APPENDIX D

REVIEW COMMENTS BY DRS. BRUCE BOLT AND I. M. IDRISS

June 24, 1999

Mr. Raphael A. Torres
Chief
Civil Engineering Branch
Department of Water Resources

Seismic Vulnerability of the Sacramento-San Joaquin Delta Levees

Dear Mr. Torres:

As you requested, I have reviewed the final draft report (December 1998) and set out below some comments and conclusions related to it. I have previously, in 1982, prepared a short report in which I estimated likely earthquake ground motions in the Delta region (included in Report references). Of course, in the ensuing seventeen years more relevant information has become available, and the CALFED report is much more extensive and detailed.

More recently, I have served on your DWR Consulting Board, which considered Phase I and Phase II of "The Seismic Stability Evaluation of Sacramento-San Joaquin Delta Levees." Several questions addressed to this Consulting Board were responded to formally and various aspects of the work in progress were discussed on an individual basis. My comments on the CALFED report address mainly Chapters 2 and 3 and then the Summary of Findings (Chapter 7).

General Comments

The Report is a comprehensive, well-written, and sound review of the problem of seismic vulnerability of these levees. It is unfortunately the case that little relevant information is available specific to the seismic response of levees with the Sacramento

Delta evolutionary construction history. Almost every qualitative parameter involved in the assessment has considerable uncertainty. What is sure is that the levees will someday be subject to a repetition of the 1868 Hayward earthquake, or a similar one centered further north, or a 1906-type earthquake, or one or more derived from thrust faulting under the west margin of the Central Valley. In addition, we know little instrumentally about the propagation of large amplitude seismic waves through the thick sedimentary deposits underlying the Delta. Also, the estimation problem is much hampered by the paucity of data on the strong wave response of the surficial Delta peats and organic soils.

On the last point, it is encouraging that DWR has responded to the 1992 Consulting Board's recommendation to install surface and downhole strong motion instruments "at the earliest possible date." Although there have not been even moderate magnitude earthquakes in the region since that time, some small ground motions have already been measured at Delta sites (e.g., March 27, 1997 from Fairfield-Vacaville). Of course, there is the problem of valid extrapolation from weak to strong motions. Nonlinear effects have been claimed to have been substantial in some recent California earthquakes (see, e.g., E.H. Field et al., Sei*smological Research Letters*, **69**, pg. 230, 1998). It is not clear to me, however, that many of the reported spectral and duration effects are not the result of source asperities, and especially phase conversion scattering in sedimentary basin structures (see Dan O'Connell of the Bureau of Reclamation, *Science*, 1999).

The Report follows a more-or-less direct probabilistic hazard analysis, which is appropriate given the seismicity uncertainties summarized above. A deterministic approach may well lead to similar average ground motion results, but without the more robust temporal estimates (return periods) given here.

According to the present Report (Figure A-12), peak ground accelerations at Sherman Island of about 0.25g have an annual probability of being exceeded of one in two hundred. It is of passing historical interest that in a 1982 Report to the East Bay Municipal Utility District my quite independent estimate was, for accelerations exceeding 0.25g per year, "about 1 in 200 or so"!

Section 3: Seismicity

The seismicity catalogs and fault information appears complete and sound. I lean towards Model 1, but it seems advisable to consider also the mapping of capable blind thurst faults more to the west (Lettus's model). Both may be true. The hazard result (M6 in 100y RT) for the eastern Delta again agrees with earlier assessments of mine inferred on a more deterministic basis.

Section 4: Fragility

The discussion of levee fragility seems well based to me. It is particularly satisfactory to have probability estimates of the number of failures per exposure period (Appendix B). Given the various uncertainties, however (both intrinsic and from the assumptions), it might have been better to describe the failure functions as bands rather than lines.

Incidentally, it is not quite clear (pg. 13, Section 4.3) how the critical ground motion property of shaking duration was handled. The sentence here leaves open the question of adequate incorporation of the physical response of peaty soils to many cycles of moderate srrong motion.

The results of the study, based on present knowledge, are not very encouraging. According to Table 4.2, peak accelerations of about 0.2g lead to one or more levee failures per 100 miles. As I and others concluded years ago, Sherman Island is particularly vulnerable to flooding. I am still not entirely convinced, however, that an amplification factor of 1.6 (pg. 13) will occur. More relevant strong-motion measurements are vital.

Section 7: Summary of Findings

I judge all six paragraphs to be adequately supported by the studies discussed or referenced. There are really no surprises, so the last two recommendations are, until further earthquake measurements become available, particularly valuable and in need of follow up.

Signed,

Bruce A. Bolt

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7 July 1999

Mr. Ralph A. Torres, Chief
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Dear Mr. Torres:

As requested in your letter, I have reviewed the copy of the final draft report on "Seismic Vulnerability of the Sacramento-San Joaquin Delta Levees", which you enclosed with that letter. A committee chaired by you prepared this report for CALFED.

The report does provide an excellent framework for assessing the vulnerability and the potential risks associated with maintaining the Sacramento-San Joaquin Delta Levees. Your Committee is to be congratulated on completing a comprehensive study and documenting the results in a reasonably complete report. The appendices contain a wealth of information useful for this and other projects in this area.

One issue that deserves further consideration is the resolution regarding the blind thrust faults in the area (page 7 of the report).

The other issue that deserves further detailed evaluation is that related to assessing the seismic response of the levees. I believe that it would be very useful to complete a series of two-dimensional analyses to estimate the response of these levees during various size earthquakes and at various levels of shaking. These analyses can then be used to estimate the hazard (i.e., levels of shaking for given return periods) for the levees. These levels of shaking can be significantly different from those calculated for the rock outcrop. The use of a constant amplification factor (i.e., independent of height of levee, independent of earthquake magnitude, and independent of the level of shaking) may not be justifiable and deserves further study.

While the fragility discussion is presented in elegant equation format, the derivation and the utilization of specific parameters does need further explanations and documentation. This report will have long-term usefulness and it is essential that each part be fully documented and reasonably well supported.

Please accept my apologies for the delay in transmitting these comments to you. I read the report shortly after receiving it from you, but my travel schedule precluded transmitting the comments in a more timely manner. I trust, nevertheless, that you will find these comments useful in finalizing the report and in scheduling and implementing future tasks.

Please let me know if you wish any amplification or additional input regarding the above comments.

Sincerely,

I. M. Idriss

APPENDIX E
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APPENDIX H

PROPOSALS FOR ECOSYSTEM RESTORATION

STATE OF CALIFORNIA PETE WILSON, Governor

DELTA PROTECTION COMMISSION
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July 10, 1998

To: Delta Protection Commission

From: Margit Aramburu, Executive Director

Subject: Alternative Proposal for CALFED Ecosystem Restoration Program in the Delta

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BACKGROUND:

In the Delta Protection Commission's comment letter on the CALFED Draft Ecosystem Restoration Program Plan (ERPP), the Commission made a number of suggestions for high priority projects to enhance and restore habitat. This memo outlines more specific ideas for implementation of those recommended priorities. The memo has been prepared in partnership with representatives of the North, Central, and South Delta Water agencies, and represents ideas acceptable to those entities. None of the Water Agencies have taken a formal position on the memo or the ideas in the memo. The purpose of the review by the Delta Protection Commission is to help refine this list of suggested "alternative" projects to forward to the CALFED Bay Delta Advisory Committee (BDAC), the public entity providing input to the CALFED process. The list is a draft list which should change after public and Commission review and input.

The Commission should review the attached memo, seek public comments and input on the suggestions in the memo, and direct staff to continue working on refinement of the memo with other Delta interests to present to BDAC at its September 1998 meeting to be held in Stockton.

CALFED ERPP HABITAT RESTORATION TARGETS FOR DELTA ECOLOGICAL ZONE (See Exhibit 1):

Tidal Perennial Aquatic	7,000 ac
Shoal	500 ac
Nontidal Perennial Aquatic (deep open water)	500 ac
Nontidal Perennial Aquatic (shallow open water)	2,100 ac
Midchannel Islands	200 to 800 ac

Fresh Emergent Wetland (tidal)		30,000 to 45,000 ac
Fresh Emergent Wetland (nontidal)		20,000 ac
Seasonal Wetland	Improve:	4,000 ac
	Restore:	30,000 ac
Inland Dune Scrub		50 to 100 ac
Perennial Grassland		4,000 to 6,000 ac
Wildlife Friendly Agricultural Land		40,000 to 75,000 ac

DELTA PROTECTION COMMISSION COMMENTS ON DRAFT ERPP:

The Delta Protection Commission comments regarding the ERPP recommended that the ERPP be modified to prioritize the following restoration programs:

Restoration and/or enhancement of lands currently in public and/or nonprofit ownership (or currently in the acquisition process) and designated for restoration, including Twitchell Island, Sherman Island and Prospect Island. Approximately 35,000 acres fall in this category.

Acquisition and/or enhancement of currently flooded lands to create and/or enhance emergent habitat, including Franks Tract, Big Break, Mildred Island, Little Mandeville, Island, etc. Approximately 7,000 acres fall in this category.

Development and implementation of management plans for upland areas already in public or nonprofit ownership, including Calhoun Cut Ecological Preserve (approximately 1,000 acres), Rhode Island, etc.

Development and implementation of individual management plans for private agricultural properties and development of funds to offset costs of voluntary implementation of such plans (plans could include flooding programs, enhanced levees and pumps to enhance flooding and drainage, recommended crop rotation cycles, size and location of permanent brood ponds, etc.)

Development and implementation of individual management plans for privately-owned lands managed for wildlife habitat, such as duck clubs and upland hunting clubs, and development of funds to offset costs of voluntary implementation of such plans.

Control of stressors should be revised to avoid duplication with existing regulatory programs, such as existing dredging "windows", and the programs that are developed should respect the needs of existing land uses, such as water-oriented recreation. Where funds are needed to carry out specific programs, those funds should be made available to private land owners to implement CALFED programs.

Protection, enhancement and restoration of in-channel islands and waterside berms.

LISTING OF SITES BY TYPE OF HABITAT TO BE CREATED/ENHANCED:

Managed Wetlands (within levees):

GOAL: Prepare specific enhancement and management plans and obtain funding for restoration and management on all lands already owned by public agencies or nonprofits before funding any additional retirement of privately-owned agricultural lands.

OPPORTUNITIES:

Yolo Bypass Wetlands:	3,600 ac /DFG
Sherman Island:	10,000 ac /DWR
Twitchell Island:	3,500 ac /DWR
Stone Lakes Wildlife Refuge:	1,090 ac /DPR
	1,000 ac /Sacramento County

[plus additional acquisition and management to complete the 9,000 ac refuge]

Jepsen Prairie Preserve:	1,600 ac /Solano County Farmlands and Open Space Trust
Calhoun Cut:	970 ac /DFG
Tip of Grand Island:	250 ac /Corps of Engineers
Prospect Island:	1,200 ac /Bureau of Reclamation
North Delta Cross Channel:	100 ac /Bureau of Reclamation
Wright-Elmwood Mitgn.Bank:	80 ac /Private
Medford Island Mitign. Bank:	1,200 ac /Private

Enhancement of Existing Shallow Water Areas and Other Areas Outside Levees:

GOAL: Identify publicly-owned, water-covered sites and privately-owned, water-covered sites that could be enhanced and managed to provide improved shallow water habitat suitable for fish nursery areas. Identify other sites outside existing levees that could be enhanced for shallow water or other related habitats.

OPPORTUNITIES:

Big Break:	800 ac /EBRPD
Browns Island:	600 ac / EBRPD
Franks Tract:	3,500 ac /DPR
Little Franks Tract:	330 ac /DPR
Mildred Island:	1,000 ac /Private
Little Mandeville Island:	375 ac /Private
Venice Tip:	160 ac /Port of Stockton
Tip of Prospect:	300 ac /Port of Sacramento
Decker: North Tip:	40 ac /DFG
Decker: East Side:	140 ac /Port of Sacramento
Lower Sherman Island Wildlife Area:	3,100 ac /DFG

Delta Meadows:	134 ac /DPR
Little Holland Tract:	1,600 ac /Private
Kimball Island:	100 ac /Private
Rhode Island:	DFG
Fern Island:	80 ac/ Private
Little Hastings Tract:	125 ac/ Private
Port of Stockton Lands such as:	
Browns Island:	100 ac
Donlon Island:	225 ac
Mandeville Tip:	176 ac
Venice Cut	211 ac
North Headreach:	53 ac
Tule Island:	36 ac
North Spud:	28 ac
South Spud:	60 ac
Acker Island:	7 ac
Webb Tract Berms and Islands:	285 ac /DFG
Sycamore Island:	13 ac /DFG
Acker Island:	25 ac /DFG
Cabin Slough Islands:	15 ac /DFG
Miner Slough Islands:	34 ac /DFG
Lost Slough Islands:	38 ac /DFG

DESCRIPTION OF SITES SHOWN ON MAPS:

One map illustrates sites which are publicly owned, owned by a nonprofit entity, or which are subject to a conservation easement, which are currently managed for ecosystem values:

Yolo Bypass Wetlands Project, DFG and Yolo Basin Foundation
Various Duck Clubs in the Yolo Bypass with a Conservation Easement, Private
Jepsen Prairie Preserve, Solano County Farmlands and Open Space Foundation
Cosumnes Preserve, Nature Conservancy, Bureau of Reclamation and others
Stone Lakes Wildlife Refuge Lands Under Management, U.S. Fish and Wildlife Service
Lower Sherman Island Wildlife Management Area, DFG
Palm Tract/Portions Subject to Conservation Easement, Private
White Slough Wildlife Area, DFG/DWR
Medford Island/Portions included in Mitigation Bank, Private
Woodbridge Ecological Preserve, DFG/DWR
Kimball Island Mitigation Bank, Private
Wright Elmwood Mitigation Bank, Private

One map illustrates publicly owned lands **not** actively managed for ecosystem values:

Calhoun Cut, DFG
Port of Sacramento Lands
Port of Stockton Lands
Twitchell Island, DWR
Sherman Island, DWR
Tip of Grand Island, Corps
Browns Island, EBRPD/SLC
Big Break, EBRPD
Franks Tract, DPR
Little Franks Tract, DPR
Lands in the East Delta, DWR

One map illustrates private lands with opportunity for enhancement and/or restoration:

Lands in the Yolo Bypass already subject to flood easements
Other lands subject to levee height restrictions
Lands in the boundary of Stone Lakes Wildlife Refuge south of Lambert Road (management agreements)
Water-covered Lands in the Meadows (east of Locke)
Lands proposed by the owner for restoration/enhancement (Bouldin and portions of Holland)
In-Channel Islands

ENHANCEMENT OF RIPARIAN CORRIDORS:

One of the key concepts of the ERPP is restoration and enhancement of Delta riparian corridors. This memo describes alternative concepts for enhancement of three key riparian corridors consistent with the need to maintain and enhance the flood control and water conveyance functions of the major tributaries to the Delta.

The CALFED program has identified the need for riparian habitat enhancement to improve migratory corridors for anadromous fish, such as salmon, and spawning habitat for those fish species that spawn in the Delta environment, such as Delta smelt. In addition, the riparian habitat corridors provide habitat for birds, mammals, insects, reptiles, amphibians, and indigenous plants.

Sacramento River Corridor Enhancement: Currently the Sacramento River corridor is bounded by large, project levees which are largely unvegetated.

The ERPP recommends enhancing riparian corridors along several smaller sloughs and waterways between the Sacramento River and the Deep Water Ship Channel to the west, including Steamboat, Miner, Oxford, and Elk Sloughs. Additional enhancement is proposed on the main channel of the Sacramento River from Sacramento to Rio Vista.

As an alternative, CALFED should consider possible enlargement and enhancement of a corridor west of the Deep Water Ship Channel, within the Yolo Bypass. Such a waterway could connect to the main stem of the Sacramento River at either or both the Sutter Weir or the Sacramento Weir. There is an existing channel, the Toe Drain, which lies west of the Ship Channel. The Toe Drain is largely unvegetated but lies within the Yolo Bypass, where the lands are already subject to a flood easement purchased by the federal government to provide additional flood protection to the City of Sacramento and the Delta area. While the Sacramento River can contain flows of about 150,000 cfs, the Yolo Bypass can contain about 450,000 cfs. Locating an enhanced riparian corridor within the Yolo Bypass would also address the identified issues of stranding of fish within the Yolo Bypass at the end of the flood season. Creation of an enlarged, excavated channel would enhance flood water carrying capacity of the Yolo Bypass, which would then allow introduction and maintenance of beneficial plant material into the floodway.

Mokelumne River Corridor Enhancement: Currently the Mokelumne River, downstream of the confluence with the Cosumnes River, is within non-project levees. Downstream of McCormack Williamson Tract, the Mokelumne River splits into the North Fork, which lies between Tyler and Staten Islands, and the South Fork, which lies between Staten Island and New Hope, Brack, Canal Ranch and Terminous. At the south end of Staten Island, the South Fork turns toward the west and rejoins the North Fork near the south end of Tyler Island, at the northwest end of Bouldin Island, and near the crossing of Highway 12. The South Fork has been the subject of several projects on Staten Island to recreate berms at the waterside toe of the levees. At the south end of Staten Island, several in-channel islands have been protected with riprap and bolstered with placement of earthen material. Along the North Fork on the shoreline of Tyler Island, a Category III funded project is being planned to protect existing riparian vegetation on the waterside berms and at the toe of the levees.

The CALFED program and the ERPP recommend use of the North Fork as a water conveyance channel, and the use of the South Fork as a riparian corridor, with enhancement of the adjacent waterways of Beaver, Hog, and Sycamore Sloughs, and with new setback levees and flooding of large tracts of existing farmed lands on New Hope, Brack, Canal Ranch and Terminous Tracts. The deeply subsided lands would be temporarily flooded during flood season and the upper elevation areas in New Hope, Brack, Canal Ranch and Terminous would be permanently flooded, thereby eliminating some of the most productive farmland in the Delta.

As an alternative, CALFED should consider enhancing the South Fork for water conveyance and flood control, in effect dividing the flow of the Mokelumne River between its North and South Forks. Both Forks should be examined for additional habitat opportunities as channel capabilities are increased by dredging and/or necessary levee setbacks. There are major constrictions in the upper reaches of the South Fork. Relieving those restrictions will present important opportunities for flood control and habitat enhancement.

The easternmost location of a water conveyance alignment will keep the maximum possible distance between the saline waters of the Bay (the principal source of bromides and other salts), and water to be exported for irrigation and for drinking water.

In order to optimize the quality of the water conveyed through the Mokelumne corridor, the conveyance alignment should continue south from Staten Island, passing to the east of Bouldin and Venice Islands.

The Mokelumne River corridor must serve multiple purposes: water conveyance through the Delta, flood control for Sacramento and San Joaquin Counties, and a riparian habitat corridor for aquatic and terrestrial species.

San Joaquin River Corridor: The San Joaquin River is channelized, with newly enhanced levees along urban development in the South Stockton area.

The ERPP recommends restoration of floodplain habitat along the lower San Joaquin River between Mossdale and Stockton with levee setbacks and an overflow basin, and improved riparian habitat along leveed sloughs. The ERPP includes installation of a barrier at the head of Old River to keep migratory fish in the mainstem of the San Joaquin River. The purposes of the enhancement of the San Joaquin River are joint benefits associated with flood water transport and enhancement of fisheries migration corridors.

Currently, south of Mossdale to the San Joaquin County boundary, the San Joaquin River provides multiple opportunities to enhance riparian vegetation. For most months of most years, flows in these reaches of the San Joaquin River do not exceed 3,000 cfs. The low-flow channel could be established generally near the west or left bank of the existing levee system which, once stabilized and bermed, could support nearly continuous areas of large riparian vegetation to shade the low flow channel. Oxbows and bends currently cut off from the river flows could be re-opened and maintained providing feeding and resting areas for aquatic species.
North of Mossdale to Stockton, the mainstem of the San Joaquin could continue to be enhanced for seasonal migratory fish passage through the release of pulse flows necessary to stimulate inland migration, and enhance seaward migration.

Enhancement of riparian vegetation corridors could proceed on two other waterways: Paradise Cut to Old River to Grant Line Canal to Old River, and Old River to Middle River to San Joaquin River. Paradise Cut is a flood control channel designed to carry 15,000 cfs, which has not been maintained. To improve Paradise Cut, the weir to Paradise Cut could be enlarged, the Cut could be enlarged by incorporating mitigation lands east of the Cut to be provided by the Gold Rush City project (900 acres) and by clearing and dredging the connection to Grant Line Canal. Grant Line Canal connects to Old River, a waterway with numerous in-channel islands suitable for management and enhancement. The result could be flood flow capacity enlarged to 20,000 cfs, and a riparian corridor suitable for avian and terrestrial species. Middle River leaves the main stem of the San Joaquin north of Stewart Tract, flows north between Union and Roberts Islands,

and rejoins the San Joaquin River between Medford and Mandeville Islands. The portions of this waterway between Roberts and Union Islands should be cleared of brush to increase flood flow capacity and the levees should be improved to accommodate the planting of trees that will not adversely affect flood flows and will provide habitat for avian and terrestrial species.

WILDLIFE FRIENDLY FARMING PRACTICES PROGRAM:

In the 1993-94 period, a Crop Shift Demonstration Project was conducted on Rindge Tract. The Department of Fish and Game recommended certain measures to mitigate any impact to wildlife from the demonstration project. Most of those measures were implemented as a part of the demonstration project, and the results were monitored and positive results were reported.

Based on this positive demonstration project, many years of previous and subsequent experiences with post-harvest flooding of agricultural lands in the Delta, and intuition, a wildlife friendly agricultural practices program might be formulated and described as follows:

Objectives:

1. Extend availability of post-harvest flooded grain fields to cover full period of usage by migratory birds.

2. Enhance food value of post-harvest flooded grain fields by intentionally leaving more grain in the fields by either modifying harvest practices or intentionally not harvesting portions of the fields to be flooded.

3. Create fringe areas during important periods to enhance forage opportunities for certain species (e.g. Sandhill cranes, Swainsons hawks)

4. Extend availaibity of program across the Delta lands utilized by important migratory speicies to discourage over-concentration in one area.

5. Avoid interference with exisitng agricultural economy of the region.

Program:

1. Participation would be voluntary.

2. Include a combination of early-harvested and late-harvested small grain crops to increase time availability of post-harvest flooded habitat.

3. Participants would agree to leave small percentages (5 to 10%) of crop unharvested in small plots in participating fields distributed across area to be flooded.

4. Harvest specifications:

A. Wheat/Barley stubble 12 inches or less in height and not disced prior to flooding.

B. Corn stubble 24 inches or less in height (harvested portions can be single-disced prior to flooding.

5. Flooding specifications:

A. Wheat/Barley flooded as soon as practicable after September 15th.

B. Corn fields flooded as soon as practicable after harvest and left flooded until at least January 15th.

C. Where practicable, some marginal area of flooded fields to be left dry or shallowly flooded for raptor, crane, and shorebird foraging during flood-up periods.

6. Compensation. Payment for additional costs incurred and revenues foregone would be based on a dual scale:

A. A payment to the entity incurring the additional drainage cost would be made for additional drainage costs resulting from increased drainage caused by the program (estimated to be approximately $15.00 per flooded acre).

B. An additional payment would be made to the farming entity for unharvested acreage based on the value of the unharvested crop less harvest, drying (if any), hauling, and other similar costs not otherwise incurred (estimated to be approximately $100/ton of crop not harvested, or $20 to $40 per acre for participating acreage, depending on percentage of crop not harvested).

SUMMARY OF ERPP HABITAT RESTORATION TARGETS AND PROGRAMMATIC ACTIONS FOR THE SACRAMENTO-SAN JOAQUIN DELTA ECOLOGICAL ZONE.

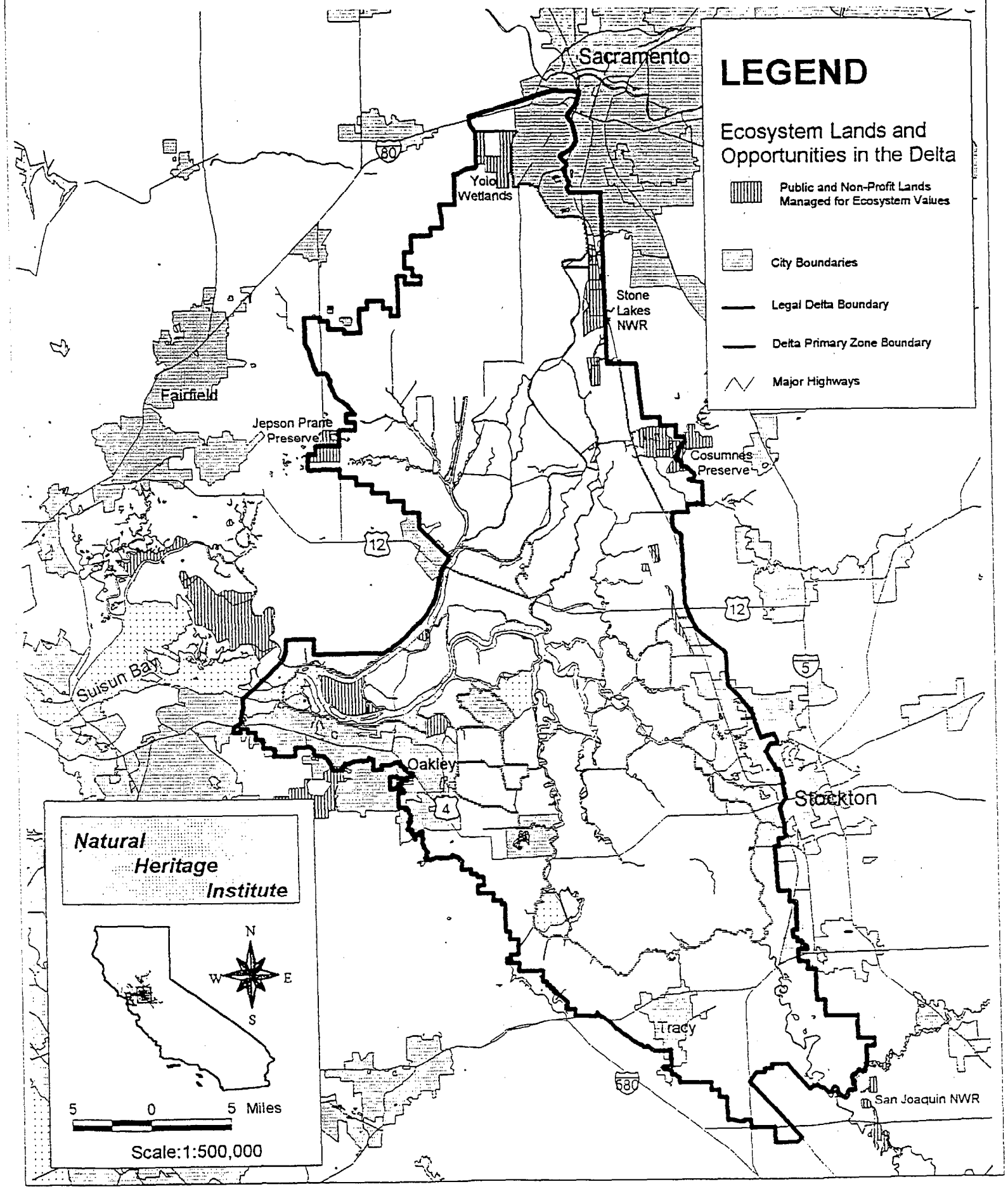
Habitat Type	North Delta Acreage	East Delta Acreage	South Delta Acreage	Central and West Delta Acreage	Total Acreage
Tidal Perennial Aquatic	1,500	1,000	2,000	2,500	7,000
Shoal	0	0	0	500	500*
Nontidal Perennial Aquatic (deep open water)	0	200	200	100	500
Nontidal Perennial Aquatic (shallow open water)	1,000	300	300	500	2,100
Midchannel Islands	50 to 200	50 to 200	50 to 200	50 to 200	200 to 800*
Fresh Emergent Wetland (tidal)	TBD [to be determined]	TBD	TBD	TBD	30,000 to 45,000
Fresh Emergent Wetland (nontidal)	3,000	3,000	4,000	10,000	20,000
Seasonal Wetland	Improve: 1,000 Restore: 4,000	1,000 6,000	500 12,000	1,500 8,000	4,000 30,000
Inland Dune Scrub	0	0	0	50 to 100	50 to 100*
Perennial Grassland	1,000	1,000	1,000 to 2,000	1,000 to 2,000	4,000 to 6,000
Wildlife Friendly Agricultural Land	TBD	TBD	TBD	TBD	40,000 to 75,000*
				Total acres	138,000 to 191,000

* Denotes acreages that have minimal impact to existing agricultural land uses and practices.

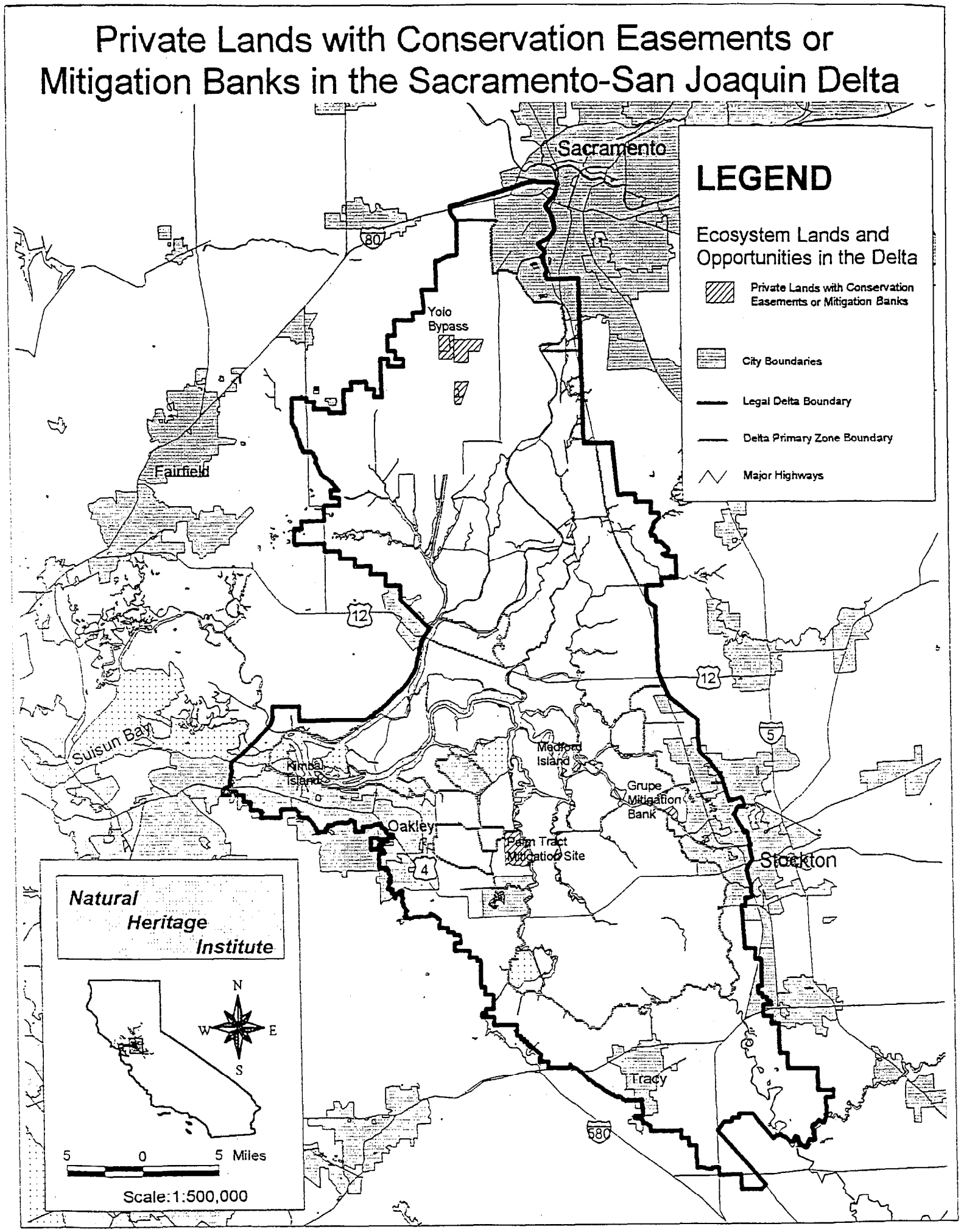
Note: Table does not include acreages for riparian and riverine aquatic habitat, Delta sloughs, levee reliability program, or conveyance facilities.

Exhibit 1

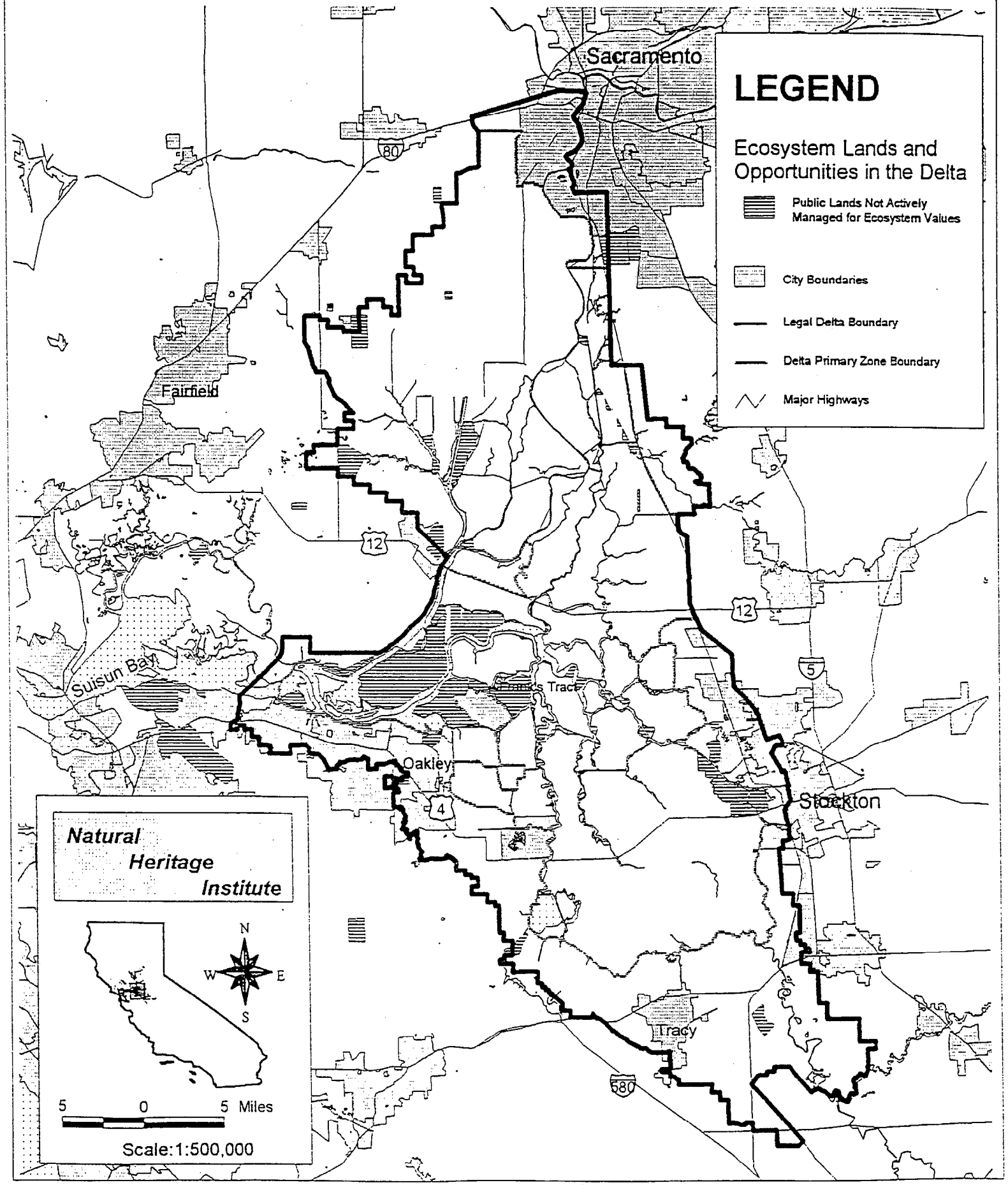
Public and Non-Profit Lands Managed for Ecosystem Values in the Sacramento-San Joaquin Delta



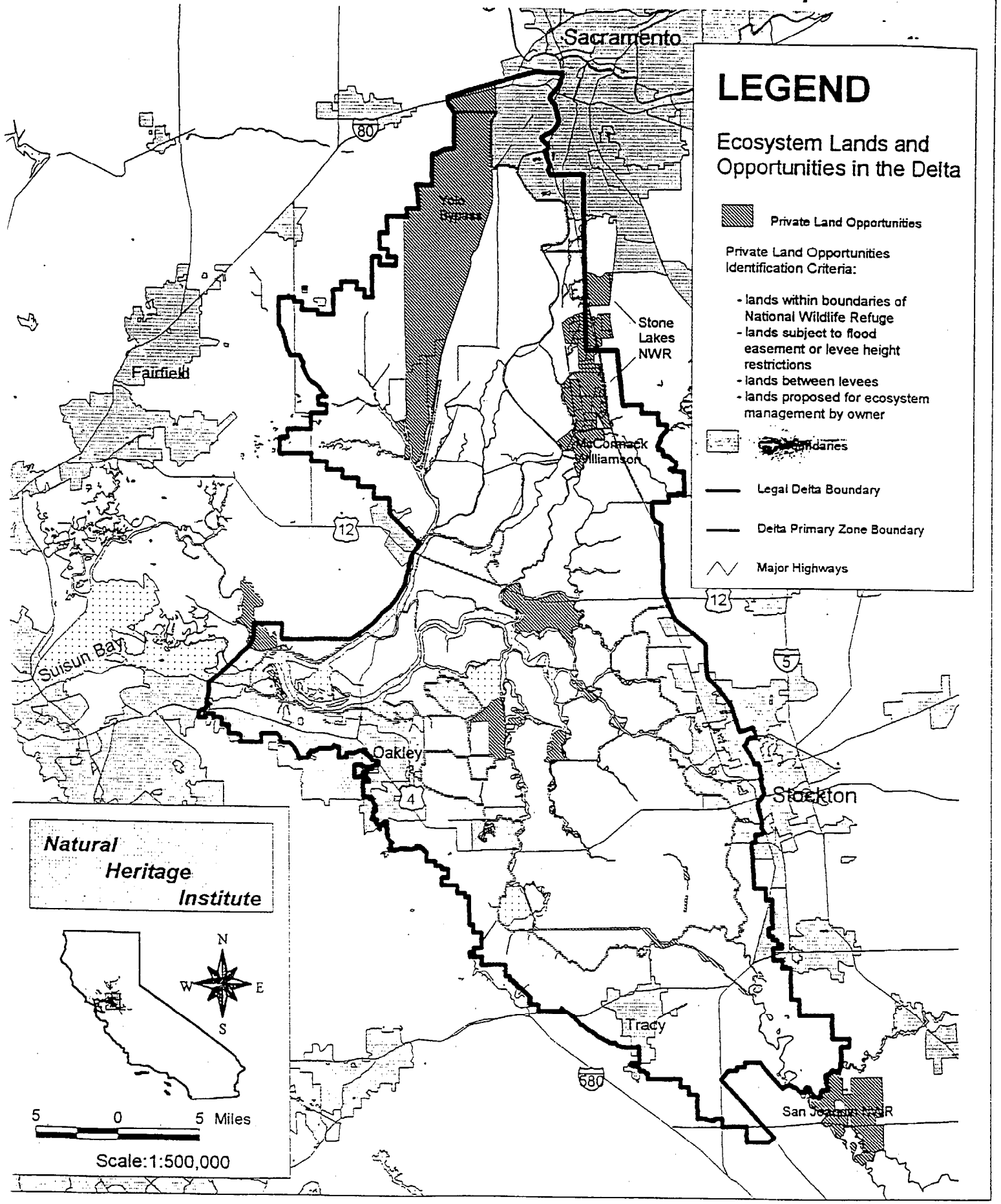
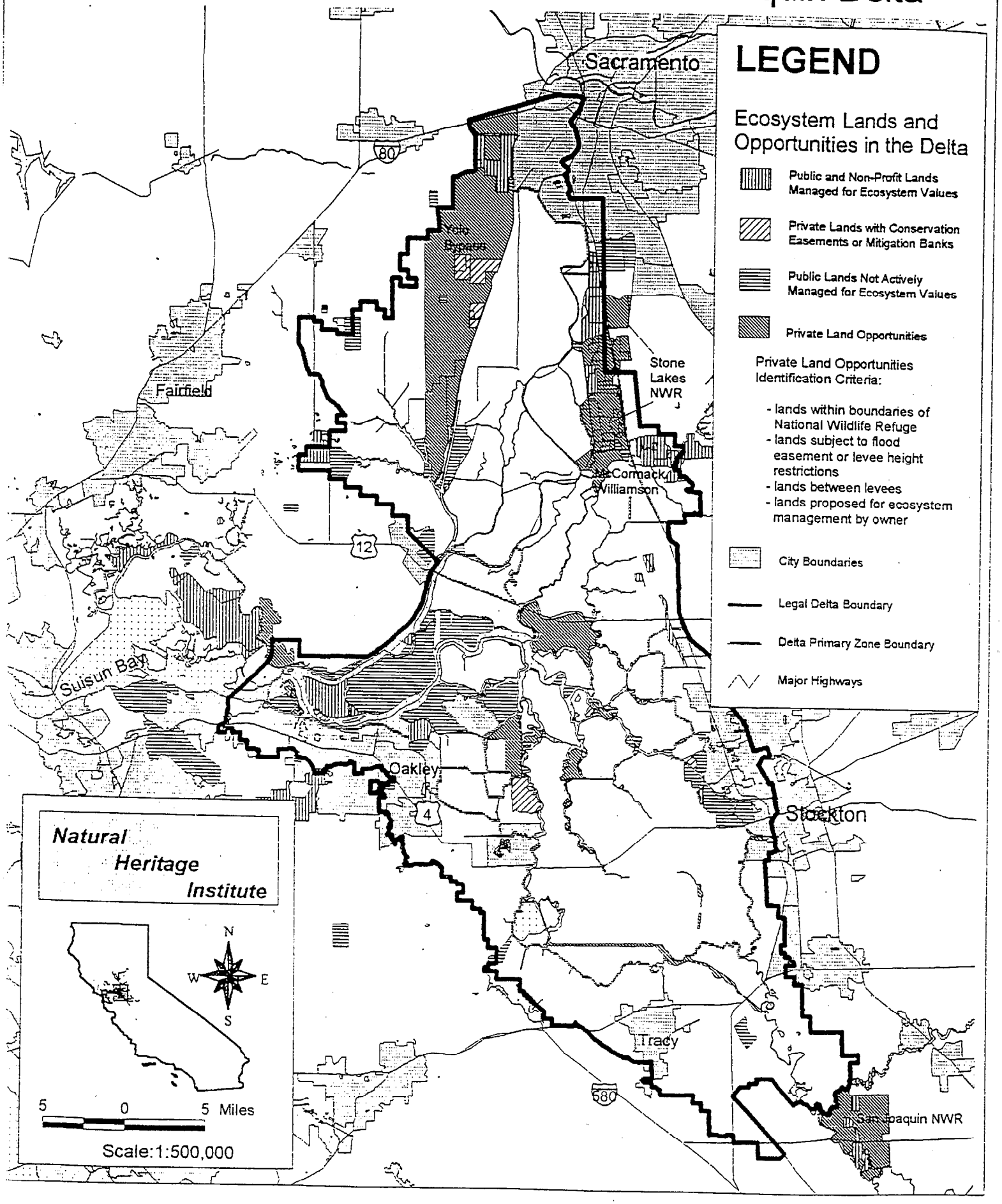
Private Lands with Conservation Easements or Mitigation Banks in the Sacramento-San Joaquin Delta



Public Lands Not Actively Managed for Ecosystem Values in the Sacramento-San Joaquin Delta



Opportunities for Ecosystem Protection and Restoration on Private Lands in the Sacramento-San Joaquin Delta



Ecosystem Management and Restoration Opportunities in the Sacramento-San Joaquin Delta