

# CHAPTER FIVE: RESOURCE PROTECTION, MANAGEMENT, AND RESTORATION

## INTRODUCTION

The Tijuana River National Estuarine Research Reserve (NERR) Resource Protection, Management and Restoration programs provide coordinated, proactive responses to the unique opportunities and challenges to habitat protection the Reserve faces. The three sections of the plan -- protection, management, and restoration -- work in concert to meet a shared set of goals. The Resource Protection section first addresses state and federal laws directing the protection and preservation of the estuary and describes how those laws are implemented. In the Resource Management section, the current Reserve-specific management actions and needed improvements are described. The Restoration section describes the extensive opportunity and need for habitat restoration, the accomplishments to date, and the priorities for future restoration activities. The Plan of Action, which concludes the chapter, sets a course for enhanced protection and management of the Reserve's natural resources.

In keeping with the vision statement for this Management Plan, many of the protection, management, and restoration tasks emphasize improvements in the southern end of the Reserve. The proposed protection, management and restoration actions will substantially improve the quality of the resources and the experience of Reserve visitors.

The Tijuana River NERR Resource Protection, Management, and Restoration program will be periodically reviewed and revised in response to changing watershed conditions and as new habitat management opportunities emerge. All actions will be based on the best technical information available.

## I. MISSION

The Mission of the Resource Protection, Management, and Restoration Plan is:

**To preserve the Reserve's ecosystems and maintain the integrity of those ecosystems through informed action.**

## II. GOALS

The Tijuana River Resource Protection, Management, and Restoration Plan addresses past, present, and future conditions that have affected or can affect the integrity of the

estuarine ecosystem. The Resource Protection, Management and Restoration plan has four goals:

**Goal 1: Preserve, restore, enhance and protect habitats to maintain biodiversity, maintain important migratory bird resources, and aid in the recovery of threatened and endangered species** (Refuge goal).

Goal 2: Respond to identified problems, particularly those in the southern end of the Reserve, by establishing cooperative and integrated programs and approaches.

Goal 3: Monitor and assess land use activities within the watershed and attempt to influence practices to promote the health of the Reserve.

Goal 4: Complete acquisition of all parcels within the adopted Reserve boundary.

### **III. POLICIES**

#### **A. GENERAL SUPPORT AND POLICY GUIDANCE**

Because each of the agencies involved in the management of the Reserve must abide by its own laws and policies, the Management Authority cannot prescribe resource protection policy to the operating agencies. However, the Management Authority does provide an essential forum for liaison and coordination. The role of the Management Authority and its resource protection, management and restoration committee is to assist all the participating agencies to implement their policies in a coordinated fashion to achieve the goal of a seamless Reserve.

Through Management Authority action in preparation of this Management Plan, all participants agree that the public lands of the Tijuana River Estuary are set aside for long-term protection of significant estuarine and other natural and cultural resources. Low-intensity recreational, educational, and research uses of the area are permitted to the extent they are compatible with resource protection and Refuge purposes. The following tools will be employed, to enhance protection, management, and restoration of Reserve resources:

- The Conceptual Zoning Scheme established for the Reserve at its creation and reaffirmed as part of this plan will guide land-use decisions.
- An active and integrated law enforcement program will be employed. This includes actions ranging from preventative measures such as high visibility patrols, to aggressive action to investigate and convict violators.

- A coordinated public education program implemented through informal personal contacts, formal classes, signing, brochures, news releases and other outreach will inform the public about Reserve resources and requirements for their protection.
- Barriers including fences, posts, and cables will be employed as necessary, in addition to signing, to passively channelize public use and keep unauthorized people from entering environmentally sensitive areas.
- The efforts of U.S. Border Patrol are necessary to control undocumented immigration across the international border. These efforts should be employed in manner that does not damage resources.
- Adaptive management principles will be applied to managing the resources of the Reserve.
- Management Authority members will actively seek funding to complete habitat restoration of all Reserve habitats to ensure that the entire land base serves as viable habitat for native flora and fauna. This will include provisions for use of the Reserve as a site to mitigate off-site resource damage. Habitat restoration that mitigates for damage to other habitats may be conducted at the Reserve only as directed by the policy provided on in this chapter.
- Control of feral dogs and cats and wild exotic and alien species that prey on endangered wildlife will be controlled. Active management of native predator populations may also be required to protect endangered species. Invasive exotic plants degrade habitats and likewise require aggressive control efforts.
- All management activities, including siting of new buildings and other facilities are subject to environmental compliance review to ensure they do not unduly harm resources.
- Reserve management will cooperate with adjacent municipalities to resolve boundary-related issues in a manner that considers needs of infrastructure maintenance, neighbors' safety, and resource protection.
- Management of healthy, native habitats (located primarily on Refuge lands) will be accomplished primarily through preservation, with little active manipulation of vegetation or hydrology. Active habitat management techniques generally will be applied only to restore degraded ecological functions, protect endangered species, or control exotic species of plants and animals.

- Vector control is necessary to prevent mosquito-borne human disease. The Reserve places primary reliance on biological agents and seeks to minimize the use of chemical treatments.
- Land acquisition will be pursued to eliminate inholdings in public lands, acquire necessary buffers to rare habitats, and meet the restoration program needs.

## B. CONCEPTUAL ZONING SCHEME AND OVERALL LAND MANAGEMENT POLICIES

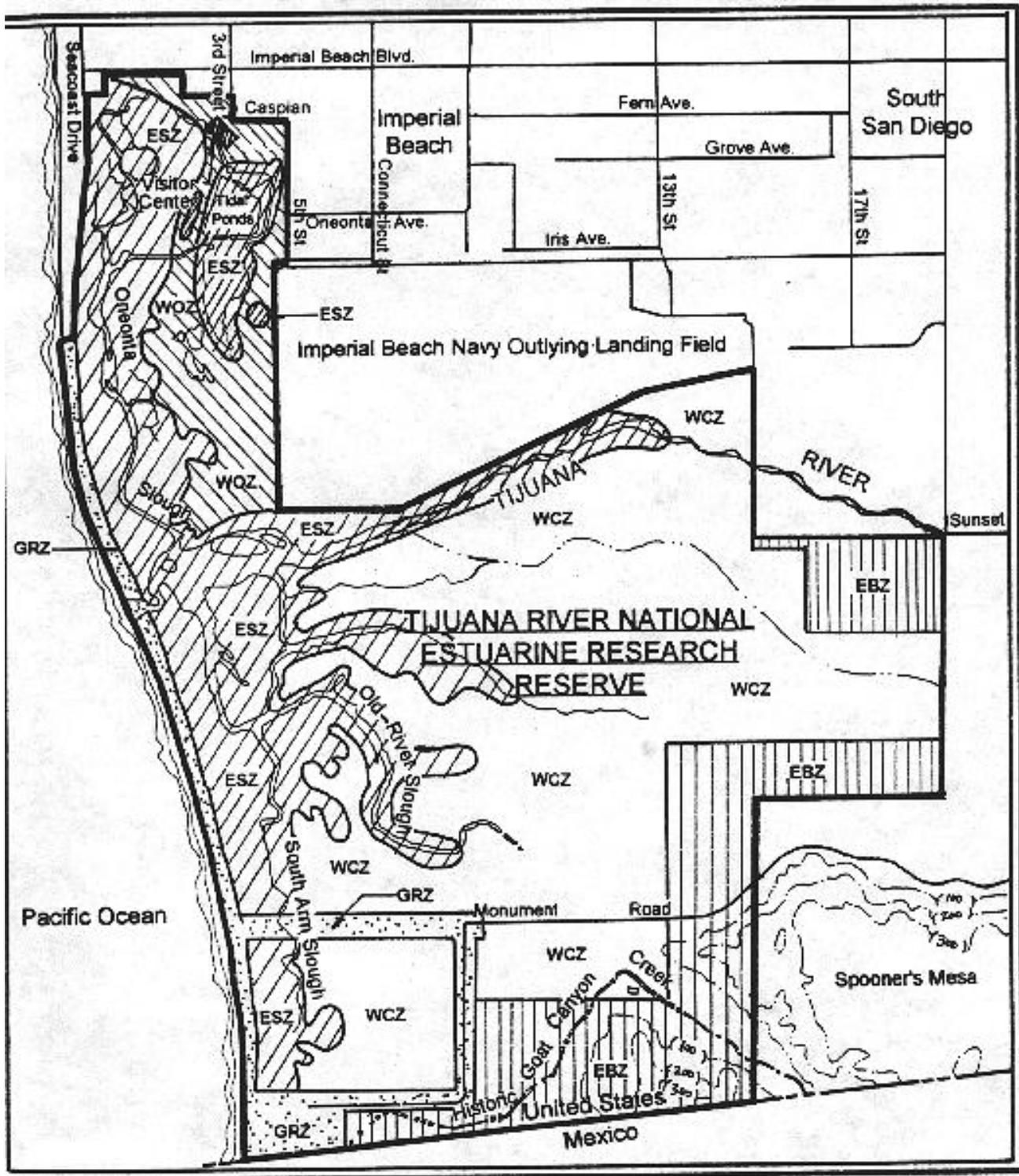
The conceptual zoning scheme has been prepared for the Reserve based on the sensitivity of natural resources. The zoning is periodically reviewed as new information is developed about the dynamic conditions within the Reserve. The Reserve geographic information system will be maintained and updated to store all information required to substantiate sensitivity classifications. The Reserve manager, the Refuge manager, and both Restoration and Research committees of the Management Authority all share responsibility for identifying necessary changes in the conceptual use zones. The public will be provided opportunities to comment on any proposed changes in access and public use.

Proposed changes in the zoning scheme are brought before the Management Authority for review and action as needed. Proposals for changing land uses within the Reserve will be reviewed by the Management Authority to ensure that they are consistent with the mission and goals of the Reserve and land-owning agencies. Program regulations acknowledge the value of secondary uses as long as the purposes for which the Research Reserve and Refuge were established are maintained. Changes in land uses are expected for the development of facilities which are integral to the Reserve's mission.

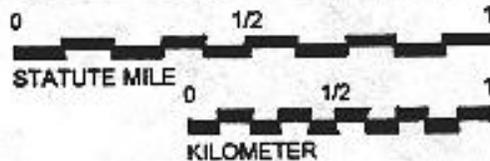
The zoning scheme within the Reserve includes five resource use zones:

- Endangered Species Protection/Preservation Zone (ESZ)
- Wetland/Wildlife Conservation Zone (WCZ)
- Wildlife Orientation/Interpretation Zone (WOZ)
- General Recreation Zone (GRZ)
- Ecological Buffer Zone (EBZ)

The zoning scheme assumes that uses will be most restricted and management will be aimed at protection in those areas that contain sensitive natural estuarine habitat and endangered or threatened species. Varying degrees of use and management will be allowed in other zones depending on the presence of disturbed habitat and existing uses. Zoning assignment for Reserve lands are shown in Figure 10. Provided below is a summary of the zoning scheme.



-  EBZ. Ecological Buffer Zone
-  ESZ. Endangered Species Protection/Preservation Zone
-  WCZ. Wetland/Wildlife Conservation Zone/Interpretation Zone
-  WQZ. Wildlife Orientation Zone
-  GRZ. General Recreation Zone



TRNERR CONCEPTUAL  
LAND USE ZONES  
FIGURE 10

**TABLE 4: Tijuana River NERR Resource Use Zones**

RESOURCE ZONE	DESCRIPTION
<u>Endangered Species Protection/ Preservation Zone</u>	Encompasses most of the lower estuary and includes the tidal channels, natural salt marsh habitat, and the back dunes. The main management objective of this zone is to maintain a natural and healthy estuarine ecosystem and one that can support the endangered species that are dependent on this habitat (the clapper rail, least tern, and salt marsh bird's beak are all inhabitants of this zone). Uses, future development, and management actions are limited to those activities directly contributing to resource protection and restoration.
<u>Wetland/Wildlife Conservation Zone</u>	Encompasses disturbed marsh and upland habitats that are immediately adjacent to the Endangered Species Protection/Preservation Zone. The main management objective in this zone is to maintain relatively natural conditions that can provide complementary habitat to endangered species and other wildlife, and to minimize any direct impacts on the Endangered Species Protection/ Preservation Zone. Since this zone includes several areas of disturbed estuarine and riverine habitat, more intensive management and wetland/upland enhancement and restoration is needed. Some public use is also allowed in this zone, mainly along pedestrian and equestrian trails.
<u>Wildlife Orientation/ Interpretation Zone</u>	Encompasses a northern section of the Reserve that has been identified as particularly appropriate for estuarine education and interpretation because of its location, history of disturbance, and access. The main purpose of this zone is to offer visitors an opportunity to see the estuary and learn about its resources while minimizing visitor-related impact.
<u>General Recreation Zone</u>	Encompasses parts of the Reserve that have been traditionally used for compatible coastal-related recreation and are set aside for such use in the future. This zone includes parts of the Border Field State Park and the intertidal beach immediately fronting the ocean (and not including the back dunes). Compatible recreational activities include horseback riding, hiking, picnicking, and a variety of beach uses. Temporary access restrictions may be employed if endangered species nest seaward of the dunes.
<u>Ecological Buffer Zone</u>	Encompasses both vacant and agricultural parcels under production in the eastern part of the Reserve and adjacent to the river corridor. The main objective of this zone is to provide a land use buffer between the sensitive habitats within the estuary and non-compatible land uses.

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The zoning scheme adopted in the 1986 Reserve Management Plan was reevaluated in 1997, and is retained in the current plan. A review of appropriate changes to the zoning scheme will be performed as part of the Goat Canyon Management Plan in the south end of the Reserve. Many facilities, including trails, have been developed according to this scheme, and the public is well informed and comfortable with the current zoning. It is important to recognize that the scheme was adopted when the primary endangered species of management concern were light-footed clapper rails and California least terns. Hence ESZ was restricted to salt marsh and dune habitats of those species. In the interim, least Bell's vireo and Critical Habitat for that species were listed in the Reserve. That habitat occurs in the WCZ and EBZ. Because existing public uses have proven compatible with the vireo, no extension of ESZ is planned.

Given San Diego County's biodiversity and continuing urbanization, it is likely that additional species will be listed in the future. It is possible that habitats of those species will include areas of the Reserve. That event will not automatically require revision of the conceptual zoning scheme. However, the Management Authority and operating agencies are aware that existing and proposed secondary uses may need to be reevaluated as habitat areas of endangered species change.

### C. POLICIES REGARDING THE USE OF TRNERR AS A MITIGATION SITE

Requests for mitigation activity within the Reserve will be considered by the Management Authority on a case-by-case basis. Projects will generally be evaluated for their compatibility with the Tijuana Estuary Tidal Restoration Program and ancillary support programs developed by the restoration committee of the Management Authority. Each proposal will be judged on whether it is appropriate in terms of existing Reserve policies, conceptual use zones, current conditions, and long-range restoration, research, public access and facilities development plans.

Priority is given to proposed restoration and/or mitigation projects as follows:

Priority 1:Habitat restoration with no connection to off-site activities.

Priority 2:Habitat restoration to satisfy damage assessment or penalty.

Priority 3:Compensatory mitigation.

An assessment of the environmental impact from which the mitigation arises will also be part of the Management Authority deliberation.

Land owning agencies maintain authority for decisions to accept mitigation funds for

activities on their lands. Actions by the Management Authority will be considered advisory and will be factored into the ultimate decision-making process by the land-owning agency along with pertinent agency policies and covenants. Actions involving lands that are deed-restricted due to public trustee requirements related to initial acquisition will be considered in accordance with the provisions established in the underlying deed.

#### **IV. EXISTING CONDITIONS AND PERCEIVED NEEDS**

##### **A. RESOURCE PROTECTION**

##### **1. Land Acquisition Status**

###### **a. Context for Land Acquisition**

The goal of the land acquisition program is to secure under public ownership all areas within the designated Reserve boundary, as shown in Figure 2. Land acquisition is coordinated by the California Coastal Conservancy and, in most cases, is carried out by the Coastal Conservancy in consultation with the Reserve Management Authority and NOAA. Funding has generally been provided by the Coastal Conservancy and NOAA on a state/Federal 50/50 cost-sharing basis. In periods of limited funding, important innovations have been and will continue to be undertaken to acquire properties. These purchases involve complex agreements between collaborating organizations in the public and nonprofit sectors and depend on multiple funding sources and creative acquisition approaches.

A land acquisition program was initiated with the designation of the Reserve in 1981 and outlined in the final environmental impact statement (FEIS) prepared at that time. The specific properties to be acquired and program priorities are periodically reconfirmed by the Management Authority. Since initiation of the program in 1986, 308 acres have been acquired, largely in a cooperative program carried out by the Coastal Conservancy and the City of San Diego. Approximately 73 acres remain in private ownership. Acquisition has been undertaken exclusively on a “willing seller” basis. Landowners are periodically contacted by member agencies of the Management Authority to determine their interest in selling.

None of the lands remaining in private ownership are within an approved NWR acquisition boundary. Additional planning documents would be required before FWS could pursue additional NWR acquisition.

###### **b. Assessment of Boundaries**

Reserve boundaries were initially delineated in the FEIS based on the following principles (Department of Commerce and California Coastal Commission, 1981):

- Encompass the critical habitats and resource features of Tijuana River Estuary; provide an "umbrella" for existing public ownership;
- Delineate Reserve boundaries in an area large enough to preclude direct threats of encroachment into critical habitat areas;
- Include enough of the watershed area for reasonable and consistent management of the immediate floodplain possible; and
- Facilitate reasonable public access and use of the site for research, education, and other compatible activities.

As new data has been acquired and the Reserve has developed experience with land management, a better understanding has been gained of the role and characteristics of buffer areas and the relationship between sensitive estuarine resources and upstream habitats and land uses. New information may indicate a need to change the existing Reserve boundaries, either to include new land areas or remove areas currently within the boundaries. The National Estuarine Research Reserve Program Regulations (15 CFR Part 921) acknowledge that boundary changes may be required. Opportunities for public comment will be provided in the event that changes proposed by the Reserve Management Authority are judged necessary by NOAA.

Criteria for including new land parcels not currently within Reserve boundaries include:

- Parcels include land classified as "Endangered Species Protection/Preservation Zone" or lie immediately adjacent to lands classified as such;
- Parcels are judged essential for implementing key aspects of the management plan (i.e., estuarine restoration, education, and research);
- Parcels are evaluated as having wildlife conservation value and are donated for National Estuarine Research Reserve purposes.

#### c. Priority Parcels

Land parcels not in public ownership are assessed and assigned one of three priority levels as part of the land acquisition program. The designations are as follows:

Priority 1: Parcels that include core wetland areas (i.e., lower, middle, and upper marsh communities, and tidal channels). These correspond roughly to parcels including areas classified as "Endangered Species Protection/Preservation Zone" and "Wetland/Wildlife Conservation Zone" in the conceptual land use zoning scheme.

Priority 2: Parcels that may include riparian habitat, salt pannes, brackish ponds, and upland coastal scrub and therefore have some wildlife value, or parcels that are of strategic importance for management because they provide critical access for restoration, interpretation and enforcement activities. These parcels may be classified as "Wildlife Orientation/Interpretation zone," "General Recreation zone," and "Ecological Buffer Zone" in the conceptual land use zoning scheme.

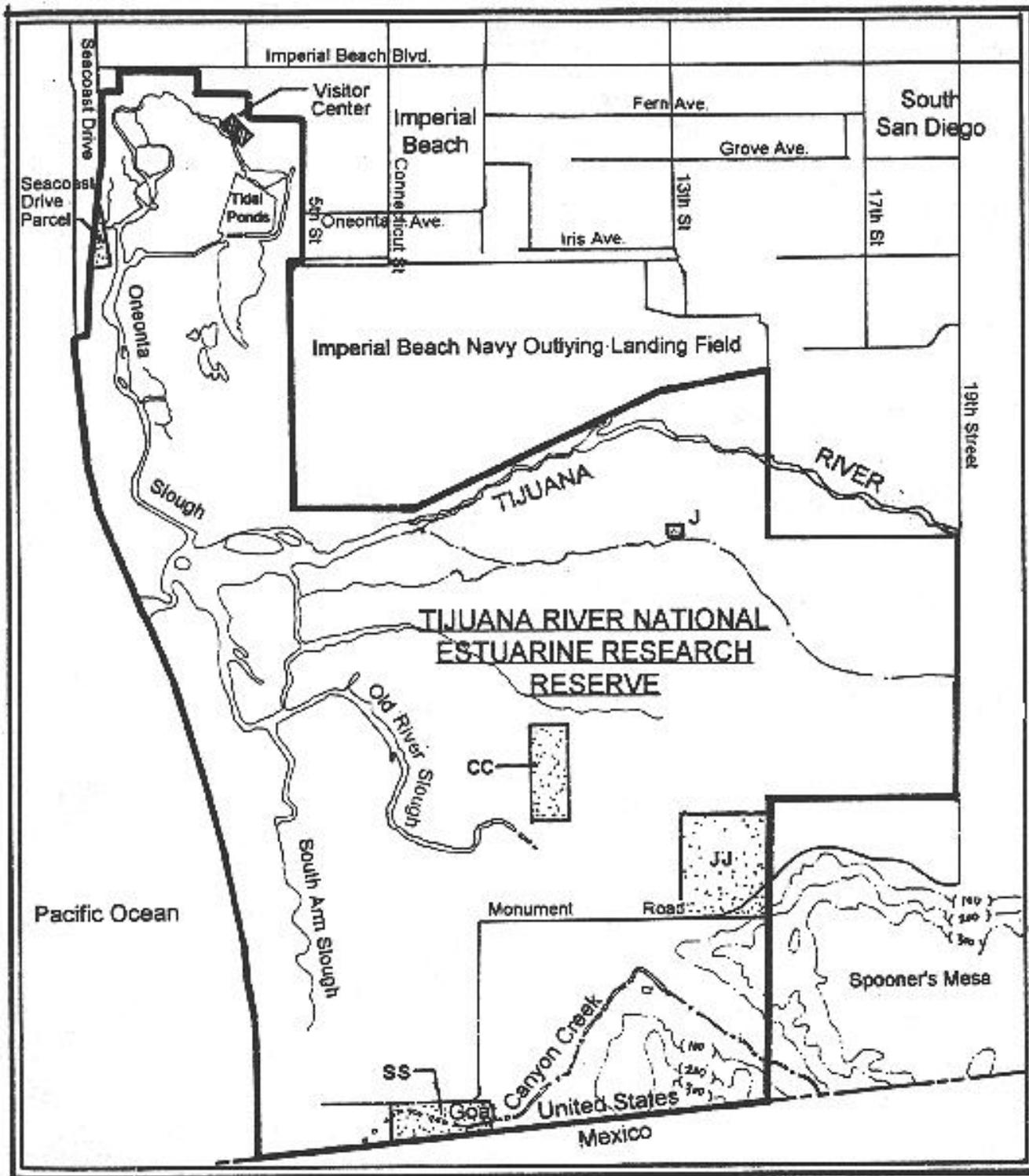
Priority 3: Parcels where there is a need to maintain current land uses that are compatible with Reserve objectives. These parcels are all classified as "Ecological Buffer Zone" in the conceptual land use zoning scheme.

The following parcels are the privately owned properties within the Reserve previously identified for acquisition and remaining in private ownership as of July of 1997. As of December, 1997 negotiations are underway to purchase one or more of the Seacoast Drive parcels. The purchase agreement will involve multiple funding sources. Lands not yet in public ownership are described in the following table.

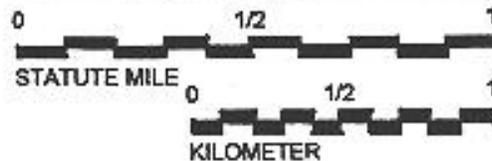
**TABLE 5: Lands Proposed for Acquisition by TRNERR**

<b>Property</b>	<b>Description</b>	<b>Land Use Zone</b>	<b>Priority</b>	<b>Acreage</b>
CC	Riparian scrub, vacant land	WCZ	1	20.34
Seacoast Dr. parcel-- APN#632-030-14	Oneonta Slough wetlands	ESZ	1	.13
Seacoast Dr. parcel--- APN#632-040-15	Oneonta Slough wetlands	ESZ	1	.13
Seacoast Dr. parcel -- APN#632-040-16	Filled Oneonta Slough wetlands	ESZ	1	1.25
JJ	Riparian scrub, vacant land	EBZ	2	39.83
SS	Vacant land on U.S. Mexico Border - includes several brackish ponds	EBZ	2	10.43
J	Small parcel on Sunset	WCZ	2	.79
<b>TOTAL</b>				<b>72.9</b>

The location of parcels proposed for purchase within the Reserve is shown in Figure 11.



Parcel	Acreage	Parcel	Acreage
J	0.79	SS	10.43
CC	20.34	JJ	39.83
		Seacoast Drive	
		# 632-030-14	0.13
		# 632-040-15	0.13
		# 632-040-16	1.25
		<b>TOTAL</b>	<b>72.90</b>



LOCATION OF PARCELS PROPOSED FOR PURCHASE WITHIN TRNERR

FIGURE 11

#### d. Consolidation of Land Ownership to Streamline Reserve Management

In 1996-1997 the Management Authority recognized the need to reduce the administrative complexity of planning for projects in the southern end of the Reserve. Projects are urgently needed to address progressive damage to natural resources, stormwater and sediment management, and public access problems in the vicinity of Goat Canyon.

In 1997, the Coastal Conservancy proposed a transfer of approximately 400 acres of highly degraded land owned by the City of San Diego to the California Department of Parks and Recreation (CDPR), Border Field State Park unit. Public agency staff and community interests tentatively reached agreement in spring of 1997 to transfer land. This transfer was formally approved in the summer of 1997 and the transaction was initiated. The subject land was originally purchased by the City with state and federal funds in a cooperative program as part of the creation of the Tijuana River NERR. The transfer of ownership occurs with no cost to either party.

## **2. Law Enforcement and Surveillance Activities**

### a. Existing Conditions

#### i. General

Law enforcement is necessary at Tijuana River NERR to protect natural resources, ensure public safety, and protect private and public property from criminal activity. Enforcement is a critical and essential part of Reserve and Refuge management. A unique enforcement issue at Tijuana River NERR is control of the international border and illegal entry into the United States.

Law enforcement at the Reserve is a joint responsibility of the land-owning agencies and the political jurisdictions in which the Reserve is located. Hence, there are a number of agencies with varying jurisdictions, authorities, and responsibilities related to law enforcement within the Reserve. This arrangement is positive in that many agencies are present and interested in protecting Reserve resources, visitors, and property. There are also obstacles due to different jurisdictions, incompatible communication systems, and non-standard agency policies and procedures.

#### ii. Responsible Agencies

Following is a listing of various law enforcement agencies within the Reserve and their general responsibilities.

**TABLE 6: Matrix of Law Enforcement Responsibilities at the Reserve**

LAW ENFORCEMENT AGENCY	RESPONSIBILITIES
California Department of Parks and Recreation	CDPR Rangers are responsible for patrol activities at Border Field State Park and enforcement of State Park Regulations codified in Title 14, State of California Code. State Park Rangers and Superintendents with law enforcement authority are Peace Officers of the State of California and, as such, have full police powers throughout the state, including all federal, city, and county lands in the Reserve.
U. S. Fish and Wildlife Service	<p>Some FWS employees assigned to Tijuana Slough NWR are law enforcement officers of the National Wildlife Refuge System. Refuge officers may be full-time law enforcement officers or dual-role employees with both enforcement and other duties. Both full-time and dual capacity refuge officers have identical authority and jurisdiction. Refuge Officers enforce Refuge regulations of Subchapter C, Title 50, Code of Federal Regulations, which apply only to Refuge lands. They are also able to enforce the Endangered Species Act, Migratory Bird Treaty Act, and other federal wildlife laws throughout the jurisdiction of the United States. However, at this time, Refuge officers of the Reserve have no state authority and cannot enforce state laws off-Refuge.</p> <p>Occasionally, special agents of the FWS Division of Law Enforcement may be detailed to work on special cases at the Reserve. Their legal authority is the same as Refuge officers.</p>
California Department of Fish and Game	State game wardens enforce wildlife regulations throughout the state. As California Peace Officers, they have full police power. However, no CDF&G officers are assigned full time to the Tijuana Valley, and their work there is generally on an on-call basis.
San Diego County Sheriff, and San Diego City Police	<p>The sheriff has the broadest authority of any enforcement officer, and sheriff's deputies have jurisdiction over all lands and all laws and regulations at the Reserve. The Sheriff's Department also provides police services for the City of Imperial Beach.</p> <p>The San Diego City Police are responsible for general law enforcement within the City of San Diego, including City owned areas of the Reserve.</p>

	Although the City Police and Sheriff's Department have full jurisdiction, they usually restrict active enforcement to general criminal activity and traffic, as opposed to natural resource type offenses. Sheriff's deputies regularly investigate general criminal activities such as larcenies and burglaries that occur in the Reserve headquarters area in Imperial Beach.
U. S. Border Patrol	<p>The Border Patrol of the U. S. Immigration and Naturalization Service is charged with controlling the borders of the United States, including apprehension of persons entering the country without proper authorization. Historically, the Reserve area has been a major avenue of illegal entry into the United States, and immigrant traffic has produced devastating impacts to the Reserve. The Border Patrol has a large presence in the Tijuana Valley. The success of Operation Gatekeeper in reducing foot traffic has been a recent major success for habitat preservation at the Reserve.</p> <p>Besides apprehending undocumented immigrants, the Border Patrol also deals with drug smugglers and other criminals entering the United States. The 24-hour-a-day presence of many Border Patrol agents, and their substantial transportation and communications capabilities, make them an integral part of the Reserve law enforcement community. In the Reserve, the Border Patrol uses a network of roads constructed to assist in surveillance.</p>
San Diego County, Dept. of Parks and Recreation	San Diego County Park Rangers patrol County Parks, including county lands in the Reserve, to enforce Park Regulations. County Park Rangers cannot make arrest or issue citations.

iii. Memorandum of Understanding:

In August 1996, a Memorandum of Understanding for Interagency Joint Response Law Enforcement was drafted by a Law Enforcement Committee of the Management Authority. The draft is prepared for participation by: Border Patrol, FWS, CDPR, San Diego City Police Department, San Diego County Sheriff, and San Diego County Department of Parks and Recreation. The agreement has not been finalized or signed.

b. Perceived Needs in Law Enforcement

The following activities have been identified as necessary to implement a successful, sustainable law enforcement program at Tijuana River NERR:

- The MOU for Interagency Law Enforcement support needs to be completed and signed by participating agencies.
- FWS needs to hire a full-time enforcement officer to work at Tijuana River NERR.
- FWS needs to acquire state authority for Refuge officers. This could come from CDPR, California Department of Fish and Game, or from the Sheriff. Without state authority, Refuge officers have inadequate jurisdiction to fully participate in resource protection throughout the Reserve.
- The Law Enforcement subcommittee of the Management Authority needs to resume its work in this area until the following tasks are accomplished:

The MOU is signed;

All participants have the necessary authority to function in a "seamless Reserve";

Standard procedures for interagency communications are developed and adopted by all cooperating agencies.

- Once FWS has a full-time officer, the operating agencies' patrol and surveillance program should be better coordinated by the Reserve manager and Refuge manager.
- The operating agencies (FWS and CDPR) need to coordinate more closely with other agencies, especially the Sheriff's Department and Border Patrol.
- A Reserve-wide system for reporting violations and apprehensions needs to be developed for statistical and management action purposes, with annual reports generated to inform the Management Authority of enforcement issues, problems, and accomplishments. Each agency currently maintains separate records systems. Those will remain intact, but a joint reporting system is also needed.

### **3. Construction of Fences and Barriers**

Physical barriers are used or needed in various locations in the Reserve to direct, control, or prevent human use that might damage natural resources. Barriers include wire fences, timber and rock barriers, and planted vegetation. Efforts are made to harmonize fence and barrier design with the natural environment and associated structures.

Temporary barriers are periodically needed at construction sites and in areas where access must be restricted to establish vegetation or protect sensitive species. Efforts will

be made in the design and use of materials to harmonize with the natural environment. An exception is made where public safety or resource protection calls for use of bright colors or particular materials. All temporary barriers will be removed at the earliest possible time to prevent unnecessary visual impact.

A fence has been constructed by the United States government at the international border in an effort to control cross-border travel. Proposals have been made to change the design of the fence to improve effectiveness. Land owning agencies within the Reserve should receive notice of proposals for any changes at the international border. Any proposed change and associated mitigation efforts should be considered by the Management Authority for review in relation to Reserve policies.

#### **4. Cross-Border Resource Damage and Immigration Enforcement**

Illegal cross-border foot traffic has resulted in erosion of upland soils, trampling of sensitive upland, dune, and wetland vegetation, and direct loss of listed threatened and endangered species. Control of foot traffic from Mexico, in addition to control of foot traffic and equestrian use by legal visitors to the Reserve, is essential to the Reserve's resource protection effort.

Border policing efforts in the mid-1990's resulted in a major increase of 4-wheel-drive vehicle use in the Reserve for border surveillance and migrant apprehension. Secondary roads and informal trails within the Reserve have been improved to facilitate policing. The U.S. Border Patrol has proposed additional roads to accommodate patrol vehicles both in the immediate area of the border and in riparian and wetland areas to the north.

The operating agencies are working with Border Patrol to assure that agents minimize off-road travel. Road construction and off-road vehicle use is a major source of soil loss through erosion. This cycle of erosion and sedimentation is largely responsible for the extensive loss of wetlands in the southern portion of the Reserve. A review of additional access required for border policing is needed as part of a comprehensive public access and facilities assessment for the south end of the Reserve. This assessment must necessarily be integrated with plans for sediment and erosion control and habitat restoration for degraded parcels in the same area.

#### **5. Illegal Dumping**

Chronic illegal dumping occurs along the edges of the estuary, particularly where boundaries between private and public property are not clearly established. Large amounts of debris are accumulating in the southern reaches of the Reserve. This degrades marsh and riparian habitat in several areas, impairs water quality, and imposes a threat for flooding.

Proposed activities needed to protect habitats from dumping include:

- Improve Reserve surveillance and reporting of illegal dumping and encourage coordination among agencies.
- Educate public about Reserve regulations using printed materials.
- Encourage enforcement actions by local authorities.
- Organize regular clean-up events in areas prone to dumping.

All of these activities require an active presence of Reserve staff in the southern portion of the Reserve. Current limited staffing does not allow for routine visits. Special programs to reduce dumping should be considered, including Job Corps, Youth Conservation Corps, or other conservation training programs.

## **6. Water-borne Debris**

Water-borne litter and trash accumulate in and degrade the habitat value of the Reserve's tidal wetlands. In the NWR's Oneonta Slough, where tidal action is best, huge amounts of plastic and other garbage collect in the marsh. While often hidden by marsh vegetation, on very high tides, the prime clapper rail habitat is covered with an almost solid mat of floating garbage.

The trash enters the estuary from the ocean and from the watershed during flood and run-off events. Once in the tidal creeks, garbage gets trapped in vegetation and accumulates. The garbage greatly detracts from aesthetic qualities of the marsh and poses an unquantified threat to wildlife from entanglements and ingestions. The volume of trash is likely great enough to impact vegetation germination, growth and density.

FWS will investigate methods to remove the trash, in partnership with volunteers and local jurisdictions. Manual removal of the litter is not feasible; the amount of foot traffic that would be required, even if labor was available, would destroy the habitat values of the marsh. Some type of boat/rake device, operated at high tides during the non-breeding season, might be effective to gather large volumes to adjacent shorelines for removal by heavy equipment. A "trash boom" across the mouth of Oneonta Slough would also be required to reduce the re-accumulation of water-borne trash.

## **7. Resource Protection through Public Education and Information**

Prevention is the most effective measure of law enforcement. It is essential that recreational visitors and users of the Reserve be provided with complete and easily understood information about regulations, the reasons for them, the shared government responsibility for their enforcement, and penalties for breaking the rules.

Communication through brochures, signs, and other devices will be directed primarily at major access points. (See Public Outreach chapter). A synopsis of relevant regulations is provided in the general Reserve brochure. The same synopsis will appear on the signs at the interpretive overlooks planned for the Research Reserve. In addition, regulatory symbol signs for "No Motorized Vehicles" and "Dogs on Leash" will be posted in locations where problems have occurred in the past.

The enforcement staff, including the equestrian volunteers, will play an important role in developing this positive and preventative approach to resource protection. The emphasis during certain critical periods (e.g., the least tern nesting season) will be on personal contact and information exchange.

## B. RESOURCE MANAGEMENT

### 1. Management of Habitats

#### a. Introduction to Habitat Management at TRNERR

The Tijuana River and its estuary are a dynamic system. In changing, it is like all wetlands and coastal ecosystems. Even before the arrival of Native Americans, the forces of flood, erosion, sedimentation, storm, and fire constantly changed the face of the river and the estuary and their habitats, flora, and fauna. The Tijuana River Estuary of today is unlike the one that existed at the time of European settlement, and the system that existed in 1850 was different than it was 100 or 1,000 years before that.

However, the changes produced by human activity since the mid-19th century are unprecedented in both their scope and impact on native communities. Decades of disturbance to the watershed have significantly altered the environmental factors that control habitats. The physiographic and hydrologic conditions that produced the pre-1900 ecological communities of the Tijuana Valley have been irreversibly changed.

Since 1900 some communities, such as the dune shrub community, have been completely lost. Increased sedimentation, altered stream flows, and intentional wetland filling have all changed the face of the estuary. In more recent decades, sewage flows increased nutrients, lowered salinities, and threatened human health; increased foot traffic and vehicle use trampled vegetation and crushed nests of endangered birds. As a result, the system is highly degraded and much in need of management and restoration.

The current habitat array of the Tijuana River and Estuary is unnatural in the sense that it is different than it would have been without the human impacts incurred in the last 150 years. However, while impaired, the river and estuary ecosystem still functions,

provides huge resource benefits and supports many natural communities and hundreds if not thousands of native species.

The overall habitat management goal of the Reserve is to maintain and restore an array of naturally occurring habitats that will support the behavioral and physiologic needs of representative populations of all native plants and animals. The operating agencies recognize that the river and estuary retain dynamics that will cause change, regardless of management action. Between the flood potential of the watershed and the power of the Pacific Ocean, events will occur to alter, sometimes dramatically, the face of the Reserve. That given, the following tenets will guide habitat management efforts in support of the overall goal.

#### b. Guiding Principles for Habitat Management at Tijuana River NERR

Following are guidelines shared by all agencies involved in management of Tijuana River NERR:

- Management must be based on the best science available and must adapt to new conditions and new knowledge. Land management is also an art; research will never provide easy answers to every question.
- Storm and flood events that close the mouth of the river to the Pacific Ocean will occur. Such closures will be addressed aggressively with immediate action to re-open the estuary to the tides. Pre-planning with regulatory agencies is ongoing to ensure quick response to a closure of the river mouth.
- Management should not and will not be able to control the actions of the Tijuana River and the ocean. Changes will occur, regardless of restoration/management. Management will try to work with nature and recognizes that no particular habitat array is permanent.
- It is not necessary to recreate the same proportions of different habitat types that occurred in 1850 or 1900. Management must only ensure that no communities vanish through the action of humans, and that viable representative samples of each habitat type persists.
- A holistic, ecosystem approach to management will be used. "Single-species" management will be avoided. However, the presence of numerous federal- and state-listed endangered species requires that no action jeopardizes survival of those species; by law, they do have a priority. (Although the riparian woodland along the Tijuana River does not emulate pre-1900 conditions, it is Critical Habitat for least Bell's vireo and therefore cannot be restored to a more open habitat).

- Restoration ecology is an imperfect art and science. No planned action will produce guaranteed results. Ecological conditions necessary to produce certain plant and animal responses may occur infrequently; patience is required.
- Management of human activity is essential. Continued control of undocumented immigrant foot traffic from Mexico is critical to habitat protection. Vehicle trespass, the activity of authorized recreational users, and the illegal actions of private landowners must be regulated through education, signing, and enforcement.
- Feral and free-roaming dogs and cats are a significant threat to native wildlife. Efforts to control and remove feral dogs and cats are essential. Successful recovery of endangered species, especially vulnerable colonial nesting birds, requires active monitoring management of exotic, alien, and native predators.

### c. Management for Habitats

Following is a qualitative description of the various habitat types of the Reserve, their recognized resource values and problems, based on recommendations in The Ecology of the Tijuana Estuary, California -- A National Estuarine Research Reserve (Zedler, et.al.).

#### i. Transition from Upland Habitat to Wetland

This is a diminishing habitat in southern California; it is valued for its rarity, its function as a buffer between wetland and urbanized areas, and as a foraging ground for bird species. Habitats that are transitional between wetland and upland will be the wetlands of the future, as sea level continues to rise. Hence, a broad transition zone is needed to ensure persistence of this fringe community and the high marsh below it. Species of concern include sensitive birds (i.e., short-eared owls, black shouldered kites) and the horned lizard. *Frankenia palmeri* is a potential member of this habitat, but it has not been recorded at Tijuana Estuary.

The generic problem facing the transition habitat is urban encroachment, which occurs as fill, trash disposal, trampling, and invasion by dogs and cats. Associated impacts are invasion by exotic weeds and altered densities of native animals.

In this habitat type there is a need to remove fill, control visitor access, revegetate unofficial trails, control dumping of trash, control feral and domestic animals, control exotic plants, and plant native perennials that are likely to have occurred in this habitats.

## ii. Salt Marsh

The most widely valued attribute of the salt marsh is the habitat it provides for rare and endangered species. The cordgrass-dominated marsh is nesting and foraging habitat for the light footed clapper rails; the pickleweed-dominated areas are important to Belding's savannah sparrows; and the upper marsh is the sole habitat for salt-marsh bird's beak. In addition, the marsh is essential habitat for a variety of other organisms, including many migratory birds, insects, and other invertebrates. Salt marsh vascular plants and algal mats contribute substantially to the primary productivity base that supports estuarine food chains.

Non-tidal conditions can reduce the natural diversity of plant communities, and some species do not recover from such disturbance (e.g. annual pickleweed). There is a need to excavate and expand the salt marsh habitats and new techniques need to be explored for creating fully functional salt-marsh habitats.

## iii. Salt Pannes

The natural values of salt pannes are not often recognized, and proposals are often made to convert them to other uses. During both the wet and dry phases, salt pannes are important areas for insects, including rove beetles, and mudflat tiger beetles. When inundated, the areas serve as feeding grounds for migrant and resident birds. Species associated with the intertidal salt marsh and the transition to upland also use these areas.

Lack of qualitative information about the habitat value of salt pannes limits our ability to manage and restore them. Another continuing problem in salt pannes is the compaction of soils caused by vehicles and foot traffic.

## iv. Brackish Marsh

Areas that have reduced salinities through most of the year are currently maintained by rainfall and urban runoff. Although artificial in this sense, they do support a community of native species. Elsewhere in the region, brackish marshes are valued for their augmentation of habitat and populations of clapper rails, black-necked stilts, snowy egrets, and other birds. They also increase habitat diversity at the estuary and attract species that would not otherwise occur there (e.g., red-winged blackbirds.)

The management problem associated with brackish marsh is its potential expansion at the expense of saline wetlands. Freshwater runoff leaches soils of salts, and the brackish marsh species expand and displace those of the salt marsh. When exotic weeds (such as brass buttons) and horticultural escapes establish, the expansion of

brackish conditions detracts from the basic habitat management goal of maintaining natural habitats.

Curtailing the daily flows of sewage into Tijuana River Estuary was a major improvement in brackish marsh control. There is a need to improve the circulation of salt water and further reduce chances for brackish marsh expansion. Brackish and freshwater marsh habitats should be expanded upstream of the estuary tidal prism. Suitable sites exist along the Tijuana River and in abandoned agricultural lands. The use of treated wastewater is encouraged for creation and maintenance of artificial marshes.

#### v. Tidal Channels and Creeks

The channel habitats at Tijuana River Estuary are important to nearly all estuarine animals. All of the endangered birds use tidal channels and creek areas for feeding. In previous years, there have been recreational shell fisheries and commercial bait fisheries. At present, both shellfish gathering and fishing are prohibited at the estuary.

The problems that affect the channels and creeks ultimately have an impact on the entire estuary, because the estuarine waters move throughout the system. Tidal closure, sedimentation, disturbance from dredging, and reduced water quality (waste water input, nuisance algal blooms, and reduced salinity) all require active management. Increased sedimentation rates have an impact on benthic organisms, and the associated turbidity affects water-column species. Dredging to remove accumulated sediments and restore tidal flushing in turn creates turbidity and alters the substrate.

The tidal restoration plan should make existing channels more suitable for fish and invertebrate use. Excavation of the intertidal marsh and channels should have beneficial effects downstream as increased flows erode the fine materials that have accumulated in the channel network. New channels that will be constructed throughout the new tidal marshes should expand this habitat type substantially.

#### vi. Sand Flats and Mudflats

The intertidal flats are closely associated with tidal channels and creeks, and the impact of disturbances and consideration for management are similar. The primary values attributed to these sites are their habitat for shorebird resting and foraging and feeding areas for the light-footed clapper rail and Belding's savannah sparrow.

#### vii. Beaches and Dunes

The esthetic quality of beaches makes them the habitat most highly valued by the recreational public. Consequently, human use is extensive throughout the year.

Ecologically, the habitats are valued for their support of native animals, including the globose dune beetle, sandy beach tiger beetle, sand dune tiger beetle, wandering skipper, and two nesting birds, the California least tern and snowy plover. Other species, such as Belding's savannah sparrow, feed on dune and beach insects. The native plants are especially important to the ecosystem because they stabilize dunes, which in turn protect the estuary from sea storms.

Coastal erosion is the major problem facing the beach and dunes. Substantial losses of sand occur each winter, but not all is replenished each summer; a continual net loss is obvious from aerial photos from 1928 through 1985. The height and location of dunes has changed with recent storm overwashes, and stabilization is needed. In addition, exotics have invaded.

Fencing has helped to protect the dunes from trampling, but not all areas are protected by well maintained fences. It is widely agreed that additional dune stabilization is needed. Attempt to rebuild the dunes with dredge spoils began north of the mouth in 1985. Although the reconstructed dunes helped protect estuarine channels from overwash during the 1986 storms, there was substantial erosion on the seaward side and dune crest, and most of the transplanted dune species died. Dune reconstruction south of the mouth was attempted but storms and drought ravaged the site before vegetation could stabilize the sand.

The activities currently underway include fencing to reduce trampling and stabilize the sand, thereby facilitating revegetation efforts. Dunes from the river mouth to Seacoast Drive have been rebuilt annually each autumn to prevent overwash into Oneonta Slough. There is a need to continue these actions.

#### viii. River Channels

A riparian woodland developed after the 1980 flood, and dense vegetation is now within the Reserve. Currently, much of this habitat is federally listed critical habitat for the endangered least Bell's vireo (50 CFR 17.95). Many of the future changes that will occur at Tijuana River Estuary may have their greatest impact on this habitat type. As sewage spills come under control, streamflows will decline. Determining the best management practices for this international river remains a major challenge. The cumulative impacts of denudations, sedimentation, mouth closure, drought, hypersalinity, and sewage spills have significantly altered the estuary.

## **2. Water Treatment and Groundwater Management in the Tijuana River Valley**

### **a. Water Treatment Facilities**

Sewage contamination problems in the Tijuana River have been chronic since the 1930s. The contamination has been the result of Tijuana's rapid and constant population growth coupled with a lack of corresponding sewerage infrastructure. Due to the physiogeographic setting and relationship of the city of Tijuana to the United States, sewage that is not captured and treated in Tijuana flows into the United States in the Tijuana River or through north-draining canyons and gullies. This raw waste stream contaminates surface waters and nearshore ocean waters and degrades the Tijuana River Estuary. The contamination adversely impacts the quality of life for residents of the river valley, agricultural production, coastal recreational opportunities, and sensitive wildlife in the Reserve. A principle concern during the extended period of sewage contamination has been the reduction in salinity in the estuary and inter-tidal wetlands because of the wet season flows of contaminated fresh water and the extended season of freshwater flow. The extensive damage to the estuary from these flows has been documented by PERL (Estuary Profile, 1982).

Detailed agreements reached between the U.S. and Mexican governments over the past decade have enabled the construction of an International Treatment Plant, Ocean Outfall, and improvements and expansion to the existing Mexican infrastructure. Several of the facilities will be located in the Goat Canyon area, including the underground outfall pipe which will pass under Goat Canyon and areas to the west.

i. International Treatment Facility and Water Reclamation Plant

The International Boundary and Water Commission (IBWC) has constructed the International Treatment Plant to treat sewage overflows from Tijuana, Mexico. The City of San Diego Metropolitan Waste Water District (MWWD) is currently proposing the construction of a water reclamation plant in the southern end of the Reserve near the intersection of Monument and Dairy Mart Road, just north of the international border and adjacent to an International Wastewater Treatment Plant. This project may make freshwater available for purposes beneficial to the Reserve.

MWWD is also proposing the construction of a new bridge and road improvements to replace the existing Dairy Mart Road and Bridge. During peak storm events the existing road and bridge is often flooded or washed out. This project will provide an all-weather access to the South Bay Water Reclamation Plant, the International Treatment Plant, and the southern Tijuana River Valley.

ii. South Bay Ocean Outfall

MWWD is currently constructing the South Bay Ocean Outfall, which passes underground through the Reserve boundaries. The outfall will convey treated effluent from the international treatment facility and future City of San Diego plants to the

ocean for disposal. The ocean outfall is a joint project between the City and the federal government. Construction impacts to Reserve resources will be fully mitigated once construction is completed. Mitigation plans will be reviewed and approved by the Management Authority.

### iii. Sewage Collection Systems

Dry weather sewage flows that drain into the U.S. through Canyon del Sol, Silva Drain, Stewarts Drain, Goat Canyon, and Smuggler Gulch from unsewered areas of Tijuana will be collected and conveyed to the International Wastewater Treatment Plant by MWWD using interceptor-canyon collection systems in each drainage area. At Goat Canyon, a new interceptor system, gravity main, and pump station will be constructed to collect and convey flows. Construction of the Goat Canyon Collector began in September, 1996 and will be completed in February 1998.

#### b. Groundwater

Excessive extraction of groundwater has contributed to the depletion of groundwater supplies and saltwater intrusion in the Tijuana River Valley. The Tijuana Valley County Water District (TJVCWD) oversees and monitors the area's groundwater basins and intends to implement programs to actively recharge them. The TJVCWD is currently studying the feasibility of recharging these basins with excess stored water from surface water reservoirs and/or with reclaimed wastewater from the proposed South Bay Water Reclamation Plant. MWWD is assessing several possible markets for reclaimed water and distribution.

There is a need to explore the potential affects of the ground water recharge on Reserve habitats.

### **3. Flood Control Practices**

Damage from floodwaters is a significant concern throughout the Tijuana River Valley, and the effects of the 1993 floods are still felt in the Tijuana River NERR. The most extensive flood damage to the Reserve, however, was from localized flooding and sedimentation from Goat Canyon Creek. Riparian and wetland habitats in the southern area of the Reserve were degraded by flooding and sedimentation and the principle public access to the Reserve, Monument Road, was severely damaged during 1993 and 1995 storms. A comprehensive plan for stormwater and sediment management and construction of a new all-weather road is underway (see Facilities Plan).

Additionally, a plan for the Tijuana River Valley has been developed by the City of San Diego. These projects are outside the Reserve boundaries but are likely to have a bearing on Reserve lands. The plan uses existing flow paths and includes the removal of berms and fill that have been placed in the valley. The City also proposes an armored berm along the northern subdivision to provide for additional freeboard above anticipated 100-year flooding and to provide for increased protection while other measures are being implemented.



#### **4. Sediment and Erosion Control: Goat Canyon Creek Watershed Project**

Land use activities throughout the watershed have accelerated sedimentation resulting in the obstruction of tidal channels and the loss of wetlands. The reduced tidal exchange has triggered changes in vegetation communities and has affected the habitat of several significant estuarine populations. A long-term program at the watershed scale is required to affect the erosion/sedimentation cycle.

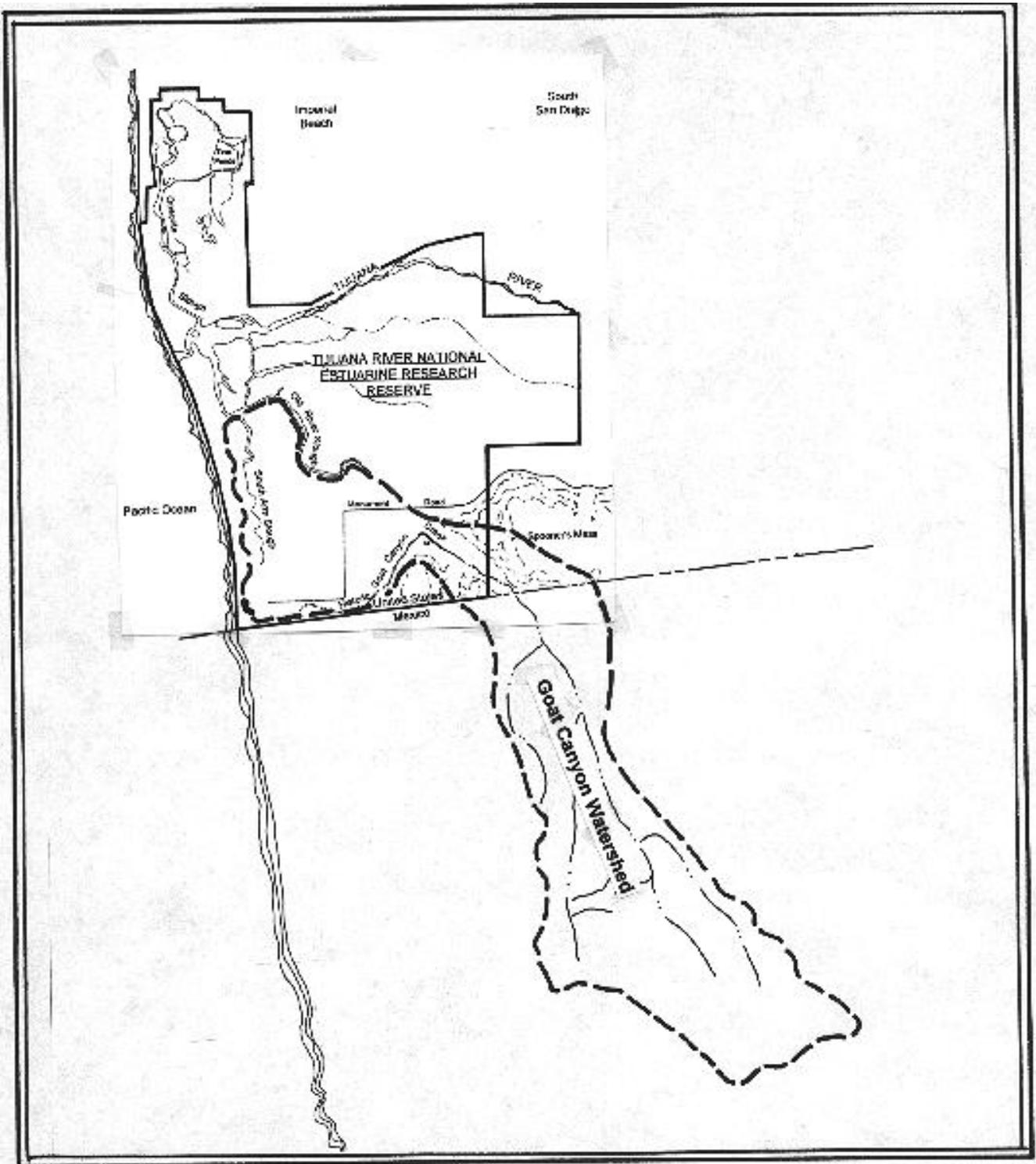
Because of significant Mexican influences on the downstream Reserve, a binational erosion control plan has been identified by the Management Authority as a priority for the Reserve. The U.S. Environmental Protection Agency has committed to participate in the program and share in its funding. The IBWC has expressed strong interest in the program. Mexican partners, including the City of Tijuana Planning Department, have expressed interest in the initiative.

The southern end of the Reserve, particularly the Goat Canyon area, is extremely vulnerable to erosion, sedimentation, and resulting flood damage. A comprehensive erosion control and restoration program is being developed for this watershed. Figure 12 shows the location of the Goat Canyon Watershed.

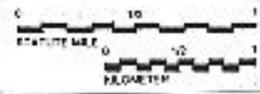
Start-up funding has been provided to the Coastal Conservancy by the U.S. EPA to develop strategies to reduce sediment flows to the estuary from the Goat Canyon Creek watershed. The State Coastal Conservancy and Southwest Wetlands Interpretive Association (SWIA) are jointly developing a needs assessment for 1998. Technical analyses and program elements will encompass the 4.6-square-mile watershed and include extensive U.S./Mexican collaboration. The proposal includes developing site-specific plans and specifications for identified problem areas and for more generalized treatments.

The combined erosion control and restoration program is needed to protect the south arm wetland restoration site from continuing sedimentation. Plans will be based on a careful assessment of stormwater and are expected to include structural and nonstructural erosion control methods, additional sediment management techniques, biotechnical slope and streambed stabilization measures and associated habitat development techniques. The program will produce a unified binational plan that identifies low-cost implementation strategies. A particular emphasis will be placed on the highly degraded, lower 1-mile reach of the creek and its critical connection to the south arm wetlands. Detailed restoration recommendations will be developed.

The Goat Canyon Creek project is closely interlinked with an initiative for improved public access to the south end of the Reserve. Funding requests have emphasized the need for a comprehensive project for the Goat Canyon area that results in plans for



--- APPROXIMATE WATERSHED



GOAT CANYON CREEK WATERSHED  
 LOCATION MAP  
 FIGURE 12

stormwater and sediment management, all-weather public access, and habitat restoration. It's expected that planning for improved interpretive features and visitor-serving facilities will soon follow.

Work in Mexico will be coordinated with the Municipio de Tijuana Planning Department and will focus on stormwater management and slope instability problems. Reserve representatives and City officials have acknowledged the interrelationship of interests and seek to engage in a planning process which identifies strategies and specific projects to control erosion and enhance public safety.

## **5. Exotic/Invasive Species Control**

### **a. Invasive Plant Control**

The control of exotic species is critically important to maintaining and enhancing resource values throughout the Reserve. Several severe invasions by exotic plant species threaten the viability of native habitats' ability to support species of special status at the Reserve. These include:

- Invasion of the coastal back dunes and upper marsh areas, especially at Border Field State Park by the exotic succulent sea fig (*Carpobrotus edulis*);
- Invasion of the riparian corridor in the Tijuana River Valley by several species of tamarisk (*Tamarix* sp.), and giant cane (*Arundo donax*); and
- Invasion of the disturbed upland areas with a host of non-native grasses and annuals.

Past management activities have approached these problems in a sporadic and ineffective manner by the occasional pulling and removal of some of the more common exotics by volunteer groups. Effective control of these exotics will require an organized effort by the managing agencies.

The following species control measures are priorities:

- Control of *Carpobrotus* infestations in the back dunes by localized spraying of Glyphosate herbicide by licensed pesticide applicators.
- Control of Tamarisk and *Arundo* in the river valley by the "cut and paint" method. Plants are cut to the ground and the stems are immediately "painted" with a systemic herbicide. This project is a very large one and must be approached on at least a local watershed basis.

- Salt addition, as guided by recent research, should be used to control exotic species invasion at street drains and sewage spill locations.
- Hand removal of plant species.

Any control efforts will be coordinated by the operating agencies to protect existing habitats, particularly nesting habitats.

Research into control techniques that favor native grasses or perennials over exotic invasive annuals is needed. Areas of research needed could include bio-control, control by prescribed burning, or pesticide applications.

A second important facet of species control is preventing colonization by new invasive species from outside the Reserve. Particular efforts are being taken by Reserve staff and restoration project managers to ensure plant propagules are collected on-site to avoid the transfer of aquatic invertebrates from other wetlands.

#### b. Predator Management

Southern California is a "biological diversity hotspot," one of a handful of places in the world where limited unique climate and soils have resulted in the evolution of myriad endemic species. That same climate has attracted millions of people to live and work here. Urban development, land use, and general human activities have destroyed or degraded the limited native habitats to a point where many species are now threatened with extinction.

The Reserve is home to numerous federally listed threatened and endangered species. (See Appendix 4.) Conservation and recovery of those species is the highest priority of the Reserve. Unfortunately, the same land-use forces that resulted in species endangerment have also fragmented the ecosystem to a point where active management intervention is required to ensure survival and aid recovery of the light-footed clapper rail, California least tern, western snowy plover, and least Bell's vireo.

Maintenance, enhancement, and restoration of habitats is essential for the survival of these species. Once habitat concerns are adequately addressed, research and monitoring data indicate that predation is the greatest threat to the survival and recovery of these endangered birds. Management of predator populations is essential and on-going management activity is conducted by FWS within the Reserve. Currently, FWS contracts annually with licensed and permitted government agencies or private organizations to provide predator management services during the nesting season for California least terns and light-footed clapper rails (March - September). Stray and feral dogs and cats are reported to local municipal animal control agencies, and some stray

dogs and cats are occasionally captured by FWS personnel and turned over to an approved animal shelter.

These past and current efforts have helped protect endangered species, but more needs to be done. Feral and stray cats -- major bird predators known to kill light-footed clapper rails -- remain common in the northern portion of the Reserve. Free-running dogs are a threat to all native wildlife, and to reserve visitors and horses. Native avian predators have also caused severe losses of California least terns in recent years.

FWS will prepare a detailed step-down management plan on predator management following approval of this Refuge Comprehensive Management Plan. The following principles and policy guidance will be followed in that plan and are intended here to inform the public of what steps need to be taken -- and will be taken -- to protect endangered species within the Reserve.

i. Predators of Concern

The following species are known predators of endangered birds and/or their eggs at the Reserve.

- |                               |                             |
|-------------------------------|-----------------------------|
| 1. domestic cat*              | 11. barn owl                |
| 2. domestic dog*              | 12. burrowing owl           |
| 3. coyote                     | 13. northern harrier        |
| 4. grey fox                   | 14. loggerhead shrike       |
| 6. red fox*                   | 15. red-tailed hawk         |
| 5. striped skunk              | 16. peregrine falcon        |
| 6. raccoon*                   | 17. gulls (several species) |
| 7. opossum*                   | 18. raven                   |
| 8. California ground squirrel | 19. common crow             |
| 9. long-tailed weasel         | 20. gull-billed tern        |
| 10. Norway rat*               | 21. kestrel                 |

\* indicates non-native (exotic, introduced, or naturalized) species.

This list is not exhaustive, and other species including small rodents, snakes, other corvids and raptors, and icterids may also prey on endangered birds and their eggs. Brown-headed cowbirds are not a predator, but they parasitize the nests of least Bell's vireo and other songbirds and are subject to control efforts in the Tijuana Valley, outside the Reserve.

ii. Program Responsibility

Predator management activities will be conducted and supervised by uniformed employees of government agencies, primarily USDA Animal and Plant Health Investigative Service - Animal Damage Control and FWS. Local government animal control agencies may also be utilized to control domestic dogs and cats.

### iii. Responsibilities and Authorities

50 CFR 25.11 states that National Wildlife Refuges are established "... for the protection and preservation of endangered or threatened species and their habitat." 50 CFR 30.11 authorizes control of feral animals, including dogs and cats, on National Wildlife Refuges. 50 CFR 31.14 authorizes taking of animal species detrimental to the management program of a wildlife refuge. 50 CFR 28.43 authorizes the disposal of dogs and cats running at large on a national wildlife refuge and harming humans or wildlife. Approved Endangered Species Recovery Plans for California least tern and light-footed clapper rail call for predator management programs as essential to the recovery of those species.

### iv. Control Methods

Non-lethal control methods are preferred and live-trapping of known predators will be vigorously attempted before any lethal methods are employed. The most humane methods available will be used.

- Exclosures and predator fences are not a viable management option at the Reserve because of the dispersed nature of endangered species nesting sites and the fact that nesting birds use different portions of the Reserve in different years.
- Live trapping and may include box style live mammal traps, decoy funnel traps for cowbirds, and Bal-chatri traps for raptors.
- Hazing, or scare tactics may be used to deter predators from disrupting and hunting in least tern colonies. This may include the use of pyrotechnics, firearms or other audio or visual stimuli to scare predators. Special authorization from the Regional Office, FWS, must be obtained to haze predators that are themselves endangered (e.g. peregrine falcon).
- Some predators, particularly canids, are not vulnerable to box-trapping methods. Padded jaw steel traps may be used to humanely capture mammalian predators, if other live-trapping methods prove ineffective. Pole traps may be used to capture avian predators if less severe methods (hazing, Bal-chatri traps) prove ineffective.

- As a last resort, lethal methods including shooting or body grip traps may be used to take predators that are identified as known and immediate threats to endangered species within the Reserve.

#### v. Disposition of Captured Predators

- All domestic dogs and cats captured will be taken to an approved shelter facility operated by a cooperating local unit of government, or a Humane Society, or in a veterinary care facility.
- All raptors and other avian predators live captured will be removed and held in an licensed/permitted rehabilitation/holding center until they can be released back into the wild. Release will be at a suitable distant location, if a suitable location is not available, at the Reserve after the endangered species nesting season.
- Non-target wildlife such as rabbits and hares that are captured unharmed will be released immediately at the location of capture.
- Non-native wild mammalian predators will be euthanized using approved humane methods.
- Native mammalian predators such as coyotes or weasels that are known to take endangered species in an opportunistic/non-methodical fashion, and which have not been identified as problem individuals, will be released back into suitable habitat, away from endangered species nesting areas, as soon as possible.
- Target and non-target predators that are injured may be euthanized, or taken to an approved rehabilitation center/veterinary care facility, depending on species status and extent of injuries, at the discretion of the Refuge manager.

#### vi. Operations

- Live-trapping of feral and free-roaming cats will be conducted year-round, on a continual basis by Refuge personnel. Initiation of this program will be preceded by a public awareness/education program in inform and educate Refuge neighbors of the threat that cats posed to wildlife, and the need to control cats on the Reserve.
- General predator management activities are tied temporally and spatially to California least tern nesting. Control efforts will be initiated annually by the April 1, and will continue through the end of least tern nesting attempts. Efforts will include

monitoring predator activities within and around nesting areas, and preemptive and post-incident control activities involving both avian and mammalian predators.

- Several species are known threats to least terns, and by their biology, are assumed to be hunting endangered species when they are in the area. These include: red fox, kestrel, and loggerhead shrike. Red fox are non-native, and will be removed whenever they occur on the Reserve. Kestrels and loggerhead shrikes are valuable and common components of Reserve avifauna. But, the propensity of those birds to prey on least terns makes their presence incompatible with endangered species conservation. Kestrels and loggerhead shrikes will be preemptively removed whenever they appear at least tern colonies.
- Several potential serious avian predators of least terns are themselves "sensitive" species. Those include gull-billed terns, burrowing owls, northern harriers and other native raptors. Control action against these species will be post-incident, after predation is documented. Once documented, control actions must be aggressive to prevent devastation of endangered species.
- Traps of any type will not be set unless they can be tended regularly by authorized personnel. Traps set for mammalian predators will be checked daily within 2 hours of sunrise. Traps set for avian predators will be checked frequently, at least every four hours. Checks may be made by remote sensing.

#### vii. Coordination

Local law enforcement and the Border Patrol will be informed of any planned carrying or use of firearms by predator management personnel within the Reserve. Coordination and approval of the land owning agency must be obtained prior to initiating predator control activities off National Wildlife Refuge land within the Reserve.

### **6. Fire Suppression**

Wildfires are of great concern at the Tijuana River NERR. Although large wildfires (40 acres and larger) have not been documented in this area, fire occurrence is related to the amount of human use and activity that are occurring in the estuary. Small fires (under 40 acres) have been a part of the history of the area, with nearly all fires documented being human-caused. Many of the wildfires that have occurred over time were caused by escaped illegal campfires created for cooking and warmth by illegal immigrants or transients occupying the area. Routine fire patrols in high activity areas during the summer months when fire danger is highest can minimize the amount of these nuisance fires.

Fire suppression for the Reserve is conducted by agency resources and personnel as well as through assistance from local, state, and federal fire departments as needed. The FWS maintains administrative roads and trails that could serve as firebreaks during wildfire suppression. Defensible space is maintained around all Refuge facilities, and water sources are available for fire suppression needs.

The Refuge currently has a fire dispatch plan that addresses initial response to wildfires, as well as the procedure for requesting additional fire-fighting resources. In addition, a detailed Fire Management Plan is being prepared for the Refuge.

The FWS may use prescribed burning as a tool to restore wildlife habitats, reduce fuel loads, and minimize wildfire hazards on Refuge property. The role and implementation of prescribed burning in resource management and fuel reduction projects would be addressed specifically in prescribed burn plans written for each project to be conducted on Refuge property.

## **7. Mosquito Control**

To protect public health and safety, mosquito abatement efforts are performed by the Vector Surveillance and Control Division of the San Diego County Department of Environment Health, in coordination with the operating agencies. The operating agencies encourage the minimum use of chemical treatments.

A mosquito management plan was prepared to provide short-term relief and long-range control of mosquito populations while minimizing problems normally associated with the use of conventional pesticides by FWS, CDPR and Department of the Navy in 1984. The operating agencies in conjunction with the Resource Protection committee of the Management Authority need to revisit this plan and identify opportunities to reduce the use of or need for chemical applications without compromising public health. Issues to consider include:

- Chemicals used;
- Frequency of use;
- Use of ditching; and
- Emerging issue of monitoring effects of chemicals, particularly on invertebrates

### **C. RESTORATION**

#### **1. Introduction to Restoration at Tijuana River NERR**

In the 1980s, hydrological and biological studies were undertaken to begin developing an understanding of the estuary's natural resources and conditions. These studies were undertaken by a number of organizations, principal among them the Pacific Estuarine

Research Laboratory (PERL) at San Diego State University (SDSU), FWS, and various private consultants under contract with Management Authority agencies. The studies documented extensive wetlands loss in the estuary during the past 50-100 years and extremely variable habitat quality in the existing wetland and riparian areas. Most significantly, studies indicated that the tidal flushing in the estuary, as indicated by the diurnal tidal prism, had been reduced by approximately 80 percent since 1852, primarily a result of human-induced sedimentation. Since 1981, a principal goal of the Reserve has been to protect, enhance, and restore the delicately balanced wetland ecosystem.

## **2. 1998 Habitat Enhancement Objectives**

Upon presentation of the Tijuana Estuary Hydrologic Analysis (Philip Williams Associates, February 1987), the Management Authority declared the following restoration objectives for the lands within the Research Reserve. The objectives have been reviewed and modified to represent the current restoration priorities.

### a. Objectives for Restoring the Estuary

1. Restore the tidal prism to approximately the size that existed in the 19th century to encourage removal of the sediment by the tides and to minimize the potential for channel closure.
2. Allow for continued functioning of a tidal hydrodynamic system with future anticipated geomorphic changes, including sea level rise, migration of the barrier beach, and changing river channel locations. Successful restoration of the tidal prism is predicated on reducing sedimentation rates and reducing the potential for dune overwash.
3. Minimize future loss of restored and existing wetland area due to inland migration of the barrier beach by dune restoration.
4. Minimize future loss of restored and existing wetland area by Tijuana River sedimentation.
5. Minimize future loss of wetland area by sedimentation from Goat Canyon.
6. Restore areas of former salt marsh affected by sedimentation to the maximum extent feasible.
7. Restore former mudflat affected by sedimentation to the maximum extent feasible.
8. Minimize the disturbance of marsh plain areas in the north arm of the estuary.

9. Minimize the potential year-round reduction in salinity in the marsh plain and intertidal areas due to possible future wastewater flows, while preserving the ability for flood flows to lower salinity for short periods in winter.
10. Restore the barrier beach dune and vegetation by restricting public access and coordinating appropriate plant community restoration projects.
11. Provide same acreage of high marsh. High marsh acreage may be decreased in some locales as a result of increases in tidal circulation. Increase quality and extent of transition zone habitats.
12. Identify existing resources so that a salvage operation can be planned and carried out as an integral part of implementing the enhancement plan.
13. Integrate research findings into the restoration effort.
14. Incorporate a phasing program in the enhancement plan.
15. Minimize impact on privately owned parcels.
16. Protect and enhance endangered species habitat.

b. Objectives for Restoring the River Corridor

1. Control exotic plant species invasions in the riparian corridor.
2. Provide for the restoration of a continuous native riparian woodland corridor.
3. Ensure that flood hazards are not increased.
4. Manage gravel extraction activities to the benefit of sediment management and future creation of plant and wildlife habitats.
5. Consider future groundwater management for beneficial development of riparian corridor.
6. Enhance riparian endangered species habitat by controlling exotic species and monitoring endangered species populations.

**3. Adaptive Management Design Approach**

With leadership PERL, restoration planning at Tijuana Estuary has been conceived as an adaptive management design approach. This approach to restoration design and implementation acknowledges the numerous uncertainties in the restoration field and incorporates careful review of actions taken in a phased approach. Alternatives are often tested on a small scale before full-scale implementation. Elements of the design which are less certain become the experimental treatments of a pilot program with results then evaluated in selecting the approach for later project components. Inherent in adaptive management is the need for long-term, ecosystem level monitoring. In adopting this approach the Management Authority acknowledges the thorough integration of research and restoration as a basic tenet of the Reserve program.

#### **4. Post-Construction Monitoring**

An appropriate monitoring program is expected for any restoration activity within the Reserve. Intertidal wetland restoration particularly is expected to entail extensive monitoring to better determine design and construction techniques through the adaptive management design process described above. The integration of the restoration planning and construction with post-project implementation programs is also envisioned. However, if adaptive management is successful, research and monitoring requirements will decline as restoration proceeds. For example, the extensive and costly research component of the Oneonta Tidal Linkage project need not be repeated as basic experimental designs are implemented.

The Management Authority has recognized the need for personnel to coordinate the linkages between the programs. A commitment has been made by the Management Authority to hire a Research Coordinator who could meet this need (see Administrative Framework and Research chapters). These responsibilities are now distributed between Restoration and Research committees and the overextended staff of the state and federal lead agencies.

#### **5. Tijuana Estuary Tidal Restoration Program**

A conceptual plan for wetland and estuarine restoration, the Tijuana Estuary Tidal Restoration Program, was selected by the Management Authority in 1988 to achieve many of the restoration objectives. A more detailed level of planning and design, environmental impact statement and regulatory review was undertaken. With funding and coordination from the Coastal Conservancy and FWS, a programmatic EIR/EIS was prepared and certified in October 1992.

The Tijuana Estuary Tidal Restoration Program area includes approximately 520 acres of intertidal wetland and estuarine channel restoration in the north and south arms of the Tijuana River Estuary. The first phase of the program consisted of two areas of excavation: the Oneonta Tidal Linkage in the north arm of the estuary and the Model

Marsh in the south arm. A third area initially identified for excavation, known as the Oneonta Slough Excavation, was eliminated due to its environmental impact and the development of alternative remedies for maintaining a functional channel.

The primary goal of the Restoration Program is to restore natural habitat values of the Reserve that have been degraded. Over the past 50 to 100 years, the Tijuana Estuary has experienced large scale sedimentation events, incipient sedimentation, dune overwash and channel constriction, localized diking and filling, and extended periods of sewage contamination. The Tijuana Estuary Tidal Restoration Program is designed to increase salt marsh habitat and restore tidal flushing to areas that have silted in over the past few decades. Intertidal mudflats are also a priority for habitat restoration.

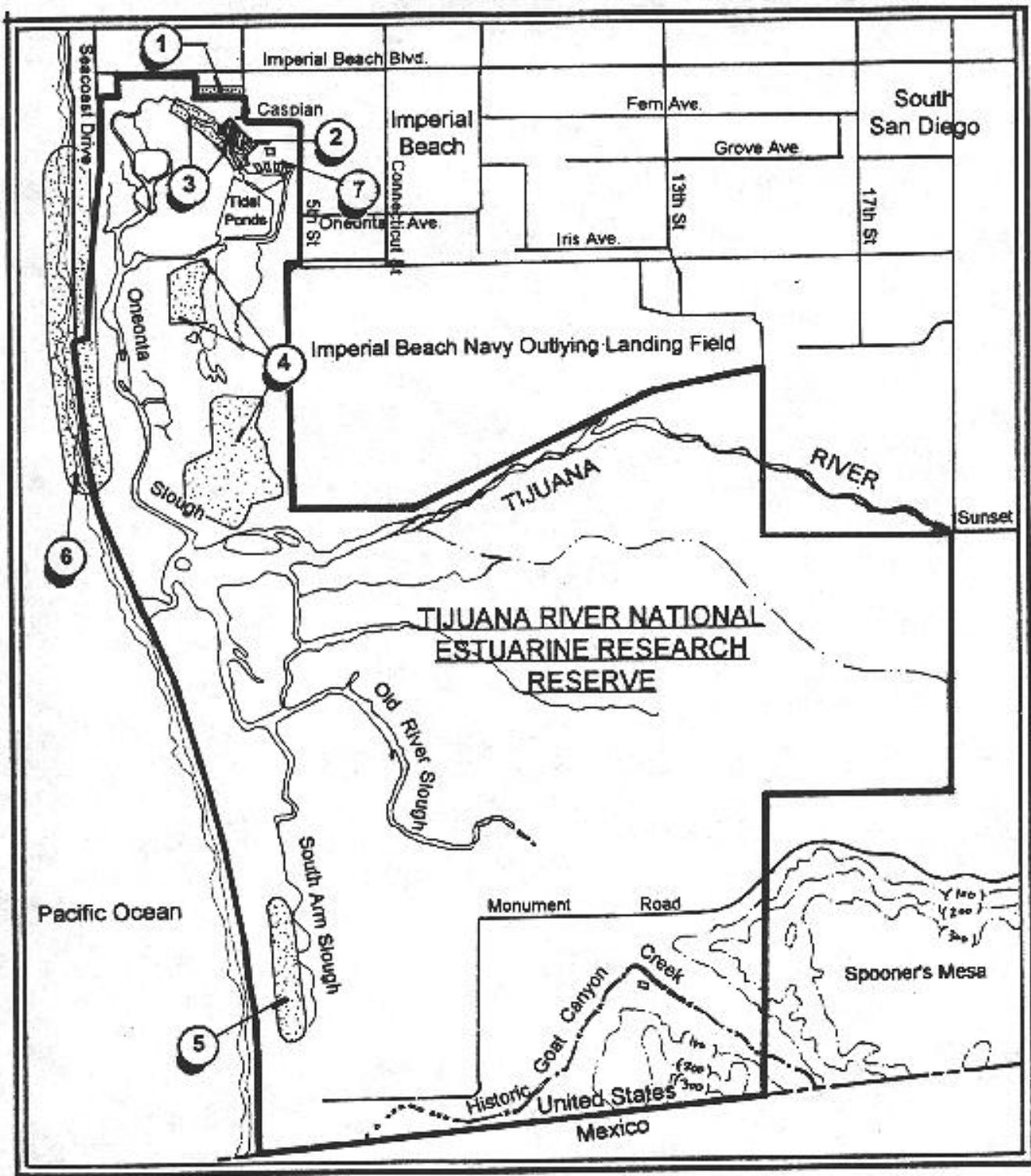
#### a. Oneonta Tidal Linkage

The first component of the multi-phased project, the Oneonta Tidal Linkage, was constructed in the north arm of the estuary in winter 1997 (shown in Figure 13, along with other completed restoration projects).

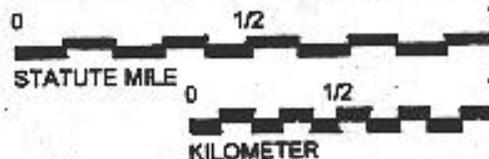
The Oneonta Tidal Linkage provides a tidal connection between the northern part of Oneonta Slough and tidal lagoons located southeast of the Estuary Visitor's Center (see Figure 13). The channel is expected to enhance circulation in some 200 acres of intertidal saltmarsh stabilizing the channel system in the north arm and reducing sedimentation in the tidal channels. The project includes a timber footbridge to maintain visitor access. The channel and bridge concentrate public use on the upland ridge immediately south of the Visitor Center, offering increased protection to the Oneonta Slough saltmarsh, which supports San Diego County's largest population of endangered light-footed clapper rail. The project will result in an increase of approximately 1.8 acres of salt marsh habitat immediately adjacent to the Visitor Center providing an excellent interpretive opportunity. An extensive research program to be conducted by PERL is integrated into the Oneonta Tidal Linkage design.

#### b. Model Marsh

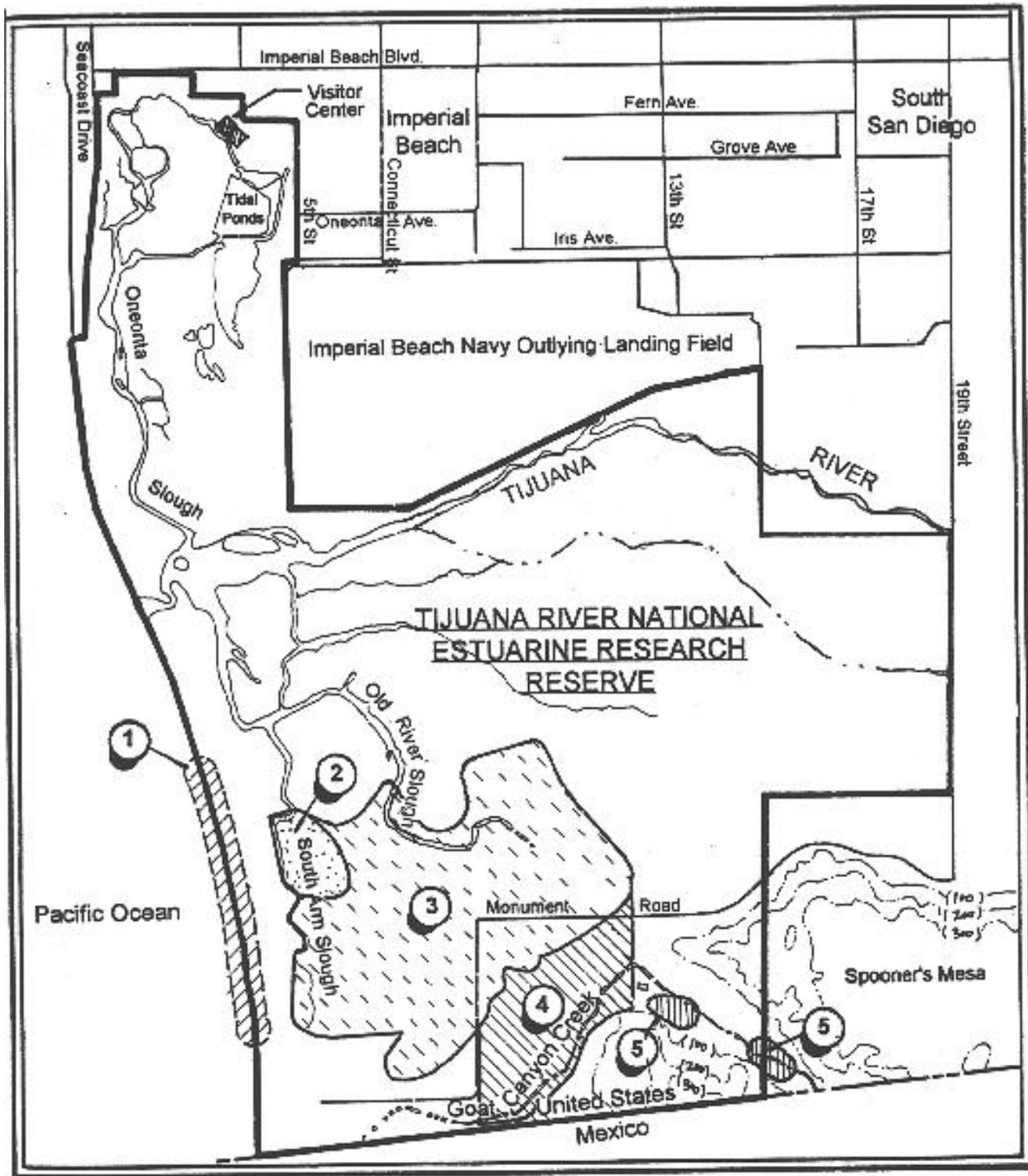
A 20-acre intertidal wetland with tidal channels will be constructed on a degraded marsh plain in the southern arm of the estuary (shown in Figure 14). The original site selected for the Model Marsh was adjacent to the existing Old River Slough channel just north of the visitor's kiosk in Border Field State Park. However, because of extensive sedimentation of Old River Slough by Goat Canyon Creek, project planners have proposed its relocation to an adjacent site on the South Arm Slough, while the Goat Canyon Creek sediment control measures are undertaken. This new site is currently under study.



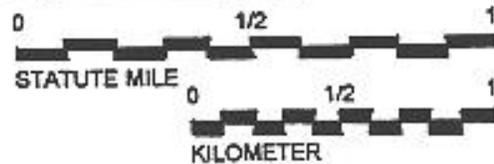
- |                                      |                                                    |
|--------------------------------------|----------------------------------------------------|
| 1. Caspian and 3rd St. Riparian Area | 5. Back Dune Restoration - Border Field State Park |
| 2. Native Plant Demonstration Garden | 6. Dune Stabilization - Natl. Wildlife Refuge      |
| 3. Oneonta Tidal Linkage             | 7. P.E.R.L. Mesocosm Facility                      |
| 4. Upland Restoration                |                                                    |



COMPLETED RESTORATION  
PROJECTS AT TRNERR  
FIGURE 13



1. Barrier Beach Nourishment Site
2. Model Marsh Intertidal Wetland
3. South Arm Intertidal Restoration Area
4. Goat Canyon Creek Riparian Restoration Area
5. Goat Canyon Sediment Management Sites



PROPOSED RESTORATION  
PROJECTS AT TRNERR  
FIGURE 14

The Model Marsh is the first component of approximately 500 acres of intertidal wetland restoration planned for the southern arm of the estuary. Through information gained from the Oneonta Tidal Linkage, construction will be incorporated into the 20-acre marsh design. New basic research relating to variable site characteristics -- elevations, proximity to water, soils, and planting protocols -- will be incorporated into the project. Research and monitoring data from the Oneonta Tidal Linkage and the Model Marsh will be used to determine design details for the subsequent components in the southern restoration area.

Soils analysis must be conducted for the selected site prior to completing project engineering and design. Soil classifications and grain size in the area are varied. It is expected that construction will require separating soil by grain size, with part of the material used for beach replenishment and the remainder marketed for construction products. Construction funding for the 20-acre marsh and subsequent components has not been identified.

#### c. Subsequent Intertidal Restoration Components

Restoration modules totaling approximately 500 acres contiguous to the Model Marsh site were identified in the Tijuana Estuary Tidal Restoration Program EIR/EIS. Engineering design and supplemental environmental review is required to facilitate additional development. Preliminary field investigation reveals a high sand content, indicating a likelihood that the project can be engineered as a wetland excavation/beach replenishment project. The project buildout is estimated at 20 years because of the combined effects of regulatory review for each project component, adherence to the adaptive management design approach, and the considerable per-acre cost of implementation.

#### d. Oneonta Slough Channel Migration

An excavation of Oneonta Slough was originally included as part of the Tijuana Estuary Tidal Restoration Program. The Oneonta Slough project consists of excavation of a hardpan area on the east bank of the slough near its junction with the river. The removal of the hardpan was recommended to offset the eastward migration of the barrier beach. It was believed that the channel migration would be impeded by the hardpan and constriction would occur, resulting in deteriorated water quality to the north with detrimental results for saltmarsh species.

Upon consultation with hydrologist Phil Williams, the Restoration Committee concluded that while incremental loss of channel capacity at the site may occur due to barrier beach migration, the incremental action is likely to be accommodated by channel development to the east. It was concluded that the main hazard to Oneonta Slough habitats resulting from the hardpan would arise from a catastrophic event such as

occurred in 1983, when an unusual ocean storm resulted in waves overtopping the dunes and the sudden filling of the Oneonta Slough channel with beach sand. Following the 1983 disaster, the FWS was unable to secure a permit from the Army Corps of Engineers for six to seven months and a hypersaline drought ensued, resulting in a precipitous loss of life in Oneonta Slough.

Based on discussions with engineers and Phil Williams, the Restoration Committee recommended putting on hold plans for hardpan excavation and instead, seek a standing permit with the Corps to reopen the channel should it be closed by a sudden storm. FWS is in the process of obtaining such a permit.

## **6. Other Restoration Programs**

### **a. Dune Re-establishment and Stabilization**

Prior to recent storms, the barrier beach along Tijuana estuary consisted of significant sand dunes. Historical air photos of the area show that these dunes were originally stabilized by vegetation. Photos from the 1960s show extensive vehicle damage to the dunes. Together with foot traffic, these disturbances set the stage for massive erosion. During the winters of 1982-83 and 1988-89, storm waves washed over the beach and pushed enormous quantities of dune sand into the estuarine channels. The result has been a further reduction of the tidal prism and an ongoing threat of the closing of the ocean entrance.

Future maintenance of the estuarine channels requires the re-establishment of the coastal dunes and their stabilization with native dune vegetation. Unless the dunes are stabilized, they will continue to be washed into the channels during storms, greatly reducing the effectiveness of the dredging program. Native coastal dune vegetation has probably suffered a greater percentage of destruction than any other habitat in San Diego county. It is therefore recommended that the removal of exotic plants be undertaken concurrent with a revegetation program.

The following dune stabilization needs exist:

- Replacement of dune sand from estuarine channels back to the beach;
- Planting of native dune species over the dunes and removal of exotics;
- Irrigating transplants to ensure establishment; and
- Monitoring dune vegetation and slope profiles to assess success.

### **b. Caspian and Third Street Riparian Area**

In 1990, a stormwater channel was excavated to convey street runoff from 3rd Street and Caspian Way to the marsh. The channel was planted with cottonwoods and

willows to filter nutrients and contaminants thereby protecting the Oneonta Slough habitats.

## **7. Relationship of Restoration Plan to Other Program Areas**

Because of the large scale of intertidal wetland and estuarine channel restoration proposed for Tijuana Estuary and a recognition of the present rudimentary knowledge of the art and science of restoration, the restoration program is designed in increments with careful monitoring and review of initial phases informing the design of subsequent phases. The design process can be enhanced further by coordinating applied research with project monitoring, thereby providing more information to the process and enhancing the likelihood of success. This approach, referred to as an adaptive management program, is described in detail in the Tidal Restoration Program EIR/EIS, Chapters 1 and 2.

Through the Tijuana Estuary Tidal Restoration Program, the Management Authority and the state and federal lead agencies (Coastal Conservancy and FWS) have acknowledged and endorsed the integration of research and restoration. The Management Authority through its committees will work to ensure that this coordinated effort succeeds and that both restoration and research proceed without undue cost or delay resulting from the coordinated adaptive management approach.

## **8. Restoration Needs**

The large scale restoration proposed for the Reserve will require a considerable investment of funds. Clearly, such a large program far exceeds the restoration budgets of the Reserve operating agencies and its member organizations. Implementation of the multi-million dollar program requires an innovative fundraising approach which targets a variety of funding sources, both public and private.

The primary source of funding for large-scale natural resource restoration projects in the region in recent years has been from mitigation funds arising from damages attributed to large private developments and public infrastructure projects. The needs of possible funding organizations have not influenced restoration design. The Reserve mitigation policies are described in the policies section of this chapter. The current program has balanced management resource protection with human activities, and incorporates an adaptive management process that includes research and monitoring.

With the construction of the Oneonta Tidal Linkage in 1997 and completion of Model Marsh plans and permits scheduled for 1998, the Reserve is prepared to compete in earnest for restoration funding. Planning and implementation for additional phases of the Tijuana Estuary Tidal Restoration Program and numerous other supporting natural resource projects remain unfunded.

The Coastal Conservancy, working closely with the Reserve manager, will continue to coordinate fundraising for Reserve restoration programs. State wildlife bond funds, other appropriate state and federal funding sources, including competitive environmental awards, and private sources, both within the nonprofit and corporate sectors, will be considered.

## **V. RESOURCE PROTECTION, MANAGEMENT, AND RESTORATION PLAN OF ACTION**

**GOAL 1. Preserve, restore, enhance and protect habitats to maintain biodiversity, maintain important migratory bird resources, and aid in the recovery of threatened and endangered species.**

Objective 1a: Maintain effective law enforcement and fire suppression programs that cover the entire Reserve and are well-coordinated between agencies.

### Tasks

- Increase preventative law enforcement measures including high visibility patrols and increased communication with rental stable owners to ensure compliance of the renters with regulations.
- Where appropriate, cross-deputize law enforcement officials from FWS, CDPR, County of San Diego.
- Formalize the relationship with County of San Diego for emergency response to ensure the entire Reserve area receives emergency services.
- Maintain funding for the fire-suppression crew.
- Develop a program to reduce illegal dumping at the southern end of the Reserve (coordinated with law enforcement program) that assigns responsibilities for removal of debris among land owning agencies and establishes a Reserve-wide policy for illegal dumping.
- Obtain funding for an additional full-time law enforcement officer.
- Establish communication system (i.e. radio frequencies) between operating agencies.

- Develop methods to execute clean-up of water-borne trash in Oneonta Slough and install a boom across the Slough mouth to reduce deposition of water-borne trash in the marsh.

Objective 1b: Manage habitats, predators and people to maximize recruitment of endangered species.

Tasks

- Develop and implement a comprehensive predator management program including year-round control of feral dogs and cats and seasonal monitoring/management of native predators.
- Investigate potential to enhance saltmarsh habitats for light-footed clapper rail through creation of small tidal creeks in cordgrass stands.
- Maintain annual, recurring monitoring efforts to document populations and production of endangered species (clapper rail spring call counts and winter high-tide counts; California least tern and western snowy plover nest monitoring; least Bell's vireo breeding survey; annual surveys on distribution and abundance of saltmarsh birdsbeak).
- Increase active enforcement of areas closed to protect endangered species.
- Complement "Tern-Watch" and other educational efforts, and posting, with apprehension and prosecution of violators.
- Evaluate Reserve vernal pools habitats and develop plan for restoration and introduction/re-introduction of listed vernal pool species as appropriate.
- Evaluate upland sites for potential creation of new vernal pool habitats.
- Develop a cooperative agreement between operating agencies and U.S. Border Patrol to enhance apprehension efforts near the border and reduce operation of enforcement vehicles wetland habitat areas.

Objective 1c: Management of habitats within the Reserve based on the habitat management guidelines put forward in the Resource Protection, Management and Restoration section).

Tasks

- Develop and fund a plan to control invasion by exotic plants.

- Review existing mosquito/vector control program with San Diego County Health Department and NOAA to identify ways in which to minimize use of chemical pesticides.
- Operating agencies will continue ongoing habitat management practices, such as dune re-establishment, until habitats are stabilized.
- Establish protocols by which impacts from events such as storms and floods are assessed and repaired.

**GOAL 2. Respond to identified resource management problems, particularly those in the southern end of the Reserve, by establishing cooperative and integrated programs and approaches.**

Objective 2a: Develop a comprehensive erosion control program that anticipates border-area land management.

Tasks

- Develop and initiate implementation of an erosion control program for the Goat Canyon sub-watershed.
  - Subtasks: 1) Target priority problems
  - 2) Identify and involve all stakeholders
  - 3) Apply integrated solutions that make use of the expertise and authority of multiple agencies
  - 4) Measure success through strategic monitoring
- Work with land owning agencies and the U.S. Border Patrol to ensure that management activities and road building and road maintenance activities have minimal impacts on downstream habitats and complement the goals of the erosion control plan.

Objective 2b: Restore degraded habitats based on the guidelines put forward in the Resource Protection, Management and Restoration chapter.

Tasks

- The Restoration committee of the Management Authority will maintain an updated and prioritized list of projects needed to restore degraded habitats.

- Acquire funding to implement priority projects including components of the Tidal Restoration Program in a sequence determined by the design team and reviewed by the Restoration Committee.
- Acquire funding to plan and implement restoration programs specific to the Goat Canyon sub-watershed.
- The Management Authority will guide selection, approval and monitoring of restoration projects funded and/or performed by entities not affiliated with the Reserve based on criteria and priorities.

**GOAL 3. Monitor and assess land use activities within the watershed, in particular the neighboring Tijuana River Valley, and attempt to influence practices to promote the health of the Reserve.**

Objective 3a: Establish relationships with land managers, municipalities and others to promote land management practices which improve the health of the Reserve.

Tasks

- Identify the land uses that have particular impact on downstream resources and are amenable to conservation practices.
- Identify key partnerships through which agreements can lead to improved resource values at the Reserve.
- Coordinate with neighboring municipal governments to identify and generate strategies to avoid impacts of public works projects on downstream Reserve resources.
- Establish program outline, goals and objectives and task forces for initiating proactive resource protection work outside the Reserve.

Objective 3b: Initiate programs that build upon existing water quality monitoring and treatment programs in the watershed to bear direct benefits to the Reserve resources.

**GOAL 4. Complete acquisition of all parcels within the adopted Reserve boundary.**

Tasks

- Maintain a list of status of each parcel, willingness of owner to sell, and special circumstances or conditions that may affect transaction.
- Update appraisals as opportunities arise for negotiation and/or purchase.
- Identify funding sources or public agencies willing to purchase properties
- Enlist assistance of private or quasi-public agencies to assist with funding for acquisition or to facilitate property ownership transaction.