Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Bureau. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

1. Name and address of the compiler of this form:

Dr. Mike McCoy
Vice President, Southwest Wetland Interpretive Association
P.O. Box 575
Imperial Beach, California 91933
United States of America
mccoy4ib@aol.com

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

2. Date this sheet was completed/updated:

1/21/05

3. Country:

United States of America

4. Name of the Ramsar site:

Tijuana River National Estuarine Research Reserve (TRNERR)

5. Map of site included:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps.

a) hard copy (required for inclusion of site in the Ramsar List): *yes* x -or- *no* ☐

b) digital (electronic) format (optional): *yes* x -or- *no* ☐

Note: the western boundary is the shoreline itself.

6. Geographical coordinates (latitude/longitude):

Approximate central point: 117º 07' 00" W x 32º 33'00" N

7. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

TRNERR is located in the southwest corner of the United States of America and within the State of California. The nearest town is Imperial Beach (28,000), which borders TRNERR on the northern boundary of the Reserve, and San Diego County is the administrative region. Tijuana (approximate population of 3.2.5-3 million) is on the other side of the international border, in Mexico. The TRNERR separates Tijuana and San Diego.

8. Elevation: (average and/or max. & min.)

Average = 3.3 meters, Maximum = 100 meters & Minimum = 0 meters

9. Area: (in hectares)

1,021 ha

10. Overview:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Tijuana River National Estuarine Research Reserve (TRNERR) provides 2,500 acres (1,011 hectares) of protected coastal wetland habitat for endangered plant, fish and animal species. This sensitive coastal wetland is home to over 370 bird species that include nine federally listed as threatened or endangered, one state listed as threatened and three regionally rare species present across most of estuary's habitats.

TRNERR is the second largest home for the federally listed endangered Light-footed Clapper Rail, supporting over 22% of the total estimated population in biogeographic region. Furthermore, TRNERR is the only bi-national watershed in California, sharing its watershed with Mexico; serves as a major stopover for migrating birds using the Pacific Flyway; contains six wetland types under the Ramsar "Classification System for Wetland Type" (intertidal marshes, estuarine waters, sand shores, salt flats, seasonal rivers, and seasonal and permanent freshwater pools); and does not suffer habitat fragmentation faced by other coastal lagoons in southern California. This system is an excellent example of the wetlands habitat that, in the past, was a prominent feature in Southern California's coastal zone; today, more than 95% of those wetlands have been converted for coastal development or severely degraded. This unique area is one of the most biologically productive systems on Earth and has been recognized by several national environmental organizations for its ecological significance.

11. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

1 • 2 • 3 • 5 • 6 • 7 • 8

12. Justification for the application of each Criterion listed in 11. above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: Justified by the lack of habitat fragmentation and by the fact that it is a remnant of a wetland type. TJNERR has not suffered habitat fragmentation caused by the presence of a railway system within the lagoon, as evidenced in many (if not most) coastal lagoons in southern California. This system is an excellent example of the wetlands habitat that, in the past, was a prominent feature in Southern California's coastal zone; today, more than 95% of those wetlands have been converted for coastal development or severely degraded. In addition, TJNERR is the only bi-national watershed in California. With 1,020 hectares (2,521 acres) of tidally flushed wetland, riparian and upland habitat, TJNERR receives drainage from a 1,731 square-mile watershed, of which 73% lies within Mexico.

Criterion 2:

This is the most significant of the Ramsar criteria, due to TRNERR's value to the supporting vulnerable, endangered and critically endangered species and threatened habitat. Home to more than 370 bird species, over 95% of TRNERR is designated as critical habitat that supports six bird species listed as federally threatened or endangered (Light-footed Clapper Rail *Rallus longirostris levipes;* Least Bell's vireo *Vireo bellii pusillus*; California least tern *Sterna antillarum browni;* Brown pelican *Pelecanus occidentalis*; Southwestern willow flycatcher *Empidonax traillii extimus;* and one federally listed endangered plant subspecies (i.e. Salt marsh Bird's Beak *Cordylanthus maritimus maritimus).* Furthermore, located within TRNERR's 1,021 hectares is the Tijuana Slough National Wildlife Refuge (NWR). Comprised of 428 hectares, NWR was established in 1980 under the United States Endangered Species Act (1973) and incorporated into TRNERR in 1982 with the expressed purpose of "conserving fish or wildlife which are listed as endangered species or threatened species…or plants which are listed as endangered species or threatened species."

A few small vernal pools can be found in the Reserve. These shallow pools, which hold a few inches of water during the wet months, host San Diego fairy shrimp *Branchinecta sandiegonensis*, a federally endangered species as well as in the IUCN Red List (IUCN, 2004).

Criterion 3: TRNERR is distinct from other wetlands north of Point Conception, California, and contains most of the plant communities found in all of the southern California wetlands. The site is home to many regionally significant plant species, including: Pickleweed (*Salicornia virginica*); Sea Blight (*Suaeda californica*); Sea Lavender (*Lamonium californicum*); Marsh jaumea *Jaumea carnosa*. Low-mean high water dominated by native cordgrass (*Spartina foliosa*).

Criterion 6: TRNERR is the second largest home for the federally listed endangered Light-footed Clapper Rail, with an estimated 77 pairs residing in the estuary in 2003-2004 (1% threshold given by Wetlands International (2002): is 10).

---

13. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):
Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:
Biogeographic Region: Southern Blight, which runs from San Quentin, Mexico, to Point Conception, California.

b) biogeographic regionalisation scheme (include reference citation):
NOAA Biogeographic system. Reference: Comprehensive Management Plan for the Tijuana River Estuarine Research Reserve and Tijuana Slough National Wildlife Refuge. March 1999. California Department of Parks and Recreation, USFWS and NOAA. CONCUR Incorporated, 1832 2nd Street Berkeley, CA 94710.

---

14. Physical features of the site:
Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

- **Geology/Geomorphology and Soil Type/Salinity**

  The principal geological formations prevailing in TRNERR are quaternary and recent alluvial and slopewash deposits reaching depths of 40 meters. Sandstone, shales, and limestones underlie the unconsolidated deposits. Recent beach sand deposits occur along the shoreward length of the estuary. The lower valley is bound to the north, east, and south by sandstone and conglomerates that account for the mesa topography.

  Over the last 10 years, low marsh areas have had consistent mean soil salinities that range from 40 to 44 ppt (parts per thousand). High marsh areas appear to be more dependent on annual tide levels and weather patterns, causing the salinities to fluctuate from year to year. The mudflats at the estuary's mouth and lower parts of the estuary are occasionally covered by sands transported during storms from the beach. The saline Chino silt loams, considered highly erosive but suitable for agriculture, occur upstream from the flats. The fine sandy loams located in the southern portion of TRNERR blanket the mesas and terraces are also considered highly erosive and are contributing substantially to downstream sedimentation.

- **Origins – Natural or Artificial**

The Tijuana Estuary is located at the end of the Tijuana River Valley, where it meets the Pacific Ocean. The Tijuana River Valley is a historic river valley naturally formed by both ocean and riverine processes over long periods of time.

- **Hydrology**

Similar to many southern California rivers in the United States of America, annual stream flows of the Tijuana River can vary dramatically with observations representing variations from 10% to 400% mean annual flow. Mean annual discharges tend to be around .85 cubic meters per second (cms) with the largest recorded flow on record being 2,123.25 cms in 1916. Based upon records going back to 1973, the Tijuana River experiences low and high as frequently as intermediate class flows.

The Tijuana River has a highly variable year-to-year and month-to-month flow. The Tijuana River and its estuary is distinct from many of the other wetlands in the region in that it experiences many months with no flow, while other estuaries in the region generally experience year-round freshwater intrusion caused by recent and ongoing urban encroachment. For the most part, the Tijuana Estuary can be considered a

seasonally marine-dominated estuary experiencing fresh water input only during the "wet season" months of December through May during which flood events can occur. The input of freshwater into the estuary from the Tijuana River is controlled for the most part by four main structures: the Morena reservoir, the Barrett reservoir, the Rodriguez dam on Rio de las Palmas; and the newly created diversion structures in Tijuana that divert river water to sewage treatment plants located in the United States of America. However, these structures can be overwhelmed by large rain events, causing large volumes of fresh water to be discharged into the Tijuana River and ultimately into the estuary.

Despite low flows that occur frequently during the summer and winter months (aside from large rain events) the Tijuana River mouth located at the estuary has generally remained open throughout the year. The main river channel and northern channel at TRNERR are normally flushed by mixed, diurnal tides twice daily. This is considered a unique and important characteristic of TRNERR since all other estuaries in this region of southern California (such as San Elijo Lagoon, Bataquitos Lagoon, Agua Hediondo, Buena Vista Lagoon, and Los Penesquitos Lagoon) have diminished tidal exchange with repeated mouth closures. Unlike TRNERR, these other lagoons are bisected by highways and a railway system that impede water flows at the river mouth and it the tidal creeks further reducing the tidal prism promoting conditions for frequent mouth closures. However, TRNERR has still experienced human generated impacts (i.e. sedimentation) that have caused an overall loss of 80% of its diurnal tidal prisms[1]. Many of the current management efforts at TRNERR have focused on restoring this tidal marsh.

- **Water Chemistry and Quality**

Water chemistry in the open water channels of TRNERR is similar, under normal conditions, to the chemical composition of the ocean because of the small volumes of freshwater discharged from the Tijuana River during the spring, summer and fall. During the winter, rains and releases from upstream storage and water treatment facilities can reduce the salinity in the estuary.

Deteriorated water quality represents a significant problem for the TRNERR, especially in the river channel and along the ocean beach, and has necessitated short-term closure of parts of the TRNERR for public health and safety. While measures (e.g. construction of the International Wastewater Treatment Plant, artificial diversions of the Tijuana River during low flows to sewage treatment plants using offshore outfalls) have been taken to reduce sewage input into the estuary from the Tijuana River and adjacent coastal waters, large sewage discharges still impact the estuary. Generally these discharges occur during and shortly after large storm events that tend to overwhelm sewage treatment plants that are forced to release sewage laden waters directly into the river and estuary. Sewage discharges into the river and estuary also occur due to failures at sewage pump stations and their associated pipelines, as well as failures in Mexico's conveyance station all located within the watershed. Effects of the sewage discharges on the estuary have not yet been fully investigated and have been difficult to evaluate due to two other environmental problems caused by urban encroachment. These problems are: heavy siltation and excessive amounts of fresh water following large rain events.

- **Water Depths and Permanence**

Water depths and permanence in the estuary's tidal channels depend mostly on tidal variations from the Pacific Ocean. Depths in the estuary's tidal channels depend mostly on tidal variations from the Pacific Ocean. Depths in the estuary's channels average approximately 1.8 meters and can range from 1.2-1.8 meters at low tides and up to 3.2 meters during high tides.

- **Fluctuations in Water Level/Tidal Variations**

Once again, fluctuations in water level within the estuary at TRNERR are dependent mostly upon tidal variations caused by the diurnal tides of the Pacific Ocean in this region. Tidal variations range from –.85 meters to +2.35 meters (relative to sea level) for a total variation of approximately 3 meters overall.

- **Downstream area**

[1] The volume of water that flows in and out of an area between higher high tide and lower low tide

None, the Tijuana River discharges into the Pacific Ocean once it passes through the estuary at TRNERR.

- **Climate**

Weather conditions at TRNERR can be characterized as typical of a Mediterranean climate. Annual rainfall averages nine to ten inches (228-254 mm) with a majority of this rainfall occurring during January through March. Recent studies at TRNERR and its watershed have shown that the amounts and times of rainfall and stream flow in the entire watershed are more important for estuarine dynamics than total precipitation. Average temperatures reach annual lows of 52 degrees Fahrenheit (11 degrees Celsius) in the winter months and rise to 68 degrees Fahrenheit (20 degrees Celsius) in July. Prevailing winds generally come from the northwest in winter and the southwest in the summer.

15. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The estuary at TRNERR receives freshwater flows from the Tijuana River that receives drainage from a 4,483 square-kilometer watershed of which 73% lies within Mexico.

The Tijuana River has played a major role in the geomorphology of the Tijuana Valley. Originating at the confluence of Arroyo del Alamar and Rio de las Palmas in Mexico, the Tijuana River is an ephemeral stream draining a 4,483 square-kilometer watershed of which 73% lies within Mexico. The lower Tijuana Valley, where TRNERR is located, is a relatively wide and flat area confined to the south by high mesas and to the north by steep-sloped terraces. Several narrow canyons also drain to the lower valley.

The climate is Mediterranean. The soil types are sand and clay.

---

16. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

- TRNERR experiences a high level of ground water recharge, as evidenced by the presence of willows along the river valley.
- Flood control is relatively high due to the wide flood plain present at TRNERR that absorbs large flows from the Tijuana River. Furthermore, these large flows tend to be accelerated by the concrete channel in Mexico that directs the Tijuana River into the estuary. In the mid 1970's the U.S. Army Corps of Engineers constructed a dissipater system at the international border to decrease water flow velocity by distributing it over a large area, thereby allowing the river to conform to its natural course.
- TRNERR traps large volumes of sediment that can vary from 100,000 – 1,000,000 cubic meters annually.
- Shoreline stabilization at TRNERR is influenced by a large alluvial fan to the ocean that replenishes sand along the beach. Furthermore, there is a dunal system present at TRNERR that stabilizes the shoreline, replenishes sand along the beach and serves as a buffer zone between the ocean and the estuary, protecting the estuary from overwash caused by storm generated surge and swells.

---

17. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:
List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

H; F; E; G; N; Tp; Ts.

---

18. General ecological features:
Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

The tidal flushing of the Tijuana Estuary maintains a variety of habitats, which in turn support a broad range of organisms. The Estuary's vegetation communities were important in the designation of the Reserve. The vegetation communities of salt marshes in southern California are considered distinct from marshes north of Point Conception (the northern most point of this bioregion), including Elkhorn Slough, because of much more limited rainfall and hypersaline soils affecting plant growth rates and species composition. In addition to having regionally significant species, TRNERR includes most of the plant communities found in other southern California wetlands. The following coastal habitats and vegetation types can be found at TRNERR:

Habitats at TRNERR:

- **Sand dunes and beaches:** Sand dunes and beaches represent about 32.4 hectares of the total Reserve area. Sand deposits are continually shifted during floods and ocean storms, thus creating relatively unstable habitat. In recent years, the dune system has become unstable, allowing sand to be blown into the tidal channels.
- **Open tidal channels and mudflats:** The estuary includes 40.5 – 60 hectares of open-water channels. Sand, silty clay, and mixed substrates create a variety of subtidal habitats and intertidal mudflats.
- **Salt marshes:** Salt marshes represent 166 hectares of the total area of the Reserve. Of the 166 hectares, 27 hectares are classified as "low marsh," 54 hectares as "middle marsh," and 85 hectares as "high marsh."
- **Fresh-brackish marsh:** Freshwater brackish marshes occur throughout the Reserve and are dominated by bulrushes and cattails.
- **Riparian habitats:** The riparian areas of the Reserve cover approximately 162 hectares. These encompass the entire span of habitats upstream from mean high tide, including freshwater marshes and upland areas.
- **Coastal sage scrub:** The bluffs adjacent to the international border along the southern boundary of the Reserve are classified as coastal sage scrub. This community is considered sensitive habitat throughout San Diego County and Southern California.
- **Vernal Pools:** A few small vernal pools can be found in the Reserve. These shallow pools, which hold a few inches of water during the wet months, host San Diego fairy shrimp, a federally endangered species.

Main Vegetation Types At TRNERR

- **Cordgrass and Succulents:** Cordgrass (*Spartina foliosa*) forms robust stands along tidal channels in the northern reaches of the Reserve. Large stands of this species are rare in the other more disturbed southern California wetlands. Significant efforts have been made to artificially germinate this species due to its importance as habitat for the federally endangered Light-footed clapper rail. Above the cordgrass-dominated community are found several succulents, including the annual pickleweed (*Salicornia bigelovii*) and saltwort (*Batis maritime*) as dominants, and pickleweed (*Salicornia virginica*) and sea blite (*Suaeda californica*). At higher elevations, these succulents grade into a dense matted cover of shoregrass (*Monanthochloe littoralis*). At the highest elevations, another species of pickleweed (*Salicornia subterminalis*) becomes co-dominant with shoregrass.
- **Algal Mats:** The low-growing, open canopies of vascular plants in southern California marshes allow light penetration to the soil surface and subsequent development of lush algal mats. Filamentous blue-green and green algae and dozens of species of diatoms form mats up to one centimeter thick in most

soils and occur at all intertidal elevations. These algal mats have been studied at TRNERR since the 1970's and have been found to be as productive as the overstorey salt marsh plants and play a more important role as a food source in the estuarine food chain.

- **Coastal Sage Scrub Communities:** As mentioned above, TRNERR contains coastal sage scrub habitat on the southern boundary of the Reserve. This type of habitat is comprised mostly of *Eriogonum, Rhus laurine, Rhus integrifolia, Baccharis consanguinea, Artemisia californica, Lotus scoparius, Encelia farinosa*, and *Simmondsia chinensia* in varying combinations.
- **Mulefat (*Baccharis viminea*):** Mulefat can be found within the upland habitat of the Reserve. In the northeastern and southern regions of the Reserve, mulefat is the dominant plant species. In other areas of upland habitat at the Reserve, mulefat can be found in mixed plant communities, along with *Juncus* and *Haplopappus venetus*, *Salix*, and *Tamarix*.

Invasive Plant Species

- **Grasses:** Dominant exotic grasses present at TRNERR are of the *Avena* and *Bromus* species and located in parts of the northern region of the estuary, as well as within the center of the Reserve.
- **Tamarisk:** Invasive, non-native. Tends to invade high marsh and upland areas and there is concern that it could move further into the marsh because of its high tolerance to salt. We are currently conducting a technical removal of the species from the habitat.

---

19. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

- **Salt marsh Bird's Beak *(Cordylanthus maritimus):*** Salt marsh bird's beak was once a common plant of the upper marsh but is now listed as endangered under the Federal Endangered Species Act. Filling and destruction of upper marsh habitat in Californian estuaries are considered major factors in contributing to this plant's endangered status. At TRNERR, salt marsh bird's beak occurs near areas with slightly disturbed soil surface, such as along the edges of paths and roads, sparsely vegetated openings and depressions.
- **Cordgrass *(Spartina foliosa):*** Cordgrass can be considered biogegraphically important since large stands of this species are rare in the other more disturbed southern California wetlands. Furthermore, cordgrass serves as the favored habitat, especially when it exists in large stands, for the federally endangered Light-footed clapper rail (*Rallus longirostris levipes*).
- **Pickleweed (*Salicornia virginica*):** While this type of flora is not rare to salt marsh lagoons in this region, it does serve as the favored nesting habitat for the (state listed) threatened Belding savannah sparrow.
- **Mulefat (*Baccharis viminea*):** While this type of flora is not rare to salt marsh lagoons in this region, it does serve as a favored nesting habitat for the federally endangered Least Bell's Vireo.
- **Willow (*Salix spp.*):** While this type of flora is not rare to salt marsh lagoons in this region, it does serve as a favored nesting habitat for the federally endangered Least Bell's Vireo.

---

20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Bird populations have been an important factor in the special protective status attributed to the Tijuana Estuary at TRNERR. TRNERR is home to over 370 bird species that use the wide array of habitats present in the lower and upper estuary, including the ocean beach and dunes, mudflats, mud banks, salt marshes and riparian areas. Furthermore, TRNERR is located along the Pacific flyway and is used for migration and wintering habitat for a variety of waterfowl and shorebirds. Wintering waterfowl include pintail (*Anas acuta*), cinnamon teal (*Anas cyanoptere*), American wigeon (*Anas americana*), surf scoter (*Melanitta perspicillata*) and ruddy duck (*Oxyura jamaicensis*). The Reserve's wetlands are important habitats for a large number of shorebirds that account for the majority of the migratory bird population. While

about 20 species occur regularly along the mudflats of the estuary, four species (i.e. Willet (*Catoptrophorus semipalmatus*), Dowitcher (*Limnodromus griseus*), Western sandpiper (*Calidris mauri*), and Marbled godwit (*Limosa fedoa*) account for most of the shorebird population throughout the year. Abundance and species composition of the migratory birds fluctuate seasonally. Intertidal sand and mudflats support the largest numbers of individuals and species.

Endangered/Threatened Birds at TRNERR

- **Brown pelican (*Pelecanus occidentalis*):** The brown pelican is listed as federally endangered and recent counts recording 747 individuals countywide. While the Brown pelican resides in TRNERR, exact counts specific to TRNERR are currently not available since this species of bird tends to move up and down the coastline of southern San Diego throughout the day.
- **California least tern (*Sterna antillarum browni*):** The California least tern is federally endangered with a total of 303 nests reported in TRNERR. Fences and temporary enclosures have been built to protect the nesting areas since nests and fledglings are vulnerable to vehicle, horse, and foot traffic on the beach.
- **Least Bell's vireo (*Vireo bellii pusillus*):** Also listed as federally endangered, the least Bell's vireo nests in the riparian vegetation adjacent to intermittent streams and channels of the Tijuana River. Willow thickets are the main territorial sites both in the southern and eastern portions of the Reserve with approximately 54 least Bell's vireo nests in the Reserve.
- **Light-footed clapper rail (*Rallus longirostris levipes*):** The listing of the light-footed clapper rail as federally endangered is associated with the encroachment and destruction of coastal salt marshes and the fragmentation of salt-mash habitats (e.g. cordgrass). Recent censuses indicate that the entire population of this subspecies within the United States of America may be as low as 325. 77 pairs of light-footed clapper rail have been recorded at TRNERR, making it the second largest population of this endangered species in the United States of America.
- **Western snowy plover (*Charadrius alexandrinus nivosus*):** The coastal population of the Western snowy plover is federally endangered with a small number recorded at TRNERR. The western snowy plover tend to nest within dune system and at the mouth of the estuary from mid-March to mid-September. Peak nesting season occurs from April through June with annual nests counts ranging from 11 to 15 nests within the Reserve. Successful nesting, formerly reduced by trampling by undocumented immigrant traffic, is now limited primarily by avian predators.
- **Southwestern willow flycatcher (*Empidonax traillii extimus*):** The southwestern willow flycathcher is also listed as federally endangered and resides at TRNERR. While this species is present at TRNERR, no counts were available.
- **Belding's savannah sparrow (*Passerculus sandwichensis beldingi*):** The State listed Belding's savannah sparrow uses the higher salt marsh habitats, particularly pickleweed communities, for nesting with nesting occurring anywhere from March to August. With incomplete coverage in the survey in the southern portion of the Reserve, 250 pairs of sparrows were found. The long breeding season of this species, coupled with its sensitivity to disturbance, requires that human activities in the upper marsh be restricted for most of the year to avoid further declines in the population.

Regionally/Locally Rare Species

- Elegant tern (*Sterna elegans*)
- Black skimmer (*Rhynchops niger*)
- Northern harrier (*Circus cyaneus*)

FISH

The small tidal creeks and channels of the estuary support a relatively diverse population of fish including 29 species representing 19 families. For the past 15 years, fish assemblages have been sampled in the estuary at TRNERR and often include by topsmelt (*Atherinops affinis*), longjaw mudsucker (*Gillichthys mirabilis*), arrow goby (*Clevelendia ios*) and the California killifish (*Fundulus parvipinnis*). Adult striped mullet (*Mugul cepalus*) are also common. Abundance varies widely from year to year, but total density peaks in the summer and declines in the winter.

Commercially Important Fish
The tidal channels at TNERR function as a nursery for important recreational fish, such as the diamond turbot (*Hypsopsetta guttulata)* and the California halibut (*Paralichthys californicus*), as well as the croaker family, topsmelt (*Atherinops affinis*), and northern anchovy (*Engraulis mordax*). Other game fish that have been found in the estuary include: kelp bass (*Paralabrax clathratus*), sand bass (*Paralabrax maculatofasciatus*), opaleye (*Girella nigricans*), and white croaker (*Genyonemus lineatus*). While these fish species are not harvested commercially, they are fished recreationally offshore by both private and commercial recreational fishing boats.

---

21. Social and cultural values:
e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

SOCIAL VALUES
TRNERR provides several social values with regard to public use that involve: environmental education, interpretive programs, special events, recreation (e.g. wildlife observation, foot trails, equestrian trails, beach use, surfing and photography), and scientific research. More detailed explanation of these services can be found in sections 25-27.

CULTURAL VALUES
A number of historical and archaeological sites exist in the Reserve.

Archeological Sites: Archaeological sites are prevalent within the TRNERR due in most part the presence of a year-round freshwater source, ample food availability (e.g. shellfish, fish), the presence of meta-volcanic rocks that were ideal for tool making, and fertile soil. Many of these sites are considered to be in premier condition and tend to be located mostly in the coastal shore, near the estuary and within the nearby uplands. Sites identified in the Reserve indicate past use by the San Dieguito, La Jolla, and Yuman cultural groups.

Identified sites in Goat Canyon and Otay Mesa, located within the Reserve, include a 4,000-year-old shell midden site in excellent condition, prehistoric quarries where stone was collected for the production of tools and a habitation site. These sites show a range of human activities from thousands of years ago and are considered the best example of prehistoric lagoon occupation for this time period. Interpretive value of this shell midden is very high as it can be used to discuss the range of biological life, prehistoric occupation at a coastal lagoon and prehistoric occupation across southern California. Other culturally valuable areas located within the Reserve can be found at Lichty and Monument Mesa, considered one of the premier unexcavated sites in San Diego County.

TRNERR also encompasses many recorded paleontological localities associated with two fossil-containing formations: the San Diego Formation and an unnamed Pleistocene terrace deposits. The most significant aspect of these paleontological sites is the excellent preservation of the fossils. This is especially true for fossils from the San Diego Formation, preserved in original shell material, with some forms even retaining color. Another significant aspect of these sites is that they are still available for field studies. This contrasts with other sites in the San Diego area that have either been covered over or completely destroyed by urban encroachment and development. The San Diego Formation also has a high potential for yielding important remains of fossil marine vertebrates, especially marine mammals of which not much is known.

Historical Sites: Located within the TNERR, Smuggler's Gulch has served as a historical entrance to California from Northern Baja California Mexico for indigenous peoples and both the Spanish soldiers and missionaries.

---

22. Land tenure/ownership:
(a) within the Ramsar site:

TRNERR is primarily owned by the California State Department of Parks and Recreation (DPR), the United States Fish and Wildlife Service (USFW) and the United States Navy. Other parcels of the Reserve are owned by the City of San Diego, the County of San Diego, and the International Boundary Water Commission.

(b) in the surrounding area:
TRNERR is bordered to the north by the City of Imperial Beach; to the east by the City of Chula Vista and County of San Diego; and to the south by Baja California Mexico.

---

23. Current land (including water) use:
(a) within the Ramsar site:
The current land use at TRNERR consists of: the National Research Reserve, administered by DPR and the National Wildlife Refuge, administered by USFW. Large sections of TRNERR are fenced off for protection of critical habitat and restoration efforts. However, there also exist established trails within the Reserve for use by the public and private landowners present within the Reserve. These trails are used for hiking, viewing of natural wildlife and vegetation and equestrian use. Agriculture, irrigation, water use for industrial and urban use, fishing, aquaculture and hunting are not permitted within the Reserve.

(b) in the surroundings/catchment:
Land use in the surrounding area consists of a U.S. Navy landing field and both coastal and urban use.

---

24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:
(a) within the Ramsar site:

- Border Patrol: Authorized by the President of the United Sates, "Operation Gatekeeper" has resulted in numerous impacts to TRNERR. Operation Gatekeeper was enacted to tighten illegal traffic along the border between the United States of America and Mexico. This has resulted in the construction of a border fence, intensive lighting of the border area, and a series of dirt roads running along the fence and its immediate environs. These roads accommodate Border Patrol off-road vehicles and exacerbate sedimentation, water quality issues, degradation and fragmentation of habitat; and contributed to the disturbance of resident wildlife due to the bright lights and noise associated with vehicle traffic in the immediate border fence vicinity.

(b) in the surrounding area:

- Sediment Flows: Large sediment flows from the unvegetated hillsides located on the United States and Mexican side of the border contribute to the largest negative impacts to TRNERR. Even the smallest rain events contribute to significant sediment flows that eventually deposit themselves in TRNERR. Such flows lead to habitat degradation and/or loss and impede restoration/enhancement efforts in the model marsh located within the Reserve.
- Urban Encroachment: Urban encroachment from the cities of Imperial Beach (U.S.A.), San Diego (U.S.A.), Chula Vista (U.S.A.) and Tijuana (Mexico) also contributes heavily to adverse impacts to TRNERR. Impacts to the Reserve by urban encroachment include: erosion and sedimentation; accelerated fresh water runoff associated with hardscaping (i.e. paved surfaces); pollution; introduction of exotic species (such tamarisk, giant weed arundo; castor bean; iceplant); and predation by both feral animals and house pets (e.g. cats).
- Isolation From Surrounding Habitat: Currently there are no wildlife corridors that connect TRNERR with surrounding habitat and open space. This limits genetic diversity within animal species that reside year round within the Reserve and could contribute to significant declines in local species. Furthermore, there also is a lack of buffer zones that effectively separate the Reserve from bordering urban development.

---

25. Conservation measures taken:
List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

There have been several conservation measures taken at TRNERR.

- Critical Habitat Designation: Established in 1982, over 95% of TRNERR is dedicated as critical/sensitive habitat that includes the Tijuana Slough National Wildlife Refuge (NWR). Established in 1980 under the U.S. Endangered Species Act, NWR is comprised of 428 hectares and is a federally recognized protected area administered by the USFWS. Most of this critical habitat is surrounded by fencing for protection and monitored by both USFWS and Department of Parks and Recreation staff. In 1986, the first draft of the Tijuana River Comprehensive Management Plan was certified to provide a seamless management document and encourage interagency coordination and management between DPR and USFWS at TRNERR and NWR, as well as with members of the management authority.
- TETRP (Model Marsh): Located within the Reserve, the Tijuana Estuary Tidal Restoration Program (TETRP) is a multi-phased restoration program designed to restore tidal exchange and wetland habitats at TRNERR. The initial phase, termed the Oneota Tidal Linkage, was implemented in 1997 and consisted of an .8-hectare restoration of a tidal channel constructed in the northern arm of the estuary. The second phase of TETRP (i.e. TETRP-1) occurred in 1999-2000 and consisted of a 8 hectare Model Marsh Project that was constructed in an area of former salt marsh that had filled through a series of natural and human-made events (e.g. sedimentation from nearby unvegetated hillsides). Approximately 8,495 cubic meters of soil was excavated to create a now-thriving marsh plain with tidal channels. The final phase of TETRP (i.e. TETRP-2) is currently under planning.
- Goat Canyon Quarry Restoration: Soil from the Model Marsh excavation was used to reconstruct an abandoned quarry. The surrounding slopes have been revegetated with native coastal upland species. Furthermore, there is an invasive plant identification and removal program coupled with the revegetation program. Both of these programs are part of the TRNERR monitoring and research program.
- Tijuana River Comprehensive Management Plan: Management of TRNERR is governed by the Tijuana River Comprehensive Management Plan that provides a guideline for management needs and priorities, as well as mechanisms for agency interaction. First certified in 1986, this management plan is revised by the management authority every six years to update management needs and priorities with the latest updated version due in 2004. This plan also outlines the monitoring activities (e.g. water quality) that occur in the Reserve.
- Coastal Training Program (CTP): The CTP offers a systematic approach that inventories current programs, determines training needs, and offers an opportunity for partnership and collaboration between agencies/organizations, local governments and Tribes, and educational institutions. The goal of the CTP is to improve decision-making related to coastal resource management at local and regional levels. The objectives of the CTP are to: provide the best available science-based information, tools, and techniques to those individuals and groups that are making important decisions regarding resources within coastal watershed, estuaries, and nearshore waters; increase networking and collaboration across sectors and disciplines related to coastal management issues in local and biogeographic areas; and increase understanding of the environmental, social and economic consequences of human activity within the coastal landscape.
- Invasives Program: Initiated in 2003, the Invasives Program was implemented in order to locate and characterize areas within the Reserve that are dominated by invasive species of vegetation (e.g. tamarisk) and to provide a methodology that will successfully remove these species from the Reserve and aid in the restoration of native plant species and habitats.

---

26. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

The following conservation measures are planned for the 2004-2009 edition of the Tijuana River Comprehensive Management Plan management plan:

- TETRP-2 (Model Marsh): Initiated in 2002, the final phase of the Model Marsh will increase the marsh by 80 hectare by removing non-native vegetation in the surrounding area and expanding tidal channels.
- Los Laurels Canyon: A joint project with Mexican government agencies and non-profits. The vision of this project is to reduce erosion from the canyon's hillsides and the subsequent sedimentation in

the Reserve. Furthermore, this project will include community participation on both sides of the border. The planning phase of project has been funded and a scope of work is currently being drafted.

- Goat Canyon Enhancement Project: Flood-borne sediment has buried more than twelve hectare of marsh since the mid-1980's. This project is currently in the permitting stage, with the construction of sediment retention basins, expected in 2004, to protect future projects in the TETRP restoration area that have been affected by large sediment flows from Mexico that flow through this canyon and into TRNERR.
- Matadero Canyon: This project will establish a conservation park on the Mexican side of the border in Tijuana to be used by local communities for recreation and to provide hands-on examples of resource management and conservation at work. This project is currently in the planning phase.

---

27. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

TRNERR has been an important research site for over 30 years, providing significant contributions to the understanding, protection, and restoration of local wetlands. As part of the National Estuarine Research Reserve System, scientific activities conducted at the Reserve increase overall knowledge of this coastal environment at a national level.

- TETRP-1 (Model Marsh): Described under question #23, TETRP provides the only example of a human-made/restored marsh system in southern California. TETRP allows wetland scientists an opportunity to investigate wetland restoration issues. Current research at TETRP is being conducted by scientists from the Pacific Estuarine Research Lab (PERL), the Scripps Institution of Oceanography, and the University of California, San Diego.
- Goat Canyon Quarry Restoration: Also described under question #23, the Goat Canyon Quarry Restoration project provides scientists with an example of a restoration effort that includes reconstructed slopes and revegetation. In 2001, a five-year monitoring and maintenance program was established to assure that the reconstructed slopes will remain stable and the habitat successful.
- Wetlab: TRNERR possesses an onsite wetlab that can be used by both local and visiting scientists to aid in their research and work at the Reserve. Furthermore, volunteers use the wetlab to study bacterial contamination of estuarine waters, contributing to the Reserve's mission to link community education with research. The construction of a larger wetlab is currently being planned in order to allow greater access to scientific equipment and resources and to provide short-term accommodations to visiting scientists.
- Ongoing PhD Worldwide Fellowship Program: Managed by the Reserve's Research Coordinator, TRNERR provides a fellowship program to scientists worldwide. This program provides access to onsite locations (e.g. the Model Marsh) within the Reserve, use of the onsite wetlab, coordination with ongoing research and monitoring efforts, and access to databanks kept at the Reserve.
- Field Station: Under the direction of Dr. Joy Zedler, PERL designated TRNERR as an auxillary field station in 1997 to be used to aid in the collection, sharing, and understanding of wetland restoration and environmental data in southern California.

---

28. Current conservation education:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Educational Facilities, Informational Booklets and Educational Potential

- Visitor Center: Designed by noted architect Rob Quigley and winner of a coveted Orchid award, the Visitor Center houses natural exhibits, an audio-visual room, a library and classroom space for the center's education program. The Visitor Center is used by more than 16,000 people a year that include local community members, tourists, recreational groups (e.g. Audubon Society) and local schools. Numerous informational booklets are available (in both English and Spanish) for free to all visitors. The Educational potential for the Reserve is extremely high for this region with binational outreach programs to complement the local outreach programs to local schools, community groups and graduate students worldwide. This potential will rise even further after the construction of an interpretive amphitheater next to the Visitor Center and the expansion of the onsite research facility.

Educational Programs and Services (descriptions of these programs and services available upon request)

- Jr. Rangers Program;
- Outreach to local schools (daily groups);
- Junior Lifeguard Program;
- Y.M.C.A.;
- Bird Watching Workshops/Walks; and
- Monthly Speaker Series.

---

29. Current recreation and tourism:
State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

TRNERR provides both recreation and tourism uses for the public with over 85,000 tourists visiting the Reserve annually. TRNERR provides the following for public recreation and tourism:

- ***Borderfield State Park.*** Borderfield State Park is located in the southwestern corner of the Reserve and provides public parking, access to the beach, bathrooms and cooking areas. This area is available all year and frequently used by families from both Tijuana, Mexico and from around the San Diego area, especially on the weekends. Sensitive habitats located near Borderfield State Park are fenced off and include signage to protect them from impacts associated with public use of this park.
- ***Interpretive Center.*** The Interpretive Center is located in northern portion of TRNERR and provides public parking, access to trails within the Reserve, and an interpretive museum that provides public education and resources with regard to the importance and value (e.g. endangered species, native species and habitat) of TRNERR. Bilingual (i.e. Spanish and English) staff lead workshops for local schools, community members and volunteer groups active in the Reserve and local communities, as well as to answer any questions concerning the Reserve.
- ***Established Trails.*** Established pedestrian and horseback riding trails exist throughout the Reserve and are maintained by TRNERR staff. TRNERR staff works to provide such access while limiting impacts to native habitats in the Reserve.
- ***Border Monument (#258).*** This monument marks the furthest southwest corner of the United States of America and is located at Borderfield State Park. This monument is listed separately as a valued resource for tourism, since many of the visitors to TRNERR come specifically to view this monument.

Planned facilities for TRNERR include the expansion of Borderfield State Park, the Interpretive Center, the construction of an outdoor amphitheater adjacent to the Interpretive Center and connecting established trails to the Oregon/Mexico Coastal Trail that is being proposed and constructed by the California Coastal Conservancy.

---

30. Jurisdiction:
Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

TRNERR is administered jointly by California State Department of Parks and Recreation (DPR) and the United States Fish and Wildlife Service (USFW). Other jurisdictional agencies include the United States Navy, the National Oceanic and Atmosphere Administration, the United States Border Patrol, the City of Imperial Beach, the City of San Diego, the County of San Diego, the California Coastal Commission, the California State Department of Fish & Game, and the International Boundary Water Commission, and Southwest Wetlands Interpretive Association (SWIA).

Many of the programs including education, research, a coastal training program, invasive plant control, the TETRP project, staff positions, and the visitor center are under joint management. The Reserve Manager from California Department of Parks and Recreation, the Refuge Manager from the US Fish and Wildlife Service and the Southwest Wetlands Interpretive Association, an NGO, co-operatively manage many of the programs and projects. These partnerships are essential in making operations seamless and efficient.

The strength of these commitments between agencies and NGO's are increasingly imperative to ensure funding and protection of the resource.

31. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Clay Phillips, Reserve Manager
The Tijuana Reserve Management Authority
301 Caspian Way
Imperial Beach, CA 91932
cphillip@parks.ca.gov

32. Bibliographical references:

scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

CONCUR, Inc. 1997. Comprehensive Management Plan for Tijuana River National Estuarine Research Reserve and Tijuana Slough National Wildlife Refuge. November 1997. 181 pp. + appendices. http://pacific.fws.gov/planning/tjs/chapter1.html

Coven, J.D. and J.B. Zedler. 1988. Nitrogen effects on Spartina foliosa and Salicornia virginica in the salt marsh at Tijuana Estuary, California. Wetlands 8:51-65.

Desmond, J.S., G.D. Williams, M. James, J.Johnson, J. Callaway, J. Zedler. 1999. Tijuana River National Estuarine Research Reserve: annual report on ecosystem monitoring. Report to NOAA National Ocean Service, Sanctuaries and Programs Division, January 1999. 31 pp. + figures.

Desmond, J.S., M. Cordery, K. Ward, J. West, and J. Zedler. 2000. Tijuana River National Estuarine Research Reserve: annual report on ecosystem monitoring. Report to NOAA National Ocean Service, Sanctuaries and Programs Division, January 2000. 30 pp. + figures.

IUCN 2004. *2004 IUCN Red List of Threatened Species.* < http://www.iucnredlist.org>.

Nordby, C.S. and J.B. Zedler. 1991. Responses of fish and macrobenthic assemblages to hydrologic disturbances in Tijuana Estuary and Los Peñasquitos Lagoon, California. Estuaries 14: 80-93.

PERL (Pacific Estuarine Research Laboratory). 1990. A manual for assessing restored and natural coastal wetlands with examples from southern California. California Sea Grant, Report NO. T-CSGCP-021, La Jolla, California.

Weis, D. A. 1999. Vertical accretion rates and heavy metal chronologies in wetland sediments of Tijuana Estuary. M.S. Thesis, San Diego State University, San Diego, CA.

West, J.M., M. Cordery, K.M. Ward, and J.B. Zedler. 2001a. Tijuana River National Estuarine Research: Annual Report on ecosystem monitoring. Report to NOAA National Ocean Service, Sanctuaries and Programs Division, January 2001. 28 pp. + figures.

West, J.M., M. Cordery, K.M. Ward, and J.B. Zedler. 2001b. Tijuana River National Estuarine Research: Annual Report on ecosystem monitoring conducted January 1 – June 30, 2001. Report to NOAA National Ocean Service, Sanctuaries and Programs Division, July 2001. 16 pp. + figures.

West, J.M., M. Cordery, S. Madon, J. Zedler. 2002. Tijuana River National Estuarine Research: Annual Report on ecosystem monitoring conducted July 1, 2001 – June 30, 2002. Report to NOAA National Ocean Service, Sanctuaries and Programs Division, July 2002. 23 pp. + figures.

Wetlands International. 2002. *Waterbird Population Estimates – Third Edition. Wetlands International Global Series No. 12*, Wageningen, The Netherlands

Willliams, G.D., E. Olsen, J. Desmond, D. Gibson, and J.B. Zedler. 1995. Ecosystem responses to changes in tidal and sewage flows into Tijuana Estuary. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C. 55 pp. + appendices.

Williams, G.D., J.M. West, and J.B. Zedler. 2001. Shifts in fish and invertebrate assemblages of two southern California estuaries during the 1997-98 El Niño event. Bulletin of the Southern California Academy of Sciences 100(3):212-237.

Zedler, J.B., and C.S. Nordby. 1986. The ecology of Tijuana Estuary, California: An estuarine profile. U.S. Fish and Wildlife Service Biological Report 85(7.5). 104 pp.

Zedler, J.B., C.S. Nordby, and T. Griswold. 1990. Linkages: Among estuarine habitats and with the watershed. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA Office of Coastal Resource Management, Marine and Estuarine Management Division. Washington D.C.

Zedler, J.B., C.S. Nordby, and B.E. Kus. 1992. The Ecology of Tijuana Estuary, California: A National Estuarine Research Reserve, NOAA Office of Coastal Resource Management, Sanctuaries and Reserves Division, Washington D.C.

Zedler, J.B., and R. Langis. 1991. Assessing the sources and loadings of pollutants affecting Tijuana Estuary. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA Office of Coastal Resource Management, Marine and Estuarine Management Division. Washington D.C.