

APPENDIX 1. Summaries for States, Provinces, and Territories within the Breeding Range of the Caspian Tern in Canada, the United States, and Mexico.

Summaries are arranged by the five distinct North American populations: Pacific Coast/Western (interior), Central Canada, Great Lakes, Gulf Coast, and Atlantic Coast (Wires and Cuthbert 2000). An account for North Dakota is included in a section on Outlying Populations.

PACIFIC COAST/WESTERN (INTERIOR) REGION

ALASKA

Status and Distribution: Gill and Mewaldt (1983) predicted that the northward expansion of Caspian Terns along the Pacific Coast would eventually lead to their breeding in Alaska. The annual presence since the late 1980s of adults and young-of-the-year in the western Copper River Delta area suggests local breeding (Gibson and Kessel 1992, Kessel and Gibson 1994, McCaffery et al. 1997). The first confirmed breeding records of the Caspian Tern in Alaska were of three nests discovered in both 1996 and 1997 on Neragon Island. The tern nests were generally associated with loose Glaucous Gull colonies. The second documented breeding record was of four nests (16 adults) discovered on a small island in Twin Glacier Lake at the Taku River (J. Johnson pers.comm.).

Major Populations: The state lacks a major population of breeding Caspian Terns. Six of the state's documented nests were on Neragon Island (McCaffery et al. 1997) and four were on a small island in Twin Glacier Lake (J. Johnson pers. comm.).

Population Trends: After its first discovery in the state in 1981, the species has since occurred annually in summer in Southeastern and Southcoastal Alaska (Gibson and Kessel 1992). Although numbers are small (up to 80 in 1989), this range expansion and population increase may reflect recent growth of the Caspian Tern population along the Pacific Coast. One Caspian Tern banded as a nestling in Grays Harbor was recovered in Alaska near Orcas and the Copper River Delta (D. Craig unpubl. data).

Research/monitoring: There are no specific research or monitoring efforts for Caspian Terns in Alaska. The discovery of breeding in the state has been the result of research on other wildlife species (McCaffery et al. 1997, J. Johnson pers. comm.).

Status: No status assigned.

Natural Heritage Rank: Vulnerable.

Habitat Conditions: At Neragon Island nests were generally on the higher, drier portions of the island either in the lee of driftwood fragments that had collected sand or in an open sandy area (McCaffery et al. 1997). Nest scrapes were bare or sparsely lined with bivalve shell fragments, twigs, dry grass, or other vegetative debris. The small island in Twin Glacier Lake consisted of a few rocky outcrops and gravel (J. Johnson, pers. comm.). Nests were unlined scrapes in the gravel.

Threats: Specific threats to Alaska's Caspian Terns are unknown.

BRITISH COLUMBIA

Status and Distribution: Although the Caspian Tern is currently considered a fairly common to locally very common summer visitant on the southern coast of British Columbia, there is only a single breeding record for the province from Roberts Banks in the Fraser River Delta (Campbell et al. 1990). In 1984, observations there included an adult and two flightless chicks in June and a recently fledged young (perhaps 3 weeks old) being fed by an adult on a muddy beach at (Campbell et al. 1990).

Major Populations: The province lacks a major population of breeding Caspian Terns (see above).

Population Trends: Although recorded as early as 1905 in the interior in the Okanagan Valley, the Caspian Tern was not known from the coast of British Columbia until two were sighted at Nanaimo in 1959 (Campbell 1971, Campbell et al. 1990). During the 1960s, it increased to become a regular summer visitor to southern coastal areas of the province. Numbers continued to increase gradually during the 1970s then dramatically in the 1980s. Campbell et al. (1990) noted that this range expansion correlated with the establishment and growth of breeding colonies in California and Washington.

Research/monitoring: There are no specific research or monitoring efforts for Caspian Terns in the province.

Status: No status assigned.

Natural Heritage Rank: Unranked.

Habitat Conditions: There are no nesting records for the province upon which to characterize habitat.

Threats: Specific threats to Caspian Terns in British Columbia are unknown.

WASHINGTON

Status and Distribution: The distribution and abundance of Caspian Terns in the state has fluctuated dramatically since first reported in 1929 along the coast at Westport (Kitchin 1930). The initial breeding records of small colonies (1-50 pairs) came from eastern Washington at Moses Lake and nearby on the Columbia River (Kitchin 1930, Decker and Bowles 1932). Breeding was not recorded in coastal Washington until the 1950s (Gill and Mewaldt 1983). The small coastal colonies that started in Grays Harbor shifted locally there among three islands. The Grays Harbor colonies grew rapidly into the early 1980s, and Caspian Terns expanded on the coast to breed in Willapa Bay and the Columbia River estuary (Gill and Mewaldt 1983; see Oregon account below).

The first estimate of the statewide breeding population was for 1975 (Penland 1982) when there were about 1,250 pairs at 4 sites (83% at 1 coastal site [2 colonies] and 7% at 2 interior sites). The Washington breeding population may have been most concentrated in 1987, when 3,590 pairs nested on Sand Island in Grays Harbor. The statewide population appeared to reach a peak in 1982 at 3,884

pairs (Gunpowder Sands 1,000, Sand Island 2,608, and Potholes Reservoir 276; WDFW in litt., Penland 1982, Finger and Tabor 1997). By 1995 there was no successful breeding in Grays Harbor. The Washington breeding population was about 1,000 pairs in 1997; 1,351 pairs in 2000 at 5 sites (1 coastal [45% of pairs], 4 interior [55%]); and 1,416 pairs at 6 sites (1 coastal [27%], 5 interior [73%]) in 2001 (Wires and Cuthbert 2000, Table 5).

The statewide breeding population declined from its peak in the 1980s partly because of habitat changes in the coastal breeding sites. The loss of coastal colonies in the late-1980s also coincided with substantial declines in marine prey species (e.g., northern anchovies, Pacific sand lance, and herring) along the Oregon and Washington coast associated with weak ocean upwellings and El Niño events during the 1980s and 1990s (Collis 2001a). During this same time period, U. Wilson (in Carter et al. 2000) observed declines in colony attendance and colony abandonment in other breeding seabirds (i.e., Common Murre, *Uria aalge californica*) in Washington related to these same oceanographic conditions. The interior Caspian Tern population has been relatively stable in the last 30 years despite shifts in the number and location of breeding sites.

The following summarizes colony occupation and tern abundance for three areas: coastal bays, the mid-Columbia River, and the Columbia River basin of eastern Washington. Records for most sites are sporadic at best until the late 1990s.

Coastal Bays

North Puget Sound, Snohomish County. The Everett Naval Station is built on a mainland fill of Port Gardner Bay. In the early 1980s a small number of Arctic Terns were breeding on bare ground denuded by construction activity (Bird 1994). Caspian Terns (40 adults) were first recorded at the location in 1990, but there was no nesting detected. Nesting was recorded in the next five years with the following estimates of breeding numbers: 1991 (500 adults), 1992 (500 adults), 1993 (750 adults), 1994 (2,600 adults), and 1995 (~2,600 adults, Bird 1994, J. Flavin in litt.). During this period the only specific estimate of breeding success was a report of 2,500 fledged young in 1994 (Bird 1994). In 1995, the colony site was covered in wooden stakes and monofilament line as part of an Environmental Engineering Office/Environmental Protection Agency management plan implemented by citizen volunteers (J. Flavin in litt., Smith et al. 1997). The Caspian Terns moved to nearby (dredge-spoil) Jetty Island, where a fenced berm had been constructed as an alternate breeding location (Bird 1994). The ~50 nests with single eggs on the island were abandoned coincident with an adult Bald Eagle hunting incubating terns (J. Flavin in litt.). In 1996, the mainland habitat had been developed into a ball field, the Jetty Island berm was grown over with vegetation, and an adult Bald Eagle was resident. There are no subsequent reports of Caspian Terns nesting in the northern Puget Sound area.

Commencement Bay, South Puget Sound, Pierce County. Caspian Terns nested at a mainland site in southern Puget Sound at Ruston, Washington (Shugart and Tirhi 2001). This site was fenced after it was designated an EPA Superfund site (ASARCO), and nesting occurred on a mound of soil (21 m tall, covering 3 ha) that was covered by tarps. Terns established nests on sandbags (used to secure the tarps) that had broken open or on the exposed soil where tarps had blown off. Gary Shugart (pers. comm.) first noticed large numbers of Caspian Terns (100s to 1,000s) loafing in the area in 1994 and suspected possible breeding as of 1998. Breeding on the ASARCO soil mounds was documented in 1999 (423 pairs, ~0.4 chicks/pair) and 2000 (~620 pairs [1,000 ad.], 500-600 young

fledged) (Collis et al. 2000, Shugart and Tirhi 2001, A. Edwards pers. comm.). In 2001, the terns were discouraged from settling on the soil, but they successfully initiated nests on an experimental breeding barge about 7 km to the east of ASARCO (Collis et al. in press). The best estimate was 388 breeding pairs on the barge before it was removed. Additional eggs, not attributed to breeding pairs, were dumped or abandoned on the experimental barge (237 eggs) and on two nearby barges lacking nest substrate (11 eggs, 22 eggs) (Collis et al. in press). Also in 2001, G. Shugart (unpubl. data) observed a small number of flightless young on a building roof near the experimental barge. The availability of future experimental breeding barges or any other breeding habitat in Commencement Bay is uncertain.

Grays Harbor, Grays Harbor County. Caspian Terns were first documented breeding on the Pacific Northwest coast with the discovery of nine pairs on Goose Island in 1957 (Alcorn 1958). From 1957 to 1996, Caspian Terns bred on at least three different islands in Grays Harbor: Goose Island (~12 ha) supports dense dune vegetation, Whitcomb Island (~5 ha) is a lower sandy island with scattered vegetation or tidal flat (depending on winter weather patterns), and Sand Island (8 ha) is covered in dense dune vegetation except for a long sand bar (Penland 1982, D. Craig pers. obs.). On these islands terns typically nested in vegetation-free areas of sand and scattered driftwood (Penland 1982). The Goose Island population reached a peak at about 100 pairs in 1973, followed by a rapid shift to Whitcomb Island (Penland 1982). The Whitcomb population rapidly declined in the late 1970s coincident with a move to Sand Island. Whitcomb Island eroded and subsequent breeding occurred intermittently with peak numbers recorded in 1989 (1,377 pairs). In 1981, >2,000 pairs nested at Sand Island, which was then the largest known Caspian Tern colony anywhere on the Pacific Coast of North America (Gill and Mewaldt 1983). In 1987, an estimated 3,590 pairs nested on Sand Island, but by 1993 this colony disappeared (WDFW 1999). During the 1990s there was no confirmed successful nesting by Caspian Terns in Grays Harbor, although small numbers of terns attempted to nest at Whitcomb Island (M. Zahn unpubl. data). This site, currently known as Whitcomb Flats, is now underwater at the seasonally highest tides.

Estimates based on extensive census data of breeding pairs for Goose Island are: 1957 (9), 1958 (70, 150 young), 1971-1972 (breeding), 1973 (800-1,000), 1974 (150), 1975 (90), 1976-2001 (0). Estimates of breeding pairs for Whitcomb Island are: 1974 (1,000; 2,000-3,000 young), 1975 (1,075; 1,600 young), 1976 (1,240; 1,600-2,400 young), 1977 (307; 127 young), 1978 (77), 1979 (10), 1980 (7), 1981 (0), 1987 (0), 1989 (1,377), 1993 (107), 1994-1995 (0), 1996 (34, failed). Comparable estimates for Sand Island are: 1974-1975 (0), 1976 (600), 1977 (1,737; 1,200 young), 1978 (1,779; 3,600 young), 1979 (1,892; 1,334 young), 1980 (2,190), 1981 (2,157; 4,428 young), 1982 (2,608; young observed), 1984 (2,775; young observed), 1987 (3,590), 1988 (2,826), 1989 (1,547), and 1993-2001 (0) (D. Bell pers. comm.; WDFW in litt.; Alcorn 1958; Smith and Mudd 1978; Penland 1981, 1982; D. Craig unpubl. data).

Willapa Bay, Pacific County. The data for Willapa Bay, between Grays Harbor and the Columbia River estuary, are sporadic at best. A breeding colony of Caspian Terns was first recorded in Willapa Bay in 1976, when 700 breeding adults were counted on Gunpowder Island in early June (WDFW unpubl. data). In the same year, Penland (1982) estimated 425 breeding pairs at Ellen Sands, which is north of Gunpowder Sands. All subsequent breeding is described to have been on Gunpowder Sands. By 1980 this colony had grown to ~1,000 breeding pairs, and it apparently reached a peak of ~1,500 pairs in 1982 (Speich and Wahl 1989). Thereafter the Gunpowder Sands colony declined to

1,207 adults in 1985, and the last confirmed nesting was by 351 adults in 1989 (E. Cummins/WDFW unpubl. data). In 2000 and 2001 this former colony site was mostly inundated at most high tides.

Mid-Columbia River

Miller Rocks, Klickitat County. Miller Rocks, just upstream of the mouth of the Deschutes River, are three small basalt-rock islands created by waters impounded by mid-Columbia River dams. Intensive colonial waterbird surveys in the mid-1970s and late 1990s did not detect breeding terns at this location (Thomson and Tabor 1981, Roby et al. 1998, Collis et al. 2000). In 2001, the ~15 pairs of Caspian Terns that bred on the edge of a larger California Gull colony on Miller Rocks were suspected to be renesting after failing at first attempts at Threemile Canyon Island farther upriver (Collis et al. 2001b).

Crescent Island, Walla Walla County. Crescent Island, just below the confluence of the Snake and Columbia rivers, was built in 1985 from nearby dredge materials and topsoil specifically to attract nesting waterfowl (Ackerman 1994). The comma-shaped (~3-ha) island is largely covered in vegetation established over the last 15 years from an initial planting of grass and about a dozen trees (Boe 1985). An unspecified number of Caspian Terns apparently bred on Crescent Island in the year it was created (Ackerman 1994), but there are no specific records currently known for the first 12 years of the island's existence. Ring-billed and California gulls started nesting in 1986 and currently dominate most of the remaining exposed soils along the ridge of the comma. Since at least 1994 Caspian Tern nesting has been limited to the northeast end of the island and immediately adjacent to a sub-colony of the larger gullery (Ackerman 1994). From 1997-2001, Caspian Tern numbers have been based on aerial photos and on colony counts from a blind. Today Caspian Terns nest side by side with a sub-colony of exclusively California Gulls. Specific estimates of tern breeding pairs are: 1997 (~614 [990 adults]), 1998 (~356 [575 adults]), 1999 (~552 [890 adults]), 2000 (571), and 2001 (720) (Roby et al. 1998; Collis et al. 2000, 2001b, 2002).

Columbia River Islands upstream of the Snake River, Benton, Franklin, and Grant counties. Penland (1982) surveyed the Columbia River upstream of Pasco in the interest of relocating Caspian Terns described in a personal observation of G. Alcorn from the 1930s. Decker and Bowles (1932) found a colony of 50 pairs breeding on a small gravelly island in the Columbia River in Benton County, but Penland (1982) found no evidence of breeding in 1975 nor did Thompson and Tabor (1981) in 1977 and 1978. Recent annual intensive surveys of the islands of the Hanford Reach and upstream of the Tri-City area have failed to detect breeding Caspian Terns (Roby et al. 1998; Collis et al. 1999, 2000, 2001b). Cabin Island, just upstream from the Priest Rapids Dam, did have five pairs of Caspian Terns among a larger colony of Ring-billed Gulls in 1975 (Penland 1982). Although breeding gulls were monitored at Cabin Island in the mid-1990s, no breeding terns were found (Pochop et al. 1999).

Columbia River Basin, Eastern Washington

Potholes Reservoir and Moses Lake, Grant County. Moses Lake is a shallow curved lake (~32 km x 1 km) in the ancient bed of the Columbia River. Kitchen (1930) found a single Caspian Tern nest at Moses Lake in association with a colony of Ring-billed Gulls. This was the first authenticated breeding record for the state (Kitchen 1930), but there are no other published breeding records for the site. The Moses Lake colony apparently disappeared in the mid-1950s (G. Alcorn pers. comm. in Penland 1982). In the late 1950s, additional river water was impounded by the O'Sullivan Dam

creating another shallow marsh and lake complex ~10 km south of Moses Lake called Potholes Reservoir. Potholes Reservoir has hundreds of small sandy islands that are used by colonial waterbirds, including Caspian Terns (Penland 1982, Finger and Tabor 1997). Most islands are unnamed, so exact estimates for nesting pairs at a particular island are difficult to track. In the 1970s, specific counts of breeding pairs at a small-unnamed island were: 1972-1973 (72), 1974 (5), 1975 (12); terns shifted to a larger island in 1975 (~80, Penland 1982). Additional estimates of breeding pairs are: 1981 (242), 1982 (276), 1989 (418), 1991 (120), and 1997 (259 on 3 islands) (Conover 1983, Finger and Tabor 1997). From 1998-1999, an estimated 150-270 pairs bred in the reservoir (R. Friese pers. comm.). In 2000, a Potholes island with 150 pairs of Caspian Terns was dubbed Solstice Island in recognition of the discovery date (M. Antolos pers. comm.). In 2001, Solstice Island had ~250 pairs of terns (Collis et al. 2001b).

Banks Lake, Grant County. Banks Lake is a small lake with limited island habitat. Nesting by terns was suspected in the mid-1990s, but was unconfirmed until 1997 (R. Friese pers. comm.). From 1997-1999, about 15 pairs bred (R. Friese pers. comm.). Specific estimates of breeding pairs were made in 2000 (10) and 2001 (20–25) (Collis et al. 2000, 2001b).

Sprague Lake, Adams County. This small lake has a history similar to that of Banks Lake. An estimated 20 breeding pairs used the limited island habitat of this lake from 1997-1998 (R. Friese pers. comm.). Specific estimates of breeding pairs were made in 1999 (~50), 2000 (20), and 2001 (15-25) (M. Monda pers. comm.; Collis et al. 2000, 2001b).

Major Populations: The state's major population was in Grays Harbor in the late 1970s and 1980s. The site of the present day Everett Naval Station had a significant number of breeding Caspian Terns in 1994 as did the ASARCO Superfund Site in 1999 and 2000. Both of these colony locations were modified or destroyed to discourage Caspian Terns from breeding. In the last three years only the colonies of Crescent Island and Commencement Bay held >500 breeding pairs (Table 5).

Population Trends: Gill and Mewaldt (1983) reported a dramatic increase in the Washington tern population, but Wires and Cuthbert (2000) recently described a decline. This decline essentially reflects the relatively short histories (since the mid-1980s) of the large coastal colonies of Grays Harbor, Willapa Bay, Commencement Bay, and the Everett Naval Station. For example, there were no confirmed Caspian Tern breeding sites along the coast of Washington in 1998. Data are sparse for most colonies in the eastern interior of the state, but the Potholes Reservoir and Crescent Island colonies are likely the only ones that have remained fairly stable over the last 20 years, as water levels in the Columbia River are regulated in response to needs for hydroelectricity, shipping, and salmon passage.

Research/monitoring: On the Washington coast and Columbia River, biologists have been conducting studies of Caspian Tern reproductive biology, foraging ecology, diet, energetics (Roby et al. 1998, 2002; Collis et al. 1999, 2001a, 2002, in press; Thompson et al. 2002; M. Antolos unpubl. data), behavior (Conover 1983), dispersal patterns (S. Anderson unpubl. data), growth rate of chicks (D. Lyons unpubl. data), cortisol stress responses (A. Edwards unpubl. data), and seasonal molt (C. Thompson and E. Bridge unpubl. data). With the exception of Crescent Island in 2000 and 2001, detailed studies are lacking for the inland breeding colonies of eastern Washington.

Biologists have conducted annual monitoring of population size and reproductive success at Grays Harbor, Willapa Bay, and occasionally (1973-1996; WDFW, DNR, USFWS staff) and consistently (1997-2001, Roby et al. 2002) at Puget Sound. Biologists did intensely monitor breeding adults and banded chicks at Grays Harbor from 1973-1981, which was the basis for an early insight into the origins of breeding birds in Oregon (WDFW unpubl. data, Penland 1982, Roby et al. 2002). Biologists also have conducted broadscale surveys of interior colonies (1999-2000, K. Collis unpubl. data) and have estimated statewide populations from available data (Gill and Mewaldt 1983, Wires and Cuthbert 2000).

Status: No status assigned.

Natural Heritage Rank: Apparently Secure.

Habitat Conditions: Caspian Terns are found in Washington in a variety of marine, brackish, and freshwater habitats, usually on or near large water bodies, wherever forage fishes 10-25 cm (4-10 in) in length are readily available at the surface (Thompson et al. 2002). These terns are most numerous along the coast, especially in bays and estuaries, and rarely go beyond sight of land (Penland 1976). Caspian Terns breed in colonies, often in association with other colonial waterbirds (especially gulls) and prefer to nest at unvegetated sites on islands that are isolated, free of mammalian predators, and in large bodies of water. On the coast, they nest on sandy islands, including dredge spoil sites, in bays and estuaries (Penland 1982). Nests are usually a shallow scrape in sand or gravel, with little or no nest material, and frequently are placed adjacent to driftwood or other debris (Penland 1981). In 2001 Caspian Terns nested on barges and the roof of a building in Commencement Bay (Collis et al. in press, G. Shugart unpubl. data).

Threats: Currently the primary threat to breeding Caspian Terns in Washington is a lack of assurance of any coastal breeding habitat. In the last 20 years, habitat loss and specific management actions have destroyed habitat or discouraged nesting at the largest and most recent coastal breeding locations in Puget Sound (i.e., Everett Naval Station and Commencement Bay). All tern colonies near the large urban centers of Puget Sound or recreational waters of Potholes Reservoir are vulnerable to human disturbance, especially early in the breeding season (Collis et al. in press, M. Antolos pers. comm.). Although there was no direct evidence of mortality, signs of human disturbance (i.e., campfires and garbage) were found late in the breeding season at Solstice Island, Potholes Reservoir, in 2000 (Collis et al. 2000). Human disturbances that flush adults off nests create opportunities for gulls to steal eggs and chicks (Penland 1982). Researcher disturbances related to chick banding have resulted in as much as 35% mortality of chicks 6 to 10 days old (Penland 1981).

USDA Wildlife Services implements actions to reduce avian predation on salmonid smolts below dams and at hatcheries in the mid-Columbia River basin. These activities are part of a comprehensive program to conserve Columbia River salmonids listed as threatened or endangered under the Endangered Species Act (ESA) (USDA Wildlife Services in litt.; NMFS 2000). Fish-eating birds congregate below hydroelectric dams in spring and summer to feed on out-migrating juvenile salmonids. The Caspian Tern is one of eleven species of migratory fish-eating birds that have been identified as preying upon ESA listed spring run chinook and steelhead smolt at dams in the mid-Columbia (USDA Wildlife Services in litt.). Predator control by Wildlife Services at dams begins in April and ends in September to coincide with the out-migration of smolt. Non-lethal

methods, which include use of reflective tape, pyrotechnics, and other harassment, are supplemented with lethal methods, such as shooting or euthanasia, to provide aversive conditioning to flocks and persistent individuals (USDA, Wildlife Services in litt.). Observations of terns commuting from the dams and then west along Crab Creek, and the presence of PIT tags on Solstice Island support the hypothesis that some of the lethally collected terns belong to the Potholes Reservoir colony (C. Thompson pers. comm., Collis et al. 2000). On the basis of band returns, at least a portion of the adult terns collected at the dams were from East Sand and Crescent islands, suggesting that some of the birds are post-breeders or failed breeders from other colonies (D. Roby and K. Collis pers. comm.). Nevertheless, there is no evidence that current levels of predator management or scientific collecting are causing population declines (C. Thompson and E. Bridge unpubl. data, Roby et al. 1998). Although contaminants are a potential threat, there are no data regarding their effects on terns in Washington.

OREGON

Status and Distribution: The world's largest known nesting colony of about 8,900 pairs of Caspian Terns is currently in Oregon on East Sand Island in the Columbia River estuary (Roby et al. 2002). Today Caspian Terns are widespread but local summer residents and migrants along Oregon's coast, major rivers, and inland water bodies. In the early breeding season (Apr-Jun) these terns are typically very common within foraging distance (50-65 km) of colonies, and by mid-June failed breeders can be found wandering widely from active colonies (S. Anderson unpubl. data). The large colonies of the Columbia River are a recent phenomena, as historically breeding terns were limited to the great shallow lakes and reservoirs of the Klamath Basin and Great Basin (Gabrielson and Jewett 1940). In 1940, <1,000 pairs nested throughout Oregon, and the small declining colonies were of conservation concern (Bent 1921, Gabrielson and Jewett 1940). Data on the size of tern colonies in eastern Oregon are absent or fragmentary for most years. In the first major review of the Pacific Coast population, Gill and Mewaldt (1983) reported only a single active colony for Oregon (~200 pairs, Thompson and Tabor 1981) and historical accounts for only two other locations. Nevertheless, the recent trends in Oregon generally reflect trends of the Pacific Coast population described by Gill and Mewaldt (1983).

The following summarizes colony occupation and abundance for three areas: the Columbia River estuary, major river islands east of the Cascades, and the terminal basins of south-central and southeastern Oregon. Records for most of the state are sporadic at best until the late 1990s.

Columbia River Estuary

Columbia River Estuary islands, Clatsop County. East Sand Island is 5 km from the mouth of the Columbia River. In 1984, the discovery there of at least 1,164 nesting pairs represented the first breeding record for the Caspian Tern on the Oregon coast (U. Wilson in litt.). Terns used habitat created by deposition of dredge spoil on the eastern tip of the island in 1983 (G. Dorsey pers. com.). By 1985, primary vegetation succession had overgrown the East Sand Island dredge spoil, forcing terns to attempt nesting on the upper beaches or in driftwood debris near the vegetated dredge spoil. These nesting attempts apparently failed. By 1986, most of the colony on East Sand Island was abandoned, and the terns had apparently shifted to Rice Island, a large sandy dredge disposal island 21 km farther upriver. From 1987-1998, no terns attempted to breed on East Sand Island.

A Caspian Tern colony on Rice Island increased rapidly from the initial estimate of 1,000 pairs in 1986 to about 6,200 pairs in 1991 (A. Clark pers. obs.). Growth of this colony seemed to slow after 1991, but it again increased substantially in size between 1995 and 1996 coincident with loss of a colony at the U.S. Naval Base at Everett, Washington (Bird 1994, Smith et al. 1997). This suggests that the Everett colony was subsumed in the Rice Island colony during the 1996 breeding season. Estimated numbers of breeding pairs at Rice Island (from aerial photographs and ground counts) are: 1996 (8,149), 1997 (7,151), 1998 (8,691), 1999 (8,328), and 2000 (588). In 1998, an experimental test of decoys and playback to socially facilitate colony formation (Kress 1983) resulted in establishment of 17 nests on Miller Sands Spit, a dredge spoil island across the main river channel from Rice Island. Those nesting attempts subsequently failed from nest predation by gulls and crows, and terns have not bred there since.

In 1999, a pilot study to relocate the breeding colony of Caspian Terns on Rice Island to East Sand Island resulted in 1,400 pairs nesting at the eastern end of East Sand Island (Roby et al. 2002). This restoration effort included the removal of vegetation, to create bare sand nesting habitat, and social attraction techniques (i.e., decoys and audio playback systems; Kress 1983, 1998). The terns that nested on East Sand Island were presumably from the nearby Rice Island colony, and a total of about 8,875 breeding pairs nested in the Columbia River estuary in 1999 (Roby et al. 2002). In 2000, colony relocation efforts continued and the number of nesting pairs decreased to about 580 on Rice Island and increased to approximately 9,100 on East Sand Island (Roby et al. 2002). In 2001, East Sand Island, with approximately 9,000 pairs (Roby et al. 2002), was the only coastal breeding colony in Oregon. This colony has an uncertain future as it is subject to management aimed at reducing predation of juvenile salmonids in the Columbia River (USACE 2001).

The close proximity of the Lewis and Clark Expedition's Fort Clatsop camp to the recent breeding sites in the Columbia River estuary is frequently a source of speculation regarding the terns' historical presence. Lewis and Clark arrived in the estuary on 7 November 1805 and departed on 18 March 1806 (DeVoto 1953). Unfortunately their journals can not contribute to our understanding of Caspian Terns, as the earliest terns arrive along the Oregon coast in late March and the latest leave by the first of November (Gilligan et al. 1994).

Columbia River Islands, East Cascades

Threemile Canyon Island, Morrow County. Threemile Canyon Island is on the southern edge of Lake Umatilla, an impoundment pool of the mid-Columbia River between the John Day and McNary dams. The island at the mouth of Threemile Canyon was built from dredge material to provide waterfowl habitat and a wind/channel barrier for a public boat ramp. It is likely the only breeding colony east of the Oregon Cascades that has had predictable water levels for the last 20 years. A tern colony discovered there (next to a California and Ring-billed gull colony) held 184 pairs in 1977 and 210 in 1978 (Thompson and Tabor 1981). From 1997-2000 the colony consisted of about 200-400 pairs on the basis of aerial photographs taken during the early incubation period: 1997 (571 adults), 1998 (339 adults), 1999 (384 adults), 2000 (260 pairs), 2001 (2 pairs) (Roby et al. 1998; Collis et al. 2000, 2001b, 2002). Before egg-laying was completed in 2000 the colony was abandoned due to mink activity; the few terns that returned to nest in 2001 abandoned for the same reason (M. Antolos pers. comm.).

Terminal Basins

Lower Klamath Lake, Klamath County. Historically the Klamath Basin wetlands were a stronghold for Caspian Terns in Oregon. Finley (1907) found only one colony of Caspian Terns – at Lower Klamath Lake, Oregon – during almost two months of exploration of the Klamath Basin in 1905 but noted a reduction in tern numbers from the slaughter of many thousands of birds for the millinery market up to 1903; this may be the former “small colony” later referred to by Finley (1915). Chapman (1908) visited this lake from 1-7 July 1906 and reported 300 terns in one colony (many eggs hatched); he did not mention the location relative to the Oregon-California boundary. Nesting in association with cormorants, the terns occupied a point of a tule-mat island where they laid their eggs in fallen, matted reeds and silt. In 1906 the Bureau of Reclamation initiated construction of ditches that drained most of the region’s wetlands (Stene 1994) thereby destroying this breeding site. There are no recent breeding records for the Klamath Basin in Oregon, but terns continue to breed in the California portion of the Basin (see California account).

Spring Lake, Klamath County. Spring Lake is a small shallow lake in the Spring Lake Valley northeast of the historical wetlands of Lower Klamath Lake. Gabrielson and Jewett (1940) described the 20-50 pairs breeding at Spring Lake as the only colony that had been recorded for Klamath County “in late years.” No other information is available.

Summer Lake, Lake County. Summer Lake is a 60-square-mile terminal lake fed by the Ana River. Gabrielson and Jewett (1940) described Caspians as “usually breeding” at Summer Lake, where in “recent years” there were <50 nesting pairs. Specific estimates of breeding pairs exist for 1999 (38) and 2000 (16) (M. St. Louis pers. comm.).

Warner Valley lakes, Lake County. There never has been a specific geographic feature named Warner Lake, but the name has been used to describe the string of lakes and ponds in the southern Warner Valley that includes Crump Lake and Pelican Lake (McArthur 1982). Gabrielson and Jewett (1940) described terns as “usually breeding” at Warner Lake. In 2000, a colony of ~150 pairs was found on Pelican Island in Crump Lake (K. Collis pers. comm.).

Malheur-Harney Basin, Harney County. This terminal basin by some accounts holds the largest freshwater marsh in the western United States, and in high water years (e.g., 1982-1986) Malheur Lake is the largest lake in Oregon (Littlefield 1990). Part of the basin and lake habitat is federally managed as Malheur National Wildlife Refuge (NWR). Bendire in 1887 and 1882 (*in* Bent 1921) was the first to collect ornithological data in the area, and he found notable breeding colonies of gulls, cormorants, and pelicans in Malheur and Harney lakes. He did not list Caspian Terns among his observations, and they were not documented there until 1917 (Willett 1919). Colony sizes and locations within the basin are variable depending on the drought and flood cycle (Littlefield 1990). Various sources (Gabrielson and Jewett 1940, Littlefield 1990; G. Ivey, K. Collis, R. Roy, and M. Laws pers. comm.) provide breeding records for 1926 (“small number” among 1,500-2,000 California Gulls), 1927-1960 (“nested almost every year”), 1961-1982 (0, drought), 1983 (3 nests), 1984-1987 (300-350 pairs), 1991-1993 (0, drought), 1994 (600 pairs), 1995 (650 pairs), 1997 (65 pairs), 1998 (25 pairs, failed due to flooding), and 1999 (30). In the last two years terns have bred at two locations: Tern Island within the Malheur NWR (2000 [150 adults], 2001 [40 adults]) and an unnamed island on private property at the north end of the lake (2000 [~160 adults,], 2001 [42

adults]). Drought conditions in 2001 (e.g., 3 foot drop in lake level) are likely responsible for the decline from 2000.

Snake River islands, Malheur County. In 1980, Rogers (1980) observed a “large number” of Caspian Terns and suspected breeding around the Snake River islands in Deer Flat NWR, which spans the Oregon-Idaho border. In 1989, ~50 pairs bred on an unnamed island in the same area on an Idaho section of the river (Taylor 1990). Although “lots of birds” were recorded around this area in late May 1993, no breeding was recorded at that time (C. Trost pers. comm.); no additional confirmed nesting records are known as of 1996 (Contreras and Kindschy 1996). Breeding habitat that was once available in the area of the Snake River islands (Deer Flat NWR) was covered in high water for several years (1997-1999, T. Fenzl pers. comm.).

Major Populations: The largest colonies in the 1900s were in the wetlands of the Klamath and Malheur-Harney basins of south-central Oregon, though historic data are too few to adequately characterize colony size. Although fluctuating water levels prevent breeding every year, Malheur Lake has supported a colony of 600-650 pairs as recently as 1994-1995. At the turn of the millennium, a breeding concentration of 8,000-9,700 pairs has been in the Columbia River estuary. The East Sand Island colony is currently the largest Caspian Tern colony recorded in the world (D. Craig et al. unpubl. data). This colony is currently home to about two-thirds of the Pacific Coast population, one-quarter of the North American population, and one-tenth of the worldwide population.

Population Trends: Recent trends in Oregon reflect general trends in the Pacific Coast population. In 1940, the shallow lakes of south-central Oregon had <100 breeding pairs scattered among small declining colonies of conservation concern (Bent 1921, Gabrielson and Jewett 1940). Caspian Terns were first recorded nesting on Rice Island in the Columbia River estuary in 1986 (A. Clark pers. comm.), and by 1998 this colony had grown to 8,691 breeding pairs (Roby et al. 2002). A few small colonies still persist in south-central Oregon, but nesting is sporadic based on fluctuating water levels.

Beginning in 1999, federal, state, and tribal resource management agencies attempted to relocate the Rice Island colony (river mile 21) to East Sand Island (river mile 5) to reduce predation on salmon smolts in the Columbia River estuary (USACE 2001). By 2001, all nesting in the Columbia River estuary (about 9100 pairs) had shifted to East Sand Island, where the terns consumed significantly fewer salmon smolt (Roby et al. 2002).

Factors responsible for the increase of the Pacific Coast population include creation of nesting habitat on dredge spoil islands and other artificial sites and changes in availability of forage fishes, especially hatchery production of salmonid smolts in the Columbia River (Collis et al. 2001a).

Research/monitoring: On the Oregon coast and Columbia River, biologists have been conducting studies of Caspian Tern reproductive biology, foraging ecology, diet, energetics (Roby et al. 1999, 2002; Collis et al. 1999, 2001a, 2002, in press; M. Antolos unpubl. data), behavior (Conover 1983), dispersal patterns (S. Anderson unpubl. data), growth rate of chicks (D. Lyons unpubl. data), and seasonal molt (C. Thompson and Eli unpubl. data). Detailed studies are lacking for the inland breeding colonies of south-central Oregon.

Biologists have conducted annual monitoring of population size and reproductive success in the Columbia River estuary occasionally (1984-1993, USFWS staff) and consistently (1996-2001, Roby et al. 2001). Biologists have made occasional population or breeding pair estimates at Threemile Canyon Island (Thompson and Tabor 1981, Conover 1983, Collis et al. 2002), Summer Lake (since 1995, M. St. Louis), and Malheur Lake (since 1983, G. Ivey, M. Laws). Biologists also have conducted broad scale surveys of interior colonies (1999-2000, K. Collis unpubl. data) and have estimated statewide populations from available data (Gill and Mewaldt 1983, Wires and Cuthbert 2000).

Status: No status assigned.

Natural Heritage Rank: Apparently Secure.

Habitat Conditions: Caspian Terns are found in Oregon in a variety of marine, brackish, and freshwater habitats, usually on or near large water bodies, wherever forage fishes in the range of 10-25 cm (4-10 in) are readily available at the surface. They are most numerous along the coast, especially in bays and estuaries, but rarely range beyond sight of land. These terns breeds in colonies, often in association with other colonial waterbirds, especially gulls. They prefer to nest on unvegetated sites on islands that are isolated, free of mammalian predators, and in large bodies of water. On the coast, Caspian Terns nest on sandy islands, including dredge spoil sites, in bays and estuaries. Nests are usually a shallow scrape in sand or gravel, with little or no nest material, and frequently are adjacent to driftwood or other debris. Caspians occasionally nest amid vegetation or on mats of floating vegetation (e.g., at Malheur Lake, Upper Klamath Basin; Finley 1907).

Threats: The outstanding breeding concentration in the Columbia River estuary has an uncertain future. Although large breeding aggregations are vulnerable to oil spills, severe storms, disease outbreaks, and disruption by predators, prospects for restoring or creating suitable nesting habitat elsewhere in Oregon are poor, and nearby colony sites appear to be at capacity. Habitat on East Sand Island will need to be maintained for terns by preventing the growth of vegetation.

CALIFORNIA

Status and Distribution: Grinnell and Miller (1944) concluded that the Caspian Tern had increased slowly since the era of the “feather trade” prior to 1900. Gill and Mewaldt (1983) remarked that since the turn of the century the Pacific Coast population of Caspian Terns had shifted from breeding at numerous small colonies associated with freshwater marshes to nesting primarily in large colonies on human-created habitats along the coast. Although this general pattern is true for California, the fragmentary data on the early history of the species in the state are of very limited use in assessing population trends or in documenting any but major distributional shifts, particularly given what we know of rapid changes over short periods in recent decades when data are much better (Gill and Mewaldt 1983, Wires and Cuthbert 2000). Historical data are so sparse it is unclear if interior colonies were few or many, small or large. Prior to 1945, only six breeding sites were known for California, five in the interior and one in San Francisco Bay (Grinnell and Miller 1944).

The first estimate of the statewide breeding population was for the late 1970s (Gill and Mewaldt 1983, Table 5), when there were about 2,586 pairs at 10 sites (78% at 3 coastal sites [7 colonies],

22% at 7 interior sites). In 1997, the California breeding population was about 4,350 pairs (Wires and Cuthbert 2000). In 2000, the California population was about 2,583 pairs nesting at 12 sites (76% at 5 coastal sites [10 colonies], 24% at 7 interior sites) and in 2001 about 2,379 pairs at 12 sites (64% at 6 coastal sites [11 colonies], 36% at 6 interior sites) (Table 5). The decline from 1997 to 2000-2001 primarily reflects a drop in numbers at the Salton Sea as noted below. Other than for the very brief period when peak numbers were reached at the Salton Sea in the mid-1990s, the statewide breeding population appears to have been relatively stable in the last 30 years despite shifts in the number and location of breeding sites.

The following summarizes colony occupation and abundance for three regions in the interior (northeastern California, Central Valley, interior southern California) and the coast. Until recent years, population estimates at most sites have been sporadic and of unknown quality.

Northeastern California

Historically one of the largest wetland complexes in the West occupied the Klamath Basin of southern Oregon and northern California, with two premier water bodies being Lower Klamath and Tule lakes. Drainage of these lakes left small remnants in what are now Lower Klamath and Tule Lake NWRs, California.

Tule Lake. Bailey (1902) observed a feeding flock of about 500 Caspian Terns along the shores of Tule Lake, Modoc County, in July 1899 but did not visit the nesting island(s) or estimate breeding pairs. Biologists estimated numbers of nests in colonies on islands in the lower unit (sump 1-B) of Tule Lake NWR, Siskiyou and Modoc counties, at least in 1952 (80), 1953 (14), 1955 (3), and 1962 (19) (Klamath Basin refuge files).

Lower Klamath Lake. Finley (1907, 1915) and Chapman (1908) explored the Klamath Basin in the early 1900s and found Caspian Terns breeding at Lower Klamath Lake. Finley's reports indicated the colony was in the Oregon portion of the lake, but Chapman did not specify the location relative to the Oregon-California boundary (likely in Oregon, as Grinnell and Miller [1944] did not report breeding at Lower Klamath). Although no historic reports of Caspian Tern colonies exist for the California side of the lake, it seems quite likely they could have nested there given its large extent and its limited exploration (at a time when tern numbers were reduced from market hunting) before it was drained (See the Oregon account for more details on nesting at Lower Klamath Lake). Subsequently, refuge biologists estimated nests at Lower Klamath NWR, Siskiyou County, California, in at least 1955 (15), 1970 (20), 1972 (27), and 1976 (20) (Klamath Basin refuge files); terns nested on tule-mat islands with pelicans and cormorants (E. O'Neill pers. comm.).

Clear Lake NWR, Modoc County. There appears to have been no ornithological exploration of Clear Lake before the damming of its outflow in 1910 eliminated most marshland and greatly increased the extent of open water. Biologists have estimated numbers of nesting pairs of Caspian Terns at refuges in the Klamath Basin since at least 1952 (Klamath Basin refuge files), and since then Clear Lake NWR is the only site that has been occupied by the terns almost continuously. In most years through the mid-1970s, numbers of nesting pairs were <160 but from 1977 to the present mostly in the 200-300 range (Klamath Basin refuge files, Table 5). Islands occupied vary with lake level, and the terns usually nest in association with other colonial waterbirds, such as Ring-billed and California gulls and American White Pelicans (*Pelecanus erythrorhynchos*).

Meiss Lake, Butte Valley Wildlife Area. Meiss Lake, a shallow natural lake in the Klamath Basin reduced in size by diking in the 1940s, appears to have been little explored until it passed from private hands to become a state refuge in 1981. Estimates of nesting pairs of Caspian Terns are available only for 1979 (50), 1997 (25), 1998 (16), 1999 (27), 2000 (19), and 2001-2002 (0) (Gill and Mewaldt 1983, Table 5, Butte Valley WA files). Terns are unable to nest here during extreme droughts, when the lake shrinks and connects islands to the mainland or disappears (as in 2001-2002).

Goose Lake, Modoc County. Goose Lake, on the Modoc Plateau, is a large terminal lake straddling the Oregon-California border. Various colonial nesting waterbirds occupy low-lying islands in the southeastern (California) portion of the lake, which vary greatly in size and distribution with relatively small changes in lake level induced by climatic fluctuation. Islands suitable for Caspian Terns are not available in some years, and then the terns either do not nest or nest on peninsulas. Terns here may form a metapopulation with those at Big Sage Reservoir, about 25 km to the south, as numbers at these sites appear to be inversely correlated, with highest numbers at Goose Lake when suitable nest sites are available, perhaps indicating better foraging conditions there. Terns nest in close association with Ring-billed and California gulls and sometimes in the vicinity of Forster's Terns and Double-crested Cormorants (*Phalacrocorax auritus*). Estimates of nesting pairs of Caspian Terns at Goose Lake are: 1976 (active colony), 1977 (200), 1979 (100), 1985 (fraction of previous numbers nested on peninsula), 1997 (143), 1999 (310, on peninsula), 2000 (4, on peninsula), 2001 (~240), and 2002 (133) (B. E. Deuel in litt., Gill and Mewaldt 1983, Table 5, D. Shuford pers. obs.).

Big Sage Reservoir, Modoc County. This large reservoir on the Modoc Plateau was completed in 1921, but appears to have been virtually unexplored ornithologically until the 1970s. Caspian Terns nest there on Bird Island in close association with Ring-billed and California Gulls. Estimates of nesting pairs of Caspians are: 1976 (active colony), 1979 (75), 1981 (62 [100 ad.]), 1997 (62), 1999 (0), 2000 (48), and 2001-2002 (0) (B. E. Deuel in litt., Gill and Mewaldt 1983, Table 5, AB 39:959, D. Shuford pers. obs.).

Honey Lake Wildlife Area, Lassen County. At the edge of the Great Basin, Caspian Terns typically breed at the Dakin Unit of Honey Lake WA. They usually nest in association with Ring-billed and California gulls at Hartson Reservoir (a natural lake separated from saline Honey Lake by sand dunes), but from at least 2000-2002, they nested in an adjacent diked pond (5A). Estimates of nesting pairs are: 1956 (50-100), 1976 (155 [200-300 ad.]), 1979 (15 pairs), 1990 (248 [400 ad.]), 1997 (152), 1999 (87), 2000 (82), 2001 (92), and 2002 (46) (egg set data, Gill and Mewaldt 1983, MPCR files, Honey Lake WA files, Table 5, D. Shuford pers. obs.).

Mono Lake, Mono County. Another Great Basin breeding site for Caspian Terns is at the base of the Sierra Nevada at hypersaline Mono Lake, which lacks fish. The few breeding terns nest on barren islands in association with a large colony of California Gulls and must fly at least 15-20 km to forage at freshwater reservoirs. Estimates of nesting pairs are: 1963 (egg set), 1976 (6-12?), 1979 (10-15), 1980 (active), 1981 (active), 1987 (1), 1982 (~14), 1983 (~14), 1984 (5), 1985 (2), 1986 (1?), 1987 (3), 1988 (5 pairs), 1989 (4-5 pairs), 1990 (5), 1991(7), 1992 (10), 1993 (12-13), 1994 (12-13), 1995 (5), 1996 (8), 1997-1999 (0), 2000 (8), 2001 (6), and 2002 (11) (Jehl 1986, 1997; J. R. Jehl, Jr. in litt., Table 5, J. Hite in litt.).

Central Valley

Sutter Basin, Sutter County. H. A. Snow and others visited the nesting site of a “large colony” of Caspian Terns in the Sutter Basin of the southern Sacramento Valley from 1910 to 1916, from which they collected at least 131 egg sets (100 on 25 May 1915 alone) (egg set data, Grinnell and Miller 1944). The terns nested in association with California Gulls in overflow lands adjacent to the Sacramento River; at least in 1915 the colony was on a long peninsula. Modern hydrologic engineering does not allow flood waters to accumulate long enough for a tern colony to form.

Woodward Reservoir, Stanislaus County. Caspian Terns nested at this reservoir in the northern San Joaquin Valley at least in 1925 and 1932 (egg set data). A colony of at least moderate size is suggested by the 15-17 egg sets collected there in each of those years. Today this reservoir is heavily used for recreation and, hence, is unlikely to support nesting Caspian Terns again.

Tulare Lake Basin, Kings County. The greater Tulare Basin of the southern San Joaquin Valley formerly hosted the largest freshwater marsh and wetland system west of the Mississippi, dominated by Tulare Lake and other lesser terminal lakes (Buena Vista, Goose, Kern). Ornithological exploration was limited, in part because of the difficulty of travel, and historically Caspian Terns were known to breed there only at Buena Vista lake, as described below. It seems likely, though, that they may have bred elsewhere given that islands in Tulare Lake once accommodated nesting American White Pelicans.

In recent decades, the only summer water suitable for nesting terns occurs in floodwater storage reservoirs, agricultural evaporation ponds (and associated mitigation wetlands), sewage ponds, and, in extremely wet years, flooded agricultural fields. In years of very high runoff, water is stored in large floodwater basins for later use for irrigation. Of these basins, the South Wilbur Flood Area was used for nesting by terns at least in 1982 (450 “breeding”), 1998 (70 nests), and 1999 (~114 pairs) (MPCR files, Table 5) and the Hacienda Ranch Flood Basin in 1987 (“200 including many chicks”, MPCR files). Nesting also has occurred nearby at the Tulare Lake Drainage District South Evaporation Basin at least in 1985 (~400 pairs) and 1998 (40 nests) (AB 39:959, Table 5), Westlake Farms North Evaporation Basin in 1993 (10 nests) and 1994 (8 nests) (J. Seay/H.T. Harvey & Associates in litt.), Westlake Farms South Evaporation Basin in 1998 (3 nests, Table 5), Westlake Farms Section 3 alternative wetland in 1994 (1 nest) and 1996 (1 nest) (J. Seay/H.T. Harvey & Associates in litt.), the Lemoore Naval Air Station sewage ponds in 1998 (~20 pairs, Table 5), and agricultural fields in the Tulare lakebed ~15 km east of Kettleman City in 1999 (~20 pairs, Table 5). Nesting in the “Tulare Lake Basin” in 1983 (25 pairs [40 ad.], MPCR files) likely was in one of the larger flood basins or sets of evaporation ponds.

Buena Vista Lake, Kern County. Caspian Terns formerly nested, apparently sporadically, at Buena Vista Lake. Grinnell and Miller (1944) reported breeding from 1920-1922, but nesting appears to be documented only for 1923 (egg set data), and by the mid-1950s the lake disappeared as upstream dams deprived it of water. The only estimate of population size was from 1923, when about 30 pairs attempted to breed on a levee island but were unable to complete their sets because of gull predation (egg data slips), likely caused by disturbance from the egg collectors.

Southern California Interior

Lake Elsinore, Riverside County. On the county's coastal slope, this freshwater lake hosted an adult with a downy chick on 23 July 1995 (NASFN 49:980) and 14 nests on 7 June 1999 (Table 5). These represent the only known records for breeding Caspian Terns in the interior of southern California away from the Salton Sea. In 1999, the terns were nesting on a low-lying island in a diked impoundment at the south end of Lake Elsinore; the rest of the lake is unsuitable, especially because it is heavily used for recreation.

Salton Sea, Riverside and Imperial counties. Created in 1905-1906 when floodwaters of the Colorado River broke through canals being constructed to convey irrigation water to the Imperial Valley, the Salton Sea, maintained by agricultural runoff, now exists as a smaller version of Lake Cahuilla, which occupied the Salton Trough periodically before the Colorado was tamed. Caspian Terns were first found breeding at the Salton Sea in 1927, when about a dozen pairs and a few nests occupied a small sand island, a large part of which had been washed away by a recent storm that also ruined many nests (Pemberton 1927). Small numbers of Caspian Terns continued to breed at the Salton Sea until about 1959. Known breeding records include: 1928 (10 egg sets, small colony), 1929 (~25 pairs), 1930 (2 egg sets), 1933 (~40 pairs), 1946 (2 egg sets), 1947 (3 egg sets), 1949 (~40 pairs), 1956 (active, young reared), 1957 (~25 pairs [40 ad.], raised 12 young), and 1959 (successful nesting assumed based on numerous flying young in mid-summer) (egg set records; AFN 3:224, 10:410, 11:429, 13:455). All records appear to pertain to sites at the south end of the Salton Sea, Imperial County, though the location of one egg set for 1928 labeled Riverside County could not be verified. After a long absence, Caspian Terns recolonized the south end of the Salton Sea in 1992 and have nested there since at either Mullet Island (a large offshore island, 1992-1997), Obsidian Butte (a small nearshore island, 1997), and Rock Hill (islands created for larid nesting in a refuge pond, 1997-2001) (Molina 2001). Numbers of pairs from nest counts or estimates (1996 and 1997) are: 1992 (30), 1993 (60), 1994 (150), 1995 (313), 1996 (1,500), 1997 (1,200), 1998 (800), 1999 (211), 2000 (207), and 2001 (327). Causes for the rapid rise and then decline of this population appear to be unknown.

Other Unconfirmed Colonies

Gaines' (1977) report of five to seven nesting pairs of Caspian Terns in "recent years" at Bridgeport Reservoir, Mono County, on the edge of the Great Basin, is likely in error (R. Stallcup pers. comm.). We were unable to confirm a report of Caspians nesting in 1993 (AB 47:1150) at San Felipe Lake, San Benito County, in the southern Santa Clara Valley of the Coast Range.

Coastal Colonies

North Humboldt (Arcata) Bay, Humboldt County. Caspian Terns have nested intermittently on islands in north Humboldt Bay (Yocum and Harris 1975, Harris 1991, M. Colwell in litt.). A colony on Sand Island held >100 nests in 1966, and a colony of 27 nests was on a smaller unnamed island 0.4 km to the north in 1969. These islands were created from dredge spoils sometime in the late 1800s; during the 1960s, the smaller one was completely inundated at extremely high tides and likely no longer exists (S. Harris pers. comm.). From the 1970s to 1990s, there were no known records of confirmed breeding for anywhere in Humboldt Bay (S. Harris pers. comm.), contradicting Gill and Mewaldt's (1983) report of 20 pairs there in 1979. In late April and early May 2001, M.

Colwell (in litt.) observed about 25-30 territorial adults on Sand Island, some of which mobbed him while he was in a kayak about 300 m offshore. On 14 August 2002, he observed adults and about five flightless young at Sand Island, for the first confirmation of nesting there in over 30 years.

San Francisco Bay estuary in Napa, Solano, Contra Costa, Alameda, and San Mateo counties. After initial establishment in San Francisco Bay salt ponds, colonies expanded or relocated to new sites, or later recolonized old ones, typically in response to disturbance from routine maintenance of salt pond levees or predation. Knowledge of nesting colonies was fragmentary until surveys of the South Bay were initiated in 1971 (Gill 1972, 1977), repeated in 1981 (Rigney and Rigney 1981), and conducted with some regularity thereafter (SFBBO unpubl. data). The history of establishment and size of colonies in the Central and North bays is less well known, and baywide surveys have been conducted only since 2000.

Caspian Terns were first documented breeding in South San Francisco Bay via collection of eggs in 1916 (Grinnell and Miller 1944). In 1922, a colony was located on a salt pond levee 3.2 km north of the east approach to the Dumbarton Bridge, Alameda County (DeGroot 1931), in an area now called the Coyote Hills salt ponds; by 1924 it relocated 2.4 km to the south (Gill 1972). Estimates of colony size are: 1922 (7 nests), 1923 (2 pairs), 1924 (12 pairs), 1925 (35-50 pairs), 1926 (164 nests), 1927 (212 nests), 1928 (242 nests), 1930 (296 nests), 1931 (287 nests), 1943 (378 nests, ~400 pairs), 1964 (119 nests), 1965 (138 nests), 1966 (299 nests) (DeGroot 1931, Miller 1943, Chaniot 1970, Gill 1972). By at least 1969, terns abandoned this colony, as dredge spoils were piled on the nesting levee, and apparently relocated to a salt pond dike in the Baumberg area south of the east approach to the San Mateo Bridge, Alameda County (Gill 1972, 1977). A colony reformed at Coyote Hills in the 1990s: 1995 (5-10 nests, 47 ad., on levee between ponds N3A and N4A; J. Buffa in litt.), 1997 (30 pairs; Ryan 2000), and 1998 (22 nests, 46 ad., pond 2A levee; J. Buffa in litt.). It was inactive in 1999-2000 and inaccessible in 2001-2002 (SFBBO unpubl. data).

Estimates of the Baumberg population are: 1981 (75 nests), 1986 (125 nests), 1997 (0), 1998 (33 nests, 46 ad.), 2000 (79 nests), 2001 (116 nests), and 2002 (80 nests) (Rigney and Rigney 1981, Carter et al. 1992, Table 5, SFBBO unpubl. data). By the late 1960s, three additional colonies were located on salt pond dikes in the South Bay.

Estimates of the size of the colony on a levee between salt ponds M4 and M5 by Albrae Slough near the town of Drawbridge, Alameda County, are: 1968-1969 (100 or more pairs), 1971 (176 nests, ~200 pairs), 1977 (102 nests), 1981 (150 nests, 300 ad.), 1982 (158 nests, 316 ad.), 1983 (no survey), 1984 (220 nests, 400 ad.), 1985 (373 nests, 600 ad.), 1986 (453 nests, 650 ad.), 1987 (400 nests, 600 ad.), 1988 (300 nests, 411 ad.), 1989 (317 nests, 450 ad.), 1990 (147 nests, 315 ad., abandoned after red fox predation), 1991 (41 nests, 115 ad.), 1992 (10 nests, 42 ad.), 1993 (23 nests, 135 ad.), 1994 (79 nests, 146 ad.), 1995 (10 nests), 1996-2002 (inactive) (Gill 1972, 1977; Rigney and Rigney 1981, SFBBO in Carter et al. 1992, J. Albertson and J. Buffa in litt.). The Drawbridge colony was abandoned because of repeated red fox and feral cat predation and, perhaps, disturbance from nesting California Gulls; wire mesh fencing erected in 1991 failed to stop predation (Ryan 2000, J. Albertson and J. Buffa in litt.).

Estimates of the size of the Bair Island colony, San Mateo County, are: 1969 (active), 1971 (304 nests, ~350 pairs), 1975 (500-600 pairs), 1977 (220 nests plus ~120 chicks), 1981 (800-850 pairs), 1983 (200 nests), 1984 and 1985 (abandoned), 1988 (850 pairs), 1989 (400 pairs, abandoned), and

1992-1993 (recolonized, no young produced), 1994-2002 (inactive) (Gill 1972, 1977; Rigney and Rigney 1981, Carter et al. 1992, Ryan 2000). The Bair Island colony was abandoned following episodes of predation by introduced red foxes and erosion of levees that lead to tidal inundation of the colony (Ryan 2000, J. Alberston in litt.).

Estimates of the size of a colony at Turk Island, Alameda County, are: 1968 (active), 1981 (150 nests), 1985 (540 nests), 1986 (abandoned), and 1987-2002 (inactive) (Rigney and Rigney 1981, Ryan 2000, SFBNWR files).

Another South Bay colony has been active since 1997 near Alviso (salt ponds A5 and A7): 1997 (104 pairs), 1998 (30 nests), 1999 (122 nests), 2000 (118 nests), 2001 (155 nests, 310 adults), and 2002 (73 nests) (Ryan 2000; J. Albertson in litt.; Table 5, SFBBO unpubl. data).

Finally, solitary nests have been found in association with other larids at the Hayward Regional Shoreline (N of Hwy 92), Alameda County, from at least 1997-2001 and the Ravenswood Unit (salt pond R1), San Mateo County, 2000-2002 (Table 5, SFBBO unpubl. data).

After an initial estimate of 550 pairs in 1971 (Gill 1973), the South Bay breeding population averaged about 810 pairs (range = 550-1,225 pairs) from 1981 to 1989 (Harvey et al. 1992). In 1990, the South Bay population hit a temporary low of about 100 nests during a period of heavy predation, but it has remained below former levels with about 273 and 154 pairs in 2001 and 2002, respectively (Table 5, SFBBO unpubl. data).

After colonization of the Central Bay in the 1980s, by the 1990s its population rivaled or exceeded that of the South Bay. Terns began nesting on a sandy beach of Brooks Island, Contra Costa County, in the early 1980s, and available population estimates are: 1988 (~109 pairs), 1990 (60 pairs), 1997 (500 pairs), 2000 (~806 pairs), 2001 (~512 pairs), and 2002 (825 nests, 1,850-1,900 adults) (Carter et al. 1992, Ryan 2000, MPCR files, Table 5, East Bay Regional Parks/S. Bobzien unpubl. data). A colony at the Alameda Naval Air Station (NAS), Alameda County, was active continuously from establishment in 1985 until 1999 when it was abandoned, apparently in response to encroaching vegetation (L. Collins pers. comm.). Terns nested in elevated exposed soil in several depressions, scraped bare by dredging, where water collected and surrounded the colony on two to three sides. Available population estimates are: 1985 (>100 nests), 1986 (~260 nests), 1990 (594 pairs), 1991 (1,020 nests), 1997 (285 pairs), 1998 (267 pairs), 1999 (1 nest attempted and failed) (AB 39:959, 40:1251, 45:1157; MPCR files, Carter et al. 1992, USFWS 1998, Ryan 2000). In July 2002, a new colony was discovered on the bayshore of the city of San Francisco, San Francisco County (D. Singer in litt.). The nesting site was an insular portion of a dilapidated pier, owned by the Port of San Francisco, about 200 m north of Agua Vista Park and south of Pier 64; the surface appeared to be tar embedded with gravel with metal and wooden objects dispersed throughout (J. Yakich in litt.). A 9 July count found 133 adult Caspian Terns, 31 young in various stages of development, and 4 adults on nests (J. Yakich in litt.).

Nesting in the North Bay has been poorly documented. A colony at the Can Club, Little Island (Island #2), Napa County, was active in 1977 and held roughly 375 pairs in 1978 (Carter et al. 1992, Ryan 2000). Populations estimates for a colony at Knight Island, Solano County, are: 1989 (active), 1990 (38 nests), 2000 (~121 pairs), 2001 (~43 pairs), and 2002 (153 pairs) (Carter et al. 1992, Ryan

2000, Table 5, SFBBO unpubl. data). Counts in 2000 and 2001 were likely underestimates as they were taken from a levee far from some islands used for nesting in 2002.

Estimates of breeding pairs for the entire bay (North, Central, and South) in a single year are: 1981 (1500 at 5 sites), 1997 (1320 at 6 sites), 1998 (1135 at 7 sites), 2000 (1126 at 6 sites), 2001 (828 at 6 sites), and 2002 (1217 at 6 sites) (Gill and Mewaldt 1983, Ryan 2000, Table 5, data above). The North Bay, Central Bay, and South Bay populations, respectively, comprised about 11%, 72%, and 18% of the baywide population in 2000, 5%, 62%, and 33% in 2001, and 13%, 75%, and 13% in 2002 (Table 5).

Northern Monterey County sites. Since at least 1970, Caspian Terns have bred irregularly at three sites in close proximity on the northern coast of Monterey County. A colony was located on an eroded levee island at the Moss Landing salt ponds (commercially active 1916 to ~1973, Gordon 1995) in 1970 (50 pairs), 1978 (~109 pairs [175 ad.]), 1979 (~105 pairs [170 ad.]), 1980 (~109 pairs [175 ad.]) (AFN 24:713, SOWLS et al. 1980, Harvey 1982). Adjacent to the former salt ponds, a colony has been active at Boomerang Island, Elkhorn Slough National Estuarine Research Reserve (ESNERR), since 1991. This island was one of several salt marsh islands created as part of a wetland restoration project by California Department of Fish and Game (CDFG) (Carter et al. 1992), and at least in the mid-1990s vegetation was thinned to optimize tern nesting habitat (Parkin 1998). Breeding numbers were: 1991 (~10 pairs), 1992 (~90 pairs), 1993 (~110 pairs), 1994 (188 nests), 1995 (162 nests), 1996 (<50 pairs, failed and relocated), 1997 and 1998 (unoccupied), 1999 (~30 pairs), 2000 (~80 nests), 2001 (~65 nests), and 2002 (~50 nests) (Carter et al. 1992, Parkin 1998, Table 5, K. Wasson in litt.). In 1995, the colony had extremely poor reproductive success, which was attributed to high levels of contaminants bioaccumulated via the terns' prey after floodwaters resuspended dormant pesticides in the sediments of nearby rivers, agricultural lands, and Elkhorn Slough (Parkin 1998). After an early-season abandonment of Elkhorn Slough in 1996, apparently in response to predation (likely from raccoon or red fox) perhaps in combination with reproductive failure the previous year, terns apparently shifted to reneest that season on a beach near a lagoon or pond at the Salinas River mouth. The latter area hosted colonies of about 31 pairs (50 adults) in 1983, perhaps of <10 pairs in 1988, 34 nests in 1996, and 2 nests in 2001 (AB 37:1024, Roberson 1985, Bailey 1993, Parkin 1998, D. Roberson in litt.); a larger colony (size unknown at time of writing) was active in 2002. The colony apparently failed in 1983, and definitely did in 1996, apparently as a result of owl predation; in 1996, at least, the colony also was subject to frequent disturbance from people and dogs from an adjacent heavily traveled trail (J. Parkin in litt.). In 2001, predator management efforts at ESNERR included establishment of a fenced-in area (with decoys; still, terns nested in an unfenced area) and daily and nightly patrols as well as spraying predator urine and hot pepper solution on a berm across from the island.

Bolsa Chica, Huntington Beach, Orange County. Caspian Terns colonized two sand-fill islands created at Bolsa Chica Ecological Reserve by CDFG in 1978 as nesting sites for the endangered California Least Tern (*Sterna antillarum browni*) (Collins et al. 1991). Caspians nested on South Island only in 1986 but thereafter on North Island. Caspians nest in bare areas on these islands (vegetation removed each spring) in association with other larids (Elegant and Forster's terns and Black Skimmers). Numbers of nest attempts (which likely overestimates nesting pairs because of pairs reneesting after initial failures) were: 1986 (20), 1987 (143), 1988 (175), 1989 (118), 1990 (110), 1991 (138), 1992 (170), 1993 (278), 1994 (266), 1995 (277), 1996 (198), 1997 (175), 1998

(40), 1999 (58), 2000 (51), 2001 (92), and 2002 (192). Lower numbers since 1998 likely reflect a shift of some birds to a newly formed colony nearby at Terminal Island, Los Angeles Harbor.

Pier 400, Terminal Island, Los Angeles Harbor, Los Angeles County. This site was created beginning in 1995 with dredge material in preparation for a container terminal in Los Angeles Harbor (K. Keane pers. comm.). The southern portion of this 227-ha site was designated as a Tern Management Area (~101 ha in 2000, 10 ha in 2001), which restricts human activity other than researchers. Caspians nest there in bare to sparsely vegetated areas in association with other larids (Royal, Elegant, and Least terns and Black Skimmers). Numbers of Caspian Tern nests have been: 1997 (25), 1998 (146), 1999 (250), 2000 (336), 2001 (160), and 2002 (151) (K. Keane in litt.). In 2001, construction activity limited Caspians to a 6-ha site fenced to protect the endangered California Least Tern. Early in the 2001 breeding season researchers discouraged Caspians from expanding away from an area already occupied by that species to leave room for nesting by Least Terns; Caspians probably benefit from predator management for the former species. Size of the overall area will decrease when the container terminal is constructed, but a minimum of 6 ha will be maintained for nesting starting in 2002.

South San Diego Bay, San Diego County. Caspian Terns colonized the dikes of the salt works at the south end of San Diego Bay by at least 1941 (Unitt 1984). The site was owned by a private salt company until 1999, when it became the South San Diego Bay NWR. Terns nest there in close association with other larids (Gull-billed, Royal, Elegant, Forster's, and Least terns and Black Skimmers) along bare or sparsely vegetated levees surrounded by salt ponds. Estimates of breeding pairs or nests are: 1941 (78 pairs), 1943 (75 nests), 1953 (~100 nests), 1964 (215 nests), 1965-1966 (~350 pairs), 1974 (189 nests), 1977 (209 nests), 1980 (450 pairs), 1981 (409 pairs, F. Schaffner in Gill and Mewaldt 1983; 412 pairs, F. Schaffner in Unitt 1984), 1982 (~350 pairs), 1993 (280 pairs), 1994 (320 pairs), 1995 (250 pairs), 1997 (320 pairs), 1998 (198 pairs), 1999 (261 nests), 2000 (380 nests), 2001 (350 nests), and 2002 (357 pairs) (Emblen 1954, AFN 18:536, SOWLS et al. 1980, Unitt 1984, Schaffner 1985, B. Collins and R. Patton in litt.).

Major Populations: At the turn of the century the largest colonies were in the interior, probably in the Klamath Basin and Central Valley (though historic data are too few to be certain). Currently the largest population (1,100-1,300 pairs) occurs regularly in the San Francisco Bay estuary, though the Salton Sea briefly (1996 and 1997) had similar numbers (1,200-1,500 pairs). Relatively large populations also occur regularly at south San Diego Bay (250-450 pairs) and Clear Lake NWR (150-300 pairs).

Population Trends: The Caspian Tern population in California apparently increased slowly from the era of the "feather trade" prior to 1900 up to the 1940s (Grinnell and Miller 1944). It is unclear, though, how the state's current population compares to that prior to the feather trade and the loss of >90% of the state's wetlands (Dahl 1990). The great increase in the coastal population breeding mainly on human-created habitats may simply have offset the decline of interior populations with wetland loss.

Research/monitoring: On the California coast, biologists have conducted studies of the tern's reproductive biology, foraging ecology, and diet (Kirven 1969, Gill 1976, Baltz et al. 1979, Harvey 1982, Schew 1990, Schew et al. 1994, Horn et al. 1996; Horn and Dahdul 1998, 1999; Loeffler 1996, Chavez 1997, Cole 1997, Parkin 1998), behavior (Evans 1973), dispersal patterns (Gill and Mewaldt

1979, 1983), plumage patterns of chicks (Chaniot 1970), and contaminant loads (Ohlendorf et al. 1985, 1988; Parkin 1998). Detailed studies are lacking for inland breeding colonies.

Biologists have conducted annual monitoring of population size and (often) reproductive success at South San Francisco Bay (Gill 1972, Rigney and Rigney 1981; irregularly since 1982, regularly since 1998, San Francisco Bay Bird Observatory), Elkhorn Slough (since 1992, J. Parkin and ESNERR), Bolsa Chica (since 1986, C. Collins), Pier 400 (Los Angeles Harbor, since 1997; 1998, 2000a, 2000b, 2001), south San Diego Bay (since 1993, USFWS), Mono Lake (irregularly since 1976, regularly since 1982; J. R. Jehl, Jr., PRBO, D. Winkler), and Salton Sea (since 1992, Molina 2001). Biologists also have conducted broad scale surveys of interior colonies (1997-1999, Shuford 1998, Shuford et al. 1999, PRBO unpubl. data) and have estimated statewide populations from available data (Gill and Mewaldt 1983, Wires and Cuthbert 2000). Compilation of ongoing monitoring data and coordination of surveys at North and Central San Francisco Bay and interior sites has provided comprehensive estimates of the statewide breeding population (2000- 2002, Table 5 this report [PRBO/USFWS unpubl. data]).

State Status: No status assigned.

Natural Heritage Rank: Apparently Secure.

Habitat Conditions: In California, Caspian Terns nest in colonies and, rarely, single pairs usually near or adjacent to other colonial nesting waterbirds (gulls, skimmers, other terns, cormorants, pelicans) and semicolonial and solitary nesting shorebirds. Nesting sites in the interior typically are on sandy, earthen, or rocky islands or, rarely, peninsulas in freshwater lakes or reservoirs or saline lakes (D. Shuford pers. obs.). Formerly some colonies formed on floating tule-mat islands at Lower Klamath Lake (Chapman 1908) and Lower Klamath NWR (E. O'Neill pers. comm.). Recently others located on intact or broken levees of agricultural evaporation ponds, sewage ponds, floodwater storage basins, and flooded agricultural fields in the Tulare Basin (R. Hansen, J. Seay, D. Shuford pers. obs.) or on islands created for nesting larids at refuge impoundments at the Salton Sea (K. Molina pers. comm.). Nest sites often are on the highest point of low-lying islands, presumably for unobstructed views and to avoid flooding, but often extend to near the water's edge in single-species colonies or often cluster on the edge of colonies of gulls or pelicans that initiated nesting prior to the terns. On the coast, Caspians nest on salt pond levees, dredge spoil islands, islands created for salt marsh restoration or to enhance nesting sites for endangered Least Tern, and (rarely) on natural islands or in depressions scraped bare for dredge materials (citations above). A recent colony was on an insular dilapidated pier on the San Francisco bayshore. At South San Francisco Bay salt ponds, these terns prefer to nest on long continuous or interrupted levees or long islands free of vegetation, large rubble, or debris (Rigney and Rigney 1981). Caspian Terns typically place their nests in open, barren to sparsely vegetated areas, though also among or adjacent to driftwood, rocks, or tall annual weeds (Miller 1943, egg set data, D. Shuford pers. obs.). Nest substrates vary from sand and mud to hard soil, and eggs are placed in bare depressions or hollows or ones lined (or built up elaborately) with debris, such as dried grasses and weed, driftwood, shells, or chips of salt crust (Miller 1943, egg set data slips).

Caspian Terns typically locate their colonies close to abundant prey resources. Diet studies in California (all coastal) show most prey to be small fish (references above), though crayfish can be important in some areas (taken at freshwater areas near Elkhorn Slough, Parkin 1998). Terns forage

primarily by plunge-diving into relatively shallow bay, estuarine, or inshore marine habitats on the coast and freshwater lakes, marshes, sloughs, reservoirs, irrigation canals, and (low-salinity) saline lakes inland. Although prey resources typically are close at hand, some terns at a San Francisco Bay colony regularly flew 29 km, and occasionally up to 62 km, to forage at freshwater reservoirs (Gill 1976); birds at the small colony at hypersaline Mono Lake (devoid of fish) likewise must fly at least 15-20 km to forage at freshwater reservoirs.

Threats: In the interior of California, the greatest threat to Caspian Terns historically has been the loss of suitable nesting and foraging habitat. Today the greatest threat is a lack of high quality water at wetlands. A shift in water priorities in the Klamath Basin since 1995 is predicted to have severe impacts on remaining wetlands, particularly in summer and fall (D. Mauser pers. comm.), which potentially could reduce foraging and, perhaps, nesting habitat for the Caspian Tern. At the Salton Sea, salinity is predicted within about one to two decades to reach concentrations that will severely affect populations of invertebrates and fish and, by extension, those of the Sea's fish-eating birds (Tetra Tech 2000), such as the Caspian Tern.

Although contaminants at the Salton Sea have not been shown to cause large-scale die-offs or other major problems, there is still ongoing concern for the potential risk to waterbirds of reproductive impairment or immunotoxicity from selenium, boron, and DDE (e.g., Setmire et al. 1990, 1993; Bruehler and de Peyster 1999). Levels of organochlorines (DDE, PCBs, *trans*-nonachlor) and mercury continue to occur at potentially harmful levels in coastal populations of Caspian Terns (Ohlendorf et al. 1985, 1988), and a reproductive failure of these terns at Elkhorn Slough in 1995 was linked to bioaccumulation of organochlorine contaminants resuspended from sediments after a flood (Parkin 1998).

In San Francisco Bay, Caspian Terns are threatened by displacement via flooding during routine water management of salt ponds, routine maintenance of salt pond levees, tidal inundation after levee erosion, predation by non-native red fox and feral cats, and (potentially) human disturbance at accessible sites such as Brooks Island (Ryan 2000, J. Albertson in litt.). Vegetation encroachment apparently lead to the abandonment of a large colony at Alameda NAS (L. Collins pers. comm.), and vegetation management has been practiced at Elkhorn Slough and at Bolsa Chica (Parkin 1998, C. Collins in litt.). Predators have also disrupted nesting colonies in coastal Monterey (Parkin 1998), and other coastal colonies would undoubtedly be subject to much greater predation were it not for ongoing predator management in most areas. Inland in the Tulare Basin there is a chronic shortage of nesting sites secure from ground predators (principally coyote), and terns no longer nest at some evaporation ponds where all waterbirds are repeatedly hazed to limit risk of reproductive harm from exposure to selenium concentrated in the ponds (R. Hansen pers. comm.).

MEXICO

Status and Distribution: The earliest account of Caspian Terns in Mexico was of the 1926 discovery of about 20 breeding pairs at Laguna Ojo de Liebre (Scammon's Lagoon) (Brancroft 1927). The number of breeding pairs at this site and the number of breeding sites in Mexico has subsequently increased (Massey and Palacios 1994). Caspian Terns have recently bred at three estuaries along the Pacific coast of Baja California (Massey and Palacios 1994). In the 1990s, terns bred at the Cerro Prieto geothermal ponds in the Mexicali Valley (Molina and Garrett 2001) and

were suspected to occasionally breed on or near Montague Island in the northern Gulf of California off the Colorado River Delta (E. Palacios pers. comm.). Breeding has also been reported for the west coast of Mexico (e.g., Isla Laricion, Sinaloa), but specific estimates of breeding pairs have not been published (Blake 1953 *in* Massey and Palacios 1994, Webb and Howell 1995, E. Mellink pers. comm.).

Cerro Prieto, Baja California Norte. In the 1990s, Caspian Terns bred on small islands in ponds associated with geothermal energy production in the agricultural Mexicali Valley of the Colorado Delta region (Molina and Garrett 2001). Numbers of nests were: 1996 (30+), 1997 (30), 1998 (34), and 2000-2001 (0). In 1997, at least, the Caspians were nesting in association with Gull-billed Terns (*Sterna nilotica*).

Laguna Figueroa, Baja California Norte. In 1991, Palacios and Alfaro (1992) discovered 10 pairs of Caspian Tern nesting on a salt flat at the northern end of this closed lagoon. They observed 22 adults, nine nests with eggs, two eggs broken by predators, and a few empty scrapes; there were coyotes tracks near the nests. Palacios and Alfaro (1991) had surveyed the same area in 1991. Although they found breeding Forster's and California Least terns, there was no sign of breeding Caspian Terns. As of 1999, there had not been another survey of the area (E. Palacios pers. comm.).

Laguna Ojo de Liebre (Scammon's Lagoon), Baja California Sur. Bancroft (1927) described about 20 pairs breeding in 1926 at three small colonies but did not specify their location within the lagoon. He did convey that Caspian Terns nested adjacent to, but not mingled with, the more abundant Royal Terns. Grinnell (1928 *in* Massey and Palacios 1994), Wilbur (1987 *in* Massey and Palacios 1994), and Everett and Anderson (1991) also reported nesting by Caspian Terns at this site. In 1992, there were 120 pairs of Caspian Terns breeding on Isla Conchas within the lagoon and 40 pairs in salt crystallization ponds (saltworks) adjacent to the lagoon (Massey and Palacios 1994, E. Palacios pers. comm.). Danemann and Carmona (2000) also found Caspian Terns nesting in the saltworks in 1996. One colony of 15 nests on a sandy islet in June was abandoned in July; a second Caspian colony, sharing an islet with Gull-billed Terns, had 37 nests in June and 20 active nests and 23 well-developed nestlings in July.

Ballena Island, Laguna San Ignacio, Baja California Sur. In 1987, no Caspian Terns were noted breeding in a survey of Laguna San Ignacio (E. Palacios pers. comm.). Danemann and Guzman Poo (1992) were the first to document breeding by Caspian Terns on Ballena Island. In 1988, they observed 42 nests with eggs and 7 chicks that had joined adults in shallow water; in 1989, they found 93 pairs. In 1992, there were 150 pairs (Massey and Palacios 1994).

Major Populations: Isla Conchas and Ballena Island have both supported over 100 pairs in a single breeding season and could be considered major populations (Massey and Palacios 1994). The former site has also been a long-term and relatively stable breeding area (Bancroft 1927, Massey and Palacios 1994).

Population Trends: Historical data are scant, but the colonization of new locations and the survey work completed in 1992 suggest that Caspian Terns may be increasing in Mexico (Massey and Palacios 1994, Wires and Cuthbert 2000).

Research/monitoring: There have not been specific research projects on Caspian Terns in Mexico,

but as new breeding locations have been discovered they have been well described (Palacios and Alfaro 1991, 1992; Molina and Garrett 2001). USFWS is coordinating with biologists with ProNatura in Mexico to survey Caspian Terns in Baja California and Sonora in 2003-2004 (T. Zimmerman pers. comm.).

Status: No status assigned.

Natural Heritage Rank: Unranked.

Habitat Conditions: Nesting habitat at Laguna Figueroa, Isla Conchas, and Ballena Island are primarily sandy substrates in which nests may be lined with bits of grass and shells (Brancroft 1927, Massey and Palacios 1994, E. Palacios pers. comm.). Breeding at the saltworks has been on silt dikes alongside salt work cells that were not hypersaline, as fresh seawater was being pumped into the system (Massey and Palacios 1994, E. Palacios pers. comm.), and on sandy islands (Danemann and Carmona 2000). At the Cerro Prieto geothermal ponds, the terns nested on bare dirt islets (Molina and Garrett 2001).

Threats: Palacios and Alfaro (1991) mentioned increasing residential and recreational impacts on the colonial bird breeding habitat of coastal lagoons, but specific threats to Mexico's Caspian Terns are unknown. The Cerro Prieto ponds likely contain contaminants such as arsenic, lead, and selenium, which may pose a potential, but unknown, threat to wildlife using the ponds.

IDAHO

Status and Distribution: The early history of the Caspian Tern is limited to sparse documentation of small numbers of birds at wetlands in south and south-central Idaho in the breeding season (Davis 1934, Levy 1950, and Oring 1962). The first assertion of confirmed breeding in Idaho was by Larrison et al. (1967), who provided no details other than the fact that Dingle Marsh, Bear Lake County, was the sole breeding locale known. Although Burleigh (1972) suspected breeding, he knew of no colonies in the state. Increasing numbers of Caspian Terns feeding and roosting along Idaho's rivers were observed during the 1980's (Taylor 1990).

Snake River, Deer Flat NWR, Owyhee County. The Snake River Islands Sector of Deer Flat NWR includes 113 miles (182 km) of river and 107 islands in southwestern Idaho and eastern Oregon. Islands range in size from <1 ha to 23.5 ha and are generally only 1 to 3 m above mean river level. In 1980, Rogers (1980) observed a "large number" of Caspian Terns in the Oregon/Idaho border area and suspected breeding. Trost and Gerstell (1994) detected 50 pairs on refuge islands in 1989 and observed 100-500 adults there in late May 1993. Snake River islands, once available for breeding on the refuge, were covered in high water from 1997-1999 (T. Fenzl pers. comm.).

Mormon Reservoir, Camas County. Mormon Reservoir stores water in the Camas Creek flood plain. In this watershed, Oring (1962) noted Caspian Terns in the breeding season at Camas NWR, Jefferson County, but did not document nests. C. Trost (in Taylor 1990) discovered 10-15 nesting pairs on Gull Island in the southwest arm of Mormon Reservoir in 1984 and 20-30 pairs in 1993 (Trost and Gerstell 1994). C. Trost (unpubl. data) found 25 pairs breeding in 2002.

Magic Reservoir, Blaine and Camas Counties. In 1972, L. Liven discovered 20 nests and banded 29 young at Magic Reservoir and in 1984, C. Trost estimated 10-15 breeding pairs and 16 fledged young (Taylor 1990). In 1993, only one or two pairs were nesting among gulls on a peninsula vulnerable to disturbance by people and mammalian predators (Trost and Gerstell 1994).

Blackfoot Reservoir, Caribou County. Clark's Cut, a channel created in 1924, drains water from Grays Lake and the Grays Lake NWR into Blackfoot Reservoir via Meadow Creek. Wetlands here are characterized by major bulrush marshes and open water. L. Peterson first discovered Caspian Terns breeding here on Gull Island in 1981 (Taylor 1990). The colony has persisted and since ranged from about 10-25 pairs: 1982 (14?), 1983 (10-15), 1984 (10-15), 1993 (20-25), and 2002 (50) (Gill and Mewaldt 1983, Taylor 1990, Trost and Gerstell 1994, C. Trost unpubl. data).

Bear Lake NWR, Bear Lake County. The refuge encompasses the area known as Dingle Marsh or Dingle Swamp. Before drainage of wetlands in the 1910s and 1920s Dingle Marsh contained 10,115 ha but was reduced to about 7,000 ha. The marsh is characterized by bulrush-cattail, open water, and flooded fields. Larrison et al. (1967) reported Dingle Marsh as the only known breeding location of Caspian Terns in Idaho, but did not describe the colony's chronology or history. From 1980-1989, approximately 10-15 pairs bred annually in the refuge (G. Deutscher in Taylor 1990). Suspected winter fish kills may explain why no terns were observed in 1993 (Trost and Gerstell 1994).

North Lake Wildlife Management Area, Jefferson County. In 1972, L. Peterson observed a breeding effort by an unknown number of terns (Taylor 1990). This is the only breeding evidence for this site.

American Falls Reservoir, Bingham and Power Counties. American Falls Reservoir, at 22,660 ha, is the second largest reservoir in Idaho. In 1984, C. Trost found 2-3 pairs nesting (Taylor 1990), but Trost and Gerstell (1994) detected no breeding on a 1993 survey. In 2002, C. Trost (unpubl. data) found 5 pairs with active nests.

Minidoka NWR, Cassia and Minidoka Counties. The refuge encompasses a span of the Snake River Valley about 40 km long from the Minidoka Dam along both shores of the Snake River, including all of Lake Walcott. Wildlife habitat is primarily open water with some marshes. Davis (1934) recorded Caspian Terns in the vicinity of Rupert (the nearest town) during the breeding season, but did not document breeding. Trost and Gerstell (1994) reported two breeding pairs of Caspian Terns among pelicans and cormorants on Gull Island in 1993. In 2002, C. Trost (unpubl. data) found 4-5 pairs with active nests.

Major Populations: The state has never held major populations of Caspian Terns. As of 1993, Mormon and Blackfoot reservoirs each contained about 20-30 pairs of Caspian Terns.

Population Trends: In the 1970s, there were few to no breeding Caspian Terns in the state, perhaps as a result of pesticides (Trost and Gerstell 1994). Populations began increasing in the early 1980s and remained relatively stable between major surveys in 1984 (42 to 63 pairs) and 1993 (42 to 59 pairs, Taylor 1990, Trost and Gerstell 1994). The last major survey of the state in 2002 (C. Trost unpubl. data) estimated 70 to 80 breeding pairs in 1993 (Trost and Gerstell 1994)

Research/monitoring: Monitoring of Caspian Terns in Idaho has been sporadic at best with the exception of statewide surveys in 1984 and 1993 (Trost 1985, Taylor 1990, Trost and Gerstell 1994). There appears to have been no research conducted on the biology of Caspian Terns in Idaho.

Status: No status assigned.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Nesting habitat in Idaho is on islands or peninsulas of lakes and rivers. On sandy islands terns dig shallow scrapes, but on rocky islands they will lay eggs on bare ground. Caspian Terns nest as single pairs but more often in small groups associated with gull, tern, cormorant, or pelican colonies (Trost and Gerstell 1994).

Threats: Pesticide contamination may have depressed breeding efforts in the 1970s (Trost and Gerstell 1994). Trost and Gerstell (1994) reported that Caspian Terns “are often shot near trout hatcheries” and recommended protection from that shooting. Trost and Gerstell (1994) attributed the absence of terns at Bear Lake NWR in 1993 to winterkills of fish in shallow waters following drought. They also believed that lower water at Magic Reservoir increased the threat of predation on that colony.

NEVADA

Status and Distribution: In Nevada, Caspian Terns breed intermittently on islands in large lakes and reservoirs, and the number of colonies has apparently increased. Most colonies numbered <100 pairs except for sporadic ones of 450-685 pairs in the Carson Sink area in the Lahontan Valley, Churchill County.

Stillwater Point Reservoir, Stillwater NWR, Churchill County. The first documentation of nesting by Caspian Terns in Nevada is attributed to Alcorn (1946), who reported “a few” terns breeding on a bare island (0.13 ha) in Stillwater Point Reservoir. D. Winkler (*in* Gill and Mewaldt 1983) reported five pairs breeding there in 1977. Subsequently, there has been no confirmed breeding at this reservoir (B. Henry pers. comm.).

Lahontan Reservoir, Churchill County. Marshall (1951) documented nesting at Lahontan Reservoir with the discovery of 15 adults and an undetermined number of nests in 1949 and at least 107 Caspian Tern nests and 13 California Gull nests in 1950 (Marshall 1951). Although California and Ring-billed gulls continue to breed on the reservoir’s islands, there have been no subsequent observations of Caspian Tern nesting at this site (Gill and Mewaldt 1983, L. Neel pers. comm.).

Carson Sink, Churchill County. The Carson Sink, an ephemeral terminal lake fed by the Carson River, once covered 76,890 ha (R. Anglin *in* Jehl 1997). Stillwater National Wildlife Refuge and Game Management areas were established in 1948, primarily as a migratory stopover for Pacific Flyway waterfowl (Jehl 1997). The size (or existence) of the lake varies dramatically among years depending on rainfall and runoff. In 1983-1984, following El Niño winters, runoff expanded the lake to over 100,000 acres. Caspian Terns responded in the 1986 breeding season by establishing a colony of 475 pairs. In 1987, drought returned, forming land bridges from the islands to the

mainland, and a colony of about 110 pairs failed to fledge any young. No further nesting occurred until 1999 when another post-flood-year boom of about 685 pairs bred on newly created islands and fledged 925 young (B. Henry pers. comm.). Evaporation of the lake surrounding the islands prevented Caspian Terns from breeding from 2000 to 2002 (L. Neel pers. comm.).

Anaho Island NWR, Pyramid Lake, Washoe County. Pyramid Lake, discovered in 1844 by Capt. John Fremont, is the largest (444 km²), deepest (103 m), and limnologically perhaps the most stable of the major saline lakes in North America (Jehl 1997). Anaho Island, part of the Pyramid Lake Paiute Indian Reservation and managed as a National Wildlife Refuge since 1913, supports one of the most important colonial waterbird nesting colonies in Nevada. Ridgway (1877) and Hall's (1924) early descriptions of colonial waterbirds nesting on Anaho did not mention Caspian Terns among the colonies of American White Pelicans, California Gulls, and Double-crested Cormorants.

Marshall and Giles (1953) initially described a colony of ten pairs of Caspian Terns on Anaho Island in 1951. Subsequently, the tern colony on Anaho has been occupied irregularly. When nesting, the terns typically breed on the south end of the island in the center of a larger California Gull colony (Marshall and Giles 1953, B. Henry pers. comm.). Estimates of nesting pairs are 1951-1965 (10-125), 1979 (6), 1995 (95), 1996 (12), 1997 (1), 1998 (5), 1999-2001 (0) (Marshall and Giles 1953, Woodbury 1966 in Gill and Mewaldt 1983, B. Henry pers. comm.).

Major Populations: Currently, there are no major Caspian Tern populations in Nevada, but numbers fluctuate greatly. In the wet years of 1986 and 1999, Carson Sink supported 475 and 685 pairs, respectively. Anaho Island is probably the most consistent breeding colony in Nevada, but it was unoccupied by terns in the last three years.

Population Trends: It is difficult to characterize population trends of Caspian Terns in Nevada. Two small colonies have been inactive for decades, another was unoccupied from 1999-2001, and numbers at Carson Sink fluctuate dramatically between wet and dry periods.

Research/monitoring: Biologists at Stillwater National Wildlife Refuge have lead monitoring and banding efforts for Caspian Terns in Nevada. We are unaware of any research in Nevada specifically focused on Caspian Tern biology.

Status: No status assigned.

Natural Heritage Rank: Vulnerable-Apparently Secure.

Habitat Conditions: Nesting and foraging habitat for Caspian Terns is limiting in Nevada. Although nesting islands are consistently available at Lahontan Reservoir and Pyramid Lake, small numbers of Caspian Terns irregularly breed at these sites, suggesting adequate fish resources are not regularly available nearby. At Carson Sink, ephemeral islands and abundant fish populations are available only in very wet periods. In Nevada, Caspian Tern colonies have been associated with nesting California Gulls and American White Pelicans (L. Neel pers. comm.). Eggs are laid in simple scrapes in the sand or on bare rocks depending on the nature of the island (Marshall 1951, B. Henry and L. Neel pers. comm.).

Threats: The loss of suitable nesting and foraging habitat has long been a problem for Caspian Terns in Nevada. The arid nature of the Great Basin sets the stage for regular and intense conflicts over competing water uses by agricultural, urban, and wildlife interests.

UTAH

Status and Distribution: A relatively small number of Caspian Terns have regularly occurred in the vicinity of Great Salt Lake since the arrival of European naturalists. In 1869, Ridgway (1877 in Behle 1958) described the Caspian Tern as “more or less common” in the marshes near Salt Lake City. Recently, (Behle et al. 1985) considered the species an uncommon summer resident of northern Utah that had been recorded breeding intermittently at only four locations.

Hat (Bird) Island, Great Salt Lake, Tooele County. The size of Great Salt Lake can fluctuate dramatically among years (range 2600-6500 km²) and thereby affect the breeding of colonial waterbirds (Jehl 1997). Caspian Terns were first documented nesting in the state in 1915, when a colony of about 50 adults was located on Hat Island, a 22-acre pile of granitic conglomerate in the south arm of the lake (Palmer 1916 in Behle 1958). The visit disturbed incubating terns, and the eggs of at least 16 nests were preyed on by gulls (most likely California Gulls). Several other visits prior to 1920 found about 15 pairs of Caspian Terns breeding on Hat Island (A. Treganza in Behle 1958), but neither Allee (1925) nor Bailey (1926) found breeding in subsequent years (see Behle 1958). Behle (1958) suggested the colony may have moved to the mouth of the Bear River or Rock Island in Utah Lake.

Bear River Migratory Bird Refuge, Great Salt Lake, Box Elder County. The Bear River Migratory Bird Refuge was created in 1928 in response to major avian botulism kills in the area in 1910 and 1920. In 1935, eight Caspian Tern nests were discovered on a refuge dike. Subsequently, 13 pairs nested on West Island (Unit 4) in 1936 and 7 to 66 pairs on the East Island (Unit 3) from 1939-1949 (Behle 1958). Major floods in 1983 damaged and submerged dikes, eliminating available breeding habitat. By 1989, water levels had receded allowing restoration of habitat.

Estimates of breeding pairs are: 1935 (8), 1936 (13), 1939 (49), 1940 (66), 1941 (13), 1942 (32), 1943 (7), 1949 (35), 1983-2002 (0) (Behle 1958, Bear River Migratory Bird Refuge notes).

Egg Island and islands of Farmington Bay, Great Salt Lake, Davis County. In 1938, Behle (1958) observed and collected a female (with developing eggs) from a pair of Caspian Terns on Egg Island. In 1942 and 1944, he also observed a pair of Caspian Terns on Egg Island in early and mid-May, but he did not find a nest.

Farmington Bay Waterfowl Management Area, established in 1935, is a managed wetland complex fed by the Jordan River. In 1947, B. Shaffer (in Behle 1958) reported 16 pairs of Caspian Terns breeding on “the islands of Farmington Bay.” In some subsequent years, terns may have bred undetected in Farmington Bay but no breeding was observed during a waterbird survey of the area in 2001 (J. Bellmon, L. Johnstons, P. Merola pers. comm.).

Rock Island, Utah Lake, Utah County. Goodwin's (1904 in Behle 1958) description of the colonial waterbirds at Rock Island, Utah Lake, included American White Pelicans and Forster's Terns, but made no mention of Caspian Terns. The next account of the Rock Island colony was in 1927, when Cottam (in Behle 1958) described the Caspian Tern as "common" and breeding. From 1927 to 1942, R. Bee reported collecting Caspian Tern egg sets from a colony associated with breeding California Gulls (Bee and Hutchings 1942). Although they did not report data on colony size, they collected 15 egg sets in a single visit on 28 May 1915. Behle (1958) summarized the available data for Rock Island during the same period and noted the colony fluctuated from 0-100 pairs. In 1944, Tanner (1947 in Behle 1958) found no terns breeding, as the island had been reduced in size by rising water levels. Behle (1958) noted that water levels had still not receded by the late 1950s.

Estimates of breeding pairs are: 1927 (breeding), 1928 (30), 1930 (2), 1931 (0), 1932 (100), 1933 (40), 1934 (breeding), 1940 (17), and 1944 (0) (Behle 1958).

Population Trends: Recent perceived population declines lead to designation of the Caspian Tern as a Species of Special Concern in Utah (Utah Division of Wildlife Resources 1997). A variety of biologist and bird watchers have suggested a primary cause of the decline was loss of habitat that has not been restored or naturally occurred since the major flood event of 1983 (V. Bozلمان, J. Dolling, R. Paul, and M. Webb pers. comm.). The best population estimate for Utah is currently 345-390 pairs in 1997 (D. Paul in Wires and Cuthbert 2000). This estimate was based on aerial counts of adult birds in a specific census region that had historically supported a Caspian Tern colony (e.g. Farmington Bay), but none of these counts actually counted birds on a colony (R. Paul pers. comm.). The limits of the data for Utah are currently inadequate for trend assessment.

Research/monitoring: According to the North American Colonial Waterbird Plan, colonial waterbird monitoring in Utah is described as sporadic depending on available funds and professional interest (Kushlan et al. 2002). A program designed to monitor Caspian Terns and California and Ring-billed Gulls on islands in Great Salt Lake has not been implemented due to state budgeting issues (R. Paul pers. comm.).

Status: Species of Special Concern.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Caspian Terns breed on islands or within wetlands associated with Utah's large interior lakes. Nests are simple scrapes on the ground in open, sparsely vegetated areas often in association with California Gulls or other ground-nesting waterbirds (Behle et al. 1985).

Threats: Behle (1958) noted the precarious existence of Caspian Terns in Utah and hoped for repopulation of the species with protection of large undisturbed areas like Bear River Migratory Bird Refuge, and restoration and maintenance of isolation of Hat Island. The species is vulnerable to human disturbance and predation of eggs and young by California Gulls. Colonies have also suffered adversely from major changes in lake water levels (Behle 1958, Utah Division of Wildlife Resources 1997).

MONTANA

Status and Distribution: The early breeding history of Caspian Terns in Montana is poorly documented. Currently, Caspian Terns breed locally, primarily in northeastern Montana.

Canyon Ferry Lake Reservoir, Lewis and Clark County. Canyon Ferry Lake Reservoir was created by the impoundment of the Dearborn River immediately east of Helena. Caspian Terns were documented breeding on Island #16 in 1990 and have nested in most subsequent years (T. Carlsen unpubl. data). Nests are usually successful unless flooded by high water (T. Carlsen pers. comm.). Estimates of breeding pairs are: 1981 (0), 1983-1989 (0), 1990 (20), 1991 (25), 1992 (16), 1993 (39), 1994 (12), 1995 (22), 1996 (32), 1997 (5), 1998 (0), 1999 (2), 2000 (7), 2001 (28). Nesting has also occurred on Island #17, where breeding pair estimates have been: 1992 (31), 1993 (12), 1994 (21), 1995 (19), and 2001 (7). In 2002, T. Carlsen (pers. comm.) estimated 43 breeding pairs between the two islands.

Duck Creek Bay islands, Fort Peck Reservoir, Charles M. Russell National Wildlife Refuge, Valley County. The Fort Peck Dam on the Missouri River created islands of Fort Peck Reservoir. Many of the islands are within the Charles M. Russell National Wildlife Refuge and are monitored for the endangered Least Tern and threatened Piping Plover. Since 1987, Caspian Terns have been recorded breeding in association with Common Terns and California Gulls on unnamed islands in Duck Creek Bay and on Prairie Dog and Gull islands in the Big Dry Arm of the reservoir (C. Russell National Wildlife Refuge Notes). C. Edgewood (pers. comm.) estimated that currently “approximately 25 pairs” breed annually in the reservoir. In July 1997, the lower parts of Prairie Dog and Gull islands were flooded, and tern nests were destroyed as Fort Peck Reservoir reached full capacity (C. Russell NWR Refuge Notes).

Major Populations: There are no large populations in Montana.

Population Trends: Unknown.

Research/monitoring: Little is known about the nesting status, distribution, and habitat requirements of this species in Montana. Although annual surveys of known nesting sites are recommended to better determine the status of the species, no monitoring program is in place (Montana Natural Heritage Program).

Status: Species of Special Concern.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Montana’s Caspian Terns breed on islands in reservoirs where nests are generally located on sandy or gravelly beaches or on rocky substrate (Johnsgard 1986, Godfrey 1986). Nest substrate has not been described for Montana but it likely is very similar to that in Wyoming. In some years Caspian Terns nest on the same islands as Double-crested Cormorants.

Threats: Caspian Terns at Montana’s reservoirs are exposed to mammalian predators when water levels are too low to protect their nesting islands. Seasonal flooding or water manipulation on lakes and rivers can potentially flood nesting areas. The species shows some adaptability to changing

habitat conditions, but little is known of its site fidelity patterns in Montana. The species is very sensitive to human disturbance in or near nesting colonies.

WYOMING

Status and Distribution: Less than 25 pairs of Caspian Terns breed on reservoirs of southeastern Wyoming and on Molly Island in Yellowstone Lake (Oakleaf et al. 1982, Finholdt 1994, McEneaney 2001).

Molly Island, Yellowstone Lake, Yellowstone National Park. Molly Island is actually two small islands appropriately called Rocky Island and Sandy Island. Caspian Terns were first suspected of breeding at this location in 1932 (Wright 1934), but their nests were apparently difficult to distinguish from the 564 California Gulls nests also present. In subsequent years, numbers of breeding pairs of terns have ranged from 0 to 28: 1933 (7), 1946 (breeding), 1949-1950 (breeding), 1958 (breeding), 1959 (4), 1962 (17), 1965 (12), 1978 (0), 1979 (21), 1980 (18), 1981 (14), 1982 (17), 1983 (12), 1984 (3), 1985 (0), 1986 (0), 1989 (25), 1990 (28), 1991 (28), 1992 (27), 1993 (10), 1994 (15), 1995 (17), 1996 (6), 1997 (4), 1998 (5), 1999 (4), 2000 (0), and 2001 (3) (A. Cervoski and T. McEneaney pers. comm.). McEneaney (2001) speculated that the lack of breeding by Caspian Terns in 2000 may have reflected increased gull, cormorant, and pelican nesting.

Bird Island, Pathfinder Reservoir, Natrona and Carbon Counties. Pathfinder Reservoir, created from damming the Sweetwater River, drains into the North Platte River. Part of the reservoir is designated as Pathfinder Reservoir National Wildlife Refuge. Estimates of breeding pairs are: 1984 (20), 1986 (29), 1987 (27), 1988 (25), 1989 (12), 1990-1992 (0), 1994 (0), 1996-2001 (0) (A. Cervoski unpubl. data).

Gray Reef Reservoir, Natrona County. Gray Reef Reservoir serves to regulate peak power releases from Alcova Reservoir on the North Platte River. There is an unconfirmed record of Caspian Terns breeding in the late 1980s in a mixed colony with California Gulls and American White Pelicans (Seidle and Faanes 1997).

Soda Lake Islands, Natrona County. Although there are four Soda Lakes in Wyoming, only the one immediately north of Casper, in the same drainage basin as Pathfinder and Grays Reef reservoirs, has records of breeding Caspian Terns. Estimates of breeding pairs are: 1983 (0), 1984 (1), 1985-1988 (0), 1989 (12), 1990 (12), 1992 (10), 1994 (14), 1995-1999 (0), 2000 (7), 2001 (12), 2002 (19) (A. Cervoski unpubl. data).

Bamforth Lake, Albany County. Breeding has been recorded sporadically at Bamforth Lake. Estimates of breeding pairs are: 1982 (4), 1983-1988 (0), 1989 (18), 1990 (0), 1991 (4), 1992 (3), 1993 (1), 1994-1995 (0), 1997 (0), 1999-2001 (0) (A. Cervoski unpubl. data).

Caldwell Lake, Albany County. Three pairs of Caspian Terns were recorded breeding at Caldwell Lake in 1995 but none were found on surveys in 1986, 1987, 1990, 1994, and 1996-2001 (A. Cervoski unpubl. data).

Bear River Marshes, Uinta County. Two pairs of Caspian Terns bred at the Bear River Marshes of Woodruff Narrows Reservoir in 1986 but none were found on surveys in 1982-1984, 1987, 1990, and 1994-2001 (A. Cervoski unpubl. data).

Ocean Lake, Fremont County. There is an undocumented report of breeding at Ocean Lake in 1955 that lacks estimates of nests or pairs. Surveys at this lake in 1984, 1987, 1990, 1992, 1994-1995, and 1998 did not find any breeding terns (A. Cervoski unpubl. data).

Major Populations: There are no large populations in Wyoming. The colony at Molly Island in Yellowstone Lake has the longest history of regular breeding (T. McEneaney unpubl. data). The largest colony on record for the state was one of 29 pairs in 1986 at Pathfinder Reservoir. Surveys in 2001 found only 15 pairs for the entire state (A. Cervoski unpubl. data).

Population Trends: Numbers of Caspian Terns breeding in Wyoming are low and may be declining (Wires and Cuthbert 2000).

Research/monitoring: In 1984-1986, intensive surveys identified Caspian Terns as a species of special concern (Finholdt 1994). Presently, annual surveys that include Caspian Terns are scheduled at sites identified as important to colonial waterbirds. However, these surveys are limited by personnel and are not conducted regularly.

Status: Species of Special Concern.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Caspian Terns breed on islands in Wyoming's lakes and reservoirs, where they generally place their nests on sandy or gravelly beaches or on rocky substrate (Johnsgard 1986). At Molly Island eggs are laid in a simple scrape in the soil or sand and occasionally are lined with sticks or other small materials (T. McEneaney pers. comm.).

Threats: Specific threats to Caspian Terns of Wyoming are unknown.

CENTRAL CANADA REGION

NORTHWEST TERRITORIES

Status and Distribution: Early accounts of Caspian Terns in the Northwest Territories, dating from the 1860s, reported very small numbers at Great Slave Lake, but not until 1956 were they first documented breeding there on the West Mirage Islands (Trauger and Bromley 1976, Martin 1978, Sirois et al. 1995). Currently, Caspian Terns are known to breed in the Northwest Territories only at Great Slave Lake (Sirois et al. 1995, M. Fournier in litt.). During a comprehensive survey there from 1986 to 1994, observers found 47% of 236 nests on the west shore, 39% on the east shore of the North Arm, 13% on islands at the mouth of the East Arm, and 1% in the inner East Arm (Sirois et al. 1995). A survey of the North Arm in 1995 found 90 nests at a total of 11 locations (1 colony of 41 nests, 1 of 40 nests, and 9 with 1 nest each; M. Fournier unpubl. data). Another survey of the

North Arm in 2001 found 138 nests at a total of 6 sites (colonies of 73 nests, 39 nests, 22 nests, and 2 nests, and two sites each with single nests; M. Fournier unpubl. data). Colony locations at Great Slave Lake vary from year to year, and several new breeding sites have been located in recent years (M. Fournier in litt.). For example, in 1998 and 2001 there were colonies of 64 and 39 nests, respectively, at two sites in the West Mirage Islands, which historically have had only a few scattered pairs (M. Fournier unpubl. data).

Major Populations: The size of the population at Great Slave Lake is difficult to assess but is probably between 250-350 pairs (M. Fournier in litt.). A comprehensive survey of the lake from 1986 to 1994 yielded a coarse estimate of 236 nests at 62 sites plus 29 adult probable nesters (Sirois et al. 1995). The largest colony of 110 nests (47% of all nests) was on one islet near Northwest Point along the west shore of Great Slave Lake, the second largest (56 nests; 24% of all nests) near Trout Rock along the east shore of the North Arm. The remaining 70 nests (30%) were scattered among 60 sites. Also see data above for the North Arm in 1998 and 2001.

Population Trends: The population trend of the Caspian Tern at Great Slave Lake is probably stable, possibly increasing (M. Fournier in litt.).

Research/monitoring: After the first comprehensive survey of Great Slave Lake from 1986 to 1994, subsequent efforts have focused on the North Arm, where full surveys were conducted in 1995 and 2001 and partial surveys in 1998 and 2000 (M. Fournier in litt.). Future monitoring will likely occur at least every 5 years and more frequently if done in conjunction with waterfowl studies. A full survey of the North Arm is slated for 2002, and a survey of the entire Great Slave Lake area may occur in 2003. On surveys, the number of nests and clutch size are the only reproductive data gathered.

Status: Sensitive.

Natural Heritage Rank: Unranked.

Habitat Conditions: At Great Slave Lake, Caspian Terns nest on exposed offshore islands, usually at or near the highest point of the island (Sirois et al. 1995). Although most Caspian Terns nested in colonies with other terns and gulls, only single pairs of Caspians were at 80% of the species' nesting sites. When a colony consisted of numerous pairs of Caspian Terns and other larids, the Caspians formed the core of the colony with other species nesting on the periphery.

Threats: Threats to Caspian Terns in the Northwest Territories include competition with gulls (probably increasing), human disturbance, contaminants in the food chain (potentially), and a possible decline in biological productivity of the lake following dam construction on rivers upstream in the Mackenzie watershed (Sirois et al. 1995, M. Fournier in litt.).

ALBERTA

Status and Distribution: The early records of the Caspian Tern in Alberta, dating from 1903, indicate that the species was most frequently seen in the Lake Athabasca area in northeastern Alberta (Weseloh and Cocks 1979). The first documented breeding record for the province was in 1952,

when about 20 pairs were found nesting on what is now known as Egg Island on the west end of Lake Athabasca near Fort Chipewyan (Salt and Wilk 1966, Weseloh and Cocks 1979). Subsequent visitors to Egg Island found “a little over 20 pairs” of Caspian Terns in 1971 and 47 nests and 59 adults in 1977 (Weseloh and Cocks 1979); 84 nests in 1987, 101 in 1988, 75 in 1989, 60+ (150-200 adults, 75 eggs, 46 chicks) in 1990, 85 in 1991; and at least 150 pairs in 2001 (Cottonwood Consultants 2000; Thomas 2002; Biodiversity Species Observation Database [BSOD], Alberta Fisheries & Wildl. Mgmt. Div.). G. R. A. Ebel (in Weseloh and Cocks 1979) reported secondhand accounts from local people of two other colonies in the Lake Athabasca area, though neither has been confirmed: (1) a small colony of 8-9 pairs on the northwest shore of “Slough Lake” (*aka* Frezie Lake) located northeast of Richardson Lake across the Athabasca River and (2) a colony of about 30 pairs at Beartooth Island (believed to be near the eastern end of Burntwood Island in the mid-west end of Lake Athabasca). Away from the Lake Athabasca area, Caspian Terns have been documented breeding in northeastern Alberta at Namur Lake in 1990 (remains of >40 eggs destroyed by predators); this colony was inactive in 1998 (Cottonwood Consultants 2000; BSOD; W. Nordstrom, Alberta Natural Heritage Information Centre [ANHIC]).

Salt and Salt (1976) considered the Caspian Tern a “casual wanderer” in Alberta away from Lake Athabasca. For southern Alberta they noted records (usually single birds) from Brooks, Carseland, Sullivan Lake, Pigeon Lake, and Athabasca. Weseloh and Cocks (1979) concluded reports had increased in southern Alberta since 1952. Semenchuk (1992) considered the Caspian Tern a “rare” breeder in Alberta with two small colonies in widely separated areas: Egg Island in the north and Lake Newell in the south; he also noted the single pair with young at Lost Lake (see below). A colony with 74 nests (80 adults) was on Pelican Island at Lake Newell in 1998; prior data for this site include observations of >10 nests in an unspecified year and 1 and 4 adults in 1993 and 1994, respectively (Cottonwood Consultants 2000). Bennett (1995) also reported increases of Caspian Terns in southern Alberta, including nesting in 1991 near Vauxhall at Lost Lake (2 pairs; one pair feeding young) and Scope (Hays) Lake (5.5 km SW of Hays; adults carry fish to remote island). Subsequent nesting numbers at Lost Lake were 4 pairs (confirmed nesting) in 1992, 15 nests (37 adults) in 1993, 10 nests (40-45 adults) in 1994, 20 nests (20-54 adults) in 1995, 14 adults in 1997, and 1 nest (9 adults) in 1998 (Bennett 1995, Cottonwood Consultants 2000, BSOD). After suspected nesting at Scope (Hays) Lake (Reservoir) in 1991-1992, there were 8+ adults in 1996 (mating and nest building) and one nest in 1998 (Bennett in Sherrington 1996, Cottonwood Consultants 2000, BSOD). Other colonies have been reported in southern Alberta in recent years at Rattlesnake Lake (12 km northeast of Winnifred; 1 nest in 1989, 13 nests and 100 adults in 1998), Fincastle Lake (18 ad. [mating and nest building] in 1996), Murray Lake (mouth of Thirty Mile Coulee; 1 nest in 1998), and Tilley Slough/Tilley B Reservoir (2.5 km SE of Cowoki Lake; 1 nest in 1998) (Bennett in Sherrington 1996, Cottonwood Consultants 2000, BSOD).

At Lac La Biche in central Alberta, colonies were reported on Big Island (occupied) in 1998 and on an island 1 km northwest of Black Fox Island in 2000 (14-15 nests) (ANHIC).

Semenchuk (1992) estimated Alberta’s breeding population to be about 50 pairs total at three sites. James (1999) estimated the provincial nesting population was “not likely much above 100 pairs” on the basis of six small colonies, the largest being about 75-100 pairs. The most recent counts at 10 sites with active colonies from 1996 to 2001, though, indicate the provincial nesting population currently is about 250-300 pairs (references above).

Major Populations: On the basis of holding Alberta's largest breeding colony of Caspian Terns (up to 150 pairs), Egg Island in Lake Athabasca was designated a provincial Ecological Reserve in 1992 (Thomas 2002). The second largest colony recorded was one of 74 pairs at Pelican Island, Lake Newell, in 1998 (BSOD).

Population Trends: Nesting numbers have increased, particularly in southern Alberta since 1991 (see above).

Research/monitoring: No research has been conducted specifically on Caspian Terns in Alberta. In 1998, surveys of various colonial waterbirds throughout Alberta covered most potential and known nesting sites (except Lake Athabasca) for the Caspian Tern; recommendations were to conduct future surveys of Caspian Terns at lakes Athabasca and Newell every 3-5 years and to keep notes on nesting at other locations when conducting surveys of other colonial nesters and other species (Cottonwood Consultants 2000).

Status: Sensitive.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Limited information has been published on the habitat of Caspian Terns in Alberta. Caspian Terns there frequent lakes rich with small fish and nest on small isolated islands with little or no vegetation on large lakes and smaller reservoirs (Salt and Wilk 1966, Salt and Salt 1976, Semenchuk 1992). Egg Island, Lake Athabasca, is an elliptical, 70-m-long island, where these terns nest in loose, barren cobblestone substrate on the highest central portion (Weseloh and Cocks 1979). The nest site at Lost Lake is a small island (about 100 yards long and a few feet wide) that is mostly bare (Bennett 1995).

Threats: The overall impact of threats to nesting Caspian Terns in Alberta appear to be moderate to low (W. Nordstrom in litt.). Potential threats in Alberta include inundation or connection of nesting islands in reservoirs subject to fluctuating water levels, disturbance of some colonies by recreationists and boaters, destruction of nests and eggs by fishermen that perceive competition from colonial nesters (particularly cormorants), and (formerly) subsistence egg collecting by aboriginal people (W. Nordstrom in litt.).

SASKATCHEWAN

Status and Distribution: The Caspian Tern was first documented breeding in Saskatchewan when 11 young were banded on Rock Island in Doré Lake on 13 July 1956 (Houston 1956). Subsequent nesting records for Doré Lake include: nests with 45 young (23 banded) on 30 July 1964 (C. S. Houston fide A. R. Smith), 49 young banded on 8 July 1965 (AFN 19:555-556), colony of about 50 birds 1-11 June 1966 (G. A. Anweiler and V. Schmidt fide A. R. Smith), 70+ nests (78 young banded) on 19 July 1969 (C. S. Houston fide A. R. Smith), about 100 pair in 1971 (O. Hohn in Martin 1978), 130+ adults with young on 9 July 1973 (A. J. Erskine fide A. R. Smith), 58 young banded on 14 July 1973 (C. S. Houston fide A. R. Smith), "active" colony in 1976 (K. Roney fide A. R. Smith), and 171 young banded on 8 July 1978 (C. S. Houston fide A. R. Smith).

Vermeer (1970b) observed a pair of apparently territorial Caspian Terns on Backes Island in Primrose Lake in 1967. Hatch and Leiffers (1997 in Martin 1978) observed a territorial pair on an island in the Qu'Appelle Basin. Caldwell and Jorgenson (1979) reported a pair of Caspian Terns offering food to a chick on a small island off Perry Point on Last Mountain Lake in July 1978. One young was also banded there in 1985 (Canadian Wildlife Serv. files [C. S. Houston fide A. R. Smith]). B. Hanbidge (fide A. R. Smith) observed a possible colony at Sandy Point on Peter Pond Lake in 1989.

Smith (1996) described the Caspian Tern as a rare and local breeder in Saskatchewan. On the basis of the discovery of a colony at Churchill Lake in 1989 (112 nests, B. Hanbidge fide A. R. Smith) and the tern's status as an uncommon summer visitant to the central portion of the province, he suggested that more colonies may yet be discovered. James (1999) also concluded that other colonies likely would be found, particularly on large northern lakes, if a search was made. In 2000, A. R. Smith (in litt.) found a newly established colony with four nests at Reed Lake, a site that is very accessible and well birded.

Major Populations: Regular breeding colonies are known only from Doré Lake, Churchill Lake, and (probably) Last Mountain Lake (Smith 1996). James (1999) indicated that the only known colony in Saskatchewan in 1978 held 100 pairs [presumably this is an estimate of the number of pairs at Doré Lake on the basis of the 171 young banded there in 1978]. He indicated this colony was of "similar size today," but provided no documentation, and that another unspecified larger colony [Churchill Lake?] held no nests when it was checked in 1997, but 300 or more adults were nearby.

Population Trends: The limited data available are inadequate for trend assessment.

Research/monitoring: No systematic surveys or research have been conducted on this species in the province (James 1999, A. R. Smith in litt.).

Status: No status assigned.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Little is known of the habitat requirements of nesting Caspian Terns in Saskatchewan (A. R. Smith in litt.). Known colonies are on islands in large freshwater lakes (Houston 1956, Caldwell and Jorgenson 1979).

Threats: Little is known about threats to Caspian Terns in Saskatchewan (A. R. Smith in litt.).

MANITOBA

Status and Distribution: The first known nesting records of the Caspian Tern in Manitoba were from Lake Winnipeg, at Reindeer Island in 1914 (120 pairs; Dunlop 1915, E. Dunlop in Koonz 1999) and at Pelican Island [Berens Island] in 1918 (200-300 pairs, O'Donoghue and Gowanlock 1919). For Lake Winnipegosis, McLeod and Bondar (1953) reported a colony of "many nests" on Vance's Reef, and Evans et al. (1970) found a colony of 310 nests at Goodman Island Reef in 1969. Nesting has also been recorded near God's Lake in 1963 (Evans et al. 1970, Koonz 1999) and at

Crowduck Lake in the Whiteshell (Taylor 1983). Currently, Caspian Terns are known to nest regularly on about 15 islands in lakes Winnipeg, Winnipegosis, and Manitoba (Koonz 1999) and perhaps at a number of other lakes (see below).

Because Manitoba's Caspian Terns are concentrated at (and near) lakes Winnipeg and Winnipegosis, colony surveys have focused on these lakes. Vermeer (1970a) estimated a minimum of 2,245 pairs on these lakes from surveys of the largest colonies. A lower estimate of 1,393 pairs in 1979 apparently was an artifact of abandonment of the province's largest colony (Long Point, Lake Winnipeg), caused in part by disturbance just prior to the survey (Koonz and Rakowski 1985). The latter survey underestimated Caspian Tern numbers (B. Koonz in litt.). Wires and Cuthbert (2000) estimated about 8,780-9,980 pairs in all of Manitoba in 1989-1992. Totals were formed by summing counts from lakes Winnipeg (5,550 pairs in 1992; Little George Is. alone had 3,800) and Winnipegosis (2,763 pairs in 1989); rough estimates of 100-500 pairs each at North Moose, South Moose, and Pelican lakes in 1989; 30 pairs on the Winnipeg River (year not listed); and 136 and 1 pairs at two unnamed sites in 1990 (data compiled by L. Wires and F. Cuthbert). For sites not accounted for by Wires and Cuthbert, B. Koonz (in litt.) in 2002 estimated that, depending on the year, the following lakes might hold these numbers of breeding pairs: Kawinaw Lake (0-1,000), Dog Lake (0-500), Lake Manitoba (500-1,500), Crowduck Lake (0-75); he also estimated that North and South Moose lakes combined might hold 1,000-3,000 pairs, Lake Winnipegosis 5,000-8,000, and Lake Winnipeg 5,000-10,000. Even these do not account for current potential nesting on God's, St. Martin, Shoal, Southern Indian, Talbot, Whiteshell, Waskaiowaka, and other unsurveyed lakes (Poston et al. 1990, McNicholl in press, B. Koonz in litt.). Given fluctuations in numbers resulting from changing water levels (most lakes shallow), food supply, and disturbance, it would be valuable to survey all potential nesting sites in one year.

Counts seem to have been most consistent at Lake Winnipegosis: at least 710 pairs at 2 islands in 1970 (Vermeer 1970a), 2,763 at 5 islands in 1989 (McMahon and Koonz 1991), and 5,868 at 8 islands in 1999 (Koonz 1999). In 1999, two colonies accounted for 85% of all terns breeding at Lake Winnipegosis: Spruce Island Reef (~3,000 pairs) and Sealey Island Reef (~2,000 pairs) (files of Biodiversity Conservation Section, Wildlife Branch, Manitoba Conservation).

Major Populations: See above.

Population Trends: The lack of any comprehensive surveys of Caspian Terns in Manitoba, which holds by far the largest population in Central Canada and one of the largest in North America, makes it difficult to assess regional population trends of this species. Although numbers increased in the 1970s and 1980s, the magnitude of change is unknown because of the lack of adequate data. Given the great annual fluctuations in numbers of breeding pairs, the lack of concurrent counts on the province's largest lakes, and the lack of any surveys at all on some lakes with known or suspected colonies, it is not yet possible to accurately estimate the size of the province's Caspian Tern population (B. Koonz pers. comm.). Given this uncertainty, B. Koonz (in litt.) in 2002 estimated the Manitoba population might range from 11,000-23,000 pairs with a conservative estimate of 15,000. The uncertainty at the provincial level carries over to the continental level. Wires and Cuthbert (2000) estimated only 32,000-34,000 pairs in the North American population but this may be quite conservative.

Koonz (1999) reported that the Caspian Tern population in Manitoba appeared to be stable or increasing, but he went on to list various reasons for recent population increases. These included restrictions on the use of toxic chemicals, power dams that provide open water foraging areas in spring and fall, and reduced human disturbance (e.g., changing attitudes, larger power boats less able to negotiate reefs near nesting colonies). Although diet studies of terns are lacking at Lake Winnipegosis, their prey base may have been greatly increased by human overexploitation of the lake's large predatory fish leading to "predator release" of now more abundant smaller species that occur in larger schools and shallower water than the previously dominant fish (Koonz 1999, Wires and Cuthbert 2000).

Research/monitoring: There currently is no monitoring or research being conducted on this species in Manitoba (James 1999, B. Koonz pers. comm.).

Status: Species of Special Concern.

Natural Heritage Rank: Vulnerable.

Habitat Conditions: Caspian Terns in Manitoba nest on isolated, usually barren or sparsely vegetated, islands or reefs in large or medium-sized lakes (Koonz 1999, McNicholl in press). They typically share these sites with other colonial waterbirds, such as American White Pelicans, Double-crested Cormorants, Ring-billed Gulls, Herring Gulls, and Common Terns.

Threats: Koonz (1999) considered potential limiting factors to Caspian Terns to be toxic contaminants in the food supply during breeding, migration, or winter; degradation of wintering habitat; and perhaps Newcastle disease and avian cholera associated with other colonial waterbirds. Koonz (1982) reported vandalism at a Caspian Tern colony on Coleman Island in southern Lake Winnipegosis, where terns were shot then beheaded, perhaps as a carry over from fishermen bent on destroying colonies of cormorants perceived to be in competition for depleted stocks of commercially valuable fish. At that time, egg gathering for food was also practiced, especially near remote northern communities. Although fluctuating water levels can expose nesting sites, high waves in 1974 washed away Caspian Tern eggs on an island in Lake Winnipeg that held 700 nests in 1971 (AB 28:917).

Vermeer (1973) reported mean levels of mercury of 0.90 ppm in Caspian Tern eggs taken from Little George Island, Lake Winnipeg, in 1971, but he did not comment on possible adverse effects on the terns' reproduction. De Smet and Shoesmith (1988) examined levels of organochlorines and PCBs in the eggs of various fish-eating birds in Manitoba in 1986 and 1987. Although their study corroborated other research indicating a downward trend in these contaminants in the previous decade, organochlorine residues in eggs of the Caspian Tern were at levels that may adversely affect reproduction.

GREAT LAKES REGION

ONTARIO

Status and Distribution: The first known nesting record for the Caspian Tern in Ontario is from Sewell Island, west of Manitoulin Island, Lake Huron, in 1891 (Baille and Harrington 1936, Blokpoel 1987, Austen et al. 1994). In the mid-1930s, the species was known to breed in the province at only four localities (the Limestone Islands and Gull Island in Georgian Bay, Lake Huron; Salmon Island, Lake Ontario; and one of the Sand Islands, Lake Simcoe) though it was suspected that other nesting sites existed in Georgian Bay and elsewhere. The species' breeding distribution probably has changed little in subsequent decades though it has been much better documented (Blokpoel 1987). For example, Peck and James (1983) compiled records of confirmed breeding at 19 sites: Lake Huron (11), Lake Ontario (7), and Lake Simcoe (1). Confirmed nesting has been documented mainly at large, well-established colonies (up to hundreds of nests) in lakes Ontario and Huron (especially Georgian Bay and the North Channel) but also at the inland lakes Simcoe and Kasshabog in southern Ontario (Blokpoel 1987). For northern Ontario, Blokpoel (1987) reported probable nesting for Hudson Bay (mouth of Winisk River) and possible breeding for the Lake of the Woods area and James Bay (Akimiski Island, mouth of Attawapiskat River). R. I. G. Morrison (in Peck and James 1983) also reported breeding on an island in Akimiski Strait, James Bay.

Ludwig (1979) estimated the Ontario/Canadian Great Lakes population of Caspian Terns to be about 1,070, 1,365, and 2,053 pairs in 1963, 1967, and 1978, respectively. Comprehensive surveys of Caspian Tern colonies in the Canadian Great Lakes in 1976-1980, 1987, 1989-1990, and 1998 yielded totals of 2,185, 2,959, 3,060, and 2,437 pairs at 10, 11, 11, and 12 sites, respectively (Scharf et al. 1978; Blokpoel and Scharf 1991; Blokpoel and Tessier 1996, 1997; Scharf and Shugart 1998; Canadian Wildlife Service unpubl. data; Table 6).

Major Populations: Ontario's largest breeding populations occur in Georgian Bay and the North Channel, Lake Huron, and at Gull Island (Presqui'le Provincial Park), Hamilton Harbour, and Pigeon Island, Lake Ontario (Table 6).

Population Trends: The Ontario/Canadian Great Lakes population increased from about 1,100-1,400 pairs in the mid-1960s to 2,100-2,200 in the mid-1970s to early 1980s (Ludwig 1979, Table 6; see above). A further increase to about 3,100 pairs in 1989-1990 was followed by a drop to about 2,400 pairs in 1998 (about 115% of population in late 1970s).

Research/monitoring: Research on Caspian Terns in Ontario (often including populations on U.S. Great Lakes) has included studies of breeding biology, migration and dispersal of banded birds, reproductive success, population structure and demography, diet, and endoparasites (Ludwig 1942, 1965; Fetterolf and Blokpoel 1983, Ewins et al. 1994), seasonal distribution and site fidelity (L'Arrivée and Blokpoel 1988), contaminants (Struger and Weseloh 1985, Mora et al. 1993, Yamashita et al. 1993, Ewins et al. 1994; Grasman et al. 1996, 1998), design and evaluation of nesting habitat including artificial rafts (Jarvie and Blokpoel 1996, Lampman et al. 1996, Quinn et al. 1996, Pekarik et al. 1997), experimental measurement of nesting substrate preference (Quinn and Sirdevan 1998), evaluation of the impact of cannon-netting in colonies (Blokpoel 1981), and use of nest covers to reduce egg predation during research activities (Quinn 1984).

Monitoring of the number of nesting pairs in the entire Ontario/Canadian Great Lakes population is currently conducted about every 10 years (D. V. C. Weseloh in litt.).

Status: Vulnerable (Species of Special Concern).

Natural Heritage Rank: Vulnerable.

Habitat Conditions: Caspian Terns in Ontario breed mainly in colonies on remote shoals, small islands (up to 1.6 km in length), and (rarely) peninsulas in large lakes often in association with Herring or Ring-billed gulls or Common Terns (Peck and James 1983, Blokpoel 1987). They infrequently breed in scattered groups of one to a few pairs that usually persist for only one to two years (Blokpoel 1987). Nests, placed on raised ridges and mounds if present, are mere depressions in sand, soil, pebbles, or among rocks, usually in the open but sometimes in or near vegetation (Peck and James 1983). Although some nests are sparsely lined or unlined, most are lined with grasses, dead vegetation, small pebbles, shell fragments, fish bones, twigs, driftwood, and feathers. Since the 1970s and 1980s, colonies formed on human-created sites such as those at Hamilton Harbour and Toronto's Eastern Headland, Lake Ontario (Blokpoel and Scharf 1991).

Threats: Threats to Caspian Terns reported for Ontario include human disturbance that exposes eggs and chicks to predation, chemical contaminants, reduction in suitable nesting sites via competition with cormorants and gulls and encroachment of vegetation, and nest inundation from storm waves during periods of high water levels in the Great Lakes (Blokpoel 1987, Blokpoel and Scharf 1991, Austen et al. 1994). Although some researchers have expressed concern that Double-crested Cormorants may usurp Caspian Tern nesting habitat, the tern's population trends in the Great Lakes during the last few decades (Table 6) suggest this has not been a substantial issue (L. Wires in litt.).

MINNESOTA

Status and Distribution: Although Roberts (1932) suspected that "a few individuals, at least, must nest in the state," the observation of two Caspian Tern nests in a Common Tern colony on Gull Island in Leech Lake, Cass County, on 9 July 1969 represents the first and only breeding record of the Caspian Tern in Minnesota (Warner and Beimborn 1969, Janssen 1987).

Major Populations: No established breeding population.

Population Trends: Not applicable (see above).

Research/monitoring: Lack of an established breeding population precludes research and monitoring.

Status: No status assigned.

Natural Heritage Rank: Unranked.

Habitat Conditions: The two nesting pairs in 1969 were observed near the middle of an island “less than an acre in size” (Warner and Beimborn 1969). At least one of the two nests was located in an area of sparse vegetation, the implication being the other was not.

Threats: Not applicable as no established breeding population (see above).

WISCONSIN

Status and Distribution: Kumlien and Hollister (1951) reported breeding records from 1879 to 1893 on islands in Green Bay and off the north shore of Lake Michigan. Jackson (1928 in Scharf 1979) noted Caspian Terns nesting on Little Spider Island near Washington Island, Door County. Robbins (1991) summarized additional records of a “nesting group” on Gravel Island, Door County, in 1905, a colony at Barker’s Reef off the Door County peninsula in 1939 and 1940, young incapable of sustained flight in Brown County in 1966, and “nests” on Kidney Island, Brown County, in 1984. Surveys found nine and four nests on Kidney Island in 1989 and 1997, respectively, and two nests at the Kewaunee Confined Disposal Facility, Kewaunee County, in 1997 (Table 6).

Major Populations: Currently the species is known to breed only at Kidney Island and the Kewaunee Confined Disposal Facility (see above).

Population Trends: Caspian Terns appear to have always bred sporadically in small numbers in Wisconsin. Data are too few for trend analysis.

Research/monitoring: Known breeding sites are currently monitored by comprehensive surveys of the U.S. Great Lakes currently conducted about every 10 years (F. Cuthbert in litt.).

Status: Endangered.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Likely because of the small and sporadic breeding population, there appears to have been little published on breeding habitat conditions in Wisconsin.

Threats: No specific threats appear to have been identified for this species in Wisconsin, but it is likely affected by the same factors operating elsewhere on the Great Lakes (see other state and provincial accounts). The species appears to be limited in Wisconsin by the availability of suitable nesting islands.

MICHIGAN

Status and Distribution: The earliest breeding records of the Caspian Tern in Michigan are from Gravelly Island, Delta County, in Green Bay in 1848 and from Shoe Island (Little Hat Island), Charlevoix County, in 1896 (Scharf 1979). Currently, the species breeds on islands mainly at the northern end of Lake Michigan and, secondarily, in Thunder and Saginaw bays in Lake Huron (Ludwig 1991, Table 6). Historic and current nesting sites include Gravelly, Snake, Big Gull, and Little Gull islands, Delta County; Hat, High, and Shoe islands and High Island Shoal, Charlevoix

County; Goose Island, Mackinac County; Ile aux Galets, Emmet County; Bellow Island, Grand Traverse County; Calcite Pier at Rogers City, Presque Isle County; Thunder Bay Island, Alpena County; Black River Island, Alcona County; Little Charity Island, Charity Island reef, Arenac County, and the Saginaw Bay Confined Disposal Facility, Bay County (Ludwig 1962, 1991; Evers 1994). Some sites have long histories of occupancy (e.g., Gravelly and Hat islands), others are occupied irregularly because of fluctuating water levels (e.g., Shoe Island, Charity Island reef), and at least one was established at an artificial site (Saginaw Bay CDF) once it was created.

Major Populations: Major colonies since the mid-1970s have been at Gravelly, High, Big Gull, and Hat islands in Lake Michigan and the Saginaw Bay Confined Disposal Facility in Lake Huron (Table 6). Shoe Island, though inactive in the latter period, held an estimated 600 and 1,000-1,500 pairs in 1923 and 1924, respectively (Lincoln 1940 in Wood 1951).

Population Trends: Ludwig (1965) reported a decline in the Caspian Tern population on the Great Lakes as a whole from about 2,400 to 1,400 pairs from 1923 to 1960 then an increase to 1,620 pairs in 1964 (he reported 1,995 pairs in 1963, Ludwig 1979). The strength of these conclusions is weakened, though, by a lack of data for individual islands for 1923 and by an absence of data during 1959-1964 for Gravelly Island, which has been one of the most important nesting islands since records have been kept (Wood 1951, Table 6). Regardless, it is unclear if this trend applied equally to the Michigan population. Ludwig (1965) attributed the earlier population decrease of terns to a decline in their prey populations of herring (*Leucichthys* spp.) in response to intensive commercial fisheries and the invasion of the Sea Lamprey (*Pteromyzon marinus*). The later increase was attributed to an upsurge in tern prey via an invasion of lakes Michigan and Huron by the Alewife (*Alosa pseudoharengus*) beginning in the mid-1950s (Ludwig 1965).

Comprehensive estimates of the size of the nesting population of Caspian Terns in Michigan appear to have been unavailable until the 1960s. The 1,000-1,500 pairs estimated from Shoe Island alone in 1924 (see above), however, rivaled the size of the entire state population in the 1960s. Still the state's nesting population more than doubled from the mid-1960s to mid-1990s. Estimates of the number of nesting pairs in Michigan are: 1965 (1,145), 1966 (1,285), 1967 (1,435), 1976 (1,659), 1977 (1,587), 1978 (1,640), 1981 (1,900), 1982 (2,150), 1987 (2,699), 1989/1990 (2,946), and 1997 (2,729) (Scharf et al. 1978, Shugart et al. 1978, Payne 1983, Scharf and Shugart 1983, Blokpoel and Scharf 1991, Scharf and Shugart 1998, F. Cuthbert in litt., Table 6). These terns nested at 4, 5, 6, 8, and 7 sites in 1976, 1977, 1987, 1989/1990, and 1997, respectively.

Research/monitoring: Research on Caspian Terns in Michigan (often including populations on the Canadian Great Lakes) has included studies of breeding biology, mate retention, migration and dispersal of banded birds, reproductive success and colony site tenacity, population structure and demography, diet, and endoparasites (Ludwig 1942, 1965; Cuthbert 1985a, 1988; Ewins et al. 1994), intraseasonal movements among colony sites (Cuthbert 1985b), seasonal distribution and site fidelity (L'Arrivée and Blokpoel 1988), contaminants (Struger and Weseloh 1985, Ludwig et al. 1993, Mora et al. 1993, Yamashita et al. 1993, Ewins et al. 1994; Grasman et al. 1996, 1998), and the use of tunnels to reach blinds used for observational studies (Shugart et al. 1981).

Monitoring of the number of nesting pairs in the entire U.S. Great Lakes population is currently conducted about every 10 years (F. Cuthbert in litt.).

Status: Threatened.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Typically, Caspian Terns in Michigan nest on islands, where they lay their eggs in shallow scrapes on open pebble or sandy beaches or, rarely, directly on limestone or in unlined nests in low grasses (Ludwig 1991). The suitability of nesting habitat may be influenced by water levels, which in the Great Lakes fluctuate up to 1 m over 8 to 15 year periods (Shugart et al. 1978, Scharf and Shugart 1983). Plant succession can reduce the amount of habitat suitable for terns (and increase it for gulls), but the scouring action of winter storms and winter ice-pushes can return beaches to a bare state (Shugart et al. 1978).

Threats: Threats to Caspian Terns reported for Michigan include competition with gulls and cormorants for limited nesting space, contamination from toxic chemicals (especially PCBs) found in their prey, and nest loss from high waves, mammalian and avian predators, and human disturbance (Shugart et al. 1978, Ludwig 1991; Evers 1992, 1994). See comments above for Ontario indicating a lack of evidence of the effects of cormorants on Caspian Tern populations in the Great Lakes. On a positive note, Ludwig (1991) commented that ownership of key nesting islands by public agencies and private conservation groups provided a measure of assurance that critical breeding habitat for the state's terns will be preserved.

INDIANA

Status and Distribution: Traditionally, the Caspian Tern has been a spring and fall migrant along Indiana's shoreline on Lake Michigan (Brock and Castrale 1997). Indiana's (and southern Lake Michigan's) first nesting colony of Caspian Terns was discovered at the LTV Steel Plant landfill in East Chicago on Lake Michigan on 24 June 1997 (Brock and Castrale 1997). Although it was not possible to accurately count the nests, a count of 64 eggs and 20 downy young, and the observation that most nests contained two eggs indicated there were almost certainly >41 nests; a count of 137 adults suggested the nest total was closer to 70.

Major Populations: There is only one known breeding site for the state (see above).

Population Trends: Although the recent Indiana nesting might be viewed as a range expansion, it is difficult in the short term to draw any conclusions regarding population trends on the basis of the establishment of a single small colony. Since the early 1990s, though, numbers of migrant and summering terns have increased along the Indiana shoreline of Lake Michigan (Brock and Castrale 1997).

Research/monitoring: The Indiana Division of Fish and Wildlife conducts nests counts of colonial waterbirds at 5-year intervals (J. Castrale in litt.). No research has been conducted on nesting Caspian Terns in Indiana.

Status: No status assigned.

Natural Heritage Rank: Accidental Breeder.

Habitat Conditions: The lone current nesting colony is located on slightly elevated fill at a shoreline site at the LTV Steel mill adjacent to the Indiana Harbor Ship Canal near where it flows into Lake Michigan (Brock and Castrale 1997, J. Castrale in litt.). In association with hundreds of nesting Ring-billed Gulls, the tern colony is bisected by a rarely-used gravel road within 3 m of which the terns placed most of their nests. Most nests were mere scrapes in a substrate of fine slag that resembles sand and gravel. Although little vegetation is present, the terns seem to prefer to nest among clumps of ankle-high weeds.

Threats: Human disturbance is a potential threat at the steel mill colony, though it is unclear how much activity occurs where the terns are nesting (J. Castrale in litt.). Associated gulls and Black-crowned Night-Herons are potential predators on tern eggs and chicks.

NEW YORK

Status and Distribution: The Caspian Tern was first documented breeding in the state with the discovery of 160 nesting adults on Little Galloo Island, Jefferson County, in eastern Lake Ontario on 21 June 1986 followed by a count of 112 nests on 7 July 1986 (Weseloh and Blokpoel 1993). Subsequent broadscale surveys of the U.S. Great Lakes found 35 pairs on Little Galloo Island in 1987, 320 pairs in 1990, and 1,204 pairs in 1997 (Table 6). Other estimates of tern numbers at Little Galloo have been 640 adults and 240 chicks in 1990 (double 1989 levels), 576 adults in 1991, 555 nests in 1992, 896 nests in 1993, and 682 nests in 1994 (Weseloh and Blokpoel 1993, Chamberlaine 1998).

Major Populations: The sole breeding colony in the state is on Little Galloo Island (see above).

Population Trends: The nesting population on Little Galloo Island has increased over ten-fold since its discovery in 1986 (see above).

Research/monitoring: Monitoring of the Little Galloo colony is conducted via surveys of the U.S. Great Lakes population conducted about every 10 years (F. Cuthbert in litt.).

Status: No status assigned.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: The terns at Little Galloo Island in 1986 nested on recently-dried soil or mud with some vegetative plant growth along the receding shore of a small pond; the site was about 50 m inland from a stone beach ridge and 55-60 m from the lakeshore (Weseloh and Blokpoel 1993). The nests on Little Galloo Island were simple scrapes or depressions in bare ground usually lined with twigs, other dead vegetation, a few feathers, or other litter (Peterson 1988). Caspian Terns nesting at Little Galloo shared the island with six other species of colonial waterbirds, the most numerous being the Ring-billed Gull (73,000 pairs in 1981, Weseloh and Blokpoel 1993).

Threats: Although no specific threats have been identified for this species in New York (Peterson 1988, Chamberlaine 1998), it likely is affected by the same factors operating elsewhere on the Great Lakes (see other state and provincial accounts). The species appears to be limited in New York by the availability of suitable undeveloped nesting islands.

GULF COAST REGION

TEXAS

Status and Distribution: Caspian Terns are resident in Texas, where they breed all along, but most commonly on the upper and central, Gulf Coast. They nest primarily on dredge spoil and barrier islands (Oberholser and Fuertes 1974; Texas Colonial Waterbird Society [TCWS] 1982, TCWC 2002), and these colonies can change frequently (Wires and Cuthbert 2000).

Oberholser and Fuertes (1974) summarized the earliest accounts of Caspian Terns breeding in Texas. They reported hundreds of nesting pairs in Calhoun and Cameron counties in the 1920s, including 250 nests at Bird Island, Cameron County, in 1923 and “several hundred” nests at Shell Island, Calhoun County, in 1928 (Bird and Big Bird island are assumed to be the same; Shell Island is not on current USGS maps). Population estimates from annual monitoring by the Texas Colonial Waterbird Survey from 1973-2001 ranged from 549-2,700 pairs (median = 935, mean = 1,028, TCWC 2002). During this period, Caspian Terns bred at 82 different sites (TCWC 2002). From 1980-1996, 48 breeding sites were used (mean = 17/year), each site for about six (not necessarily consecutive) years (Wires and Cuthbert 2000).

Population data by island from 1973 to 2001 are available at <http://texascoastalprogram.fws.gov/>. Although the numbers have been relatively stable since the 1970s, these data could be a rich source of future analysis regarding the population dynamics within a region (Wires and Cuthbert 2000, D. Shuford pers. obs.).

The Texas Colonial Waterbird Society (1982) briefly described the origins, size, nesting substrate, and the level and types of human disturbance for each of the following islands.

Upper Laguna Madre Bay islands, Kenedy, Kleberg, and Nueces Counties.

Estimates of breeding pairs for these islands are: 1973 (112), 1974 (0), 1975 (130), 1976 (91), 1977 (146), 1978 (111), 1979 (182), 1980 (137), 1981 (99), 1982 (122), 1983 (114), 1984 (114), 1985 (133), 1986 (137), 1987 (124), 1988 (88), 1989 (64), 1990 (59), 1991 (149), 1992 (114), 1993 (198), 1994 (208), 1995 (256), 1996 (177), 1997 (246), 1998 (186), 1999 (222), 2000 (185), and 2001 (177). Breeding islands included Causeway Islands, DM31-34 (NM 65-74) Island, Kennedy Causeway Islands, Marker 139-155 Spoil (NM 19-35) Island, Marker 37-38 Spoil (NM 79) Island, Marker 63-65 Spoil (NM 127-131) Island, Marker 69 Spoil (NM 141) Island, Marker 72 Spoil (NM 152) Island, Marker 77A Spoil Island (NM 155), Marker 81 Spoil Island (NM 163), Marker 91 Spoil Island, MRK 39-41 SO I (New 79-85) Island, Naval Air Station Islands, North of Bird Island Marker 43, Padre Island Spoil, Pita Island/Humble Channel, South of South Bird Island, West of North Bird Island, West Side Spoil Island, and Yarborough Pass Island.

San Antonio Bay islands, Calhoun County. Estimates of breeding pairs for these islands are: 1973 (41), 1974 (10), 1975 (185), 1976 (51), 1977 (55), 1978 (2), 1979-1989 (0), 1990 (32), 1991 (0), 1992 (34), 1993 (2), 1994-1995 (0), 1996 (2), 1997-1998 (0), 1999 (4), and 2000-2001 (0). Breeding islands included Cedar Lake Island, Panther Reef, Seadrift Island, and Steamboat Island and Spoil.

Matagorda Bay, Matagorda County. Estimates of breeding pairs for the islands and wetlands of Matagorda Bay are: 1973 (410), 1974 (170), 1975 (10), 1976 (0), 1977 (6), 1978 (0), 1979 (26), 1980 (40), 1981 (35), 1982 (67), 1983 (17), 1984 (50), 1985 (90), 1986 (25), 1987 (40), 1988 (3), 1989 (25), 1990 (25), 1991 (6), 1992 (30), 1993 (0), 1994 (50), 1995 (35), 1996 (150), 1997 (65), 1998 (100), 2000 (70), and 2001 (84). Breeding islands included Dressing Point, STP Cooling Reservoir, Matagorda Bay Spoil 39-51, and Sundown Island.

Lower Laguna Madre Bay islands, Cameron, Kenedy, and Willacy Counties.

Estimates of breeding pairs for these islands are: 1974 (97), 1975 (55), 1976 (35), 1977 (220), 1978 (507), 1979 (1900), 1980 (340), 1981 (218), 1982 (65), 1983 (187), 1984 (495), 1985 (502), 1986 (303), 1987 (250), 1988 (994), 1989 (139), 1990 (336), 1991 (612), 1992 (379), 1993 (234), 1994 (191), 1995 (406), 1996 (184), 1998 (245), 1999 (247), and 2000 (281). Breeding islands included Arroyo Colorado Spoil, East Arroyo Spoil, East Flats Spoil, Four Islands, Green Hill Spoil Island, Green Island Spoils, Laguna Vista Spoil, Port Isabel Spoil, South Land Cut, South Three Islands, SW Mansfield Int, Three Island Spoil.

Lavaca Bay islands, Calhoun County. Estimates of breeding pairs for these islands are: 1973 (50), 1975 (200), 1976 (197), 1977 (219), 1978 (120), 1979 (200), 1980 (257), 1981 (30), 1982 (113), 1983 (81), 1984 (39), 1985 (60), 1986 (25), 1987 (20), 1988 (220), 1989 (35), 1990 (50), 1991 (8), 1992 (0), 1993 (0), 1994 (300), 1995 (0), 1996 (20), 1997 (253), 1998 (0), 1999 (0), 2000 (4), and 2001 (25). Breeding islands included Lavaca Bay Spoil (51-63), Lavaca Bay Spoil (63-77), Mouth of Lavaca River, and Point Comfort Alcoa.

Galveston Bay islands, Galveston County. Estimates of breeding pairs for these islands are: 1973 (33), 1975 (63), 1976 (50), 1977 (225), 1978 (352), 1979 (78), 1980 (180), 1982 (125), 1983 (125), 1984 (107), 1985 (62), 1986 (100), 1987 (50), 1988 (115), 1989 (154), 1990 (450), 1991 (230), 1992 (203), 1994 (55), 1995 (50), 1996 (75), 1997 (78), 1998 (79), 1999 (100), 2000 (126), and 2001 (56). Breeding islands included Dickinson Bay Spoil Island, Down Deer Island, Eckert Bayou Point, Jig Saw Island, Marker 52 Spoil Island, Mustang Bayou, North Deer Island, Pelican Island, Redfish Island, Rollover Pass, Snake Island, South Deer Island, Swan Lake, and Vingt-et-un Spoil.

Corpus Christi Bay islands, Nueces County. Estimates of breeding pairs for these islands are: 1973 (144), 1974 (166), 1975 (120), 1976 (156), 1977 (124), 1978 (191), 1979 (124), 1980 (123), 1981 (72), 1982 (227), 1983 (101), 1984 (113), 1985 (88), 1986 (166), 1987 (92), 1988 (55), 1989 (56), 1990 (153), 1991 (6), 1992 (62), 1993 (20), 1994 (15), 1995 (70), 1996 (189), 1997 (172), 1998 (177), 1999 (92), 2000 (149), and 2001 (187). Breeding islands included East Nueces Bay, Pelican Island Spoil, Shamrock Island, and West Nueces Bay.

Baffin Bay islands, Kleberg County. Estimates of breeding pairs for these islands are: 1973 (0), 1974 (0), 1975 (122), 1976 (14), 1977-1980 (0), 1981 (22), 1982 (13), 1983 (20), 1984 (95), 1985 (0), 1986 (34), 1987 (82), 1988 (0), 1989 (2), 1990 (18), 1991 (94), 1992 (100), 1993 (94), 1994 (6),

1995 (25), 1996 (86), 1997 (120), 1998 (0), 1999 (86), 2000 (90), and 2001 (12). Breeding islands included Marker 103-117 Spoil (NM 207-221) and South Baffin Bay Island.

Aransas Bay islands, Aransas, Calhoun, and Nueces Counties. Estimates of breeding pairs for these islands are: 1973 (121), 1974 (549), 1975 (224), 1976 (365), 1977 (215), 1978 (258), 1979 (205), 1980 (210), 1981 (94), 1982 (201), 1983 (13), 1984 (167), 1985 (247), 1986 (135), 1987 (291), 1988 (226), 1989 (149), 1990 (120), 1991 (0), 1992 (0), 1993 (47), 1994 (89), 1995 (50), 1996 (120), 1997 (188), 1998 (111), 1999 (44), 2000 (0), and 2001 (66). Breeding islands included Aransas Channel Spoil, Aransas Refuge Spoil, Big Bayou Spoil, Causeway Island Platforms, Danger Island, East Shore Spoil, GIWW Marker 53 Spoil, Long Reef-Deadman Islands, Ransom Spoil, Second Chain of Islands, Stedman Island, Third Chain of Islands, and West Harbor Island.

Major Populations: The major breeding locations of Caspian Terns in Texas change regularly. From 1997 to 2001, there were never more than three colonies >100 pairs in a single year, though 10 different locations had a colony of •100 pairs (largest 253 pairs) during the period (i.e., Shamrock Island, Kennedy Causeway Islands [Nueces County], Laguna Vista Spoil, Three Island Spoil, South Deer Island [Cameron County], Green Island Spoils [Willacy County], Dressing Point [Matagorda County], Lavaca Bay Spoils #63-77, Second Chain of Islands [Calhoun County], and South Baffin Bay Island [Kleberg County]). The largest colony on record for the state was one of 1,900 pairs at South Three Islands, Cameron County, in 1979.

Population Trends: Olberholser (1974) suggested that the species may have been more common in the 1920s on the basis of accounts of colonies containing “several hundred” nests in Calhoun and Cameron counties. The first statewide survey of colonial waterbirds in 1969 estimated the Caspian Tern population to be <800 birds, half of which were concentrated on the central coast (Olberholser 1974). Since annual monitoring began in 1973, the population has ranged from 549-2,700 pairs (median = 935, mean = 1,028). Wires and Cuthbert (2000) concluded that the Caspian Tern population in Texas had been stable since the 1970s.

Research/monitoring: The annual censuses conducted since 1973 by the Texas Colonial Waterbird Survey provide the most complete record for any state or province in North America (Chaney et al. 1978, TCWS 1982, W. Roach unpubl. data). This exemplary effort is completed by both biologists and volunteers and is currently administered by W. Roach and P. Glass of the U.S. Fish and Wildlife Service.

Research on Caspian Terns in Texas includes investigations of techniques to manage colonial waterbirds at the community and bay system (rather than individual island) level (Roach and Glass 1995), impacts of contaminants (King et al. 1991), sexual size and parental care patterns (Quinn 1990), response to predators (Quinn 1984), and the role of dredge spoil islands in colonial waterbird distribution (Chaney et al. 1978).

Status: No status assigned.

Natural Heritage Rank: Apparently Secure.

Habitat Conditions: Numerous small sand or gravel dredge spoil islands, created since the early 1900s, provide excellent breeding habitat. Although individual colonies may become unsuitable for

nesting because of natural succession of vegetation, this may be balanced by erosion at other sites within a bay (Roach and Glass 1995). Texas wildlife managers use a variety of techniques, including burning, disking, grading or re-spoiling vegetation, predator management, and erosion control, to maintain the bare, predator-free ground needed by Caspian Terns (Roach and Glass 1995).

Threats: Terrestrial predators, including raccoons and coyotes, have harassed terns early in the breeding season causing the abandonment of historical sites (Roach and Glass 1995). Quinn (1984) documented the threat of rattlesnake predation at a colony in Lavaca Bay, but considered it natural and uncommon. Roach and Glass (1995) believed the greatest threat to Caspian Terns is disturbance by humans and their pets. They expected limiting human disturbance during the nesting season would be widely beneficial to Texas waterbirds. King et al. (1979) measured environmental toxins in nine Caspian Tern eggs as part of larger study focused on contaminants of Forster's Terns and Black Skimmers at Lavaca Bay. They found a maximum concentration of 4.7 µg/g DDE, 5.4 µg/g PCB, and <0.9 µg/g of mercury and selenium. These were the highest levels of DDE and PCB in a survey of waterbird eggs in Texas (King et al. 1979). Such environmental pollutants could adversely affect Caspian Tern populations.

LOUISIANA

Status and Distribution: Caspian Terns can be common in the state throughout the year near their preferred marsh and coastal beach habitats (Lowery 1981). Audubon (1840) reported that Caspian Terns were breeding on the Louisiana coast in 1836, but did not distinguish between that species and the typically more numerous Royal Tern. Portnoy (1977) summarized early accounts of Caspian Tern breeding at the Battledore Island area (20 pairs) and at Little Deadman Island (25 pairs) in 1908, Mississippi Mud Lumps (35 nests) and Freemason Keys (50 pairs) in 1917, Freemason Island (breeding) in 1919 and 1938, Timbalier Island (breeding) in 1918 and (40 adults) in 1976, and Pass a Loutre Mud Lumps (30-36 pairs) in 1919. Bent (1921) reported 40 pairs at Grand Gosier South, Plaquemines Parish, in 1919.

An estimated 500 pairs were breeding in the state in 1967; numbers of pairs declined in the 1970s, when only four breeding sites were known (S. Shively in Wires and Cuthbert 2000). In 1976, there were six colonies and 418 birds (Portnoy 1977). In the 1980s and 1990s, colony locations changed frequently and former islands used for breeding sometimes disappeared. In 1997, surveys by Visser and Peterson (1999) estimated a total of 1,012 nesting birds at 10 colonies (mean size = 101, range = 2-420), whereas in the same year G. Lester and W. Vermillion (in Wires and Cuthbert 2000) reported 820 pairs at 8 colonies. In 2001, there were 682 pairs at nine breeding sites (W. Vermillion unpubl. data).

Chandeleurs "Archipelago," Plaquemines Parish. The Chandeleurs "Archipelago" is a series of barrier islands that include Errol, North, Curlew, Stake, and Monkey islands. Estimates of breeding pairs for the Chandeleurs are: 1919 (Errol I., breeding), 1931 (North I., breeding), 1933 (Curlew I., 25 nests), 1962 (Curlew I., few nests), 1967 (Stake I., 50 pairs), 1968 (Curlew, North, and Stake islands, 270 pairs), 1969-1972 (breeding), 1973 (Sand Islet of Monkey I., 78 nests), 1974 (Monkey I., breeding), 1975 (breeding), 1976 (Curlew I., 80 birds), and 2001 (North, Point Lydia, Curlew I., Pelican Point I., and South Pass I., 412 pairs) (Portnoy 1977, W. Vermillion unpubl. data).

Breton Island, Breton Island NWR, Plaquemines Parish. Portnoy (1977) summarized estimates of breeding pairs at Breton Island as: 1933 (1 nest), 1966-1967 (500 nests), 1968 (50 nests), and 1974 (breeding). In 2001, there were no breeding pairs (W. Vermillion unpubl. data).

Delta NWR, Plaquemines Parish. Portnoy (1977) reports unsubstantiated anecdotal accounts of breeding from 1965-1974. In 2001, there were no breeding pairs (W. Vermillion unpubl. data).

Wine Island, Terrebonne Parish. Portnoy (1977) saw 40 breeding adults from the air in 1976. In 2001, there were no breeding pairs (W. Vermillion unpubl. data).

Mitchell Key, St. Bernard Parish. Portnoy (1977) saw 150 breeding adults from the air in 1976. In 2001, there were 50 breeding pairs (W. Vermillion unpubl. data).

Three Mile Bay, St. Bernard Parish. In 2001, there were 130 breeding pairs (i.e., 25, 30, and 75) at three unnamed islands of Three Mile Bay (W. Vermillion unpubl. data).

Isle au Pitre, St. Bernard Parish. Portnoy (1977) saw 44 breeding adults from the air in 1976. In 2001, there were no breeding pairs (W. Vermillion unpubl. data).

Le Petit Pass Island, St. Bernard Parish. In 2001, there were 25 breeding pairs (W. Vermillion unpubl. data).

Grand Island, St. Bernard Parish. In 2001, there were 65 breeding pairs (W. Vermillion unpubl. data).

Major Populations: The Chandeleurs “Archipelago” has been the major breeding area for Caspian Terns in the state (Lowery 1981). The six islands with >100 nesting terns (Curlew Island, Wine Island, Grand Gosier South, Pelican Point, South Pass Island, or Mitchell Key) each have contained at least 10% of the total Louisiana breeding population in a given year (Visser and Peterson 1999, W. Vermillion unpubl. data).

Population Trends: The current population of 682 pairs (W. Vermillion unpubl. data) suggests the overall population trend is increasing from the last population low point of 1976 when there may have only been about 250 pairs (Portnoy 1977).

Research/monitoring: Monitoring efforts have been conducted primarily to evaluate the utility of dredge spoil islands to colonial waterbirds or the potential impact on wildlife of an oil spill off the Louisiana coast (Portnoy 1977, Visser and Peterson 1999). The Louisiana Department of Fish and Wildlife and the Louisiana Natural Heritage Program also collect data on colonial waterbird breeding sites. There appears to be no specific research on Caspian Terns in Louisiana.

Status: No status assigned.

Natural Heritage Rank: Critically Imperiled-Imperiled.

Habitat Conditions: Caspian Terns in Louisiana currently breed only on isolated beaches of small barrier islands and sandbars (Visser and Peterson 1999), though historically they also bred on shell berms in salt marshes (Portnoy 1977). During 1987-1997, 44% (28 of 63) of the breeding islands were of dredge-spoil origin (Wires and Cuthbert 2000). In 1996-1997, at least one-third of nesting sites and 35% of pairs were on dredge spoil islands. In 1997, the four largest colonies (Curlew Island, Wine Island, Grand Gosier South, or Mitchell Key) were all located on relatively large barrier islands (Visser and Peterson 1999).

Dredge spoil islands of the southeastern United States are suitable for Caspian Tern breeding for about four years following deposition (McNair 2000), after which vegetation typically overgrows nesting areas unless fresh spoil is added. Major storms and hurricanes can create and destroy Caspian Tern nesting sites, thereby greatly altering habitat quality and quantity from season to season (Visser and Peterson 1999). Wine Island was supplemented with dredge material in 1991 (Visser and Peterson 1999).

Threats: Visser and Peterson (1999) calculated that an oil spill on Curlew Island, Wine Island, Grand Gosier South, or Mitchell Key during the nesting season could be a major disaster. Each of these islands contains at least 10% of the Caspian Tern breeding pairs in Louisiana, increasing the potential impact of an environmental disaster. Hurricanes or other major tropical storms can destroy flightless young by flooding colony sites, which may have occurred when Hurricane Chantal hit Louisiana in late August 1989 (Visser and Peterson 1999).

ALABAMA

Status and Distribution: The initial account of breeding by Caspian Terns in Alabama in 1976 was from Portnoy's (1977) observation of 132 adults nesting on Little Dauphin Island, a dredge disposal site immediately north of Dauphin Island at the mouth of Mobile Bay, Mobile County. All subsequent breeding in the state has also been on islands in the greater Mobile Bay ecosystem.

Blakeley Island, Mobile County. In 1979, at least 340 adults were present on Blakeley Island in Grand Bay (Winn and Winn 1987 in McNair 2000).

Gaillard Island, Mobile County. Clapp and Buckley (1984) reported that six pairs bred on a new dredge spoil site named Gaillard Island in 1983. This island receives new dredge material annually and has likely held breeding terns every year since 1983 (R. Clay pers. comm.). Estimates of breeding pairs are: 1983 (6), 1988 (150), 1989 (157), 1990 (255), 1992 (182), 1993 (418), 1995 (245), 1996 (606), 1997 (522), 1998 (450), 1999 (348), 2000 (334), and 2001 (288) (Clay 1992, R. Clay unpubl. data).

Cat Island, Mobile County. R. Clay (pers. comm.) noted 18 pairs of Caspian Terns breeding on Cat Island in Heron Bay in 1999 and about 50 pairs in 2002. Apparently there was no breeding in 2000 or 2001.

Major Populations: Gaillard Island in Mobile Bay and the islands of the greater Mobile Bay ecosystem support the state's entire breeding population of Caspian Terns.

Population Trends: After Portnoy's (1977) initial discovery of 132 breeding birds in 1976, numbers appear to have declined until a new dredge spoil island became available. Following colonization of Gaillard Island, Caspian Terns rapidly increased from 6 pairs in 1983 to over 600 pairs in 1996 then declined to about 300 pairs in 2000-2001 (Clay 1992, R. Clay unpubl. data).

Research/monitoring: The Alabama Nongame Wildlife Department monitors nesting activity on Gaillard Island annually (Clay 1992).

Status: No status assigned.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Dredge spoil islands in the southeastern United States are suitable for Caspian Tern breeding for about four years following deposition (McNair 2000), after which vegetation typically overgrows nesting areas unless fresh spoil is added. Gaillard Island is designed to have fresh spoil added annually (Clay 1992).

Threats: Specific threats to Alabama's Caspian Terns are unknown.

MISSISSIPPI

Status and Distribution: The Caspian Tern is a "fairly common" resident in Mississippi but only an occasional or accidental breeder (Toups and Jackson 1987, Turcotte and Watts 1999). Five pairs of Caspian Terns bred on Horn Island in 1966 and 15 pairs on Petit Bois Island in 1967 and 1968; both islands are of natural origin (Portnoy 1977). Breeding was last confirmed in 1976 when four adults bred at Horn Island Pass, Mississippi Sound (Portnoy 1977). Although coastal waterbird surveys have been conducted in Mississippi since the late 1990s, no breeding Caspian Terns have been detected (McNair 2000, M. Woodrey pers. comm.). Occasional summer observations of recently fledged young at Pascagoula River Marsh (Toups and Jackson 1987) are inconclusive, as the birds may have moved some distance from their nesting sites.

Major Populations: None.

Population Trends: Toups and Jackson (1987) and Turcotte and Watts (1999) do not provide information on population trends of the species in Mississippi. The few breeding attempts in the 1960s and 1970s did not lead to the establishment of a regular breeding population.

Research/monitoring: The lack of an established breeding population has not warranted any research or monitoring efforts on Caspian Terns in Mississippi.

Status: No status assigned.

Natural Heritage Rank: Accidental Breeder.

Habitat Conditions: There appear to be no descriptions of the nesting habitat or substrate used by Caspian Terns in their few breeding attempts in the state. Caspian Terns on the Gulf Coast usually nest on the periphery of larger larid colonies, especially those of Royal Terns (Portnoy 1977).

Threats: The lack of an established nesting population precludes assessment of threats to the species.

FLORIDA

Status and Distribution: Caspian Terns were first documented breeding in Florida in 1962 with the observation of a single pair within a Black Skimmer colony at Boca Ciega Bay in the greater Tampa Bay ecosystem (Woolfenden and Meyerriecks 1963). Tampa Bay has continued to be the primary breeding location for Caspian Terns in the state over the last thirty years (Stevenson and Anderson 1994).

Gulf Coast

Tampa Bay, Hillsborough and Pinellas Counties. Since the discovery of nesting in 1962 at Boca Ciega Bay, Pinellas County (Woolfenden and Meyerriecks 1963), Caspian Terns likely have bred annually in the greater Tampa Bay area (R. Paul pers. comm.). In 1967, a nest with a large chick was found at Gulfport, Pinellas County, 2 miles south of the Boca Ciega Bay location (Rowher 1968 in Stevenson and Anderson 1994). Subsequently, single nests were also located in 1969, 1970, and 1972 at St. Joseph Sound near Tarpon Springs just north of Tampa Bay on the Gulf Coast (Schreiber and Dinsmore 1972). In 1972 and 1973, a pair also nested at Pinellas Bayway within Tampa Bay (Dunstan et al. 1975). In 2000, 17 pairs of Caspian Terns bred on Three Rooker Island, Pinellas County, in Tampa Bay (R. Paul unpubl. data). Dunstan et al. (1975) described a colony of 16 pairs on Pelican Point, a spoil island in Hillsborough Harbor. Since then nesting has occurred annually on a series of nearby dredge spoil islands closer to the Alafia River (Alafia Banks Extension, Island 3D, and Fantasy Island, Rodgers et al. 1996). In 1978, these islands had 30 pairs (Clapp et al. 1983). In 1992, Island 3D of Alafia Banks, with 68 nests with eggs, was the only known breeding colony in Florida (Pranty 1997). From 1993-1995, the state's largest breeding concentration was on Island 3D (Pranty 1997). Caspian Terns are believed to have bred on Island 3D annually since 1975 (R. Paul pers. comm.). Estimates of nesting pairs at Hillsborough Harbor/Alafia Banks are: 1975 (16), 1978 (30), 1981 (breeding), 1982 (13), 1983 (30), 1984 (45), 1985-1986 (~50), 1987 (47), 1988 (47), 1991 (70), 1992 (68 nests), 1993 (80), 1994 (80), 1995 (84), 1996 (93), and 1997-2002 (breeding) (Dunstan et al. 1975, Clapp et al. 1983, Stevenson and Anderson 1994, Pranty 1997, R. Paul unpubl. data).

Charlotte Bay, Island Bay NWR, Charlotte County. An observation of a large chick and parent on a spoil island near Devilfish Key and Gasparilla Sound in Charlotte Bay in 1994 represents the only breeding record south of Tampa Bay (Dunstan et al. 1975, Stevenson and Anderson 1994). The terns were associated with a larger Laughing Gull colony.

Apalachicola Bay, Franklin County. Caspian Terns were first reported breeding in the Florida panhandle in 1978 with the discovery of 30 pairs on dredge spoil islands (perhaps Drake Wilson or Two-Mile Island) of Apalachicola Bay; small numbers likely nested there until 1983 (Dunstan et al. 1975, Stevenson and Anderson 1994, McNair and Gore 2000). In 1995, a new dredge spoil island was created in Apalachicola Bay, and in 1996 at least 29 pairs of Caspian Terns nested on the north

side of the island (McNair and Gore 2000). In 1997, 39 pairs used the same location, and by 1998 the colony had more than doubled to 105 pairs to become the largest colony in the state (McNair and Gore 2000).

Atlantic Coast

Merritt Island and Banana River spoil islands, Merritt Island NWR, Brevard County. The first breeding record for the state outside of Tampa Bay was of a nest noted in 1972 at Merritt Island on the Atlantic Coast (Stevenson and Anderson 1994). From 1973-1979, Caspian Terns bred in five of seven years on a dredge spoil island in the Banana River section of Merritt Island NWR until the island was apparently overgrown by vegetation (Salata 1979 in Rodgers et al. 1996, McNair and Gore 2000). Estimates of breeding pairs of Caspian Terns at Merritt Island NWR are: 1972 (1), 1973 (breeding), 1974 (2), 1975 (10 nests, 31 “pairs”), 1976 (0), 1977-1979 (adults present, breeding unconfirmed), 1980 (1), 1981-1999 (0), and 2000 (~25) (Portnoy et al. in Clapp et al. 1983, Stevenson and Anderson 1994, McNair and Gore 2000, R. Paul pers. comm.).

Major Populations: The Tampa Bay area and, more recently, Apalachicola Bay are the only locations in Florida that have ever supported >50 breeding pairs. If fresh dredge spoil islands are maintained near these locations it is likely the colonies will remain stable or grow.

Population Trends: Numbers of breeding Caspian Terns in Florida slowly increased from a single pair in 1962 (Woolfenden and Meyerriecks 1963) to over 100 pairs by 1998 (McNair and Gore 2000). R. Paul (unpubl. data) estimates the breeding population for the state in 2002 to be about 250 pairs. The increasing availability of dredge spoil island habitat appears to be an important parameter related to the increasing population (McNair 1994).

Research/monitoring: The islands of Alafia Banks in Hillsborough Bay are monitored on a regular basis as part of National Audubon’s Florida Coastal Islands Sanctuaries program (Rodgers et al. 1996). The Tampa Bay Port Authority and the U.S. Army Corps of Engineers include Caspian Terns and other nesting waterbirds in the planning process for dredging projects (Rodgers et al. 1996).

Status: No status assigned.

Natural Heritage Rank: Imperiled.

Habitat Conditions: Florida’s Caspian Terns breed on islands with sparse vegetation and a lack of terrestrial predators. Breeding substrates include sand, shells, and gravel, but all are derived from dredge materials (McNair and Gore 2000). There apparently is no shortage of dredge spoil islands in the state, but most are covered in vegetation, which makes them unsuitable for Caspian Terns (Rodgers et al. 1996). As part of the Audubon sanctuary program, island habitat of Hillsborough Bay is actively managed by burning, tilling, raking, and pulling vegetation (e.g., *Cenchrus* sp., Rodgers et al. 1996). Attempts to attract or retain Caspian Terns at specific Tampa Bay islands with habitat improvement failed at least twice in 10 years (R. Paul in Rodgers et al. 1996).

Threats: As a ground nesting colonial waterbird, the Caspian Tern is acutely vulnerable to terrestrial predators, human disturbance, chemical spills, intense storms, and unusually high tides (Rodgers et al. 1996). In years in which there is but a single colony in the state, the statewide “population” is

particularly vulnerable to such catastrophes. Natural predators (Fish Crows [*Corvus ossifragus*] and raccoons) and non-native predators (cats, dogs, and rats) are mentioned as potential causes of major mortality for Florida's terns (Schaefer 2001). In Tampa Bay, there are emerging concerns about heavy metal and organochlorine contamination hot spots (E. Long in Rodgers et al. 1996), which are potentially hazardous to Caspian Terns. Dredge spoil islands that are not regularly renewed or easily impacted by erosive storms are likely to quickly be overgrown with vegetation that prevent Caspian Terns from breeding.

ATLANTIC COAST REGION

NEWFOUNDLAND AND LABRADOR

Status and Distribution: Frazar (1887) found a colony of 200 pairs of Caspian Terns on the south coast at Cape Whittle, Newfoundland, in 1887. There are no further breeding records from that area or any other in Newfoundland for almost a century. Caspian Terns have bred on low-lying North Penguin Island near Hamilton Sound in company with larger colonies of Ring-billed Gulls and Common and Arctic Terns (Montevecchi and Tuck 1987). The only estimates of breeding pairs at North Penguin Island are 28 in 1986 and 75-100 in 1997, and they no longer breed there (Cairns et al. 1986, D. Ballam pers. comm.). Since 1999, about 100-125 pairs of Caspian Terns have bred annually on Ladle Cove Island in Ladle Cove along the northeast coast of Newfoundland (D. Ballam pers. comm.).

Bent (1921) interpreted Audubon's (1844) observation of breeding "cayenne" terns on the southern coast of Labrador to represent Caspian Terns. There are no further breeding records from that area or any other in Labrador for almost a century. In 1979, four adults and a chick (1-2 pairs) were discovered at Lake Melville (Lock 1983), but again no other breeding records are known for this location (A. R. Lock pers. comm.).

Population Trends: Data are insufficient to describe population trends of Caspian Terns in Newfoundland and Labrador.

Research/monitoring: Currently there are no research or monitoring efforts in Atlantic Canada specifically focused on Caspian Terns. Records that do exist come primarily from more general colonial waterbird surveys conducted by the Canadian Wildlife Service.

Status: No status assigned.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: North and South Penguin islands are low, sandy, and grassy islands just off of the coast of Newfoundland. South Penguin Island has a small spruce-fir forest, but trees have not yet grown on North Penguin (Montevecchi and Tuck 1987), which may explain why it remained a good tern breeding for many years. Ladle Cove Island is a low sandy and grassy island. Bare ground habitat is primarily maintained by winter storms (D. Ballam pers. comm.). The breeding habitat at

Lake Melville in Labrador was a sandy grass-covered island that is of unknown status at this time (A. R. Lock pers. comm.).

Threats: Specific threats to Caspian Terns in Newfoundland and Labrador are unknown.

QUEBÉC

Status and Distribution: Three islets (collectively called Fog Island) within what is currently the Île a la Brume Migratory Bird Sanctuary are the only known breeding area for Caspian Terns in Québec (Chapdelaine 1996). Since the location was initially described in 1884 there has been a significant decline in the estimated number of individual adults breeding: 1884 (400), 1925 (60), 1930 (90), 1935 (84), 1940 (66), 1945 (90), 1947 (30), 1950 (0), 1955 (76), 1960 (45), 1965 (10), 1972 (2), 1977 (3), 1982 (7), 1988 (15), 1990 (11), 1993 (0), 1994 (10), 1995 (32), 1996 (6), 1997-2001 (0) (Chapdelaine 1996, Canadian Wildlife Society 2002).

Reports of spring copulation and summer feeding of fledged young in the Ottawa Valley, Lac Saint-Pierre, and Magdalen Islands suggest a need to explore these regions for other potential breeding sites (Lock 1983, Canadian Wildlife Society 2002).

Population Trends: Since 1884 when there were approximately 200 pairs, the population has declined to a few pairs breeding intermittently. Historical human disturbance, including egg harvesting, and recent increased competition with Ring-billed Gulls are suggested as contributing to the near extirpation of this colony (Nettleship and Lock 1973, Canadian Wildlife Society 2002).

Research/monitoring: Environment Canada and the Canadian Wildlife Service currently conduct an annual census of the number of Caspian Terns breeding in the Île a la Brume Migratory Bird Sanctuary (Canadian Wildlife Society 2002). There are apparently no diet or reproductive studies of Caspian Terns on the Atlantic Coast of Canada.

Status: Endangered.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Habitat conditions at the Île a la Brume Migratory Bird Sanctuary are relatively stable gravel and sand beaches (S. Anderson pers. comm.).

Threats: A single small colony of ground nesting birds is extremely vulnerable to loss from a variety of catastrophic events. Québec's lone Caspian Tern colony has suffered historically from human disturbance and may be in competition with Ring-billed Gulls for breeding space (Canadian Wildlife Society 2002).

NEW JERSEY

Status and Distribution: Although previously suspected of nesting in the state (AOU 1983), Caspian Terns were first documented breeding in New Jersey in 1984, when Burger and Gochfeld

(1984) followed the reproductive chronology of a single pair nesting among Common Terns and Black Skimmers in the salt marsh island, Vol Sedge, 3 km southwest of Barnegat Light, Ocean County. The nest site was unusual in that it is apparently the first on a mat of eel grass, which was constructed by researchers to promote nesting by Black Skimmers (Burger and Gochfeld 1984). Aerial surveys were conducted by the New Jersey Division of Fish and Wildlife in 1977-1979, 1983, 1985, and 1989, but no breeding Caspian Terns were located (D. Jenkins unpubl. data). Breeding was not recorded again until 1995 when four nests were discovered at three locations: Mankiller Bay (1), Egg Island (2), and Coast Guard Ruins (1) (D. Jenkins unpubl. data). All four locations were back-bay marsh islands with nests on wrack deposits similar to those described by Burger and Gochfeld (1984). Nests were associated with other breeding gulls, terns, and skimmers (D. Jenkins unpubl. data). In 2001, one nest was located on a sand deposit of Tow Island and two nests were on wrack deposits on East Sedge Island (D. Jenkins unpubl. data).

Major Populations: No major populations, as there has been only intermittent breeding of up to four nests in a single year with only two at any one island (see above).

Population Trends: The small number of birds and intermittent breeding record precludes assessment of population trends.

Research/monitoring: Caspian Terns were initially discovered nesting in New Jersey during research focused on Common Terns and Black Skimmers (Burger and Gochfeld 1984). The lack of an established breeding population suggests that any future breeding attempts will likely be monitored incidental to other work.

Status: Species of Special Concern.

Natural Heritage Rank: Unranked.

Habitat Conditions: The first known breeding pair of Caspian Terns in New Jersey nested on eel grass mats of a salt marsh island (Burger and Gochfeld 1984); similar habitat was used at four sites in 1995.

Threats: Threats are not identified, as New Jersey lacks an established breeding population. Nests of other tern species that are placed low on salt marsh islands have been destroyed by high tides (Burger and Gochfeld 1984).

VIRGINIA

Status and Distribution: Once common along the coast, the feather and egg collecting trades apparently extirpated Caspian Terns as breeders in Virginia in the late 1800s (Weske et al. 1977). Nests were observed in 1912 and 1915 at Cobb's Island, but the breeding habitat was lost to erosion (Parnell and Soots 1976, Weske et al. 1977). Caspian Terns were not recorded breeding for almost sixty years, and since their rediscovery in 1974 no more than eight pairs have bred in a single year (Weske et al. 1977, Williams et al. 1990, B. Tuit in Wires and Cuthbert 2000).

Coastal surveys of Virginia's barrier islands from 1975-1988 found an average of two pairs of Caspian Terns breeding at scattered locations including pairs at Metompkin (6), Hog (1), Cobb (2), Little Cobb (1), Ship Shoal (8), Smith (2), and Fisherman's Island (3), Fishermans Island NWR, Northampton County (Erwin 1979, Williams et al. 1990). In 1977, the only known breeding in the state was by a pair on Fisherman's Island (Erwin 1979). Williams et al. (1990) reported estimated total breeding pairs for the state as 1975-1979 (1), 1980 (2), 1981 (1), 1982 (3), 1983 (2), 1984 (3), 1985 (1), and 1986-1988 (4).

Major Populations: There is no major population concentration of Caspian Terns in the state.

Population Trends: Caspian Terns were apparently extirpated by intensive eggging and plume collection in the late 1800s (Weske et al. 1977). There was a brief period of recolonization from 1912-1915 before the terns disappeared again and were not discovered breeding until 1974 (Weske et al. 1977). Subsequently there have been less than five breeding pairs in the state annually (Williams et al. 1990).

Research/monitoring: Coastal surveys have been conducted on an irregular basis, but The Nature Conservancy of Virginia has attempted to coordinate annual surveys since 1975 (Erwin 1979, Williams et al. 1990, B. Truitt in Wires and Cuthbert 2000).

Status: Species of Special Concern.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Caspian Terns currently nest on Virginia's barrier islands or insular marshes (Wires and Cuthbert 2000). Nests in southern Virginia are typically associated with other colonial waterbirds, especially Royal Terns (*Sterna maxima*) and Laughing Gulls (*Larus atricilla*) (Williams et al. 1990).

Threats: Specific threats to Caspian Terns in Virginia are unknown.

NORTH CAROLINA

Status and Distribution: The first confirmed breeding record for North Carolina was of two nests discovered at Oregon Inlet in 1972 (Parnell and Soots 1976). Subsequently, one pair bred at this location in 1973 and four pairs in 1974 and 1975. In 1976 and 1977, the 18 and 16 breeding birds, respectively, occupied dredge spoil islands inshore from Oregon Inlet and two spots on a nearby barrier island (Dare County, Portnoy et al. 1981). Single nests were discovered in Hyde County near Hatteras Inlet in 1974 and on Hatteras Island near Cape Point in 1986 (Parnell and Soots 1976, McNair 2000). Clapp and Buckley (1984) reported six breeding pairs in 1983. From 1990-1997, between 15 and 37 pairs were recorded breeding on the entire coast, all within Pamlico Sound near Oregon or Ocracoke inlets (McNair, 2000, D. Allen in Wires and Cuthbert 2000). Estimated breeding pairs were 37 in 1995 and 26 in 1997 (McNair 2000).

Major Populations: The Oregon Inlet region appears to be the most important Caspian Tern breeding area in North Carolina.

Population Trends: Since the discovery of two breeding pairs in 1972, the North Carolina population has increased to 15-37 pairs in the 1990s (see above).

Research/monitoring: The small number of breeding Caspian Terns has likely contributed to the lack of research on that species in North Carolina. Coastal surveys typically focused on dredge material have been conducted on an irregular basis (Parnell and Soots 1976, Parnell et al. 1978, Portnoy et al. 1981). Since 1990, the North Carolina Wildlife Commission has tried to count Caspian Terns along with other breeding colonial waterbirds.

Status: No status assigned.

Natural Heritage Rank: Critically Imperiled.

Habitat Conditions: Since at least the 1970s, dredge spoil islands have been the primary breeding habitat of Caspian Terns in North Carolina (Parnell and Soots 1976). Four of six locations in the last 10 years have been on dredge spoil (D. Allen in Wires and Cuthbert 2000). Ocracoke Island is of natural origins and had a pair or two of Caspian Terns breeding from 1984-1987, 1989-1991, and in 1995.

Threats: Specific threats to breeding colonies in North Carolina are unknown.

SOUTH CAROLINA

Although a few other suggestive observations exist, South Carolina's only confirmed breeding records are of one to two pairs at Cape Romain NWR in 1970, 1972, and 1974 (Potter et al. 1980, McNair and Post 1993). Caspian Terns at Cape Romain bred among Gull-billed Terns on a sandy substrate with some grasses (Potter et al. 1980). No breeding was found in South Carolina during a 1976 survey (Portnoy et al. 1981), nor had any additional breeding records been documented as of 1994 (McNair 1994).

GEORGIA

The single account of Caspian Terns breeding in the state was on the basis of an egg collected in 1900 at Little St. Simon Island (Johnston 1989 in McNair 1994). This egg was later reidentified as that of a Royal Tern (McNair 1994).

FLORIDA (ATLANTIC COAST)

See the Florida account in the Gulf Coast section of Appendix 1.

OUTLYING POPULATIONS

The few Caspian Terns that have bred in North Dakota are not conveniently placed in any of the five breeding regions for North America described by Wires and Cuthbert (2000). North Dakota falls in between the Pacific, Central Canada, and Great Lakes regions, thus we have included it here in an “Outlying Populations” section. See also the comments in the main text as to whether some small populations breeding in western states, particularly east of the Rocky Mountains, might possibly be more closely allied with populations in the Central Canada rather than Pacific Region.

NORTH DAKOTA

Status and Distribution: The Caspian Tern was first recorded breeding in North Dakota on the basis of an observation of a single pair with two young on an island in Lake Williams, McLean County, on 28 June 1977 (Herman et al. 1978).

Major Populations: No established breeding population.

Population Trends: Not applicable (see above).

Research/monitoring: None conducted.

Status: No status assigned.

Natural Heritage Rank: Unranked.

Habitat Conditions: The island where terns were nesting in a shallow, saline lake in 1977 is about 0.4 ha in size with a gravel base overlain by sand (Herman et al. 1978). Russian thistle (*Salsola kali*) 30-60 cm high covered roughly 60% of the island.

Threats: Not applicable as there is no established population.

APPENDIX 2. Regional, State, Provincial, and Territorial Contacts and Contributors

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