with black skimmers, Caspian terns (*Hydroprogne caspia*), and laughing gulls (*Larus atricilla*) (Palacios and Mellink 2006, pp. 49–84). At the San Diego Bay nesting colony, van Rossem's gull-billed tern chicks have been killed and injured by aggressive behavior of black skimmers (Patton 2009, p. 9).

Competition for space from nonbreeding waterbirds can also cause damage to van Rossem's gull-billed tern nests. For example, loafing Caspian terns, double-crested cormorants (*Phalacrocorax auritus*), or white and brown pelicans (*Pelecanus erythrorhynchos* and *P. occidentalis*) have displaced van Rossem's gull-billed terns and trampled their eggs, chicks, or both at Salton Sea and San Diego Bay (Molina 2001, p. 10; 2007, p. 11; 2009, p. 8; Patton 2001, p. 9, 2009, p. 9;

Molina *et al.* 2010, p. 15). These larger birds often use the same loafing sites repeatedly, returning after foraging or as nighttime roosts. The severity of van Rossem's gull-billed tern displacement and egg trampling is dependent on the extent of the use by other birds at a particular colony. The presence of larger birds at a colony site for a week or less may result in a reduction in van Rossem's gull-billed tern nesting success through displacement, egg trampling, or damage of individual nests. If their presence continues over a period of weeks, van Rossem's gull-billed terns may abandon the colony (Molina 2007, p. 11). Additionally, nesting van Rossem's gull-billed terns occasionally have to compete for space with other species of wildlife. For example, at Laguna Cuyutlán, eggs of colonial-nesting birds were crushed by an American crocodile (*Crocodylus acutus*) when it crawled onto a nesting island (Palacios and Mellink 2007, p. 220).

Inter-specific interactions often occur naturally at colonies of ground-nesting birds. As discussed in the "Biology" section above, van Rossem's gull-billed terns often adapt to such interactions by renesting at the same or other nearby nest sites after disturbances. Although the productivity of an affected nest colony of van Rossem's gull-billed terns may be reduced or prevented in a given year if such disturbances occur repeatedly, it is unlikely that a substantial proportion of nesting locations will be significantly affected repeatedly from year to year. Therefore, we do not expect any deleterious effects associated with these events to be a significant threat to van Rossem's gull-billed tern.

**Anthropogenic Nest-Site Disturbance**

Colonial nesting waterbirds are sensitive to disturbance from the actions of humans and domesticated animals (Sears 1978, p. 9; Safina and Burger 1983, p. 168, Blanc *et al.* 2006, p. 122). Disturbance of colonies can cause mortality of eggs and chicks due to increased predation and heat stress (Safina and Burger 1983, p. 169). Gull-billed terns may be especially sensitive to the presence of humans and animals in their nesting colonies and prolonged disturbance can result in decreased breeding success (Clapp *et al.* 1983, p. 348, Molina 2008, p. 190). Excessive human disturbance at a particular nest site may cause van Rossem's gull-billed terns to abandon the nesting attempt at a given site in a given year, though in some cases such abandonment results in renesting at a different nearby site. Abandonment is not necessarily

permanent; van Rossem's gull-billed terns may again use those nest sites in subsequent years, if the sites are available. However, as noted in the "Predation" section under *Factor C*, persistent renesting typically results in reduced annual productivity for that colony because fewer pairs are subsequently likely to renest and those that do are less likely to successfully fledge young (Massey and Atwood 1981, p. 604; Thompson *et al.* 1997, p. 13).

In the United States, most van Rossem's gull-billed tern nesting areas occur in areas that are managed for the benefit of wildlife species, including van Rossem's gull-billed terns and other colonial nesting waterbirds, which limits the level of human disturbance. However, because nesting occurs at different sites within and between years, including nest sites located outside of protected or managed areas, the subspecies is subject to disturbance in some areas. For example, regular visits from boaters and fishermen on Mullet Island in the Salton Sea may have caused van Rossem's gull-billed terns to move from that nest site (Molina 2001, p. 14). Also at the Salton Sea, lower water levels have allowed some nesting islands to become reconnected to the mainland, and feral dogs have intruded onto an area used by van Rossem's gull-billed tern for nesting, causing the colony to permanently abandon this nest site (Molina 2000, p. 7). Similarly, nest sites in San Diego Bay have been disturbed in the past (Patton 2001, p. 9), but predator management actions, including fencing, at this site have decreased the incidence of such disturbances (USFWS 2006, pp. 1–36). Researchers may cause disturbance of nesting birds, though monitors and researchers typically conduct their activities in such a way as to disturb the population as little as possible (Patton 2009, pp. 4–5). Nonetheless, Palacios and Mellink (2007, p. 216) suspected that researcher activity may have been a disturbance at some nest sites in Mexico, but this appears to have been events associated with individual studies and not from monitoring, which involves repeated visits within and between years. Therefore, we do not anticipate this to be an ongoing, significant threat.

In Mexico, many nest sites are protected from human disturbance by beneficial or benign land uses, or because the nest sites are not easily accessed by humans (Molina and Garrett 2001, p. 27; Palacios and Mellink 2006, pp. 71, 78), such as at the Guerrero Negro saltworks (Palacios and Mellink 2007, p. 217). However, human disturbance has been noted near van

Rossem's gull-billed tern nest sites, including two of Mexico's largest colonies, Laguna Pericos (in Marismas Nacionales) and Isla Montague, plus also Laguna del Caimanero and Laguna Cuyatlán (Palacios and Mellink 2006, pp. 60, 67, 74 and 78). Additionally, Estero Teacapán (in Marismas Nacionales), unlike most other nest sites in Mexico, is often visited by tourists (Palacios and Mellink 2006, p. 71). Available information on disturbance at nest sites in Mexico is limited to those data that were generated by only one or two visits, which limits our ability to determine the frequency of past disturbances or the likelihood that such disturbances will continue into the foreseeable future. However, frequent disturbance (among others) would likely result in van Rossem's gull-billed terns abandoning nest sites. At Isla Montague, a site for which we have intermittent data since 1992, nesting has continued at roughly the same levels despite the apparent disturbances over that time (Palacios and Mellink 1992, p. 43). Similarly, in a qualitative assessment of the terns' reaction to the presence of fishermen, Palacios and Mellink (2006, p. 67) note that van Rossem's gull-billed terns at Laguna del Caimanero appeared to become "habituated" to human disturbance and continued to nest despite the presence of people. Thus, the limited information available to us does not indicate that there is a long-term population-level threat associated with manmade nest disturbance to the van Rossem's gull-billed tern now or in the foreseeable future.

#### Intentional Killing

Human-related actions that result in the death of individual van Rossem's gull-billed terns have the potential to affect the continuing existence of the species if the number of individuals killed substantially affects the mortality rate of the subspecies. The mortality rate in a population may substantially affect a population if it continually exceeds the rate of increase (or birth rate) (Thomas 1994). Intentional killing activities may include take authorized under existing laws or unauthorized depredation. Because either action, by definition, results in the death of individual van Rossem's gull-billed terns (or, in certain cases, destruction of eggs) we assess these potential actions in this section; however, we note that the motives and level of oversight differ between the two categories. Below we assess the effects of intentional killing of van Rossem's gull-billed terns as a potential threat to the subspecies.

In the San Diego Bay region, three van Rossem's gull-billed terns have been

intentionally killed as part of the U.S. Navy's Bird/Animal Aircraft Strike Hazard (BASH) program. The Navy deemed it necessary to kill three adult van Rossem's gull-billed terns near active runways for human safety reasons, two in 2004 on Naval Base Coronado and one in 2007 at Naval Outlying Landing Field, Imperial Beach (Molina *et al.* 2010, p. 16). The Service authorized these removals under a migratory bird depredation permit for airport operations pursuant to the Migratory Bird Treaty Act (50 CFR part 21). The three van Rossem's gull-billed terns killed under the Navy's BASH program have been the only individuals intentionally killed under this program since the subspecies established a nesting colony in San Diego Bay in 1987.

Additionally, six (or possibly seven) adult van Rossem's gull-billed terns were killed between 1993 and 1995 in San Diego because they were considered potential threats to federally endangered California least terns and federally threatened western snowy plovers (Patton 2002, *in litt.*, p. 1; Molina *et al.* 2010, p. 15). These two species nest in highly managed areas in the San Diego Bay region, and management measures include limiting the effects of predators on listed species. Depredation of California least tern chicks and western snowy plover chicks by van Rossem's gull-billed terns has increased as the van Rossem's gull-billed tern population has increased in San Diego Bay (Patton 2009, Appendix C; Marschalek 2010, pp. 12–13, 20). Since 1995, only nonlethal methods have been used by local managers in what have largely been unsuccessful attempts to dissuade van Rossem's gull-billed terns from depredating the chicks of California least terns and western snowy plovers. The Navy does not currently have authorization from the Service to use limited lethal control of van Rossem's gull-billed terns in areas the Navy manages to benefit California least terns and western snowy plovers.

As the level of depredation of California least terns and western snowy plovers by van Rossem's gull-billed terns has increased in the San Diego Bay region, local land managers have considered methods other than direct lethal control of adults to reduce the impact of van Rossem's gull-billed terns on the other listed species. For example, as published in a draft Environmental Assessment under the National Environmental Policy Act, we proposed in an experiment at the San Diego Bay National Wildlife Refuge to gather data that would help us answer the following management questions: (1) Could we

reduce the loss of California least tern and western snowy plover chicks to predation by van Rossem's gull-billed terns in the vicinity of San Diego Bay by lowering the productivity within the van Rossem's gull-billed tern colony at San Diego Bay; and (2) could productivity within the van Rossem's gull-billed tern colony at San Diego Bay be reduced without causing significant direct impacts to San Diego Bay's breeding population of adult van Rossem's gull-billed terns (USFWS 2009, p. 4). In part, the experiment proposed to addle eggs of van Rossem's gull-billed terns nesting at the San Diego Bay National Wildlife Refuge to determine if population size of van Rossem's gull-billed terns in San Diego Bay could be controlled while avoiding a decline of the overall population of van Rossem's gull-billed terns (USFWS 2009, pp. 8–9). Although initially proposed for the 2009 nesting season, no further action on the proposed project was taken. No additional compliance with the National Environmental Policy Act was prepared related to the proposed project, and we are not planning to implement this proposed project now or in the foreseeable future.

The killing of van Rossem's gull-billed terns as predator control has only occurred in San Diego Bay, and no van Rossem's gull-billed terns have been killed there for predator control since 1995. We are not aware of any killing of van Rossem's gull-billed terns as BASH management anywhere except San Diego Bay, and only three individuals were killed there, two in 2004 and one in 2007. The population of van Rossem's gull-billed terns remains in the San Diego Bay area and has consistently grown since 1999 (Patton 2009, Figure 1, no page number). Given the continued level of growth of the San Diego Bay population of van Rossem's gull-billed terns over the same time period as the three individuals were killed under the BASH program, the level of take under this program has not significantly affected the San Diego Bay population of van Rossem's gull-billed terns, or the subspecies rangewide. Thus, lethal control of van Rossem's gull-billed terns for predator control and BASH prevention is currently not a significant threat to the subspecies throughout its range and, because we do not anticipate an increase in the lethal control measure associated with the Navy's BASH program, this is not a significant threat to the subspecies in the foreseeable future.

In Mexico, van Rossem's gull-billed terns forage at commercial shrimp aquaculture farms. Although lethal

control (e.g., shooting) of predators is not legally authorized in Mexico, it has been documented at some of these aquacultural operations (e.g., Palacios and Mellink 2006, p. 60). Information on whether this activity is widespread is limited. DeWalt (2000, p. 47) implied that it occurs more often than it is reported. Molina and Erwin (2006, p. 287) suggested that such activities are widespread in Mexico during times when shrimp are being harvested. Evidence of lethal control of van Rossem's gull-billed terns in Mexico is circumstantial (e.g., Molina and Erwin 2006, p. 287; Molina *et al.* 2010, p. 16), and we are not aware of any direct reports of van Rossem's gull-billed terns being shot or otherwise killed at shrimp ponds within its range. Some van Rossem's gull-billed terns may be killed in this manner; however, given the lack of evidence of lethal control of van Rossem's gull-billed terns at aquacultural ponds, we conclude that the practice does not occur frequently enough to negatively affect the status of the subspecies. We have no information to suggest this will change in the foreseeable future. Therefore, the use of lethal control at aquacultural ponds is not a significant threat to van Rossem's gull-billed tern now nor is anticipated to be a significant threat in the foreseeable future.

#### Contaminants

High levels of pesticides and heavy metals are known to cause reproductive harm in breeding birds (Longcore *et al.* 1971, p. 486; King *et al.* 1978, p. 17). The organochlorine pesticide known as DDT breaks down in the environment to form DDE, which may cause thinning of eggshells and decreased reproductive success in birds (Longcore *et al.* 1971, pp. 486, 489). Although DDT was banned in the United States in the 1970s, it was used for malarial control in Mexico until the early 1990s (García-Hernández *et al.* 2006, p. 1640). Coastal lagoons in Mexico have widely varying levels of pesticides (Páez-Osuna *et al.* 2002, p. 1305), with DDE found in elevated levels in some lagoons that contain nesting sites for van Rossem's gull-billed terns (Galindo *et al.* 1997, p. 1076; García-Hernández *et al.* 2001, p. 90; Carvalho *et al.* 2002, p. 1262). Additionally, selenium is a naturally occurring element that may also act as a contaminant and affect birds under certain conditions. At low levels, selenium is an essential trace nutrient that serves multiple metabolic functions in animals (Arthur and Beckett 1994, p. 620), but at higher concentrations it can cause embryo malformation and death (Hoffman *et al.* 1988, p. 521). The

available information indicates that levels of selenium are elevated within sediments at the Salton Sea (Miles *et al.* 2009, p. 2) and along the Colorado River channel close to the Isla Montague nesting location (García-Hernández *et al.* 2001, pp. 72 and 73), but at levels below thresholds known to cause reproductive harm at Cerro Prieto (García-Hernández *et al.* 2001, pp. 72 and 73).

Birds accrue contaminants mainly through the food they eat, with fish-eating birds commonly accumulating higher levels of contaminants than birds that feed on seeds or invertebrates (Frank *et al.* 1975, p. 214; Focardi 1988, p. 253; Ruelas-Inzunza *et al.* 2009, p. 418). For example, past studies have linked reproductive failure with heightened pesticide levels in the common tern (*Sterna hirundo*) and the roseate tern (*Sterna dougallii*), both fish-eating species (Hays and Risebrough 1972, p. 21; Fox 1976, p. 470), but are less pronounced in the black tern (*Chlidonias niger*), which is primarily insectivorous (Frank *et al.* 1975, pp. 211, 214). Although the diet of van Rossem's gull-billed terns may include fish, they typically eat a variety of prey items, with high percentages of invertebrates (Erwin *et al.* 1998a, p. 325). For example, at both Salton Sea and San Diego Bay, van Rossem's gull-billed terns primarily forage on invertebrates, with fish composing only about a quarter of their diet (Molina and Marschalek 2003, p. 23; Molina 2009a, p. 10). While van Rossem's gull-billed terns are known to prey on small chicks of other bird species, this prey item makes up the smallest portion of their diets (Molina *et al.* 2010, p. 7).

Although few studies have measured effects of contaminants on van Rossem's gull-billed tern, the available information from a small number of samples, as summarized in Molina *et al.* (2010, p. 15), found elevated levels of total DDT from one van Rossem's gull-billed tern egg from San Diego Bay, but this concentration was still below the thresholds found to be harmful in other species. Other contaminants, such as selenium (from eggs collected at Salton Sea), arsenic, cadmium, copper, mercury, nickel, and zinc (from one San Diego egg), were all found to be at concentrations below threshold levels (Molina *et al.* 2010, p. 15). Based on this best available information, we do not consider contaminants to be a significant threat to the van Rossem's gull-billed tern now or in the foreseeable future.

#### Food Availability

During periods when the subspecies is not nesting, including migration and while wintering, van Rossem's gull-billed terns, as highly mobile birds, can cover wide areas to search for food. In contrast, food availability near nesting sites is critical for successfully raising young. However, the availability of food (prey items) is naturally variable. Moreover, unlike other tern species that are dependent on fish as their sole food source, van Rossem's gull-billed terns opportunistically eat a variety of prey items found over a range of aquatic and terrestrial areas (Parnell *et al.* 1995, p. 1; Gochfeld and Burger 1996, p. 645). It is unlikely that all potential prey items for van Rossem's gull-billed tern will be affected at the same time, and this subspecies is able to refocus its foraging behavior to locate alternate sources of prey. If the overall availability of prey items is low during a given year in breeding areas, it will likely result in the reduction or loss of productivity for that year.

However, the adult van Rossem's gull-billed terns would likely survive because they are highly mobile and can find food elsewhere, even if it means abandoning the nesting attempt and flying to other nesting or foraging locations within the subspecies' range. Additionally, because van Rossem's gull-billed terns are long-lived, most individual adults will survive to nest the following year—at the original nesting location, or perhaps even moving to a different nesting location. For example, evidence suggests van Rossem's gull-billed terns regularly move between the Salton Sea, Cerro Prieto, Isla Montague, and San Diego Bay nesting locations within or between years, although food availability is not suspected as the motivation for such relocations (Molina and Garrett 2001, p. 26; Patton 2001, p. 8; Molina 2004, p. 98; Palacios 2010, p. 12 and 15). Thus, we do not consider a lack of food availability to be a significant threat to the subspecies now or in the foreseeable future.

#### Small Population Size

Small populations are disproportionately affected by demographic, genetic, and environmental stochastic (random) events, and natural catastrophes (Caughley 1994, pp. 217–227; Asquith 2001, pp. 345–352). Genetic stochastic events can further influence population demographics through inbreeding depression and genetic drift (Lande 1988, pp. 624–635; Whitlock and Bürger 2004, pp. 155–170). The point at which



a population becomes a “small population” is not clear and varies by species-specific or situational-specific factors. Moreover, there is disagreement among scientists and considerable uncertainty as to the population size adequate for long-term persistence of wildlife populations. There is, however, agreement that population viability for species of vertebrates (including birds) is more likely to be ensured if population sizes (typically breeding adults) are in the thousands of individuals rather than hundreds (Traill *et al.*, 2010, p. 32; Reed *et al.* 2003, p. 30, Table 3). However, as stated by Thomas (1990, p. 324), “there is no ‘magic’ population size that guarantees the persistence of animal populations.” Moreover, the amount of time that most authors consider to be “long term” is many decades or even centuries (for example, see Shaffer 1981, p. 132; Soulé and Simberloff 1986, p. 28; Traill *et al.* 2010, p. 31; see also Reed *et al.* 2003, p. 30, Table 3 therein).

Thus, we do not consider rarity alone to meet the information threshold indicating that the species may warrant listing. In the absence of information identifying threats to the species and linking those threats to the rarity of the species, the Service does not consider rarity or small populations alone to be a threat. A species that has always had small population sizes or been rare, yet continues to survive, could be well equipped to continue to exist into the future. Many naturally rare species have persisted for long periods within small geographic areas, and many naturally rare species exhibit traits that allow them to persist despite their small population sizes. Consequently, the fact that a species is rare or has small populations does not necessarily indicate that it may be in danger of extinction now or in the foreseeable future.

Although surveys were conducted through much of the subspecies’ breeding range in 2010, the surveys were conducted fairly late in the nesting season, and, thus, the most complete (best available) estimated breeding population size of van Rossem’s gull-billed tern is from the 2003 to 2005 period at approximately 800 pairs of adults rangewide. That translates to approximately 1,600 individual adults. This rough estimate of population size is largely based on counts of adults at nesting locations; as such, this figure approximates the number of breeding adults but does not include nonbreeding individuals. However, as discussed in the “Population Size” section, the data we have suggests the overall population of this subspecies has never been

particularly large. Although Pemberton (1927, p. 256) estimated that there were about 500 pairs (1,000 individuals) at the Salton Sea in 1927, there are no estimates of population sizes from any other location in western North America within that timeframe.

The Salton Sea now supports roughly 100 to 200 pairs (200 to 400 individuals); thus, the Salton Sea population has decreased since the 1920s. However, the Salton Sea (or Lake Cahuilla) has existed only intermittently through recent history and prehistory, which means that over time it has not served as a persistent and consistent nesting location. The available historical information suggests that the population of the subspecies in Mexico has been small since at least the early 1900s. Additionally, many of the places that van Rossem’s gull-billed terns nest currently were not occupied historically, including San Diego Bay, Laguna Ojo de Liebre (Guerrero Negro saltworks), and Cerro Prieto geothermal plant (which opened in 1973), suggesting the breeding range of the subspecies has expanded recently. However, we lack the information to determine if these additional nesting sites are the result of an actual increase in total population or just a redistribution of the breeding population.

Additionally, inbreeding depression and genetic drift are less likely in a subspecies in which individuals regularly move between and among other nesting locations, allowing opportunities for genetic mixing. Also, the wide geographic range over which the subspecies breeds suggests that it would be unlikely that all van Rossem’s gull-billed tern nesting locations would be simultaneously affected by a catastrophic environmental event (such as a drought, flood, or extreme weather). Even if a large storm event, such as a hurricane, during the breeding season were to move through the northern end of the Gulf of California to the Salton Sea area, where several large nesting populations occur (Table 1, Figure 1), it may have an effect on the subspecies’ reproductive efforts for that year; however, it is unlikely to result in the death of a significant number of adult van Rossem’s gull-billed terns because they are capable flyers. Therefore, although the small population size may possibly be cause for concern, threats associated with small population sizes (*i.e.*, demographic or genetic bottlenecks, inbreeding depression, genetic drift, and catastrophic events) are not significantly affecting van Rossem’s gull-billed tern and they are

not likely to affect the subspecies in the foreseeable future.

#### Climate Change

Direct observations of recent climate change include increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea levels, and provide unequivocal evidence for global warming of the Earth’s climate system (Intergovernmental Panel on Climate Change or IPCC 2007, p. 5). These changes in climate are expected to have an effect on many ecosystems; however, wetlands are likely to be particularly affected given their sensitivity to changes in precipitation and evapotranspiration (Maclean *et al.* 2007, p. 12). However, there is little specific information available that directly pertains to the likely effects of anthropogenic global climate change on van Rossem’s gull-billed tern. Below, we summarize the applicable information.

Climate change-related impacts were recently evaluated for the San Diego region, which includes the San Diego Bay van Rossem’s gull-billed tern nesting location, in a paper prepared by the California Energy Commission’s Public Interest Energy Research Program’s California Climate Change Center (CCCC). This paper used three climate models and two greenhouse gas emissions scenarios (A2 and B1, from the IPCC 2007, p. 18) to develop downscaled global predictions for climate change impacts to the San Diego region by 2050. The report concluded that temperatures for San Diego County would increase 1.5 °F to 4.5 °F (0.8 °C to 2.5 °C), but warming along the coast was likely to be more moderate than inland locations (approximately 50 km (30 mi) inland) due to the influence of the Pacific Ocean (CCCC 2009, p. 12). However, it is not clear whether or how much this will affect van Rossem’s gull-billed terns that nest at the San Diego Bay nesting location. We did locate one published study addressing climate change and the phenology (the timing of climate-related annual patterns in wildlife) of migration for the “eastern” subspecies of gull-billed tern and other summer- and winter-resident coastal birds along the Texas coast (Foster *et al.* 2010). In this study, the authors found that (warming) temperatures did not have a direct effect on migration phenology of “eastern” gull-billed terns at this location, but they speculated that it might be important at other places or times along migration routes (Foster *et al.* 2010, p. 122). Thus, at least for “eastern” gull-billed tern at this study site, increasing average temperature appeared to have little effect on

migration phenology. Therefore, this study does not provide evidence to support a premise that climate change is a significant threat to van Rossem's gull-billed tern.

We are not aware of similar downscaled regional climate models for the inland van Rossem's gull-billed tern nesting locations, but as suggested above, inland temperatures are expected to rise. The region containing the Salton Sea and Cerro Prieto nesting locations is very hot during the nesting season. Eggs left unattended during the heat of the day in this environment can exceed 50 °C (122 °F), some 5 to 10 degrees hotter than the temperature range for embryo development (Grant 1982, pp. 56 and 60). Thus, even under current temperature regimes, ground-nesting birds in this region must attentively cool their eggs during the day. Van Rossem's gull-billed terns soak their belly feathers in water and use other techniques to cool their eggs (and themselves) when daytime temperatures peak (Grant 1982, p. 39). We do not know the maximum temperature the subspecies can endure while nesting; however, it is clear that the subspecies has natural behavioral adaptations to keep its eggs within an acceptable temperature range for development in very hot environments. Because the remaining nesting locations are coastal—and thus the existing temperatures are milder and the potential temperature increases are more likely to be moderate—increasing temperatures associated with global climate change is not likely to be a significant threat to the subspecies.

Additionally, in the CCCC study, future precipitation projections for this region were mixed, with three simulations indicating drier conditions and three simulations indicating wetter conditions; however, all agreed on a high degree of variability of annual precipitation, which the authors suggest as indicating high likelihood of drought (CCCC 2009, p. 13). Substantial changes in the amount of precipitation could potentially affect terrestrial prey availability for van Rossem's gull-billed tern in the San Diego region, but because the modeled forecasts were inconclusive, there is little evidence to suggest that van Rossem's gull-billed terns in the San Diego Bay region would be significantly affected. Moreover, van Rossem's gull-billed terns in the San Diego Bay region can and often do forage on marine prey and prey items that depend on marine systems, which are less likely to be substantially affected by changes in precipitation (Molina and Marschalek 2003, p. 8 and Figure 8). Similarly, changes in precipitation (increase or decrease) are

not likely to affect van Rossem's gull-billed tern at the other coastal nesting locations.

However, prolonged drought could potentially affect the amount of water in the Colorado River (Karl *et al.* 2009, p. 130), which is the source of irrigation water for agricultural fields near the Salton Sea and Cerro Prieto nesting locations. If agriculture is severely curtailed in this region, the amount of food available to van Rossem's gull-billed terns will likely be substantially affected. A drought of that magnitude would also likely impact the amount of water available for maintaining nest sites at the Salton Sea. Even if a severe drought resulted in the loss of nesting habitat at the Salton Sea and Cerro Prieto, adult van Rossem's gull-billed terns would likely move to other nesting locations.

Further, three simulation scenarios in the CCCC study were used to model sea level rise for the San Diego region and results indicate an increase in sea level of 12 to 18 inches (30 to 46 centimeters) by 2050 (CCCC 2009, p. 14). The study also looked at the effects of sea level rise in combination with wave activity for six already flood-prone areas in San Diego County, estimating sea level with both tide and wave run-up elevation recurrences (CCCC 2009, pp. 14–18). South San Diego Bay, the current nesting location of the van Rossem's gull-billed tern population, was not included in the results; however, coastal areas from South Imperial Beach to Oceanside Beach were evaluated (CCCC 2009, pp. 16–18). Tidal fluctuations alone were found to inundate sandy beaches in many areas, including the Tijuana River mouth (CCCC 2009, p. 16), and incorporating a moderately common frequency of wave events for this location resulted in flooding of most of the sandy beaches here and in other coastal areas in San Diego County (CCCC 2009, p. 16).

However, in south San Diego Bay, van Rossem's gull-billed terns predominantly nest on certain artificial dikes within a network of dikes that form salt evaporation ponds (saltworks) (USFWS 2006, p. 3–67; Patton 2009, Summary [no page number]). The nesting dikes are within the outer perimeter of the saltworks, which means they are not directly exposed to the tidal waters of San Diego Bay, and the dikes in the saltworks range from about 3 to 8 feet (1 to 2.5 meters) above the water level (USFWS 2006, p. 3–64). Although the San Diego Bay National Wildlife Refuge is considering several potential alternatives for managing south San Diego Bay in the future, they all include maintaining colonial waterbird nest

sites, including for van Rossem's gull-billed tern (USFWS 2006, pp. 2–47 to 2–107). Therefore, we do not expect sea-level rise associated with anthropogenic climate change to be a significant threat to van Rossem's gull-billed tern in San Diego Bay.

While we lack information regarding the specifics of the saltworks nest sites in Mexico, it seems reasonable to assume that the nest sites at these locations will be similarly insulated from sea-level rise by a system of dikes that will be maintained for salt production. Inland nesting locations in Mexico (Cerro Prieto) and the United States (the Salton Sea) are also not threatened by sea-level rise resulting from climate change. Additionally, coastal areas of Mexico generally do not face the same magnitude of “coastal squeeze” scenarios that are predicted to occur with sea-level rise in coastal California because coastlines in Mexico are not as developed and new nest sites and foraging areas may be created as coastline migrates inland and current upland areas are converted to saltmarsh or intertidal flats (Galbraith *et al.* 2002, p. 177). Therefore, despite a high level of uncertainty, we do not expect sea-level rise associated with anthropogenic climate change to be a significant threat to van Rossem's gull-billed tern throughout the subspecies' range now or in the foreseeable future.

Other available information on the potential effects of anthropogenic global climate change on van Rossem's gull-billed tern includes a vulnerability assessment for migratory waterbirds within the African-Eurasian Flyway (Maclean *et al.* 2007, pp. 1–100). This assessment found a “minimal threat from climate change” for the gull-billed tern (Maclean *et al.* 2007, p. 84), which, by range, would be referring to the nominate subspecies (*Gelochelidon n. nilotica*) (Gochfeld and Burger 1996, p. 645). However, the methodologies used by Maclean *et al.* (2007, pp. 1–100) were not appropriate to our status assessment of van Rossem's gull-billed tern because the criteria and score levels they used were largely subjectively determined and did not translate well to our threats-based assessment under the Act. Therefore, this study does not provide evidence to support a premise that climate change is a significant threat to van Rossem's gull-billed tern.

While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make precise oceanographic and atmospheric predictions regarding its effects to van Rossem's gull-billed tern, its prey, or its

habitat. However, based on our review and evaluation of the best currently available data, we determine that the potential direct effects of predicted climate change on the subspecies is not a significant threat to the van Rossem's gull-billed tern now or in the foreseeable future.

#### Summary of Factor E

We identified that both inter-specific and manmade nest site disturbance may have an effect on the productivity of van Rossem's gull-billed terns. However, their ability to relocate and re-nest following disturbance combined with the minimal amount of human disturbance to nest sites in both Mexico and the United States indicates that nest site disturbance is not a significant threat to the subspecies now or within the foreseeable future.

Intentional killing of van Rossem's gull-billed terns has been very limited in the past and currently only occurs for human safety reasons in the United States. There is no indication that it will increase in the future. Illegal killing of birds at aquaculture facilities in Mexico has been observed but the extent to which it occurs and what effect this may have on the subspecies is not known. Although it is likely to occur at some level, the lack of documentation that van Rossem's gull-billed terns are affected by this practice suggests that it does not occur frequently. Thus, intentional killing is not a significant threat to the subspecies throughout its range, nor is it likely to become a significant threat within the foreseeable future.

Contaminants, particularly DDT/DDE and selenium, can negatively affect bird species including van Rossem's gull-billed tern and have been found at elevated levels at certain nesting locations, although very little data are available with respect to van Rossem's gull-billed terns and their nest sites. Based on the locations for which we have information, contaminant levels were below known thresholds for other species. Moreover, van Rossem's gull-billed terns are less likely to be exposed to high levels of contaminants because they eat a variety of foods, including invertebrates, and contaminants levels are less concentrated in invertebrates. Therefore, contaminants are not likely a significant threat to the subspecies now or in the foreseeable future. Food availability was also identified as a potential threat. However, food availability is naturally variable for most species and van Rossem's gull-billed terns are highly opportunistic and readily eat a wide variety of prey, making them less vulnerable to changes

in available prey items than species with more specialized diets. As such, food availability is not likely to be a significant threat to van Rossem's gull-billed tern now or within the foreseeable future.

Small population size is a threat that could leave van Rossem's gull-billed terns more vulnerable to stochastic environmental events and natural disasters, as well as genetic or demographic problems. The best available information suggests that the population size of this subspecies was likely always small, and it would appear that the range has recently expanded, suggesting that the overall population of the subspecies is not limited. Therefore, it is unlikely that small population size is a significant threat now or within the foreseeable future. Van Rossem's gull-billed terns move readily between and among populations between and potentially within years, and their wide range further ensures that small population size is currently not a significant threat, nor likely to become one in the foreseeable future.

Sea-level rise resulting from climate change is generally predicted to impact coastal-nesting waterbirds like van Rossem's gull-billed tern; however, impacts are likely to vary from species to species and from nesting location to nesting location. While climate change could potentially affect van Rossem's gull-billed tern or its habitat, information that is currently available fails to provide evidence to support a premise that climate change is a significant threat to van Rossem's gull-billed tern. Climate change-related sea-level rise is not expected to be a significant threat on the U.S. nesting locations in the foreseeable future, and we have no evidence to suggest it will significantly threaten the subspecies' habitat in Mexico. Additionally, potential temperature increases associated with global climate change are not likely to significantly affect the subspecies throughout its range because van Rossem's gull-billed terns have behavioral adaptations to keep eggs within an acceptable temperature range for development even under very high environmental temperatures. Also, severe drought would likely not constitute a significant threat to the subspecies because most of its breeding range is coastal and marine food resources would likely be unaffected.

Based on our review of the best scientific and commercial information available, we conclude that van Rossem's gull-billed tern is not threatened by other natural or manmade factors including nest site disturbance, intentional killing, contaminants, food

availability, small population size, or climate change now or in the foreseeable future.

#### Finding

As required by the Act, we considered the five factors in assessing whether van Rossem's gull-billed tern is threatened or endangered throughout all or a significant portion of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by the van Rossem's gull-billed tern. We reviewed the petition, information available in our files, and other available published and unpublished information. In considering what factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive or contribute to the risk of extinction of the species such that the species warrants listing as threatened or endangered as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively is not sufficient to compel a finding that listing is appropriate; we require evidence that these factors, alone or in combination, are operative threats that act on the species to the point that the species meets the definition of threatened or endangered under the Act.

Although foraging and nesting habitat has been lost in the past within the range of van Rossem's gull-billed tern, the subspecies' flexibility in foraging and nesting reduces the impact such losses have on the subspecies. Unlike most tern species, the foraging habitat for the subspecies includes both upland habitat and wetland areas. Additionally, because the subspecies is a capable flyer, it can quickly and effectively move between areas in search of food. Nest sites for van Rossem's gull-billed terns are more restrictive; they nest on islands and other remote areas where the risk of predation, especially from terrestrial predators, is low. However, nest site fidelity is low, meaning van Rossem's gull-billed terns can and may move from one nest site to another, both

between years or within a given year, to renest after a predation or disturbance event. Thus, provided nesting habitat is available, they have no obvious behavioral limitations that prevent them from using it. As such, the subspecies is not highly susceptible to loss of nesting habitat and appears to be resilient to changes in habitat.

Although there is the potential for eggs and young of ground-nesting colonial waterbirds to be harvested in some areas in Mexico, the activity has never been reported to affect van Rossem's gull-billed terns. If it occurs now or in the foreseeable future, it is unlikely to occur at levels (temporally, geographically, or both) that pose a significant threat to the subspecies throughout its range or at any particular nesting location. Therefore, overutilization (*Factor B*) does not appear to be a significant threat to van Rossem's gull-billed tern at this time. Similarly, disease (including WNV) (*Factor C*) does not appear to be a significant threat at this time, and neither do contaminants (DDT/DDE and selenium) despite their presence in the environment where the subspecies nests and forages (*Factor E*).

Nest predation (*Factor C*) and disturbance (*Factor E*) are a perennial problem for ground-nesting bird species. Van Rossem's gull-billed terns nest on islands and other remote areas where the risk of predation and disturbance is generally low. Disturbance may be from naturally occurring species, humans, pets, or livestock. Should a major predation or disturbance event occur at a nest site, van Rossem's gull-billed terns frequently relocate and renest. Thus, van Rossem's gull-billed terns may still reproduce even when faced with nest predation or severe disturbance, thereby reducing the magnitude of these threats should they occur. Moreover, gull-billed terns are long-lived. Should a colony fail to reproduce in a given year, most of the adult birds will likely have other chances to reproduce. Thus, nest predation and disturbance do not significantly threaten the subspecies throughout its range now or within the foreseeable future.

Managers of other species have targeted Van Rossem's gull-billed terns because they are predators. In the past, a few gull-billed terns were killed to protect California least tern and western snowy plover nest colonies (*Factor E*). However, no gull-billed terns have been killed recently for this purpose, and no lethal take permits have been granted for such activities. As such, predator control efforts (with van Rossem's gull-billed terns as the targets) are not a

current threat. Although three van Rossem's gull-billed terns were killed to protect human health and safety (within the vicinity of active airport runways), these numbers of intentional loss are small and all such actions occurred within a population (the San Diego Bay population) that has grown continually since 1999. Additionally, unauthorized lethal control (shooting) of van Rossem's gull-billed terns over commercial shrimp aquaculture farms in Mexico has been observed. Although information on whether this activity is widespread is not readily available, our review of the available information does not indicate a significant level of impact on van Rossem's gull-billed terns.

Van Rossem's gull-billed terns are generalist predators, opportunistically consuming a variety of available prey items. As a result, van Rossem's gull-billed terns may shift to other types of prey items should one become unavailable because of natural or human-influenced changes. This is in contrast to most other tern species that depend on fish as their primary prey. It is unlikely that all potential prey items for van Rossem's gull-billed tern will be affected at the same time. However, should this occur, van Rossem's gull-billed terns are capable of flying to different locations to forage. If reduced abundance of prey was to occur in breeding areas, it would likely result in the loss of productivity for that year, but because van Rossem's gull-billed terns are long-lived, most individuals would be expected to survive to nest the following year. We have no information to suggest that van Rossem's gull-billed terns are facing food shortages. Therefore, food availability (*Factor E*) is not a significant threat to the subspecies.

With an estimated minimum breeding population of approximately 1,600 adults, the population size of van Rossem's gull-billed tern is one of the smallest of any tern taxon in North America. Compared to larger populations, small populations may be more likely to be affected disproportionately by demographic, genetic, or environmental factors. Although the population of van Rossem's gull-billed tern may be relatively small, its range appears to have recently expanded. This suggests that the population is not markedly affected by demographic or genetic bottlenecks. Additionally, inbreeding depression and genetic drift is less likely in a subspecies comprised of individuals that regularly move long distances and occur at different nesting locations from time to time, which van Rossem's gull-billed terns are known to

do. Moreover, the wide range over which the subspecies breeds suggests that not all of the nesting areas would be simultaneously affected by catastrophic environmental events (droughts, floods, hurricanes). Therefore, although the small population size is a potential cause for concern, it does not appear that the threats associated with small population sizes (*Factor E*) are significantly affecting van Rossem's gull-billed tern and are not likely to in the foreseeable future.

Sea-level rise resulting from climate change is generally predicted to impact coastal-nesting waterbirds like van Rossem's gull-billed tern (*Factor E*); however, the actual impacts are likely to vary from species to species and from nesting location to nesting location. While climate change could potentially affect van Rossem's gull-billed tern or its habitat, the limited amount of available information fails to provide evidence to support a premise that climate change is a significant threat to van Rossem's gull-billed tern.

A species may be affected by more than one threat in combination. Within the preceding review of the five listing factors, we have identified multiple threats that may have interrelated impacts on the subspecies. For example, the productivity of van Rossem's gull-billed terns may be reduced because of the effects of predators (especially terrestrial predators) (*Factor C*) or nest-site disturbance (*Factor E*). Likewise, a physical change in nesting habitat (*Factor A*), such as an island becoming part of the mainland because of changes in water level, may allow for increased depredation or disturbance. Moreover, the subspecies' behavior of not nesting in areas where depredation or disturbance is likely may mean a nest site is "abandoned" before nesting is even attempted. Thus, the subspecies' productivity may be reduced because of these threats, either singularly or in combination. However, it is not necessarily easy to determine (nor is it necessarily determinable) which potential threat is the operational threat. As we discuss above, regardless of its source, we determine that such threats, either individually or in combination, are not likely to occur at a sufficient geographical or temporal scale to significantly affect the status of the species.

Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats, alone or in combination, are not of sufficient imminence, intensity, or magnitude to indicate that van Rossem's gull-billed

tern is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened) throughout its range. Therefore, we find that listing van Rossem's gull-billed tern as an endangered or threatened species throughout its range is not warranted at this time.

#### *Distinct Vertebrate Population Segments/Significant Portion of the Range*

After assessing whether the subspecies is endangered or threatened throughout its range, we next consider whether a distinct vertebrate population segment (DPS) exists and meets the definition of endangered or is likely to become endangered in the foreseeable future (threatened). We also consider whether the subspecies is endangered or threatened within a significant portion of its range. These assessments are discussed below.

#### *Distinct Vertebrate Population Segment*

Under the joint DPS policy (61 FR 4722; February 7, 1996) of the Service and National Marine Fisheries Service, three elements are considered in the decision concerning the establishment and classification of a possible DPS. These are applied similarly for additions to or removal from the Federal List of Endangered and Threatened Wildlife. These elements include:

(1) The discreteness of a population in relation to the remainder of the species to which it belongs;

(2) The significance of the population segment to the species to which it belongs; and

(3) The population segment's conservation status in relation to the Act's standards for listing, delisting, or reclassification (*i.e.*, is the population segment endangered or threatened).

#### *Discreteness*

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions:

(1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

(2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

We reviewed available information to determine whether there are population segments of van Rossem's gull-billed tern that meet the first discreteness condition of our 1996 DPS policy. We found no evidence that population segments existed that were markedly separated from each other as a consequence of physical, physiological, ecological, or behavioral factors. We are not aware of measures of genetic or morphological discontinuity that provide evidence of marked separation. As noted previously, van Rossem's gull-billed terns are highly mobile. They are migratory and regularly move between breeding and wintering areas every year. In the subspecies' winter range, individuals can mix and mingle with other individuals. At the northern end of the subspecies' range, individuals have been observed to move between nesting locations between years (Molina and Garrett 2001, p. 26; Patton 2001, p. 8; Molina 2004, p. 98), and the information we have suggests that such movements occur elsewhere within the subspecies' range. Even though a superficial examination of nesting locations (Figure 1) shows clusters of nesting locations somewhat geographically distant from other clusters, the biology of the subspecies suggests that interchange of individuals occurs between and among these clusters. In other words, an individual van Rossem's gull-billed tern that occurs within a given cluster of nesting locations during a given breeding season may occur within a different cluster of nesting locations the next year. As such, these geographically separated clusters are not biologically separate from each other. Therefore, no population of van Rossem's gull-billed tern meets the first discreteness condition of our 1996 DPS policy.

We next evaluated whether any population segments meet the second discreteness condition of our 1996 DPS policy. Nest locations at San Diego Bay and Salton Sea can be delimited from all other nest locations in Mexico by an international governmental boundary (Figure 1). However, after evaluating available information, we have concluded that breeding populations at San Diego Bay and Salton Sea do not meet the second discreteness condition because differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms between the U.S. and Mexican populations are not significant in light of section 4(a)(1)(D) of the Act. Mexico and the United States are both signatories to the Migratory Bird Treaty Act, and two of the largest nesting

populations of van Rossem's gull-billed terns in Mexico are located within biosphere reserves where development is limited by the LGEEPA (see *Factor D*).

We determined, based on a review of the best available information, that there are no populations of van Rossem's gull-billed tern that meet the discreteness conditions of the 1996 DPS policy. The DPS policy is clear that significance is analyzed only when a population segment has been identified as discrete. Because we found no population segments that meet the discreteness element under the Service's DPS policy, we will not conduct an evaluation of significance under that policy. We conclude that no population segment qualifies as a listable DPS under the Act.

#### *Significant Portion of the Range*

Having determined that the van Rossem's gull-billed tern is not endangered or threatened throughout its range, we must next consider whether there are any significant portions of the range where the van Rossem's gull-billed tern is in danger of extinction or is likely to become endangered in the foreseeable future.

Decisions by the Ninth Circuit Court of Appeals in *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (2001) and *Tucson Herpetological Society v. Salazar*, 566 F.3d 870 (2009) found that the Act requires the Service, in determining whether a species is endangered or threatened throughout a significant portion of its range, to consider whether lost historical range of a species (as opposed to its current range) constitutes a significant portion of the range of that species. While this is not our interpretation of the statute, we first address the lost historical range before addressing the current range.

#### *Lost Historical Range*

The available literature provides little information on the historical breeding range of van Rossem's gull-billed tern. The only historical nesting location where nesting was confirmed was the Salton Sea (Pemberton 1927, p. 253). However, nesting was suspected at various locations along the west coast of mainland Mexico, possibly as far south as the state of Oaxaca (see Molina and Erwin 2006, pp. 273–274; see also the “Range and Distribution” section, above). Although nesting has been confirmed in modern times at certain nesting locations in western mainland Mexico—thereby validating the suspicions of historical observers at some, but not all, potential nesting locations—the historical breeding range of van Rossem's gull-billed tern everywhere except the Salton Sea is

ambiguous and will remain so forever. Thus, the historical breeding range of van Rossem's gull-billed tern may be characterized as follows: The Salton Sea and probably western mainland Mexico.

With the exception of the Salton Sea nesting location (which was known historically, but could not have existed before the Salton Sea's creation in its modern form in 1907), the confirmation of all other van Rossem's gull-billed tern nesting locations occurred in modern times (1987 and later). Available information on modern nesting locations is summarized in Table 1, with additional discussion in the "Range and Distribution" section, above. As noted in that section, the current southernmost *confirmed* nesting location is Laguna Potosí, Guerrero, but nesting farther south in Mexico continues to be a possibility. As such, despite increased certainty of the subspecies' current breeding range in western Mexico compared to its historical range, the southern limit of that range remains ambiguous. Thus, the current breeding range of the subspecies may be characterized as follows: The Salton Sea and south through the greater Colorado River delta region, San Diego Bay, Laguna Ojo de Liebre (Baja California Sur), and western mainland Mexico at least as far south as Laguna Potosí (Guerrero) but possibly farther south.

Although we acknowledge that there is ambiguity in the historical and modern breeding ranges, the ambiguities are from essentially the same geographical area, the southern Pacific coast of Mexico (and possibly the Pacific coast of Central America). The ambiguity in the modern breeding range is essentially a perpetuation of the ambiguity in the historical breeding range. Thus, the best available information indicates that the current breeding range of van Rossem's gull-billed tern—with the modern colonizations of San Diego Bay and Laguna Ojo de Liebre—is larger than the subspecies' historical breeding range. Thus, we conclude that no portions of the subspecies' breeding range have been lost.

Little information is available on the historical winter range of van Rossem's gull-billed tern. Even today, the current winter range is not well defined. The lack of historical and modern information, especially for the southern portion of the subspecies' range, results in historical and current winter ranges that are ambiguous (see the "Range and Distribution" section for details), much in the way the breeding ranges are ambiguous. After reviewing the available information, the historical and

current winter ranges of van Rossem's gull-billed tern can be characterized as follows: Coastal western Mexico and possibly western Central America. We are not aware of any differences between the subspecies' current winter range compared to its historical winter range. Thus, we conclude that no portions of the subspecies' winter range have been lost.

Information on the areas over which van Rossem's gull-billed terns migrate is also limited. That area has likely had a corresponding increase associated with the modern colonization of nesting sites along the Pacific coast of the Baja California Peninsula, Mexico, and extreme southwestern United States. Thus, we conclude that no portions of the subspecies' range used for migration have been lost. Therefore, there is no lost historical range of van Rossem's gull-billed tern that could constitute a significant portion of the range of the subspecies.

#### Current Range

The Act defines "endangered species" as any species which is "in danger of extinction throughout all or a significant portion of its range," and "threatened species" as any species which is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The definition of "species" is also relevant to this discussion. The Act defines "species" as follows: "The term 'species' includes any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature." The phrase "significant portion of its range" (SPR) is not defined by the statute, and we have never addressed in our regulations: (1) The consequences of a determination that a species is either endangered or likely to become so throughout a significant portion of its range, but not throughout all of its range; or (2) what qualifies a portion of a range as "significant."

Two recent district court decisions have addressed whether the SPR language allows the Service to list or protect less than all members of a defined "species": *Defenders of Wildlife v. Salazar*, 729 F. Supp. 2d 1207 (D. Mont. 2010), concerning the Service's delisting of the Northern Rocky Mountain gray wolf (74 FR 15123, Apr. 12, 2009); and *WildEarth Guardians v. Salazar*, 2010 U.S. Dist. LEXIS 105253 (D. Ariz. Sept. 30, 2010), concerning the Service's 2008 finding on a petition to list the Gunnison's prairie dog (73 FR 6660, Feb. 5, 2008). The Service had asserted in both of these determinations

that it had authority, in effect, to protect only some members of a "species," as defined by the Act (*i.e.*, species, subspecies, or DPS), under the Act. Both courts ruled that the determinations were arbitrary and capricious on the grounds that this approach violated the plain and unambiguous language of the Act. The courts concluded that reading the SPR language to allow protecting only a portion of a species' range is inconsistent with the Act's definition of "species." The courts concluded that once a determination is made that a species (*i.e.*, species, subspecies, or DPS) meets the definition of "endangered species" or "threatened species," it must be placed on the list in its entirety and the Act's protections applied consistently to all members of that species (subject to modification of protections through special rules under sections 4(d) and 10(j) of the Act).

Consistent with that interpretation, and for the purposes of this finding, we interpret the phrase "significant portion of its range" in the Act's definitions of "endangered species" and "threatened species" to provide an independent basis for listing; thus there are two situations (or factual bases) under which a species would qualify for listing: A species may be endangered or threatened throughout all of its range; or a species may be endangered or threatened in only a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an "endangered species." The same analysis applies to "threatened species." Based on this interpretation and supported by existing case law, the consequence of finding that a species is endangered or threatened in only a significant portion of its range is that the entire species shall be listed as endangered or threatened, respectively, and the Act's protections shall be applied across the species' entire range.

We conclude, for the purposes of this finding, that interpreting the SPR phrase as providing an independent basis for listing is the best interpretation of the Act because it is consistent with the purposes and the plain meaning of the key definitions of the Act; it does not conflict with established past agency practice (*i.e.*, prior to the 2007 Solicitor's Opinion), as no consistent, long-term agency practice has been established; and it is consistent with the judicial opinions that have most closely examined this issue. Having concluded that the phrase "significant portion of its range" provides an independent basis for listing and protecting the entire species, we next turn to the meaning of "significant" to determine the threshold

for when such an independent basis for listing exists.

Although there are potentially many ways to determine whether a portion of a species' range is "significant," we conclude, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for "significant" in terms of an increase in the risk of extinction for the species. We conclude that a biologically based definition of "significant" best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species' conservation. Thus, for the purposes of this finding, and as explained further below, a portion of the range of a species is "significant" if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction.

We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation. *Resiliency* describes the characteristics of a species and its habitat that allow it to recover from periodic disturbance. *Redundancy* (having multiple populations distributed across the landscape) may be needed to provide a margin of safety for the species to withstand catastrophic events. *Representation* (the range of variation found in a species) ensures that the species' adaptive capabilities are conserved. Redundancy, resiliency, and representation are not independent of each other, and some characteristic of a species or area may contribute to all three. For example, distribution across a wide variety of habitat types is an indicator of representation, but it may also indicate a broad geographic distribution contributing to redundancy (decreasing the chance that any one event affects the entire species), and the likelihood that some habitat types are less susceptible to certain threats, contributing to resiliency (the ability of the species to recover from disturbance). None of these concepts is intended to be mutually exclusive, and a portion of a species' range may be determined to be "significant" due to its contributions under any one or more of these concepts.

For the purposes of this finding, we determine if a portion's biological contribution is so important that the portion qualifies as "significant" by asking whether *without that portion*, the representation, redundancy, or resiliency of the species would be so

impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction (*i.e.*, would be "endangered"). Conversely, we would not consider the portion of the range at issue to be "significant" if there is sufficient resiliency, redundancy, and representation elsewhere in the species' range that the species would not be in danger of extinction throughout its range if the population in that portion of the range in question became extirpated (extinct locally).

We recognize that this definition of "significant" (a portion of the range of a species is "significant" if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction) establishes a threshold that is relatively high. On the one hand, given that the consequences of finding a species to be endangered or threatened in an SPR would be listing the species throughout its entire range, it is important to use a threshold for "significant" that is robust. It would not be meaningful or appropriate to establish a very low threshold whereby a portion of the range can be considered "significant" even if only a negligible increase in extinction risk would result from its loss. Because nearly any portion of a species' range can be said to contribute some increment to a species' viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to conservation benefit: listing would be rangewide, even if only a portion of the range of minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for "significant" that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered "significant" only if threats in that portion result in the entire species' being currently endangered or threatened. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (9th Cir. 2001).

The definition of "significant" used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions will be imposed or resources expended that do not contribute substantially to species conservation. But we have not set the threshold so high that the phrase "in a significant portion of its range" loses independent meaning. Specifically, we have not set the threshold as high as it

was under the interpretation presented by the Service in the *Defenders* litigation. Under that interpretation, the portion of the range would have to be so important that current imperilment there would mean that the species would be *currently* imperiled everywhere. Under the definition of "significant" used in this finding, the portion of the range need not rise to such an exceptionally high level of biological significance. (We recognize that if the species is imperiled in a portion that rises to that level of biological significance, then we should conclude that the species is in fact imperiled throughout all of its range, and that we would not need to rely on the SPR language for such a listing.) Rather, under this interpretation we ask whether the species would be endangered everywhere without that portion, *i.e.*, if that portion were completely extirpated. In other words, the portion of the range need not be so important that even the species being in danger of extinction in that portion would be sufficient to cause the species in the remainder of the range to be endangered; rather, the *complete* extirpation (in a hypothetical future) of the species in that portion would be required to cause the species in the remainder of the range to be endangered.

The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that have no reasonable potential to be significant or to analyzing portions of the range in which there is no reasonable potential for the species to be endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be "significant," and (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. Thus, if we determine that a portion of the range is not "significant," we do not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is "significant." In practice, a key part of the determination that a species is in danger of extinction in a significant portion of its range is



whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats to the species occurs only in portions of the species' range that clearly would not meet the biologically based definition of "significant," such portions will not warrant further consideration.

After reviewing the potential threats throughout the range of van Rossem's gull-billed tern, we determine that there may be two portions of the tern's breeding range that could be considered to have concentrated threats for the subspecies there. Below, we outline the elevated threats found at two nesting locations, the Salton Sea in California and the islands in the impoundments associated with Campo Geotérmico Cerro Prieto (Cerro Prieto geothermal generation facility) in northeast Baja California (Table 1, Figure 1). We then assess whether these portions of the subspecies' breeding range may meet the biologically based definition of "significant," that is, whether the contributions of these portions of the gull-billed tern's range to the viability of the subspecies is so important that without those portions, the species would be in danger of extinction.

The decreasing water levels at the nesting location at Salton Sea and changing water storage practices at the nesting location at Cerro Prieto have the potential to be considered as concentrations of threats at each of these nesting locations (see Summary of Information Pertaining to the Five Factors). The observed and anticipated reduction in water levels at these locations may lead to an increase in nest predation (*Factor C*) at either site. Increased nest predation would likely result in reduced reproductive output. Moreover, the subspecies' behavior of selecting islands and other areas where terrestrial nest predators are less likely to occur makes the relative lack of predators part of what constitutes nesting habitat for this subspecies. Thus, observed and anticipated changes in water levels may also lead to a loss of nesting habitat at the respective locations (*Factor A*).

In general, for taxa that are sessile (anchored) or of limited mobility, loss of habitat would typically translate into some concurrent loss of individuals, which in turn would translate into some concomitant effect on the overall population. However, individual adult van Rossem's gull-billed terns are highly mobile; they can and do move, both in terms of their seasonal migratory

movements and in terms of their ability to move between nesting locations from year to year and within years. For example, if van Rossem's gull-billed terns returning from their wintering areas found that a particular nesting location no longer provided nesting habitat, the available information suggests that the birds can and would move to a different nesting location. Thus, habitat loss at either of these nesting locations would not necessarily result in a direct reduction in the subspecies' overall population. However, we expect that moving to a different nesting location would not be without consequences. Instead, we expect that the relocated birds would concentrate in other existing nesting locations (in potentially lower quality nest sites within existing nesting locations) or that they would occupy new, potentially less-suitable (lower quality) nesting locations. Consequently, the effects of the loss of nesting habitat would likely result in reduced reproductive output by the subspecies.

Because the van Rossem's gull-billed tern faces elevated threats at the Salton Sea and Cerro Prieto nesting locations, we next assess whether these portions of the subspecies' breeding range may meet the biologically based definition of "significant." For both areas, we evaluate whether the portion's biological contribution is so important that the portion qualifies as "significant" by asking whether *without that portion*, the representation, redundancy, or resiliency of the species' would be so impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction.

Although each nesting location has features that make it unique, we have no evidence, whether based on the locations' geography or the subspecies' biology, that suggests these nesting locations are markedly different from any other nesting location. For example, the nesting habitat is essentially the same at all nesting locations. As with nesting habitat, the subspecies' foraging habitat is similar throughout its range, whether during the breeding season, winter, or migration. Although coastal nesting locations are more common than the inland nesting locations that Salton Sea and Cerro Prieto represent, van Rossem's gull-billed terns essentially nest in the same types of areas inland as they do in coastal nesting locations. Gull-billed terns (subspecies unknown) have also been observed nesting at other inland locations in Mexico (Gómez de Silva 2005, p. 501; Molina and Erwin

2006, p. 274) (see the "Range and Distribution" section, above).

As mobile birds, individual van Rossem's gull-billed terns are not tied to any particular nesting location, and often move between nesting locations. Van Rossem's gull-billed terns that nest at either the Salton Sea or Cerro Prieto are not permanent occupants of either location. Van Rossem's gull-billed terns leave each of these areas to winter farther south. As stated under "Biology" in the *Species Information* section, van Rossem's gull-billed terns appear to be opportunistic and adaptable nesters, displaying low nest-site fidelity, and even moving to new sites and renesting within the same year. Groups of van Rossem's gull-billed terns have displayed such renesting behavior at the Salton Sea (Molina 2009b, pp. 6–7) and at Bahía Santa María (Palacios and Mellink 2007, p. 218). Van Rossem's gull-billed terns will readily take advantage of new nest sites as well as sites that are not available every year (for example, Molina 2005, p. 4; Molina 2009b, p. 2). If the Salton Sea and Cerro Prieto could no longer support nesting, other existing and potential nesting locations are distributed along a 2,250-km (1,400-mi) stretch of the subspecies' breeding range from southern California to Guerrero, Mexico (see Figure 1). There are currently nine nesting locations along the coast with multiple nest sites where breeding colonies have been documented. There is sufficient representation and redundancy of nesting habitat in the subspecies' breeding range such that van Rossem's gull-billed tern would not be in danger of extinction if either or both of the Salton Sea and Cerro Prieto nesting locations were completely lost.

Elimination of the Salton Sea and Cerro Prieto nesting locations would not result in the elimination of the individual van Rossem's gull-billed terns that would have otherwise nested at those locations. The loss of both or either of the Salton Sea or Cerro Prieto portions of the subspecies' range would not directly result in a reduction in the subspecies' overall population, but there may be a temporary reduction in the local populations' reproductive output compared to what it would have been. This potential reduction of reproductive output is not expected to reduce the subspecies' range of variation or adaptive capabilities to such a level that they would be in danger of extinction. Without these two nesting locations, we expect that the resiliency of van Rossem's gull-billed tern would not be appreciably impacted; the subspecies would continue to be able to recover from periodic disturbance and

withstand catastrophic events in other parts of its range.

In summary, although there are elevated threats related to potential changes in water level at Cerro Prieto and Salton Sea, these portions of the van Rossem's gull-billed tern's range are not significant portions of its range. Even if these nesting colonies were abandoned at some time in the future, it is likely that van Rossem's gull-billed terns would move and nest elsewhere, as they are not tied to any particular nesting location. As noted above, there is little that biologically distinguishes either Cerro Prieto or the Salton Sea from other nesting locations for van Rossem's gull-billed tern. They each happen to be inland, which undoubtedly contributes to the shared threat of changes in water levels, but the nesting and foraging areas at each of these sites do not differ notably from those in the subspecies' entire range. Existing and potential nesting locations are distributed along a 2,250-km (1,400-

mi) stretch of the subspecies' breeding range from southern California to Guerrero, Mexico. Neither Cerro Prieto nor the Salton Sea, nor even the two nesting locations combined, is a "significant" portion of the species' range because their contribution to the viability of the subspecies is not so important that the subspecies would be in danger of extinction without those portions.

We find that van Rossem's gull-billed tern is not in danger of extinction now, nor is it likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing van Rossem's gull-billed tern as endangered or threatened under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, van Rossem's gull-billed tern to our Carlsbad Fish and Wildlife Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor van Rossem's gull-

billed tern and encourage its conservation. If an emergency situation develops for the van Rossem's gull-billed tern or any other species, we will act to provide immediate protection.

#### References Cited

A complete list of references cited is available on the Internet at <http://www.regulations.gov> and upon request from the Carlsbad Fish and Wildlife Office (see **ADDRESSES** section).

#### Authors

The primary authors of this notice are staff members of the Carlsbad Fish and Wildlife Office.

**Authority:** The authority for this section is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: September 9, 2011.

**Daniel M. Ashe,**

*Director, Fish and Wildlife Service.*

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