State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

SACRAMENTO-SAN JOAQUIN
DELTA ATLAS

August 1987

FOREWORD

The Sacramento-San Joaquin Delta was originally a tidal marsh formed at the confluence of the Sacramento and San Joaquin rivers and Suisun Bay. More than 80 percent of this former marsh was leveed and developed for agriculture from the mid-1800s to the early 1900s.

Today the Delta islands and levees are of statewide importance for agriculture, water quality, flood control, recreation, fish and wildlife, water supply, commercial shipping, transportation, and other benefits.

This Atlas is the result of information gathered during Department of Water Resources studies on Delta programs and, in particular, the recent studies for Delta levee improvements.

The Atlas provides background information that should be helpful for people trying to understand and address complex problems of this estuary. The information is presented in a series of figures, photographs, and tables for easy reference.

David N. Kennedy, Director
Department of Water Resources
The Resources Agency
State of California

CONTENTS

		Page
FOREWORD		iii
INTRODUCTION		1

Tables

1	Improvements on Delta Islands	2
2	Emergency Work Expenditures on Nonproject Levees, 1980-1986, Ranked by Total Cost Expended	44
3	Emergency Work Expenditures on Nonproject Levees, 1980-1986, Ranked by Cost per Acre	45
4	Annual Levee Maintenance, 1981-1986, Ranked by Total Cost per Mile	46
5	Delta Statistics	60

Figures

1	Fresh Water Tidelands, 1872	4
2	Delta Waterways, 1987	5
3	Waterways Constructed for Shipping and Circulation	7
4	Statutory Delta, Service, Area, Uplands and Lowlands	8
5	Water Districts and Agencies	9
6	Federal Flood Control Project Levees	11
7	Local Flood Control, Nonproject Levees	13
8	National Flood Insurance Program Approved Levees	14
9	Reclamation Districts, Levee Maintenance Districts	15
10	City and Town Populations	17
11	Island Populations	19
12	Federal and State Highways	21
13	County Roads Providing Island Access	23

CONTENTS (Continued)

14	Islands Requiring Ferry Access	25
15	Recreation Areas	27
16	Water Development Facilities	29
17	Railroads and Power Transmission Lines	30
18	Gas Fields and Storage Areas	31
19	Deep Water Ship Channels	33
20	Depth of Peat	35
21	Land Surface Below Sea Level	36
22	Lowest Surface Elevations	37
23	Islands Flooded Since 1980	39
24	Flood Stage Elevations (1:100 Year Flood)	41
25	Emergency Expenditures per Acre, 1980-1985	43
26	Annual Maintenance Expenditures, 1981-1986	47
27	Irrigation Diversions	49
28	Agricultural Drainage Returns	51
29	Islands Posing Threat to Water Quality if Permanently Flooded	52
30	Location of Maximum Annual Salinity Intrusion	53
31	Key Water Quality Monitoring Stations	55
32	Counties	56
33	State Assembly Districts	57
34	State Senate Districts	58
35	Congressional Districts	59

Appendix

Excerpts from the California Water Code 61

CREDITS

Photograph on Page 3 Courtesy of Dutra Construction Company, Inc.
Photograph on Page 40 Courtesy of Kjeldsen-Sinnock & Associates, Inc.
Tideland Map (Figure 1) Courtesy of State Lands Commission
Department of Water Resources Maps by Mike Serna
Department of Water Resources Photographs by Robert Eplett
Report Design by Vera L. Padjen

INTRODUCTION

In late 1850, the Swamp and Overflow Land Act conveyed ownership of all swamp and overflow land, including Delta marshes, from the Federal Government to the State of California. Proceeds from sale of swampland by the State were to go toward reclaiming the swamplands. In 1861, the State Legislature created the Board of Swamp and Overflowed Land Commissioners to manage reclamation projects. In 1866, the Board's authority was transferred to county boards of supervisors. In 1868, the Legislature removed acreage ownership limitations, and by 1871 most of California's swampland was in private ownership.

Developers first thought levees 4 feet high and 12 feet at the base would protect Delta lands from tides and river overflow, but that proved inadequate for Delta peat soils. By 1869, substantial levees had been constructed on Sherman Island and Twitchell Island by Chinese laborers, and in 1870 and 1871 the owners reaped bountiful harvests of grain and row crops. Small-scale reclamation projects were started on Rough and Ready Island and Roberts Island in the early 1870s, but the peat soils showed their weakness as levees. The peat soils would sink, blow away when dry, and develop deep cracks and fissures throughout the levee system. Sherman and Twitchell Islands flooded annually in the early 1870s. By 1874, reclamation and preservation cost for Sherman Island's levees had totaled $500,000.

In the late 1870s, the developers had begun to realize that hand- and horse-powered labor could not maintain the reclaimed Delta islands. Steam-powered dredges began to be used to move the large volume of alluvial soils from the river channels to construct the large levees. These dredges were capable of moving material at about half the cost of hand labor.

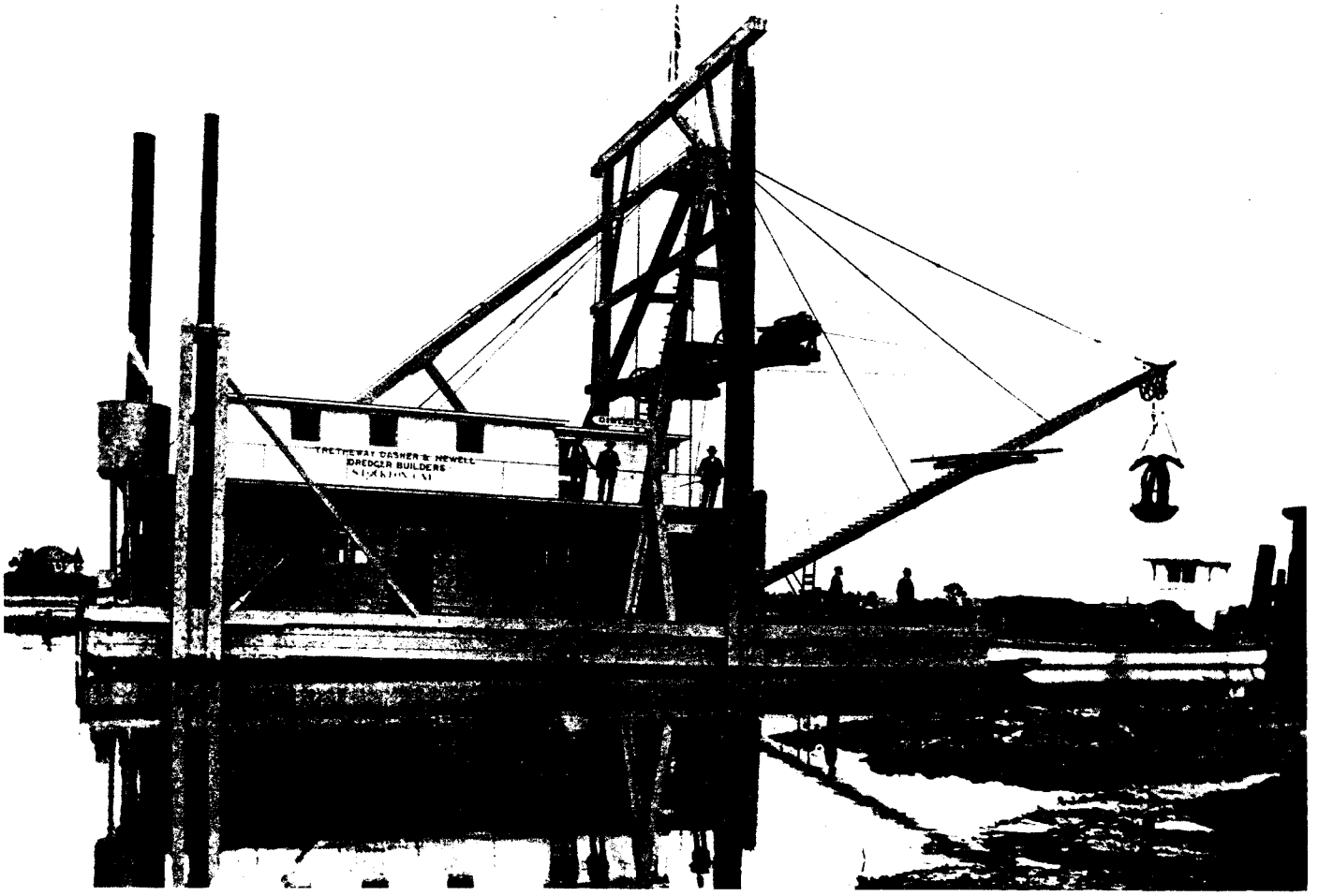
The peak of Delta land reclamation was reached with the clamshell-type dredge, still commonly used. Advantages of this machine over its predecessors were versatility, ease of operation, and modest capital and operating costs.

After World War I, the number of operating dredges decreased greatly, as nearly all Delta marshland had been reclaimed. By this time, the Delta had been transformed from a large tidal marsh to the series of improved channels and leveed islands we know today.

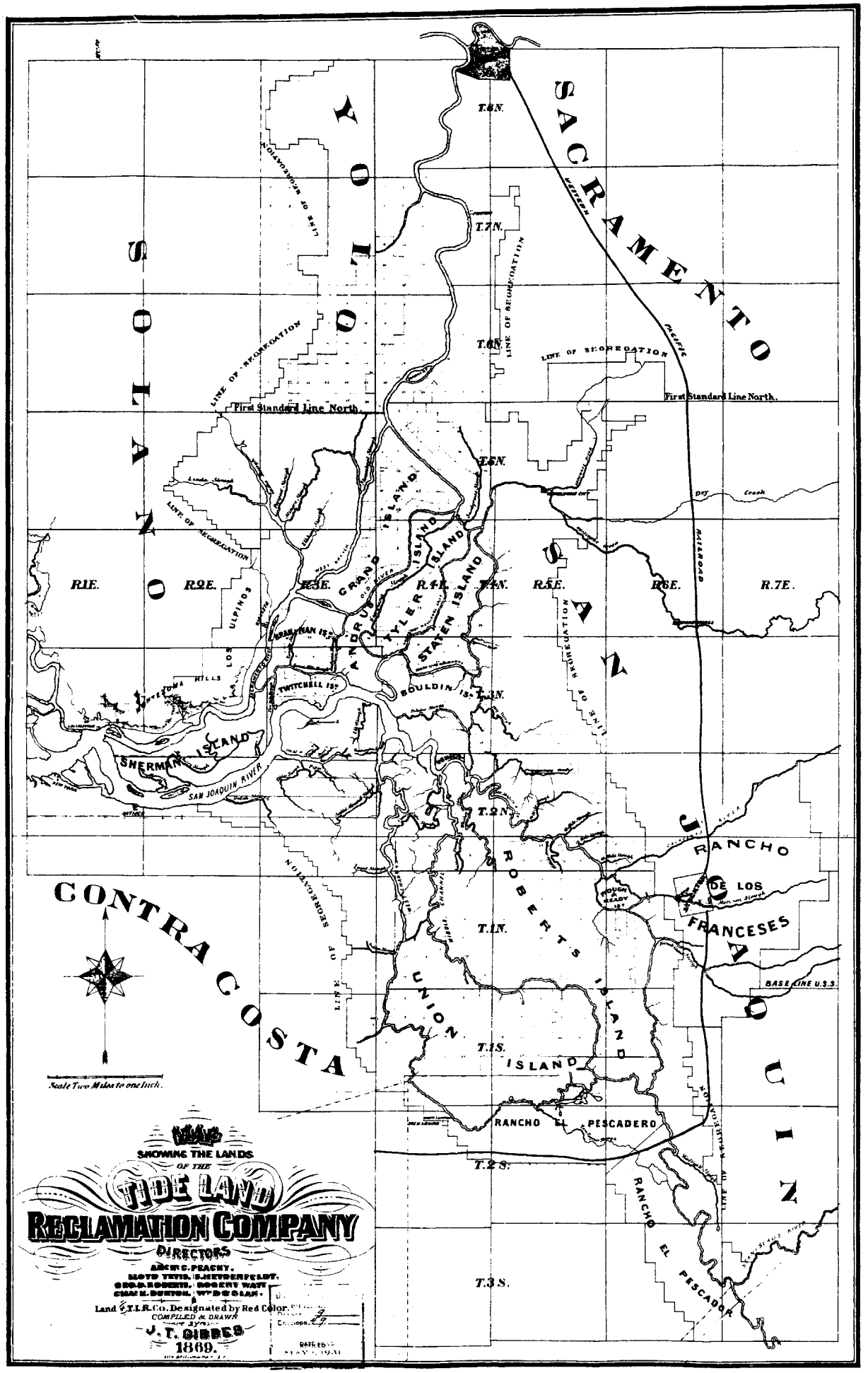
Table 1

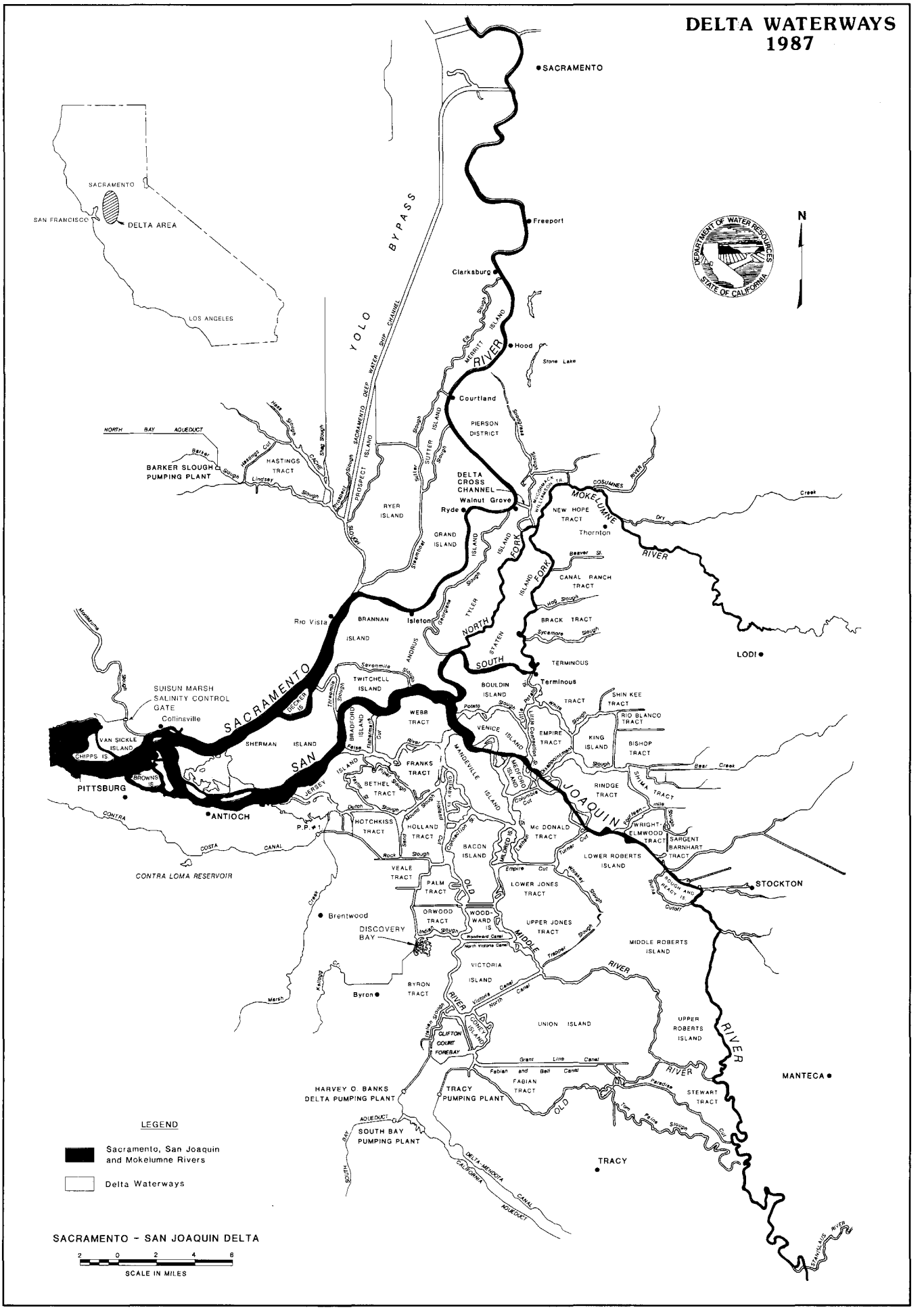
IMPROVEMENTS ON DELTA ISLANDS

R.D. No.	District Name	Project Levee Mi.	Non-Project Levee Mi.	Acres	Railroads	Public Roads	Utilities	Cities, Towns or Urban	Recreation Resorts
2028	Bacon		14.3	5,625		X	X		
--	Bethel		11.5	3,500		X	X	X	X
2042	Bishop		5.8	2,169					X
756	Bouldin		18.0	6,006		X			
2033	Brack		10.8	4,873		X			
2059	Bradford		7.4	2,051			X		
--	Brannan-Andrus	19.3	10.1	13,000		X	X	X	X
800	Byron		9.7	6,933		X	X	X	X
2086	Canal Ranch		7.5	2,996		X			
2117	Coney		5.4	935					
2111	Dead Horse		2.6	211					
2029	Empire		10.5	3,430		X	X		X
773	Fabian		18.8	6,530		X			X
2113	Fay		1.6	100					
2025	Holland		10.9	4,060		X			X
2116	Holt Station		0.4	37					
799	Hotchkiss		6.3	3,100		X	X	X	X
830	Jersey		15.6	3,471		X	X		
2038	Jones, Lower		8.8	5,894	X	X	X		X
2039	Jones, Upper		9.3	6,259		X	X		X
2044	King		9.0	3,260		X	X		X
2118	Little Mandeville		4.5	376					
2027	Mandeville		14.3	5,300					
2110	McCormack-Williamson		8.8	1,654			X		
2030	McDonald		13.7	6,145			X		
2041	Medford		5.9	1,219					
2021	Mildred		7.3	998					
1007	Naglee Burke		8.3	6,090	X	X	X		
348	New Hope		18.6	9,300	X	X	X	X	X
2024	Orwood		10.9	4,138	X	X	X		X
2036	Palm		7.5	2,436			X		
1667	Prospect	2.9	7.1	1,228					
2090	Quimby		7.0	769			X		
2037	Rindge		15.7	6,834					
2114	Rio Blanco		4.0	705					
684	Roberts, Lower		16.0	10,600	X		X		X
524	Roberts, Middle	6.1	3.7	13,687	X	X	X		
544	Roberts, Upper	10.6	4.4	8,260		X	X		
2074	Sargent Barnhart	1.5	2.8	1,214		X	X		
341	Sherman	9.7	9.8	9,937		X	X		X
2115	Shima		6.6	2,394		X	X		
2089	Stark	2.8	0.7	734		X			
38	Staten		25.4	9,173		X	X		
548	Terminous		16.1	10,470		X	X	X	X
1601	Twitchell	2.5	9.3	3,516		X	X		X
563	Tyler	12.2	10.7	8,583		X	X		X
1	Union, East	1.0	13.0	9,622		X	X		
2	Union West		16.2	12,580		X	X		
1607	Van Sickle		3.8	1,058					
2065	Veale		5.7	1,298		X	X		
2023	Venice		12.3	3,220					
2040	Victoria		15.1	7,250		X	X		
554	Walnut Grove	1.0	1.2	400		X		X	X
2026	Webb		12.8	5,490					
828	Weber		1.2	660		X	X		
2072	Woodward		8.8	1,822			X		
2119	Wright-Elmwood	____	6.8	2,121		X	X		
TOTAL	57 Local Agencies	69.6	530.3	255,721					

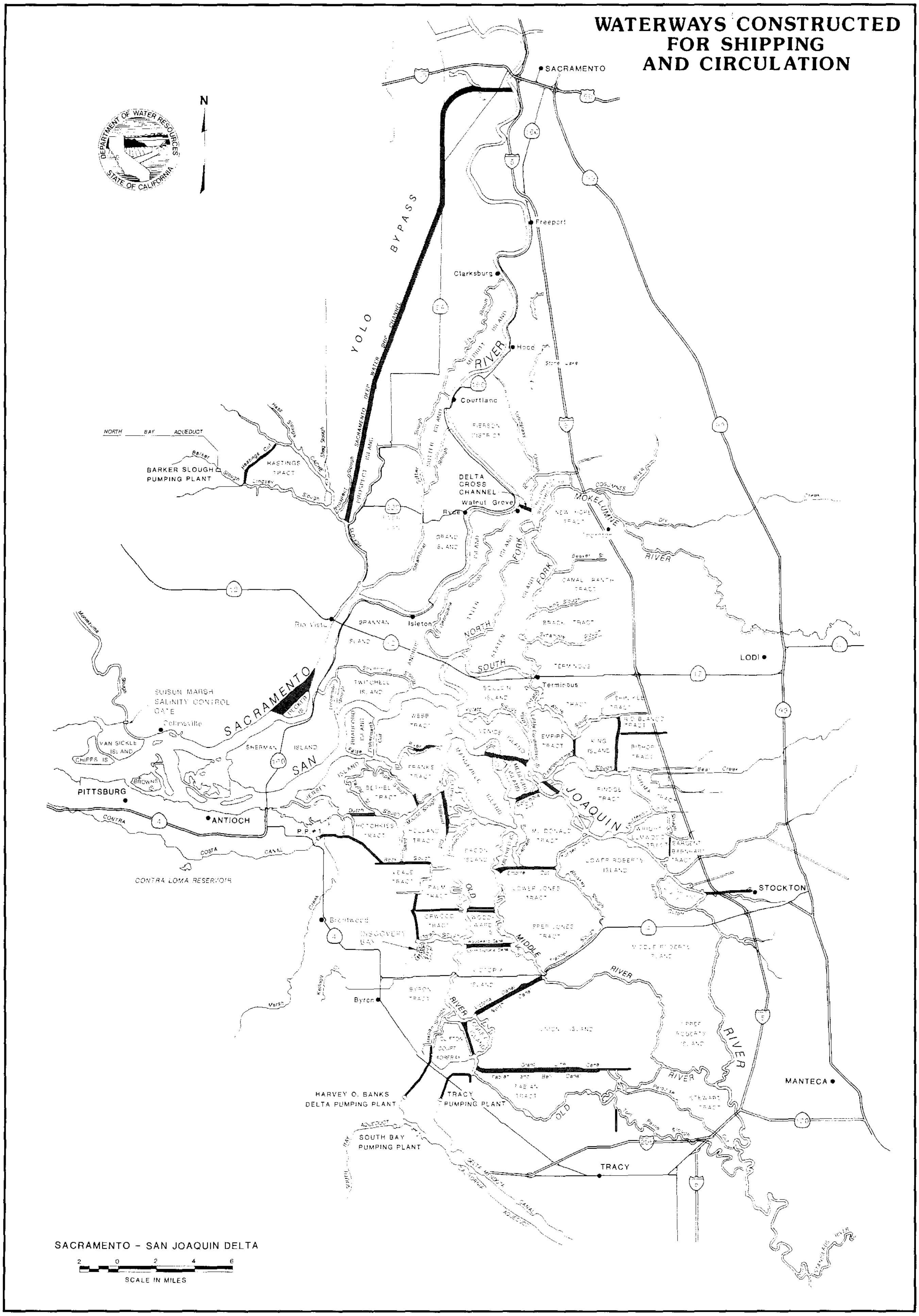


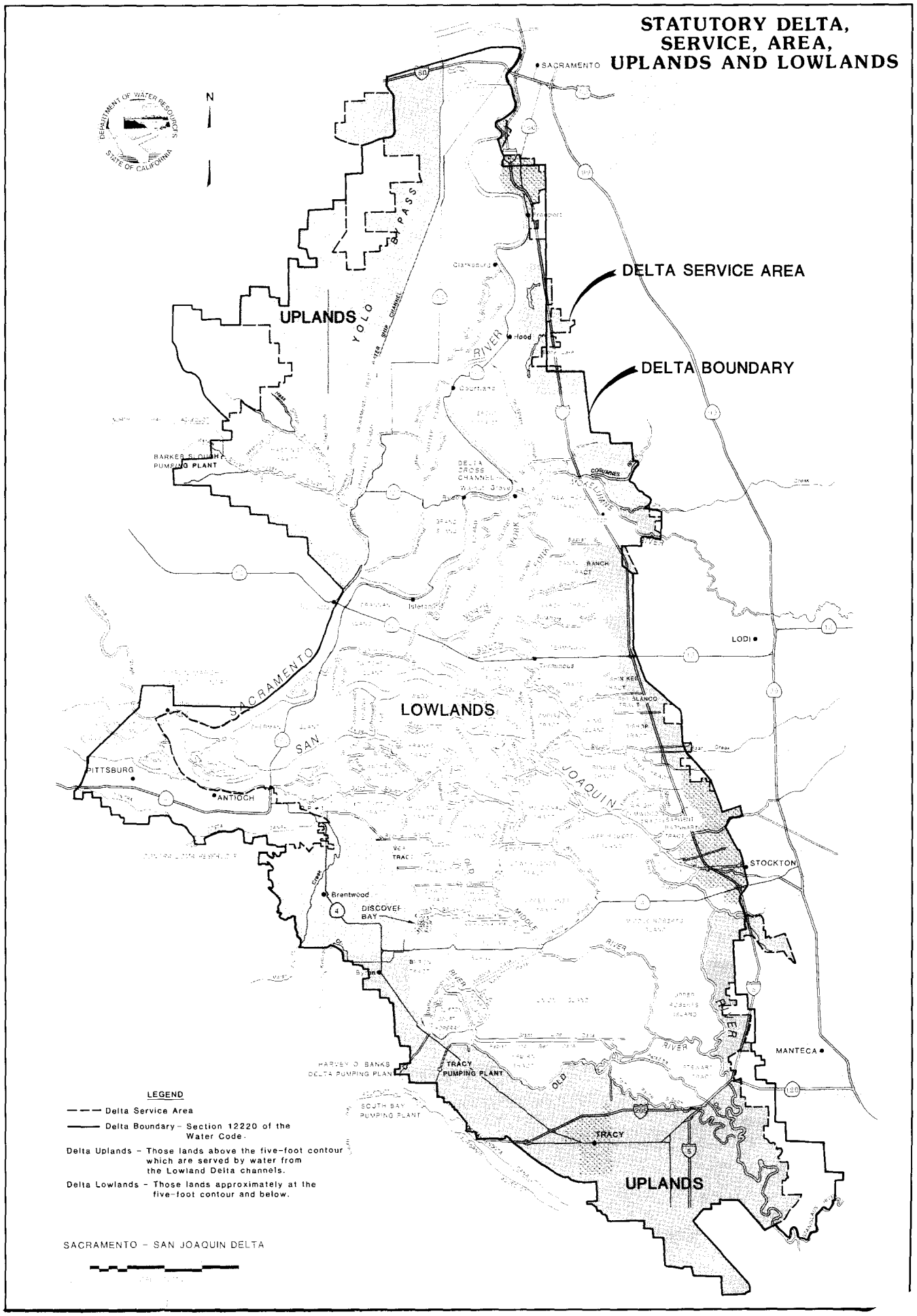
The first Delta levees were built by Chinese laborers to reclaim the area for farming. Later, clamshell dredges like this one, built about 1893, helped to transform thousands of acres of wetlands into a bountiful agricultural area. However, farming is no longer the Delta's only asset.

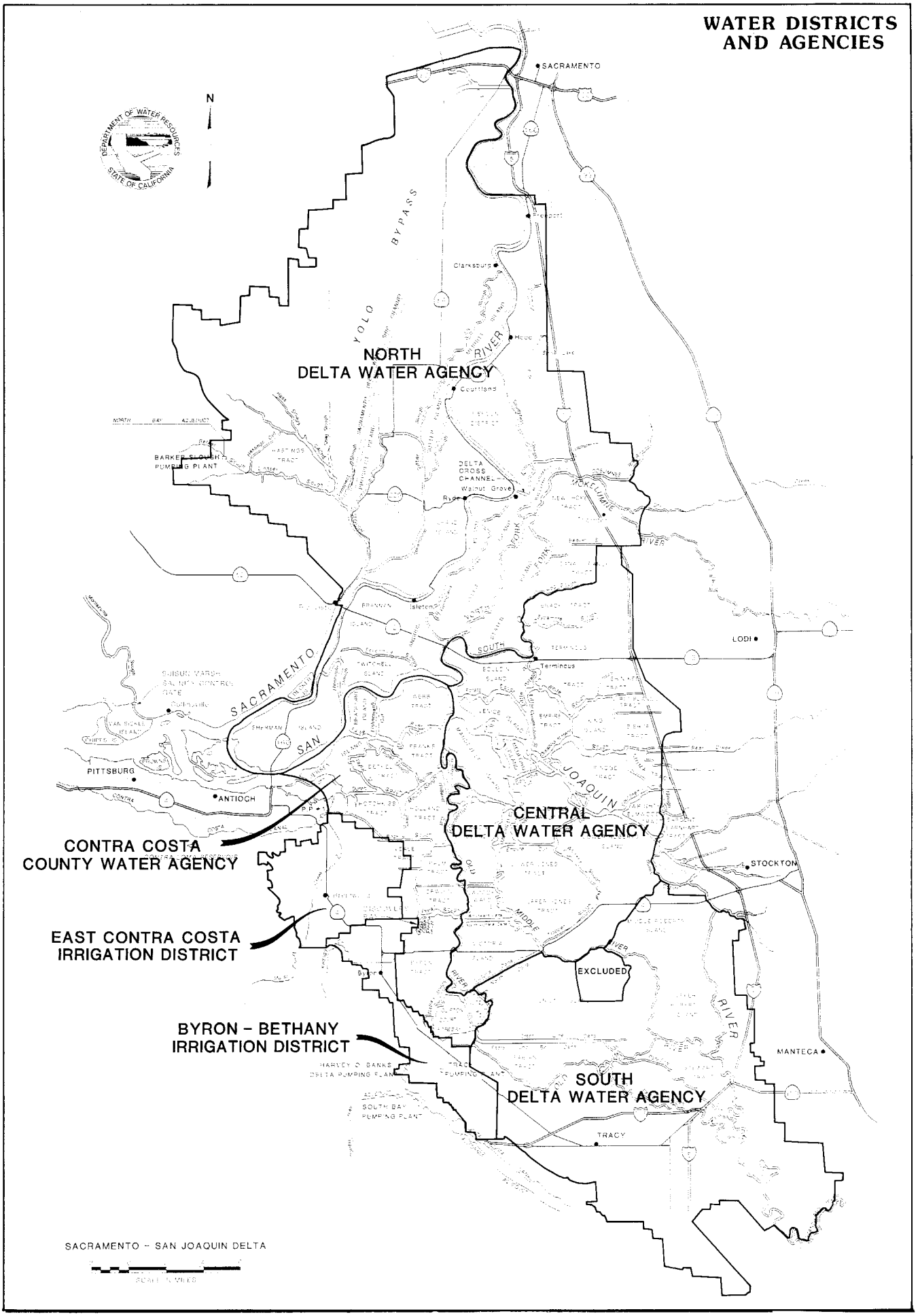

SACRAMENTO
YOLO
SOLANO
SAN JOAQUIN
CONTRA COSTA
T.6N.
T.7N.
T.6N.
T.5N.
T.4N.
T.3N.
T.2N.
T.1N.
T.1S.
T.2S.
T.3S.
R1E.
R2E.
R3E.
R4E.
R5E.
R6E.
R7E.
First Standard Line North.
LINE OF SEGREGATION
GRAND ISLAND
TYLER ISLAND
STATEN ISLAND
BRANNAN IS.
TWITCHELL IS.
BOULDIN IS.
SHERMAN ISLAND
SAN JOAQUIN RIVER
ROBERTS ISLAND
UNION ISLAND
RANCHO DE LOS FRANCESES
RANCHO EL PESCADERO
BASE LINE U.S.S.
Scale Two Miles to one Inch.
SHOWING THE LANDS OF THE
TIDE LAND RECLAMATION COMPANY
DIRECTORS
ABM. C. PEACHY.
LLOYD TEVIS. S. HEYDENFELDT.
GEO. D. ROBERTS. ROBERT WATT
CHAS. H. DUTTON. WM. D. C. CLARK.
Land of T.L.R. Co. Designated by Red Color.
COMPILED & DRAWN
J. T. GIBBS
1869.


DELTA WATERWAYS
1987
SACRAMENTO
SAN FRANCISCO
DELTA AREA
LOS ANGELES
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
N
SACRAMENTO
YOLO BYPASS
Freeport
Clarksburg
Hood
Courtland
PIERSON DISTRICT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
RYER ISLAND
GRAND ISLAND
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
PROSPECT ISLAND
SUTTER ISLAND
MERRITT ISLAND
MOKELUMNE RIVER
NEW HOPE TRACT
Thornton
CANAL RANCH TRACT
BRACK TRACT
LODI
Rio Vista
BRANNAN ISLAND
Isleton
TERMINOUS
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO SAN JOAQUIN
TWITCHELL ISLAND
BOULDIN ISLAND
SHIN KEE TRACT
RIO BLANCO TRACT
WEBB TRACT
VENICE ISLAND
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
VAN SICKLE ISLAND
SHERMAN ISLAND
CHIPPS IS.
BROWNS IS.
PITTSBURG
FRANKS TRACT
BETHEL ISLAND
MANDEVILLE ISLAND
MEDFORD ISLAND
RINDGE TRACT
SHIMA TRACT
ANTIOCH
CONTRA COSTA CANAL
P.P. #1
HOTCHKISS TRACT
HOLLAND TRACT
BACON ISLAND
Mc DONALD TRACT
WRIGHT-ELMWOOD TRACT
SARGENT
BARNHART TRACT
LOWER ROBERTS ISLAND
CONTRA LOMA RESERVOIR
VEALE TRACT
PALM TRACT
LOWER JONES TRACT
STOCKTON
Brentwood
DISCOVERY BAY
ORWOOD TRACT
WOODWARD IS
UPPER JONES TRACT
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
Byron
BYRON TRACT
UNION ISLAND
UPPER ROBERTS ISLAND
CLIFTON COURT FOREBAY
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
FABIAN TRACT
STEWART TRACT
MANTECA
SOUTH BAY PUMPING PLANT
TRACY
DELTA-MENDOTA CANAL
LEGEND
Sacramento, San Joaquin and Mokelumne Rivers
Delta Waterways
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Natural vegetation now blends the levees into hundreds of miles of scenic waterways.

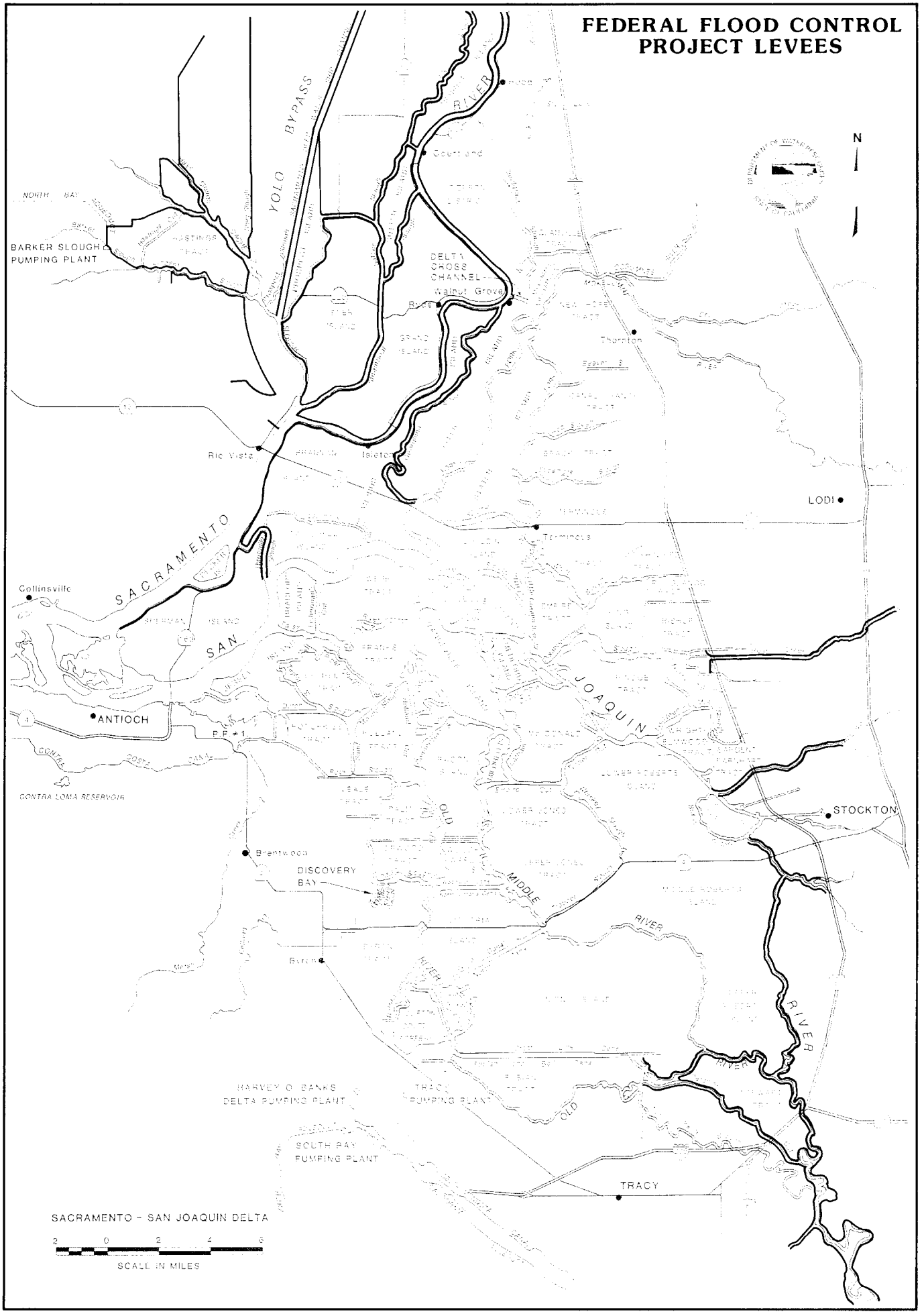

WATERWAYS CONSTRUCTED
FOR SHIPPING
AND CIRCULATION
SACRAMENTO
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
YOLO
BYPASS
Freeport
Clarksburg
Hood
RIVER
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH
PUMPING PLANT
HASTINGS TRACT
DELTA
CROSS
CHANNEL
Walnut Grove
Ryde
MOKELUMNE
RIVER
Rio Vista
Isleton
LODI
Terminous
SUISUN MARSH
SALINITY CONTROL
GATE
SACRAMENTO
SAN
JOAQUIN
PITTSBURG
ANTIOCH
CONTRA LOMA RESERVOIR
STOCKTON
Brentwood
DISCOVERY BAY
MIDDLE
RIVER
Byron
OLD
MANTECA
HARVEY O. BANKS
DELTA PUMPING PLANT
TRACY
PUMPING PLANT
SOUTH BAY
PUMPING PLANT
TRACY
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES


STATUTORY DELTA,
SERVICE, AREA,
UPLANDS AND LOWLANDS
SACRAMENTO
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
N
DELTA SERVICE AREA
DELTA BOUNDARY
UPLANDS
YOLO BYPASS
RIVER
Clarksburg
Hood
Courtland
BARKER SLOUGH
PUMPING PLANT
DELTA
CROSS
CHANNEL
COSUMNES
MOKELUMNE
RANCH
Isleton
LODI
SACRAMENTO
SAN
LOWLANDS
JOAQUIN
PITTSBURG
ANTIOCH
TRACY
OLD
STOCKTON
Brentwood
DISCOVERY
BAY
MIDDLE
RIVER
HARVEY O. BANKS
DELTA PUMPING PLANT
TRACY
PUMPING PLANT
SOUTH BAY
PUMPING PLANT
MANTECA
TRACY
UPLANDS
LEGEND
Delta Service Area
Delta Boundary - Section 12220 of the Water Code.
Delta Uplands - Those lands above the five-foot contour which are served by water from the Lowland Delta channels.
Delta Lowlands - Those lands approximately at the five-foot contour and below.
SACRAMENTO - SAN JOAQUIN DELTA

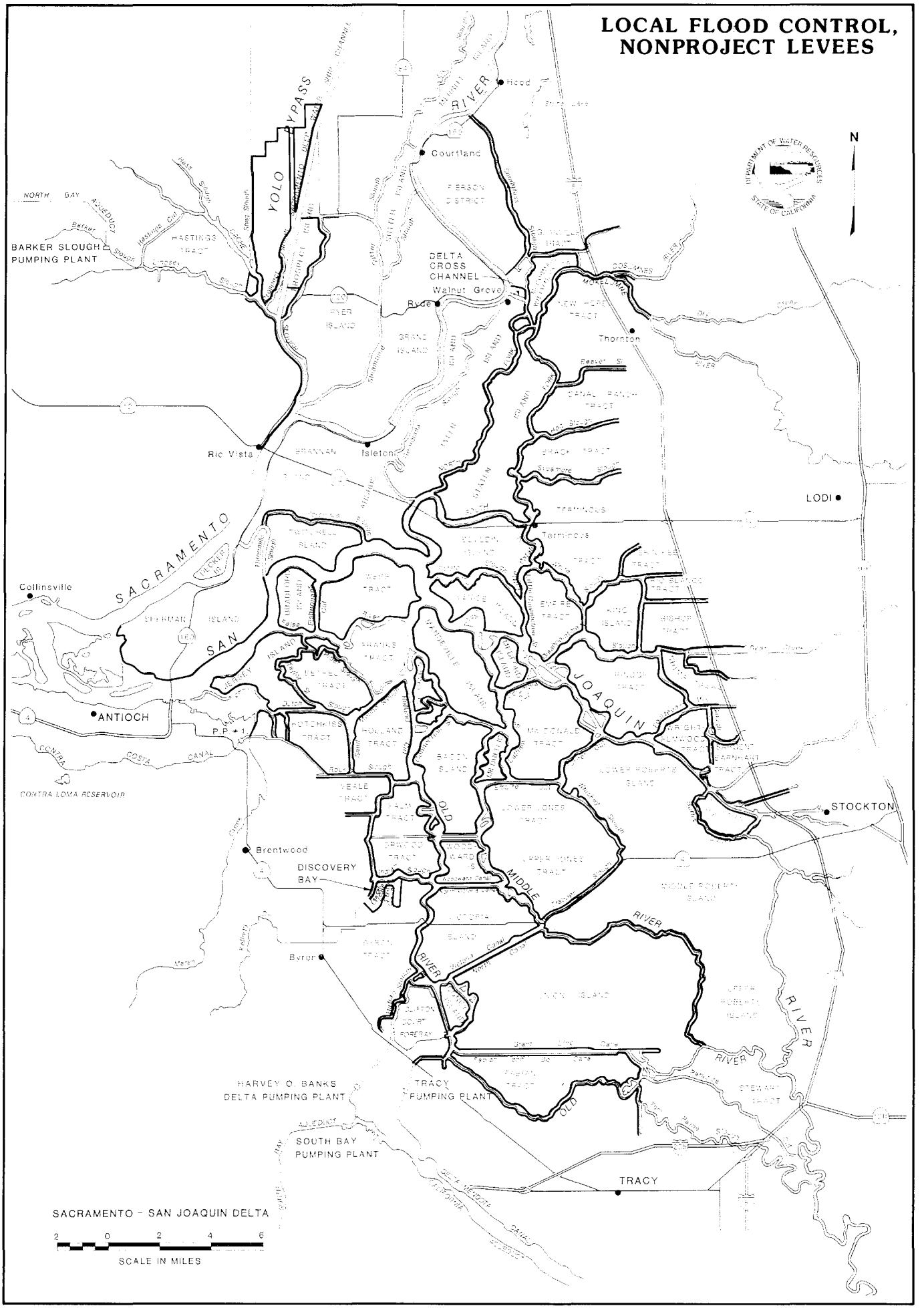

WATER DISTRICTS AND AGENCIES
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
SACRAMENTO
YOLO BYPASS
Clarksburg
NORTH DELTA WATER AGENCY
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
MOKELUMNE RIVER
SOUTH FORK
Isleton
BRANNAN ISLAND
LODI
SOUTH
Terminous
SUISUN MARSH SALINITY CONTROL GATE
SACRAMENTO
SAN
JOAQUIN
EMPIRE TRACT
PITTSBURG
ANTIOCH
CENTRAL DELTA WATER AGENCY
CONTRA COSTA COUNTY WATER AGENCY
STOCKTON
EAST CONTRA COSTA IRRIGATION DISTRICT
MIDDLE
OLD
EXCLUDED
BYRON - BETHANY IRRIGATION DISTRICT
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
SOUTH DELTA WATER AGENCY
MANTECA
TRACY
SAN JOAQUIN RIVER
SACRAMENTO - SAN JOAQUIN DELTA

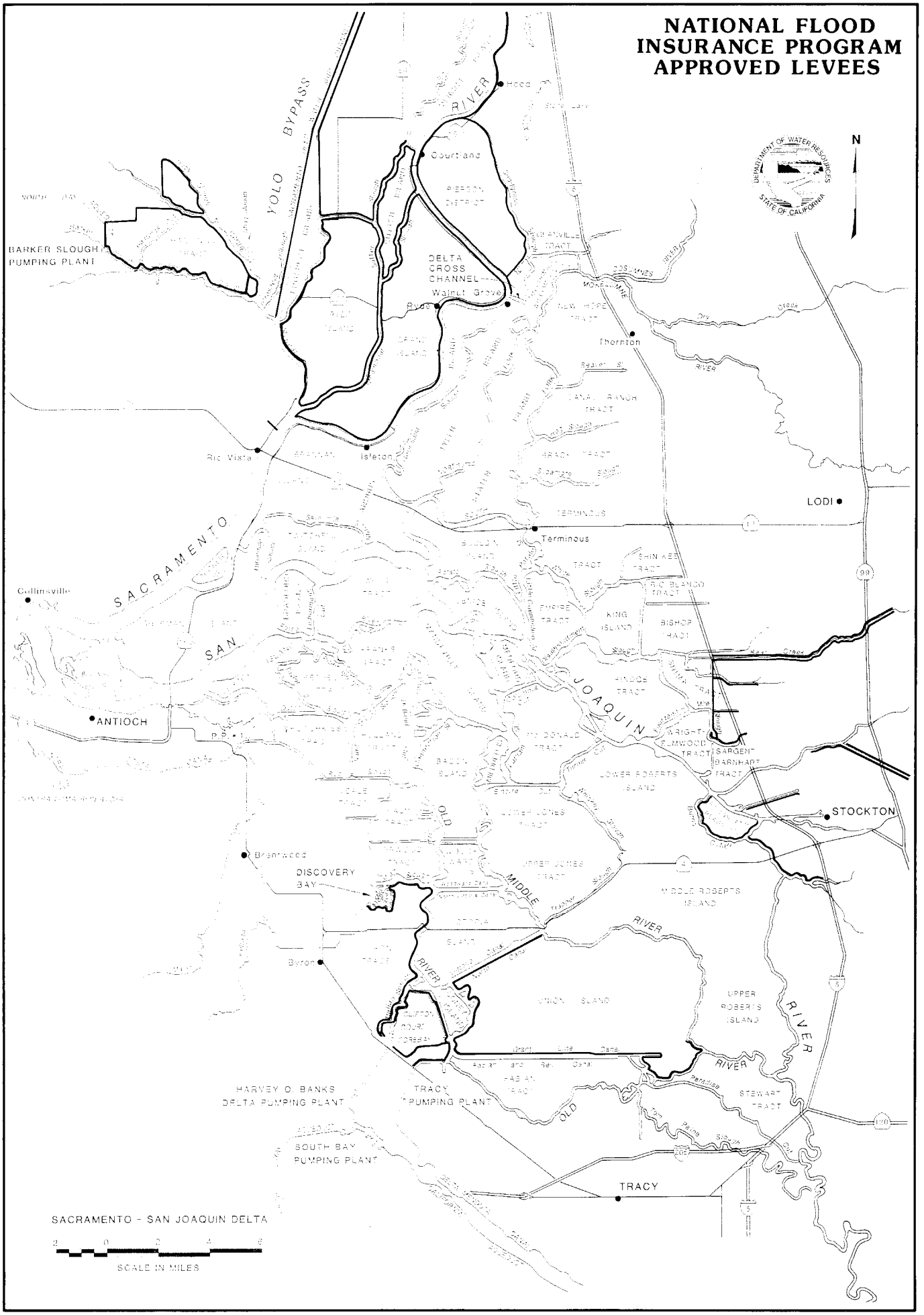
This Flood Control Project levee along the Sacramento River represents a well designed, constructed, and maintained levee, with good freeboard, gently sloping sides, and a wide crown. This levee, built by the Corps of Engineers, is maintained by a local reclamation district under State supervision. State Highway 160 uses the levee crown to provide access between Sacramento and Antioch. The irrigation pump near the center of the picture serves a farm on the landward side.

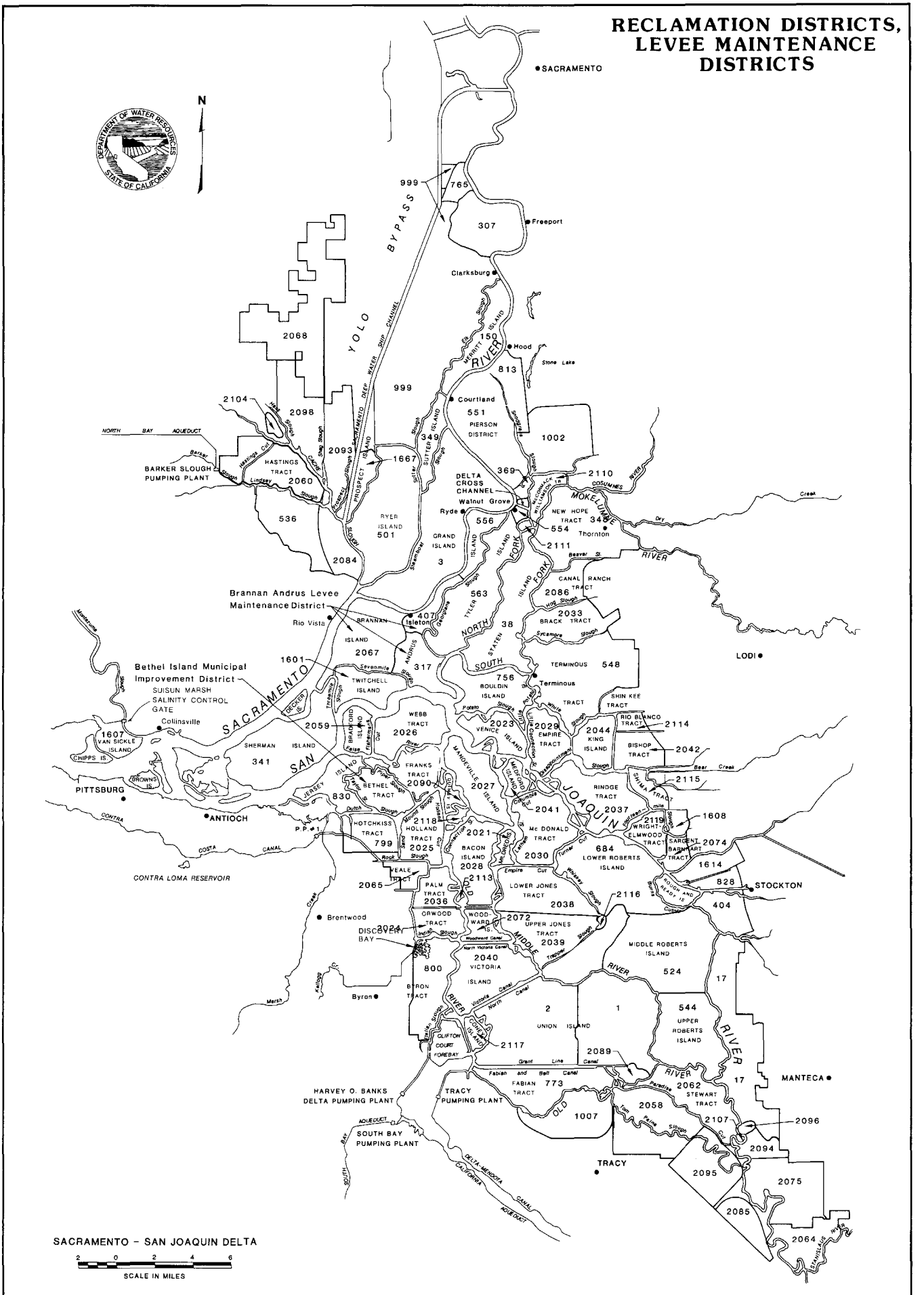
Figure 6

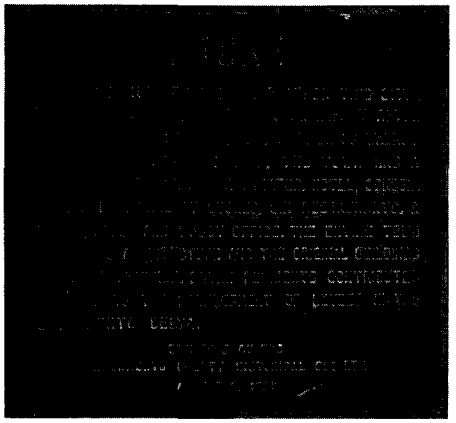

FEDERAL FLOOD CONTROL PROJECT LEVEES
N
YOLO BYPASS
RIVER
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
Thornton
Rio Vista
Isleton
LODI
Terminous
SACRAMENTO
SAN
JOAQUIN
Collinsville
ANTIOCH
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
STOCKTON
Brentwood
DISCOVERY BAY
OLD
MIDDLE
RIVER
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Nonproject levees constructed and maintained by local reclamation districts make up most of the levee system. The island floor protected by this levee is 15 feet or more below sea level. Nonproject levees are generally constructed to lower criteria than project levees. State legislation approved in 1986 provides for annual inspections and minimum levee criteria.


LOCAL FLOOD CONTROL,
NONPROJECT LEVEES
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
YOLO BYPASS
SACRAMENTO RIVER
Hood
Courtland
DELTA CROSS CHANNEL
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
LODI
Terminous
Collinsville
SACRAMENTO
SAN JOAQUIN
ANTIOCH
P.P. #1
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
STOCKTON
Brentwood
DISCOVERY BAY
Byron
OLD RIVER
MIDDLE RIVER
BARKER SLOUGH PUMPING PLANT
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

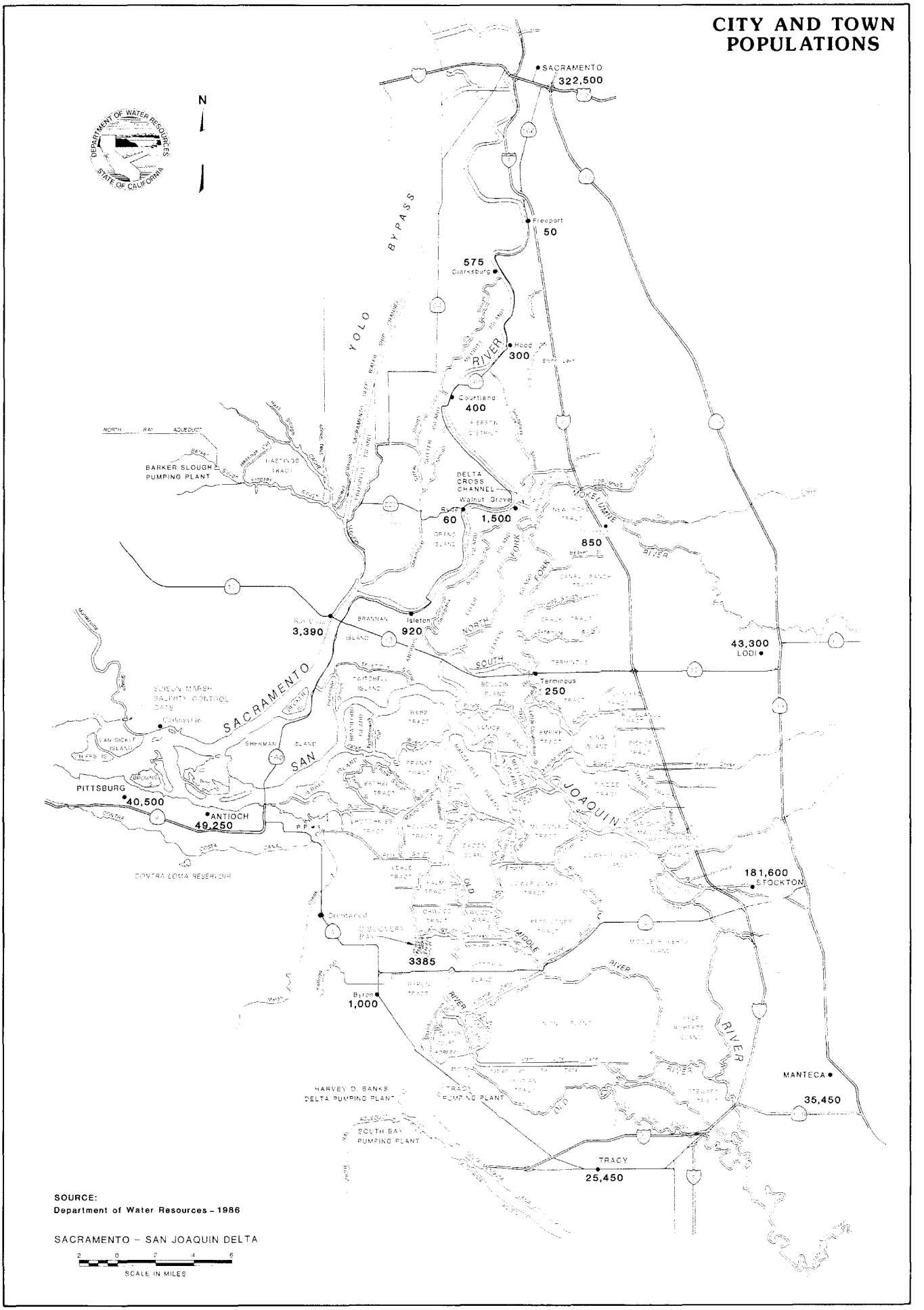

NATIONAL FLOOD INSURANCE PROGRAM APPROVED LEVEES
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
YOLO BYPASS
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
Courtland
Hood
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
LODI
Terminous
Collinsville
ANTIOCH
Brentwood
DISCOVERY BAY
Byron
STOCKTON
TRACY
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES


RECLAMATION DISTRICTS, LEVEE MAINTENANCE DISTRICTS
N
SACRAMENTO
Freeport
Clarksburg
Hood
Courtland
PIERSON DISTRICT
Walnut Grove
Ryde
Thornton
Isleton
Rio Vista
Brannan Andrus Levee Maintenance District
Bethel Island Municipal Improvement District
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
PITTSBURG
ANTIOCH
CONTRA LOMA RESERVOIR
Brentwood
Byron
LODI
STOCKTON
MANTECA
TRACY
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
BARKER SLOUGH PUMPING PLANT
NORTH BAY AQUEDUCT
DELTA CROSS CHANNEL
DISCOVERY BAY
SACRAMENTO
SAN JOAQUIN
YOLO BYPASS
MOKELUMNE RIVER
OLD RIVER
MIDDLE RIVER
SOUTH FORK
NORTH FORK
DELTA-MENDOTA CANAL
CONTRA COSTA CANAL
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES
2 0 2 4 6

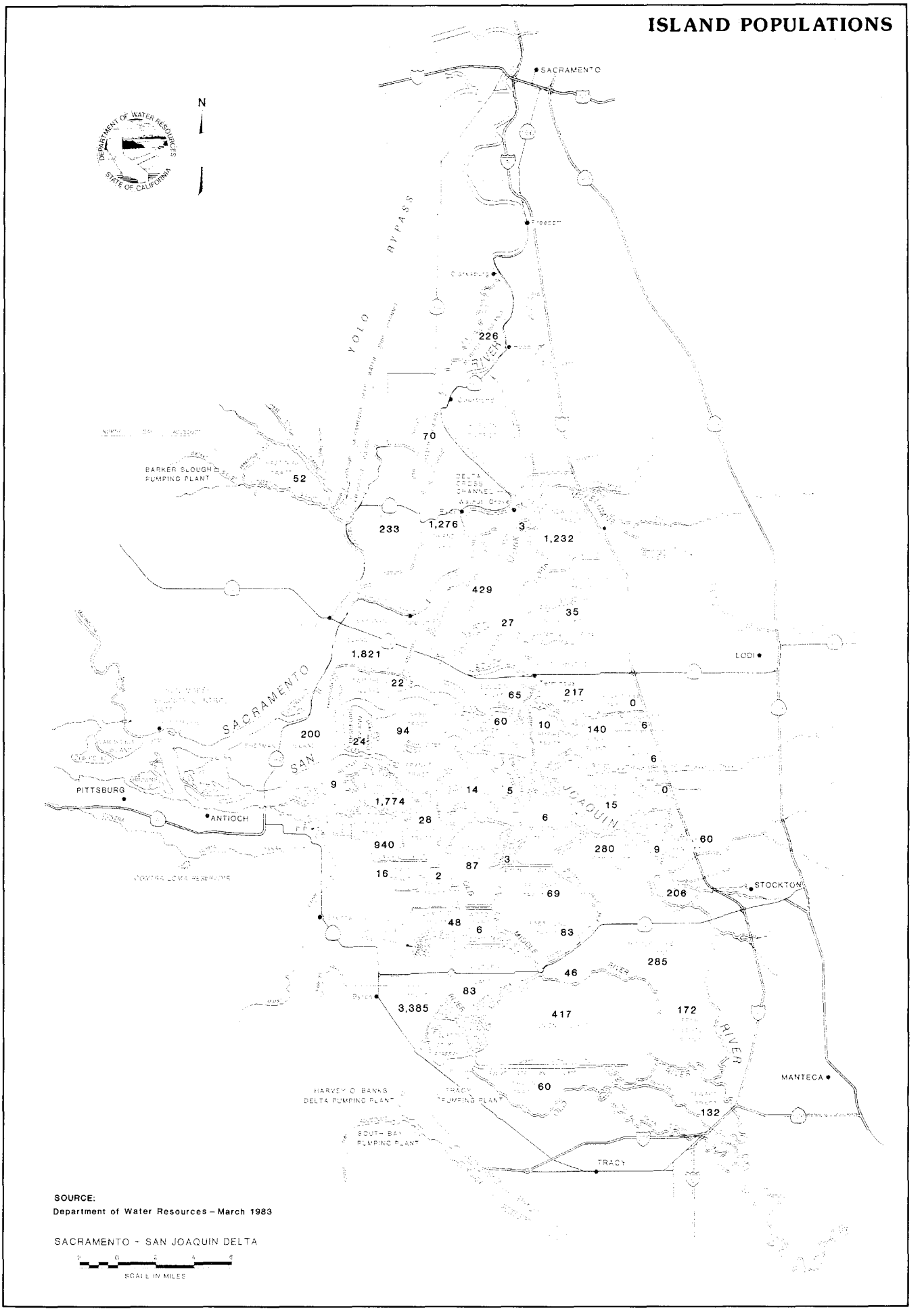


LOCKE -- A plaque (left) dedicated by the Sacramento County Historical Society in 1970 reads:

Founded in 1912 by Tin Sin Chan on this site, this unique Chinese community grew rapidly after a fire destroyed the Chinese section of Walnut Grove in 1915. At one time, the town had a population of 1500, with a theater, hotel, school, church, nine grocery stores, six restaurants, a bakery, lodge and a post office. The entire town is Chinese architecture and the original buildings are still standing. Locke residents contributed greatly to the development of levees in the Sacramento Delta.

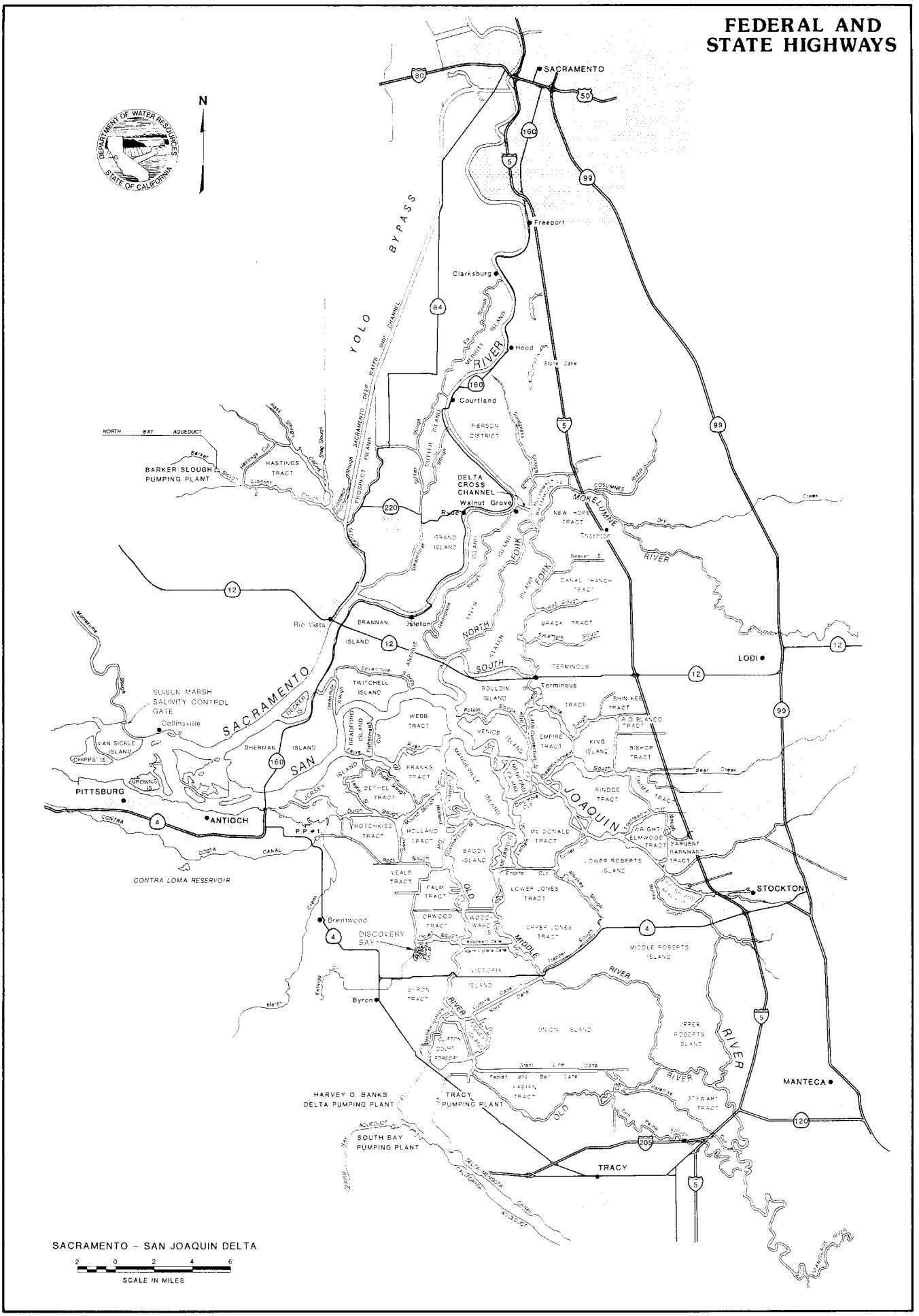

CITY AND TOWN POPULATIONS
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
SACRAMENTO 322,500
Freeport 50
575 Clarksburg
YOLO BYPASS
RIVER
Hood 300
Courtland 400
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
60
1,500
MOKELUMNE RIVER
850
NORTH FORK
3,390
BRANNAN ISLAND
Isleton 920
43,300 LODI
SUISUN MARSH SALINITY CONTROL GATE
SACRAMENTO
SAN JOAQUIN
Terminous 250
PITTSBURG 40,500
ANTIOCH 49,250
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
181,600 STOCKTON
Stringtown
3385
Byron 1,000
MIDDLE RIVER
OLD RIVER
MANTECA 35,450
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY 25,450
SOURCE:
Department of Water Resources - 1986
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Urban development is increasing as the desire to live near water draws people to the Delta. Houses, docks, and other structures obstruct inspections and maintenance of levees. Many Delta levees do not meet minimum criteria for protecting urban development.

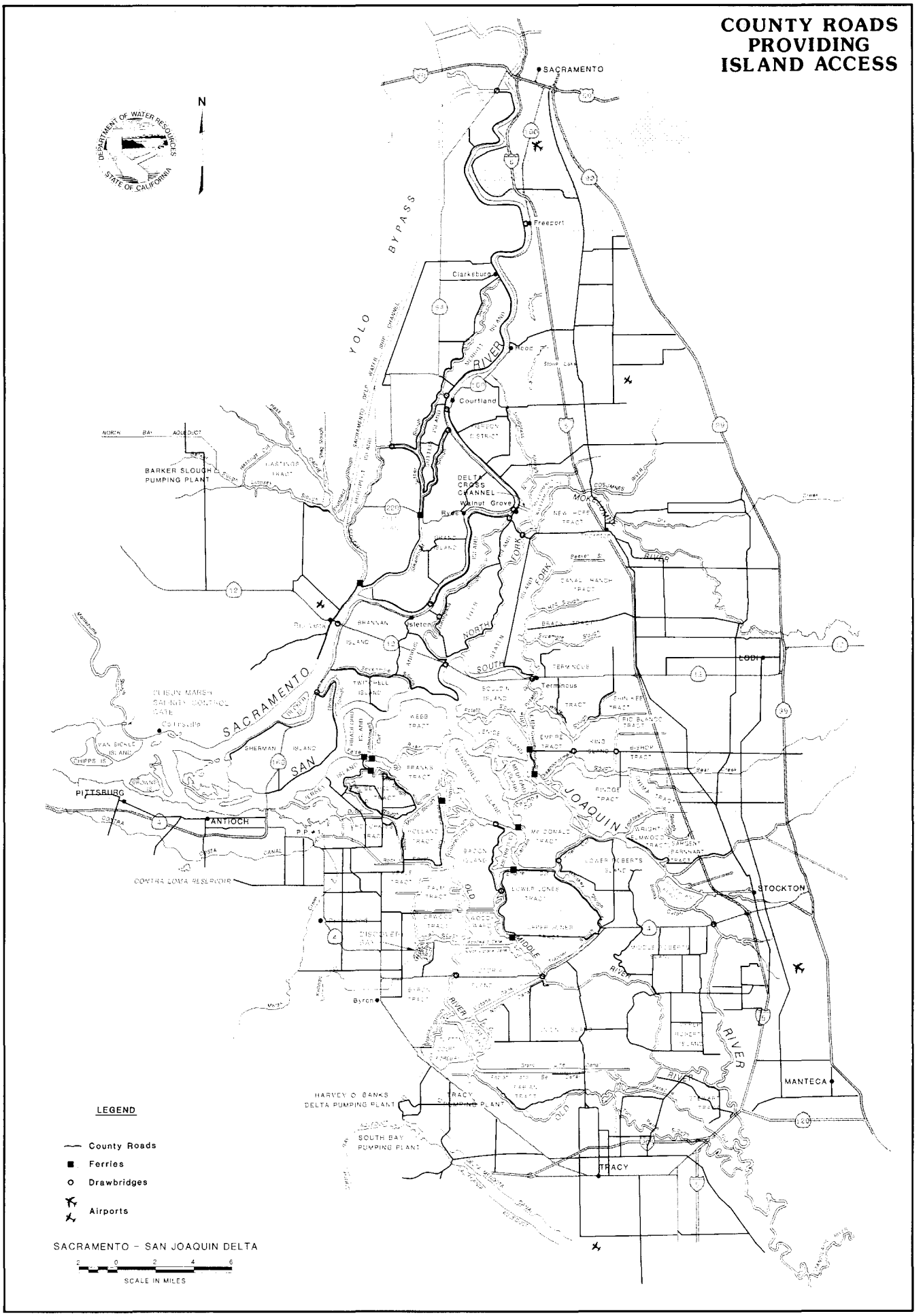

ISLAND POPULATIONS
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO
YOLO BYPASS
BARKER SLOUGH PUMPING PLANT
52
70
226
233
1,276
3
1,232
429
35
27
1,821
LODI
22
65
217
0
60
10
140
6
200
94
24
6
9
14
5
0
1,774
15
28
6
940
280
9
60
87
3
16
2
69
206
STOCKTON
48
6
83
285
46
83
3,385
417
172
MANTECA
60
132
TRACY
PITTSBURG
ANTIOCH
SACRAMENTO
SAN JOAQUIN
RIVER
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
SOURCE:
Department of Water Resources – March 1983
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES

State Highway 12 at the juncture with Highway 160 on Brannan Island. This 4-way stop can back up traffic on busy summer weekends, especially when the Rio Vista drawbridge (in the background) opens. Highway 12 is below sea level for much of its length across the Delta. In 1972, it was flooded for several months.

Interstate 5 at the Mokelumne River, near Thornton. This major north-south highway was flooded near this spot in February 1986.

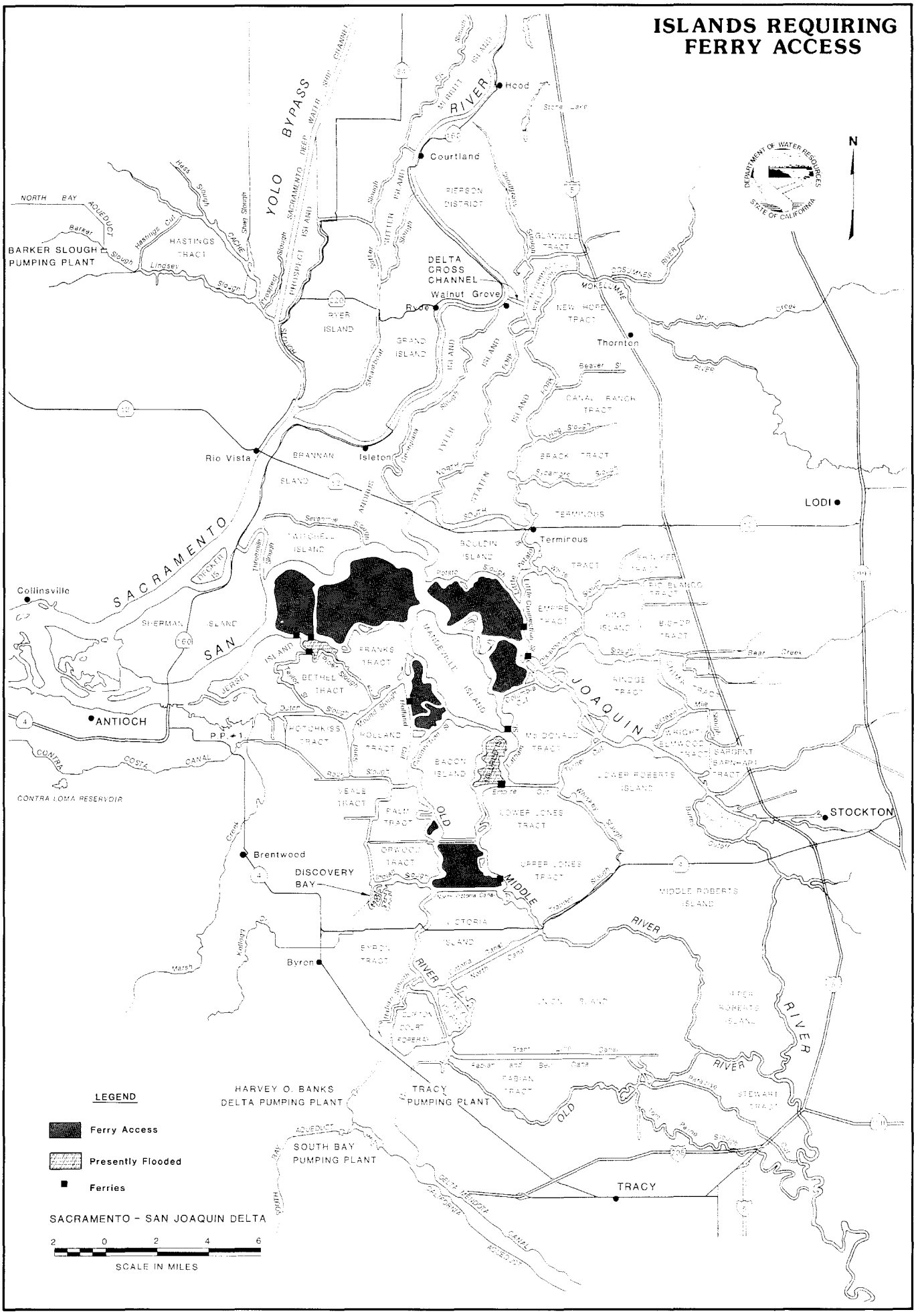

FEDERAL AND STATE HIGHWAYS
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
N
SACRAMENTO
Freeport
Clarksburg
Hood
Courtland
Walnut Grove
Ryde
Rio Vista
Isleton
Terminous
LODI
STOCKTON
MANTECA
TRACY
ANTIOCH
PITTSBURG
Collinsville
Brentwood
Byron
DISCOVERY BAY
YOLO BYPASS
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
DELTA CROSS CHANNEL
MOKELUMNE RIVER
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
SUISUN MARSH SALINITY CONTROL GATE
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY AQUEDUCT
DELTA-MENDOTA CANAL
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

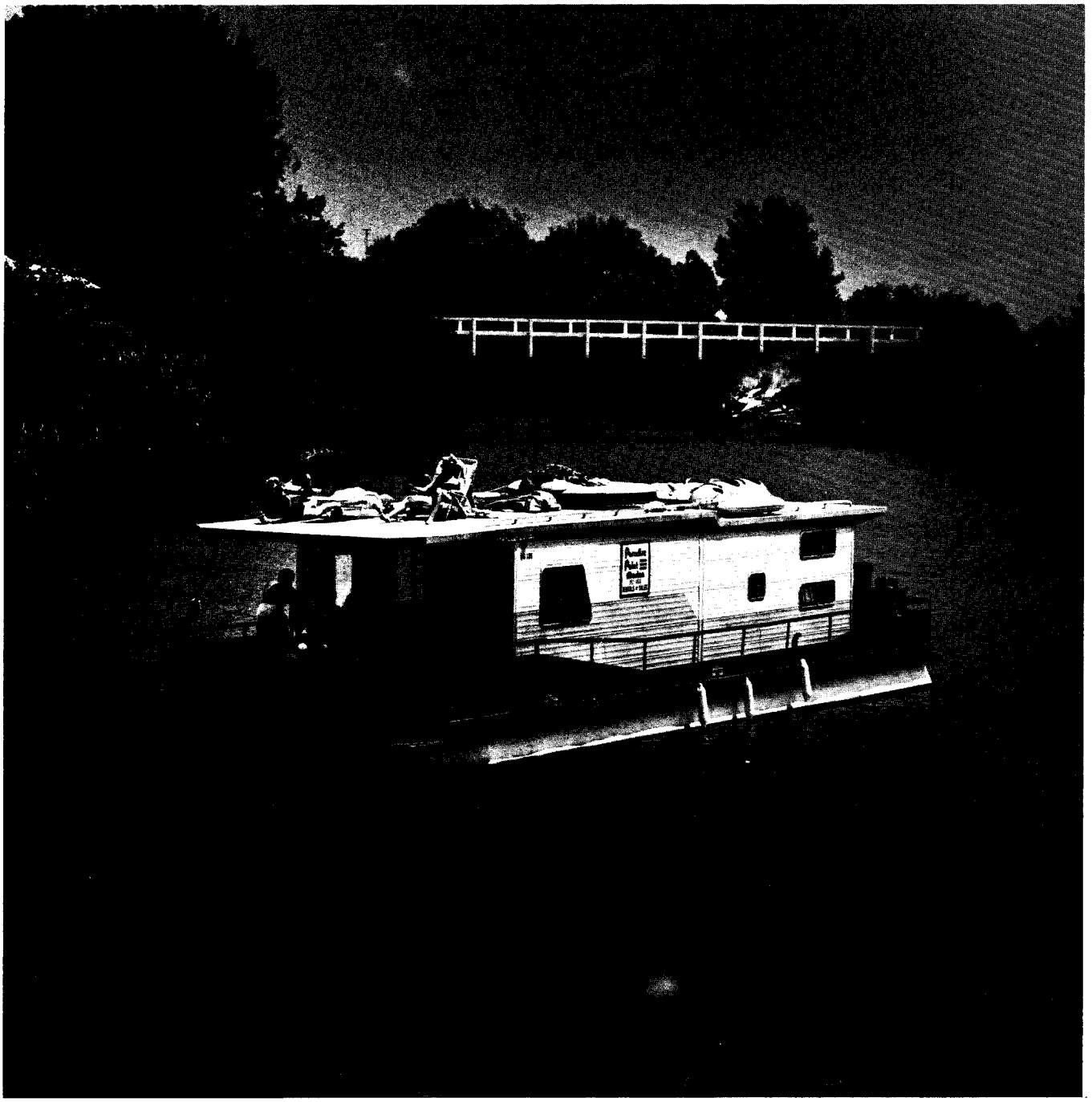
Drawbridges accommodate the mix of land and water traffic in the Delta. This bridge on Highway 160 crosses the Sacramento River near Isleton and must open frequently during the summer boating season.


COUNTY ROADS
PROVIDING
ISLAND ACCESS
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO
Freeport
Clarksburg
YOLO BYPASS
RIVER
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
MOKELUMNE
RIVER
NORTH FORK
SOUTH FORK
Isleton
BRANNAN ISLAND
LODI
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO
SAN JOAQUIN
RIVER
SHERMAN ISLAND
PITTSBURG
ANTIOCH
CONTRA LOMA RESERVOIR
STOCKTON
MIDDLE RIVER
OLD RIVER
Byron
MANTECA
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
LEGEND
County Roads
Ferries
Drawbridges
Airports
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

The Delta is one of the few places where ferries are still a way of life. Although for many they provide a nostalgic link to the past, for those who regularly travel Delta roads they can be a nuisance. As traffic increases, ferries contribute to time delays. Load limits restrict farm and freight traffic. Boaters must be careful of cables that guide the ferries. CalTrans operates this ferry across Steamboat Slough, between Grand Island and Ryer Island.

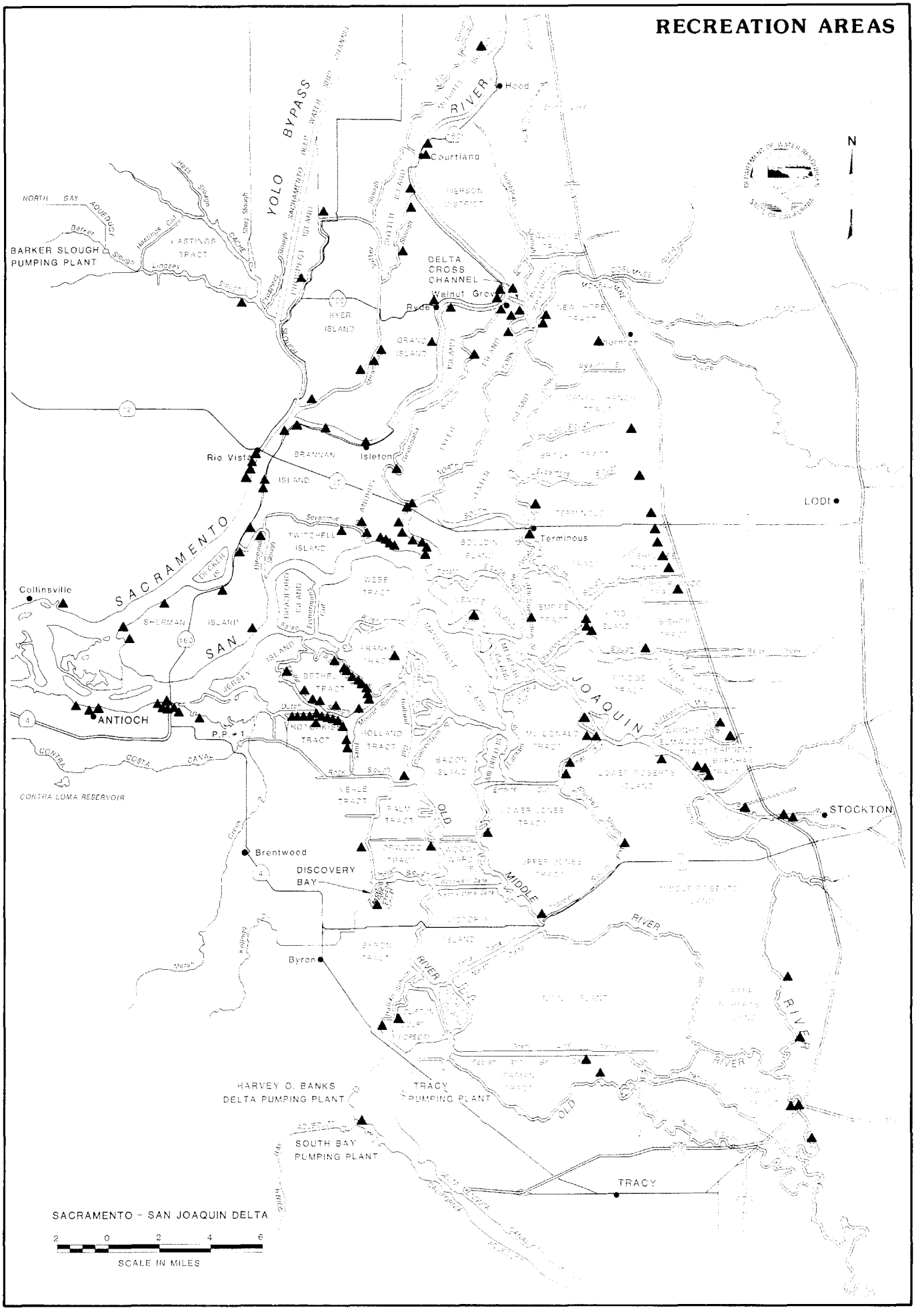
Figure 14


ISLANDS REQUIRING FERRY ACCESS
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO - SAN JOAQUIN DELTA
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
Terminous
LODI
Collinsville
ANTIOCH
Brentwood
DISCOVERY BAY
Byron
STOCKTON
TRACY
BARKER SLOUGH PUMPING PLANT
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
CONTRA LOMA RESERVOIR
DELTA CROSS CHANNEL
YOLO BYPASS
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
LEGEND
Ferry Access
Presently Flooded
Ferries
2 0 2 4 6
SCALE IN MILES



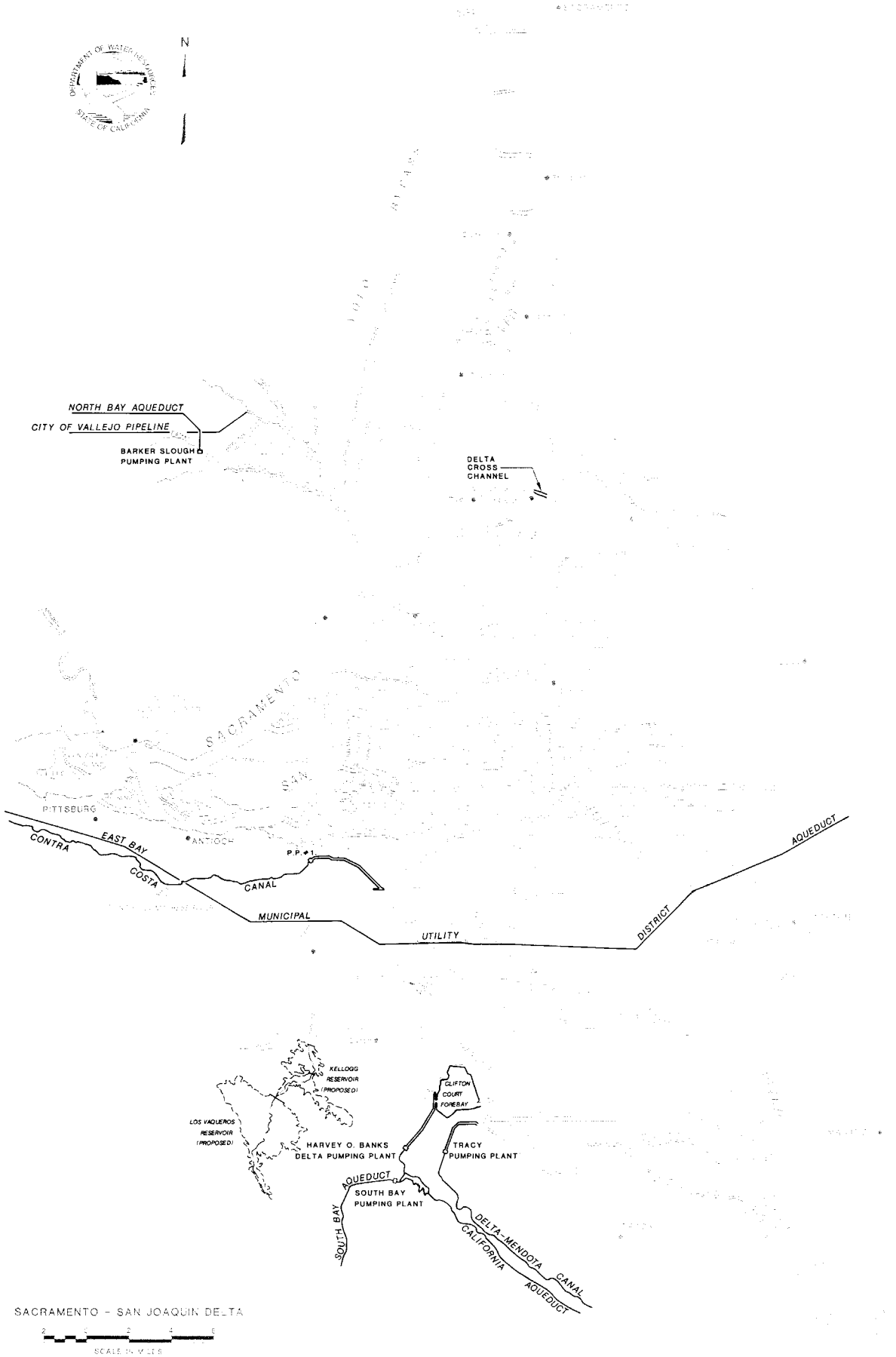
A good share of the Delta's economy is based on water-related recreation. The area is visited by fun-seekers from throughout California.

Figure 15


RECREATION AREAS
N
YOLO BYPASS
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
Hood
Courtland
Walnut Grove
Ryde
Isleton
Rio Vista
Terminous
LODI
Collinsville
ANTIOCH
Brentwood
DISCOVERY BAY
Byron
STOCKTON
TRACY
BARKER SLOUGH PUMPING PLANT
NORTH BAY AQUEDUCT
DELTA CROSS CHANNEL
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
CONTRA LOMA RESERVOIR
CONTRA COSTA CANAL
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

The Delta Cross Channel, constructed by the Bureau of Reclamation in the 1950s, connects the Sacramento River (foreground) with the Snodgrass Slough and Mokelumne River system (background). Water released from upstream storage reservoirs flows through the Cross Channel to interior Delta channels and the export facilities near Tracy.

WATER DEVELOPMENT FACILITIES



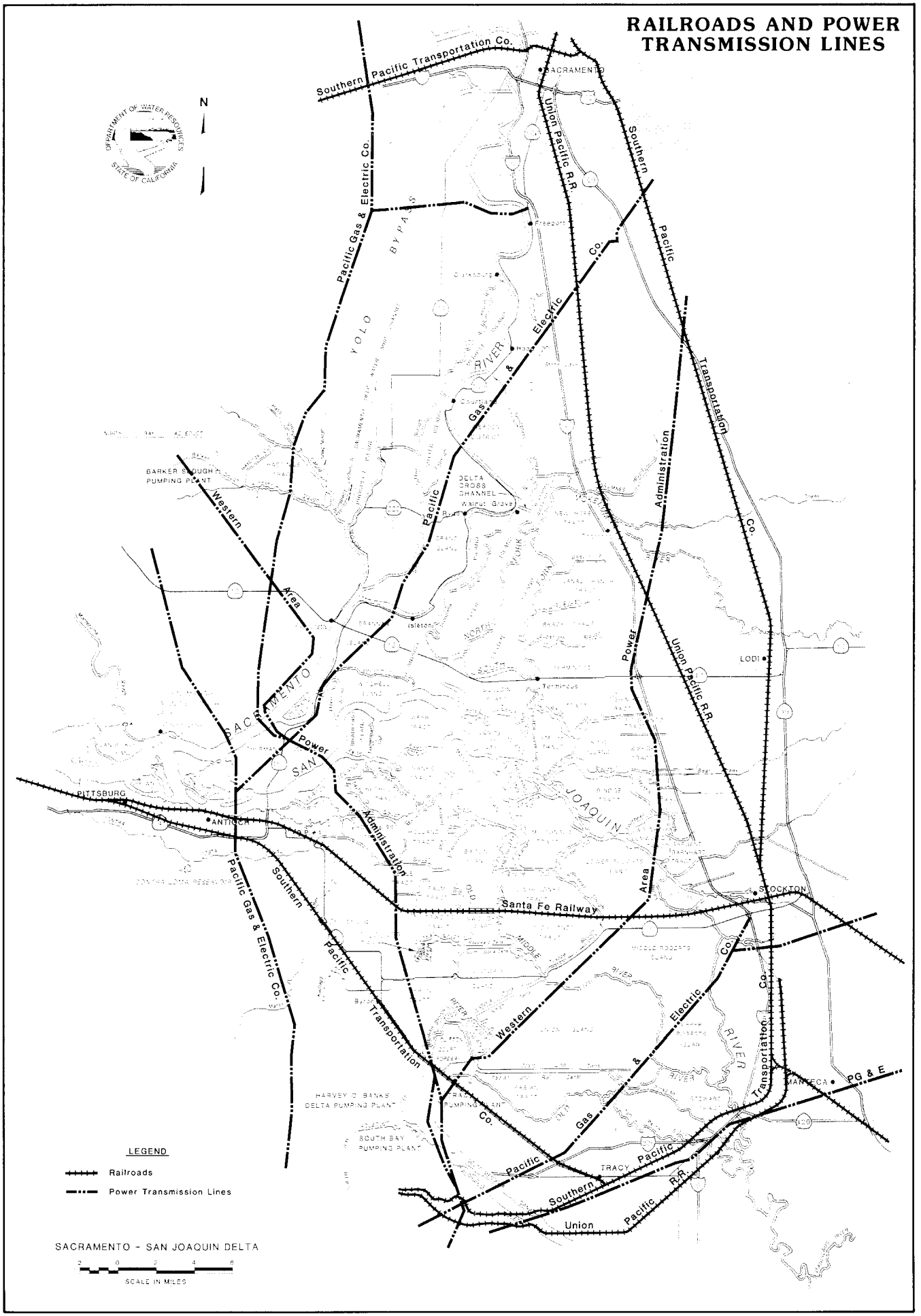
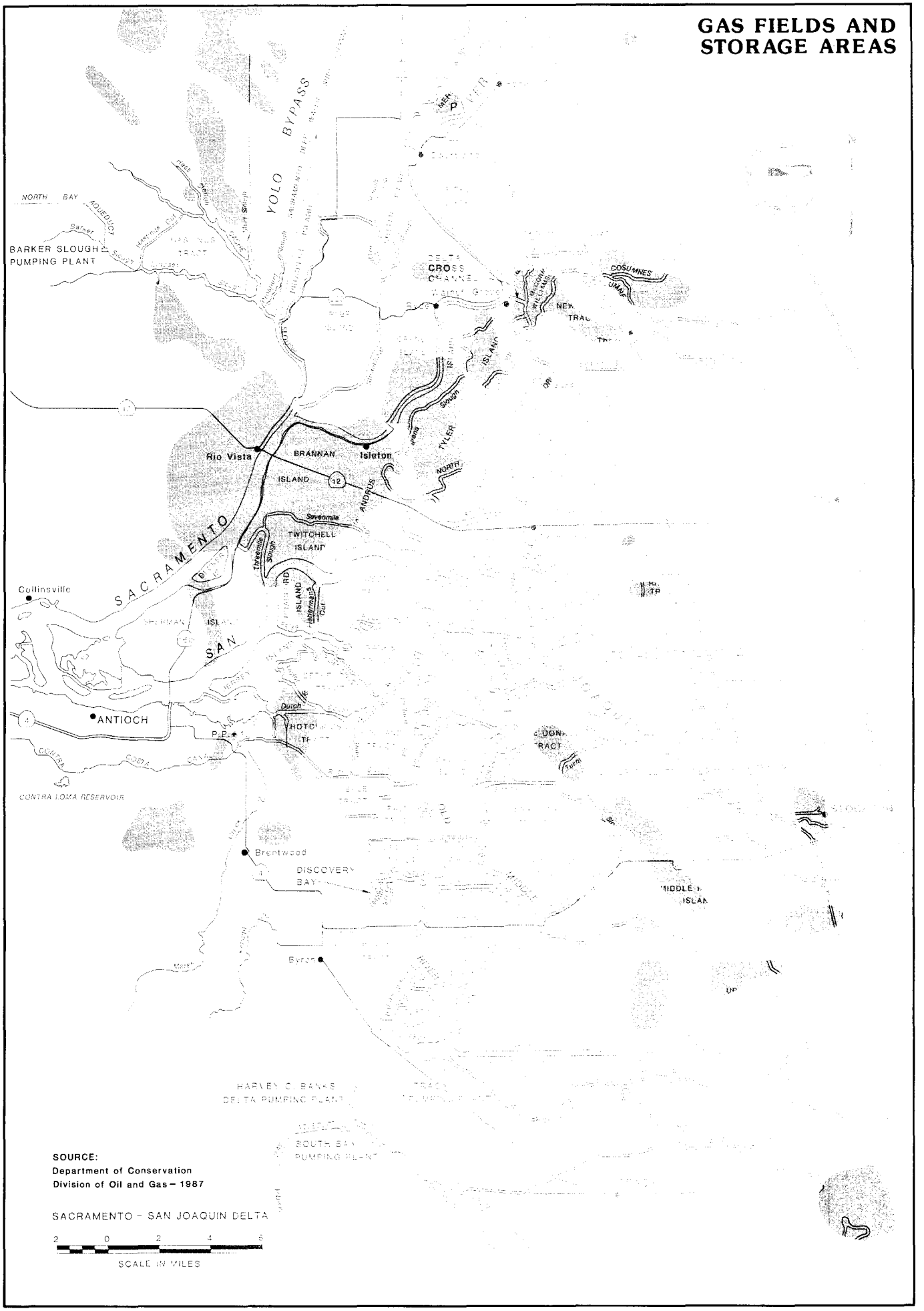
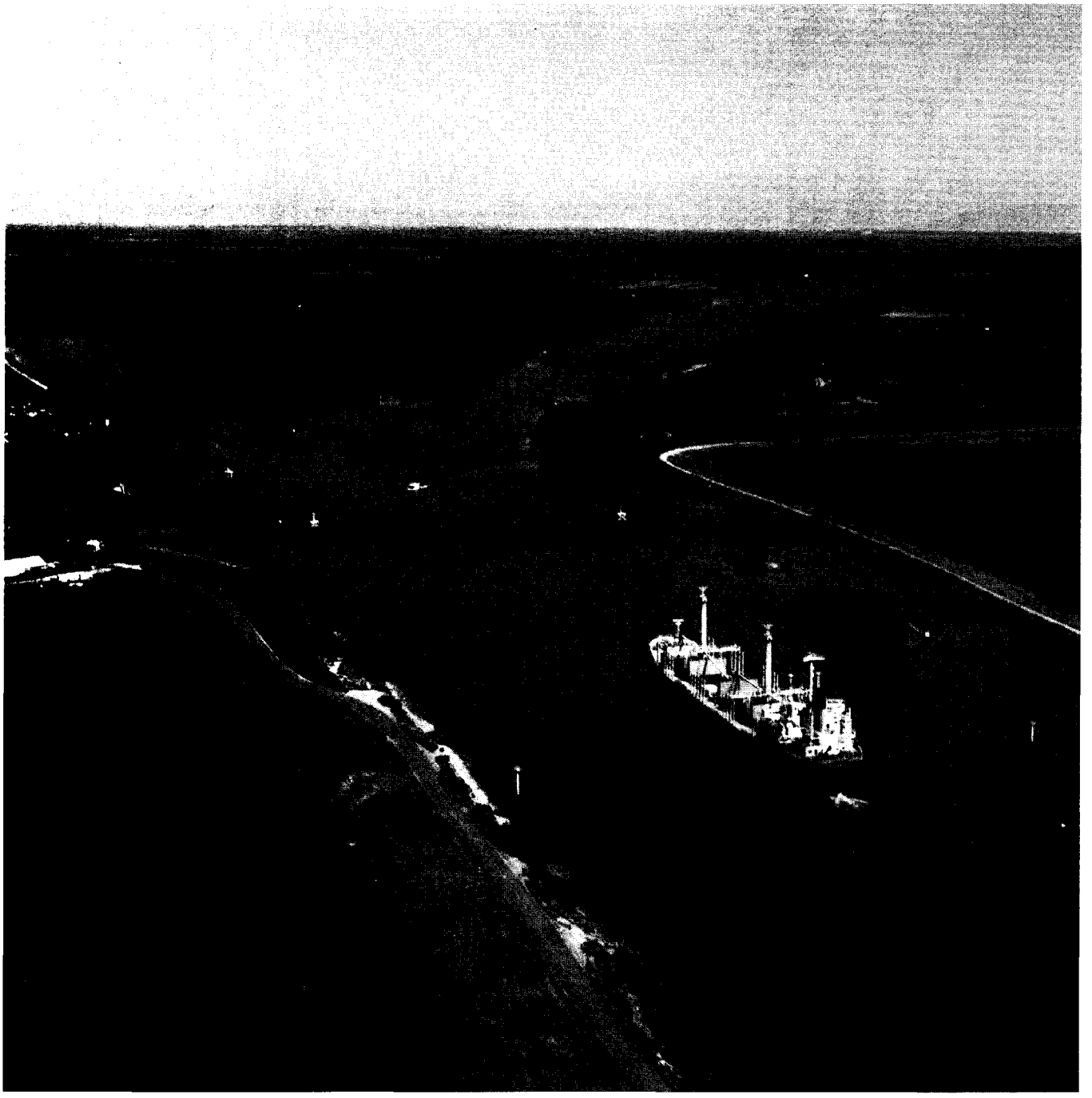
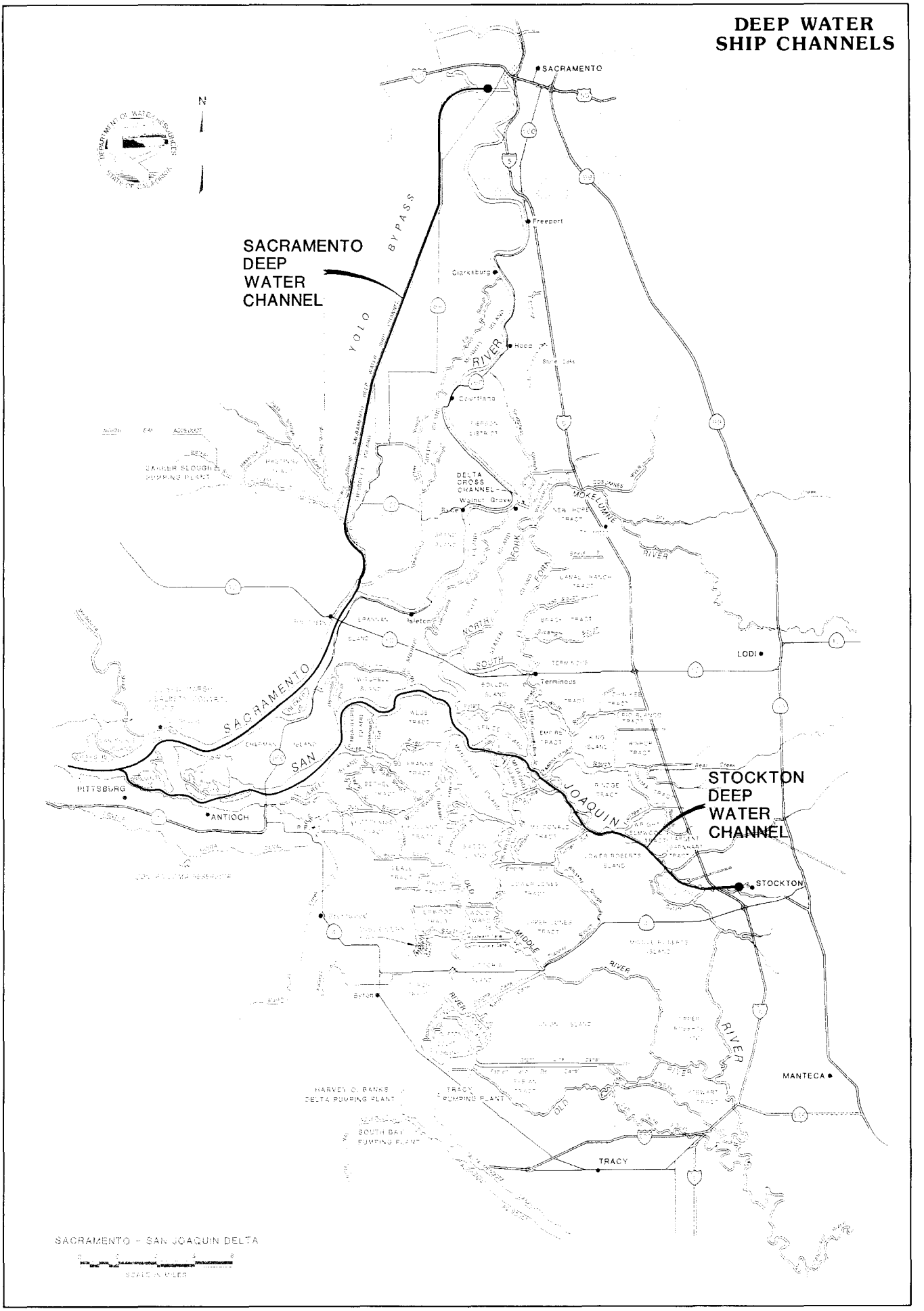

RAILROADS AND POWER TRANSMISSION LINES
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
Southern Pacific Transportation Co.
SACRAMENTO
Union Pacific R.R.
Southern Pacific Transportation Co.
Pacific Gas & Electric Co.
BYPASS
YOLO
RIVER
Pacific Gas & Electric Co.
Western Area Power Administration
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
Isleton
Terminous
LODI
Union Pacific R.R.
SACRAMENTO
SAN JOAQUIN
PITTSBURG
ANTIOCH
Southern Pacific Transportation Co.
Pacific Gas & Electric Co.
Santa Fe Railway
STOCKTON
Western Area Power Administration
Pacific Gas & Electric Co.
Southern Pacific Transportation Co.
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
MANTECA
PG & E
TRACY
Pacific Gas & Electric Co.
Southern Pacific Transportation Co.
Union Pacific R.R.
LEGEND
Railroads
Power Transmission Lines
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Figure 18

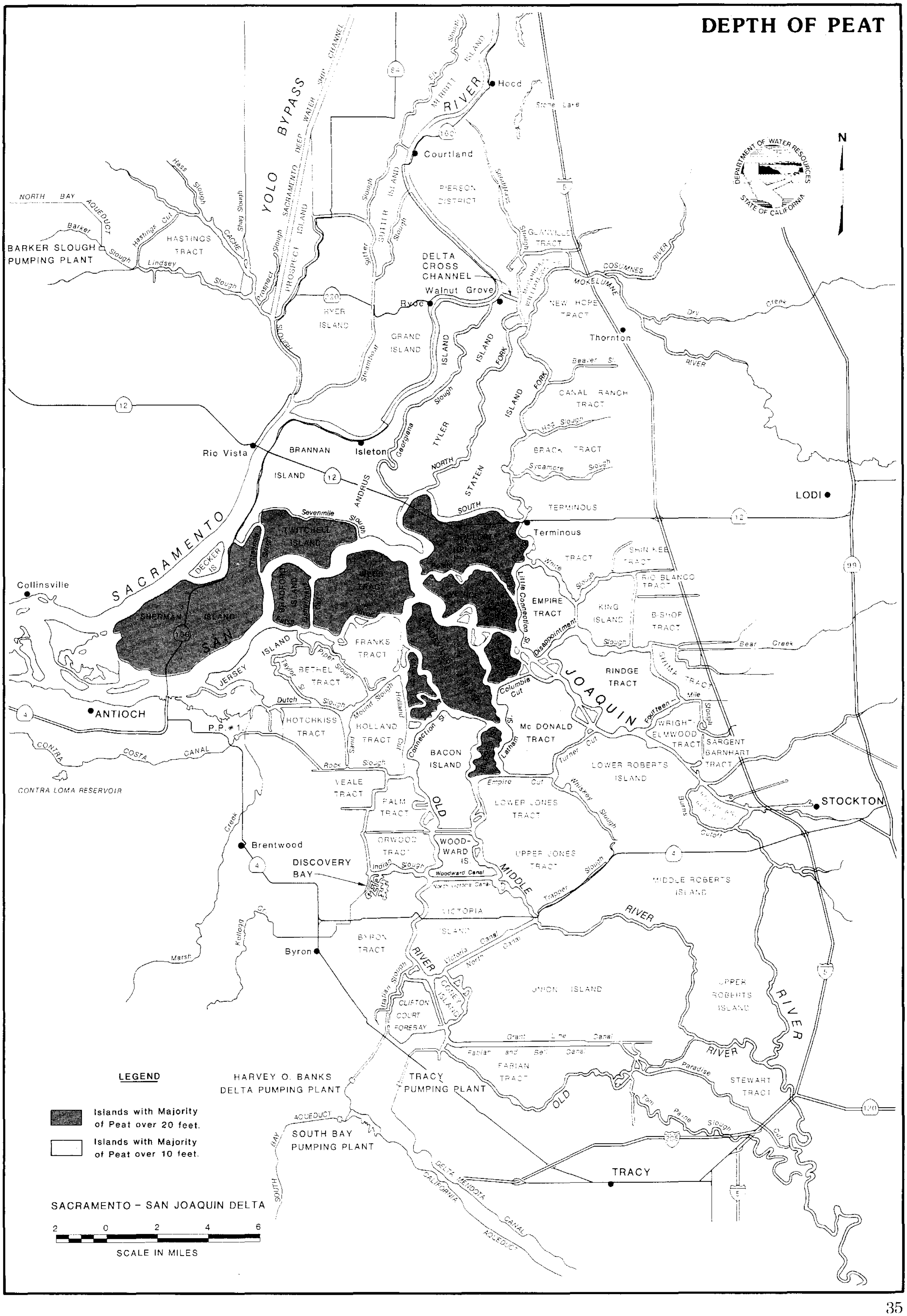

GAS FIELDS AND STORAGE AREAS
YOLO BYPASS
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
CROSS CHANNEL
COSUMNES
Rio Vista
BRANNAN ISLAND
Isleton
TYLER
NORTH
ANDROUS
Sevenmile
TWITCHELL ISLAND
Threemile Slough
SACRAMENTO
Collinsville
SAN
ANTIOCH
Dutch
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
Brentwood
DISCOVERY BAY
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
SOURCE:
Department of Conservation
Division of Oil and Gas – 1987
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

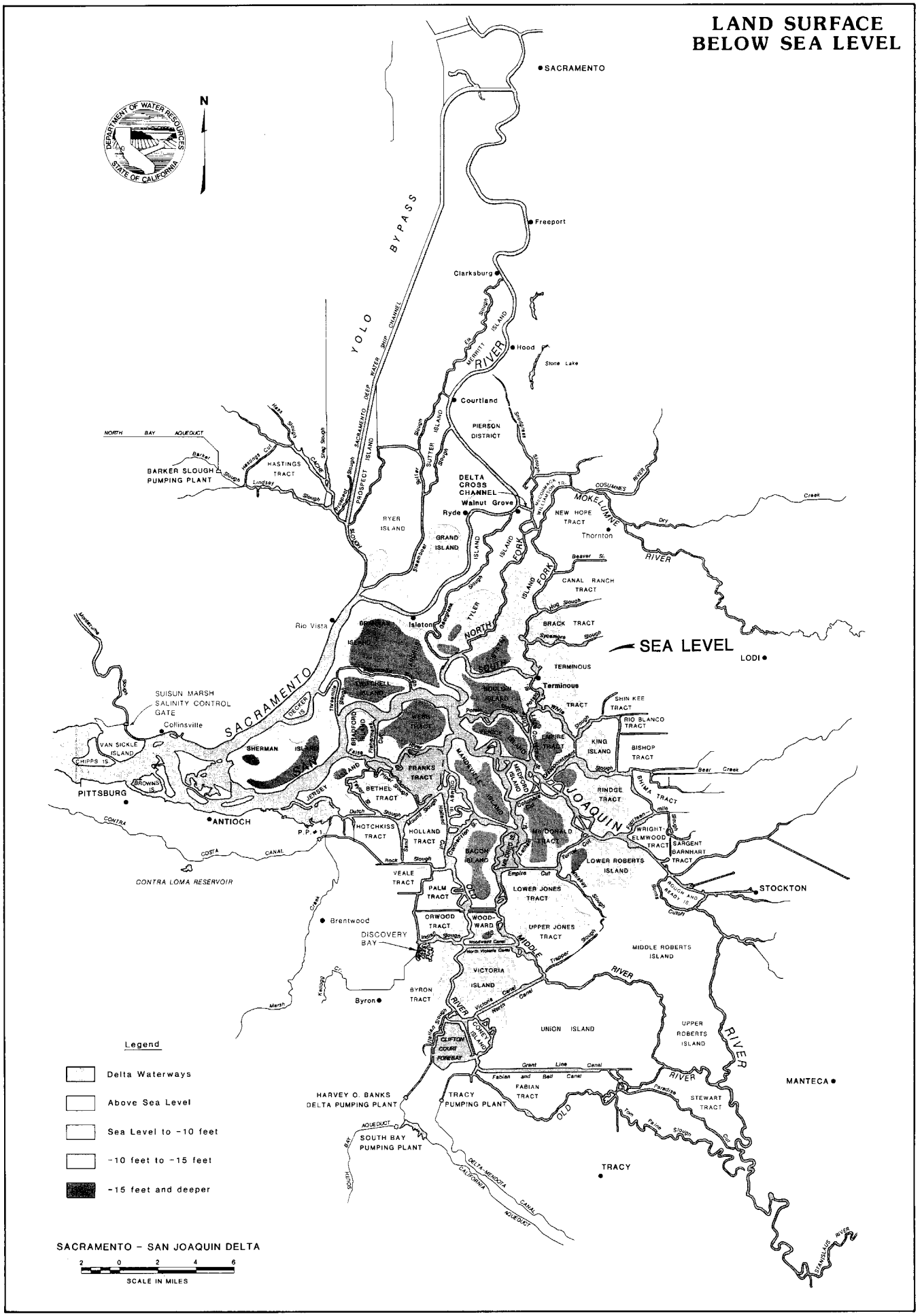


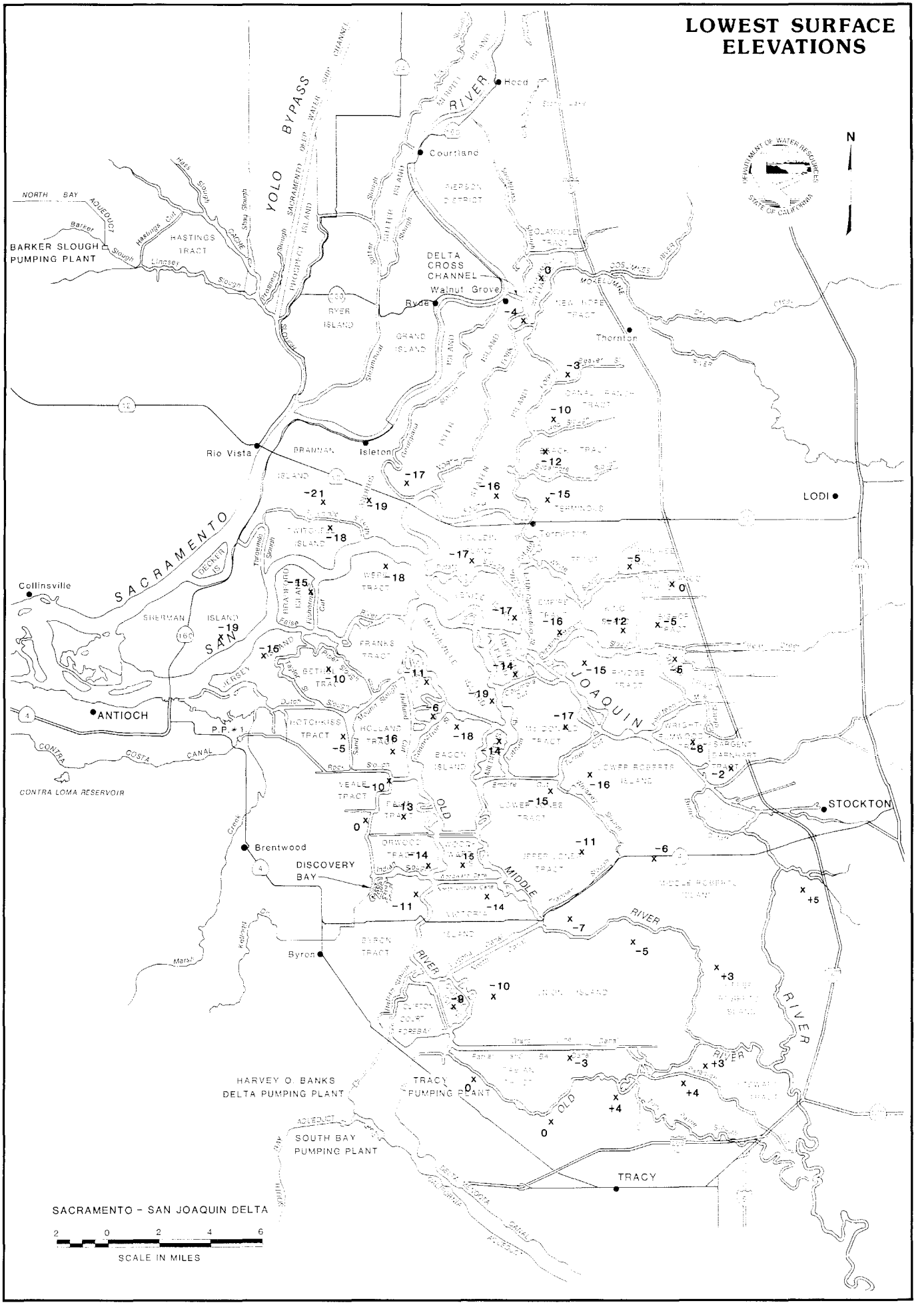
Deep-water channels, constructed by deepening existing channels and cutting some new ones, allow ocean vessels to sail inland to ports at Sacramento and Stockton. Delta waterways are shared by boats of all sizes.

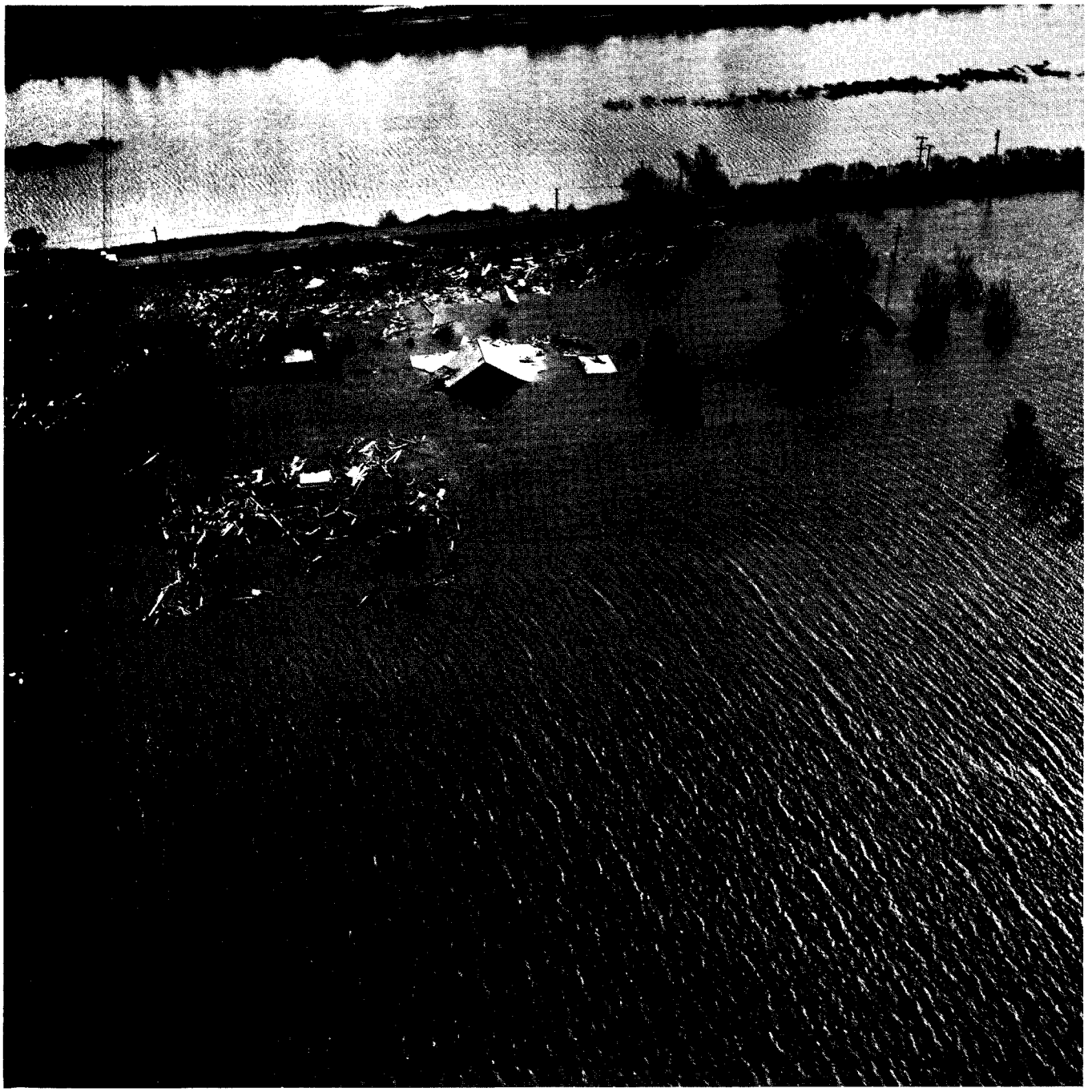

DEEP WATER
SHIP CHANNELS
SACRAMENTO
DEEP
WATER
CHANNEL
STOCKTON
DEEP
WATER
CHANNEL
SACRAMENTO
Freeport
Clarksburg
Hood
Courtland
Walnut Grove
Isleton
Terminous
LODI
STOCKTON
MANTECA
TRACY
ANTIOCH
PITTSBURG
BYRON
YOLO BYPASS
SACRAMENTO RIVER
SAN JOAQUIN RIVER
DELTA CROSS CHANNEL
MOKELUMNE RIVER
NORTH FORK
NORTH
SOUTH
MIDDLE
OLD
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
CLIFTON COURT FOREBAY
CHANNEL ISLAND
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES

The East Bay Municipal Utility District Mokelumne Aqueduct, which crosses the Delta's peat soil, shows the amount of land subsidence since construction. These concrete anchor blocks, once at ground level, are supported by piles that extend to a firm foundation.

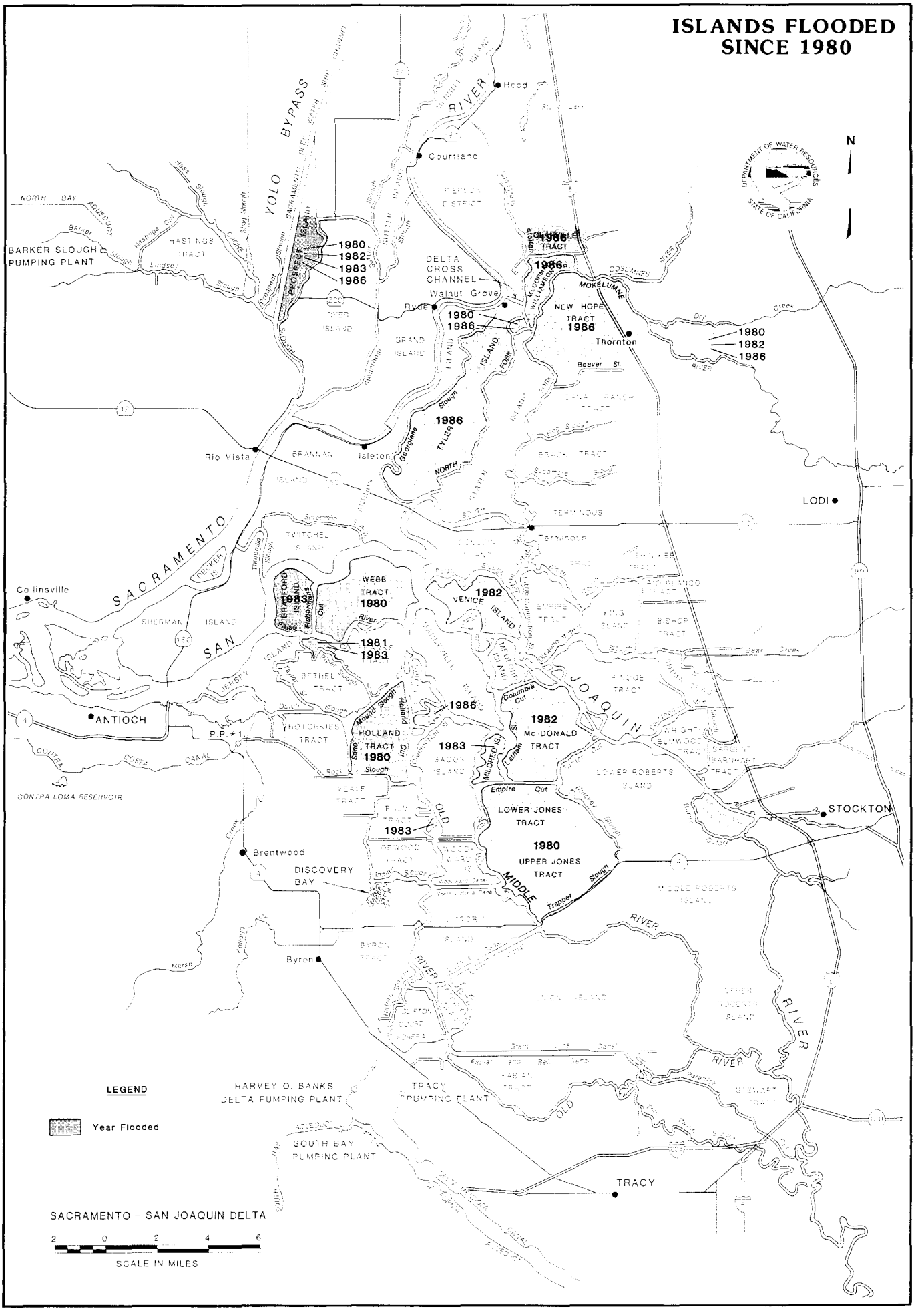

DEPTH OF PEAT
YOLO BYPASS
SACRAMENTO DEEP WATER SHIP CHANNEL
RIVER
Hood
Courtland
PIERSON DISTRICT
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
RYER ISLAND
GRAND ISLAND
NEW HOPE TRACT
Thornton
COSUMNES
MOKELUMNE
CANAL RANCH TRACT
BRACK TRACT
TERMINOUS
Terminous
LODI
Rio Vista
BRANNAN ISLAND
Isleton
TYLER ISLAND
STATEN ISLAND
SACRAMENTO
Collinsville
SHERMAN ISLAND
SAN
JOAQUIN
FRANKS TRACT
BETHEL TRACT
JERSEY ISLAND
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
RINDGE TRACT
Mc DONALD TRACT
ANTIOCH
P.P. #1
HOTCHKISS TRACT
HOLLAND TRACT
BACON ISLAND
LOWER ROBERTS ISLAND
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
VEALE TRACT
PALM TRACT
OLD
LOWER JONES TRACT
STOCKTON
Brentwood
DISCOVERY BAY
ORWOOD TRACT
WOODWARD IS
UPPER JONES TRACT
MIDDLE
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
BYRON TRACT
Byron
UNION ISLAND
UPPER ROBERTS ISLAND
CLIFTON COURT FOREBAY
FABIAN TRACT
STEWART TRACT
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
DELTA MENDOTA CANAL
CALIFORNIA AQUEDUCT
TRACY
LEGEND
Islands with Majority of Peat over 20 feet.
Islands with Majority of Peat over 10 feet.
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
N

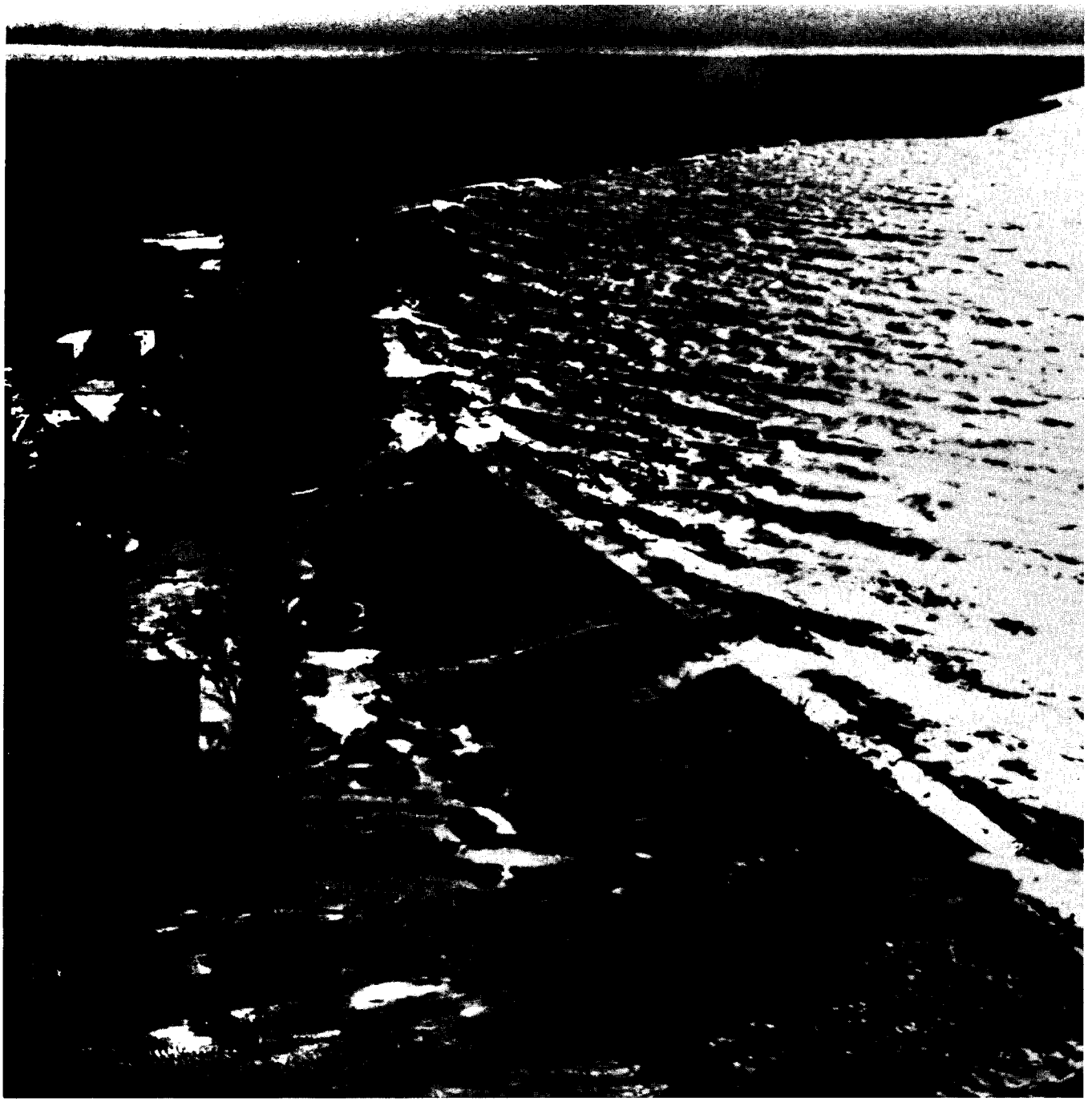

LAND SURFACE
BELOW SEA LEVEL
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
N
SACRAMENTO
Freeport
YOLO BYPASS
Clarksburg
Hood
Courtland
PIERSON DISTRICT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
RYER ISLAND
GRAND ISLAND
NEW HOPE TRACT
Thornton
MOKELUMNE RIVER
CANAL RANCH TRACT
BRACK TRACT
SEA LEVEL
LODI
TERMINOUS
Terminous
SHIN KEE TRACT
RIO BLANCO TRACT
KING ISLAND
BISHOP TRACT
BHIMA TRACT
RINDGE TRACT
WRIGHT-ELMWOOD TRACT
SARGENT
BARNHART TRACT
LOWER ROBERTS ISLAND
STOCKTON
MIDDLE ROBERTS ISLAND
UPPER ROBERTS ISLAND
MANTECA
STEWART TRACT
TRACY
Rio Vista
Isleton
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO
SUISUN
VAN SICKLE ISLAND
CHIPPS IS
BROWNS IS
PITTSBURG
ANTIOCH
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
P.P. #1
HOTCHKISS TRACT
HOLLAND TRACT
FRANKS TRACT
BETHEL TRACT
VEALE TRACT
PALM TRACT
BACON ISLAND
MEDFORD ISLAND
MacDONALD TRACT
LOWER JONES TRACT
UPPER JONES TRACT
ORWOOD TRACT
WOODWARD
Brentwood
DISCOVERY BAY
MIDDLE RIVER
VICTORIA ISLAND
BYRON TRACT
Byron
UNION ISLAND
CLIFTON COURT FOREBAY
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
FABIAN TRACT
SOUTH BAY PUMPING PLANT
DELTA-MENDOTA CANAL
AQUEDUCT
BARKER SLOUGH PUMPING PLANT
NORTH BAY AQUEDUCT
HASTINGS TRACT
PRINCIPAL DELTA CHANNELS
Legend
Delta Waterways
Above Sea Level
Sea Level to -10 feet
-10 feet to -15 feet
-15 feet and deeper
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES


LOWEST SURFACE ELEVATIONS
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
LODI
Collinsville
ANTIOCH
STOCKTON
Brentwood
DISCOVERY BAY
Byron
TRACY
BARKER SLOUGH PUMPING PLANT
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
CONTRA LOMA RESERVOIR
DELTA CROSS CHANNEL
SACRAMENTO RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
YOLO BYPASS
CONTRA COSTA CANAL
NORTH BAY AQUEDUCT
HASTINGS TRACT
RIVER ISLAND
GRAND ISLAND
BRANNAN ISLAND
SHERMAN ISLAND
DECKER IS.
WEST TRACT
FRANKS TRACT
BETHEL ISLAND
HOTCHKISS TRACT
HOLLAND TRACT
BACON ISLAND
WEALE TRACT
BYRON TRACT
UNION ISLAND
MOKELUMNE RIVER
MOSHER TRACT
CANAL RANCH TRACT
WOODWARD ISLAND
LOWER ROBERTS ISLAND
MIDDLE ROBERTS ISLAND
LOWER JONES TRACT
UPPER JONES TRACT
BRIDGE TRACT
WRIGHT ELMWOOD TRACT
EMPIRE TRACT
LOWER ROBERTS TRACT
CLIFTON COURT FOREBAY

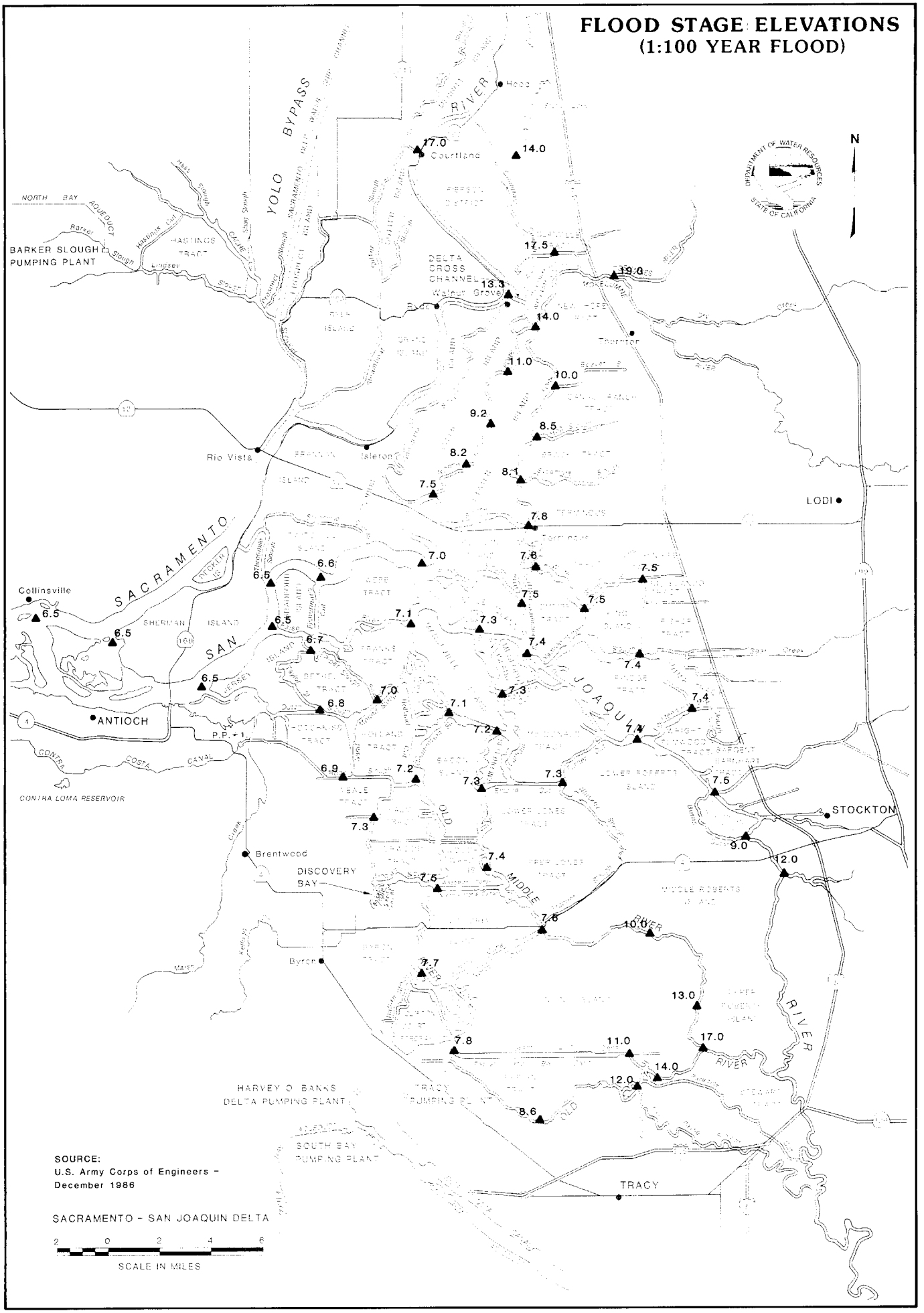


A combination of high tides, winter floodflows, and poor levees can result in flooded islands. Reclaiming the islands is costly and time consuming.


ISLANDS FLOODED SINCE 1980
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO RIVER
YOLO BYPASS
Hood
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
PROSPECT ISLAND
1980
1982
1983
1986
DELTA CROSS CHANNEL
Walnut Grove
Ryde
RIVER ISLAND
GRAND ISLAND
1980
1986
NEW HOPE TRACT
1986
Thornton
1980
1982
1986
Rio Vista
BRANNAN ISLAND
Isleton
TYLER ISLAND
1986
LODI
Terminous
SACRAMENTO SAN JOAQUIN
Collinsville
SHERMAN ISLAND
DECKER IS.
BRADFORD ISLAND
1983
WEBB TRACT
1980
1981
1983
VENICE ISLAND
1982
BETHEL ISLAND
ANTIOCH
P.P. #1
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
HOTCHKISS TRACT
HOLLAND TRACT
1980
1986
1983
MAYBERRY SLOUGH
MILDRED IS.
1982
Mc DONALD TRACT
RINDGE TRACT
BISHOP TRACT
LOWER ROBERTS ISLAND
STOCKTON
WEALE TRACT
P.M. TRACT
1983
OLD
LOWER JONES TRACT
1980
UPPER JONES TRACT
MIDDLE
Brentwood
DISCOVERY BAY
Byron
MIDDLE ROBERTS ISLAND
UPPER ROBERTS ISLAND
OLD RIVER
MIDDLE RIVER
LEGEND
Year Flooded
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES



Wind-whipped waves splash over the Jersey Island levee on the San Joaquin River. Low freeboard, high tides, and flood-stage flows led to this dangerous situation in December 1983.


FLOOD STAGE ELEVATIONS
(1:100 YEAR FLOOD)
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO RIVER
YOLO BYPASS
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
DELTA CROSS CHANNEL
Walnut Grove
RIO VISTA ISLAND
GRAND ISLAND
Hood
Courtland
Thornton
Rio Vista
Isleton
LODI
Collinsville
SHERMAN ISLAND
ANTIOCH
P.P. #1
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
Brentwood
DISCOVERY BAY
Byron
OLD RIVER
MIDDLE RIVER
SAN JOAQUIN RIVER
STOCKTON
TRACY
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
17.0
14.0
17.5
19.0
13.3
14.0
11.0
10.0
9.2
8.5
8.2
8.1
7.5
7.8
7.0
7.6
6.6
6.5
7.5
7.5
7.1
7.3
6.5
6.7
7.4
7.4
6.5
7.0
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8.6
9.0
12.0
SOURCE:
U.S. Army Corps of Engineers -
December 1986
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

California Conservation Corps crews placed protective canvas on the landward side of this levee on Holland Tract when it flooded in 1980. Without such protection, floodwaters would soon erode the remaining levee.

Figure 25

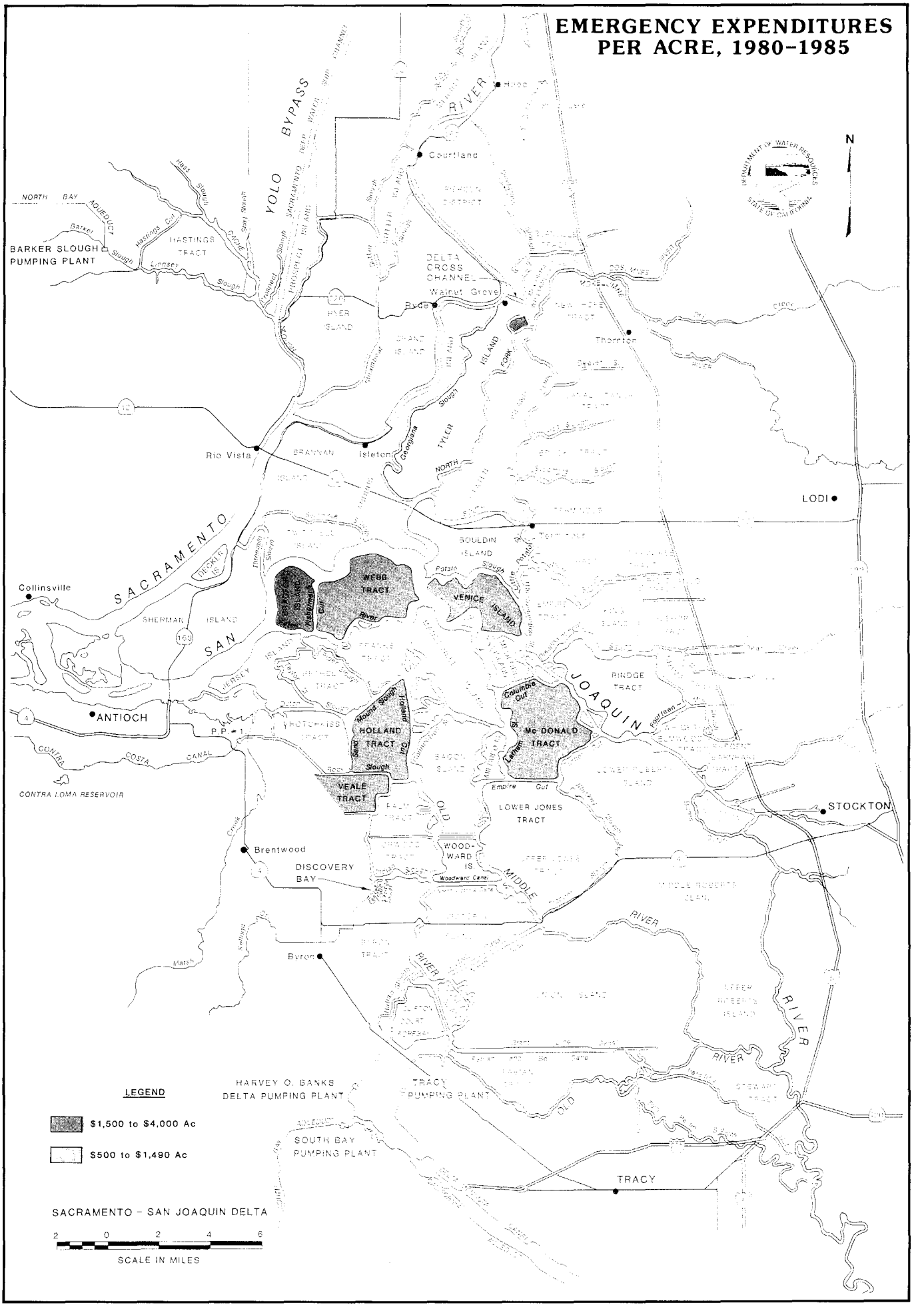

EMERGENCY EXPENDITURES PER ACRE, 1980-1985
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
Barker Slough
Hastings Cut
Lindsey Slough
Cache Slough
Ulatis Creek
YOLO BYPASS
SACRAMENTO RIVER
Hood
Courtland
DELTA CROSS CHANNEL
Walnut Grove
Rio Vista
RIVER ISLAND
GRAND ISLAND
BRANNAN ISLAND
Isleton
Georgiana Slough
TYLER ISLAND
NORTH FORK
Thornton
LODI
SOUTH FORK
SOULDIN ISLAND
Potato Slough
Collinsville
SACRAMENTO
SAN JOAQUIN
DECKER ISLAND
SHERMAN ISLAND
Threemile Slough
BRADFORD ISLAND
Railroad Cut
WEBB TRACT
VENICE ISLAND
JERSEY ISLAND
RINGGE TRACT
Columbia Cut
Mc DONALD TRACT
Fourteen Mile Slough
ANTIOCH
P.P. #1
PITTSBURG TRACT
Mound Slough
HOLLAND TRACT
Piper Slough
Holland Cut
Lathrop Slough
VEALE TRACT
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
Empire Cut
LOWER JONES TRACT
STOCKTON
OLD RIVER
Brentwood
DISCOVERY BAY
WOODWARD IS.
Woodward Canal
MIDDLE RIVER
Byron
Marsh Creek
Kellogg Creek
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
LEGEND
$1,500 to $4,000 Ac
$500 to $1,490 Ac
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Table 2

EMERGENCY WORK EXPENDITURES ON NONPROJECT LEVEES, 1980-1986, RANKED BY TOTAL COST EXPENDED[1]

R.D. No.	District Name	Project Levee Mi.	Nonproject Levee Mi.	Acres	Federal Disaster Nos.[2]	FEMA Expended[3]	NDAA Expended[3]	Local Expended	Total Expended	$/Acre
2026	Webb		12.8	5,490	3078, 651, 677	$14,537,483[4]	$ 6,845,801	$ 581,719	$21,965,003	$4,000
2030	McDonald		13.7	6,145	3078,651,677,669	9,315,210	1,579,880	1,465,667	12,360,757	2,010
2023	Venice		12.3	3,220	3078, 651, 677	6,528,288	1,491,777	825,011	8,845,076	2,750
2025	Holland		10.9	4,060	3078, 651, 677	6,655,112[4]	1,836,778	176,528	8,668,418	2,140
563	Tyler	12.2	10.7	8,583	3078, 677, 758	5,806,350	1,738,249	56,054	7,600,653	890
2059	Bradford		7.4	2,051	3078, 651, 677	371,550	5,658,293	487,906	6,517,749	3,180
2037	Rindge		15.7	6,834	3078, 651, 677	4,342,152	971,115	719,410	6,032,677	880
756	Bouldin		18.0	6,006	3078, 651, 677	2,349,581	2,103,137	287,656	4,740,374	790
2038	Jones, Lower		8.8	5,894	633, 651, 677	2,753,768	427,632	501,870	3,683,270	620
2065	Veale		5.7	1,298	3078, 651, 677	1,555,659	714,749	45,908	2,316,316	1,780
38	Staten		25.4	9,173	3078, 651, 677	1,652,450	201,283	89,663	1,943,396	210
2027	Mandeville		14.3	5,300	3078, 651, 677	1,048,887	562,761	64,335	1,675,983	320
2072	Woodward		8.8	1,822	3078, 677	952,327	215,877		1,168,204	640
1601	Twitchell	2.5	9.3	3,516	3078, 677	967,881	12,178	19,537	999,596	280
341	Sherman	9.7	9.8	9,937	3078, 677	808,423			808,423	80
2028	Bacon		14.3	5,625	3078, 677	467,443	259,121	73,651	800,215	140
2039	Jones, Upper		9.3	6,259	3078,633,677	726,121			726,121	120
2029	Empire		10.5	3,430	3078, 651, 677	404,375	221,272	27,700	653,347	190
1607	Van Sickle		3.8	1,058	651, 677	264,501	326,386	31,075	621,962	590
2033	Brack		10.8	4,873	3078, 651, 677	296,481	166,376	60,214	523,071	110
2041	Medford		5.9	1,219	3078, 651, 677	378,793	105,597		484,390	400
2044	King		9.0	3,260	3078, 651, 677	302,043	161,109	19,239	482,391	150
2111	Dead Horse		2.6	211	3078, 677	134,664	255,122	16,807	406,593	1,930
2042	Bishop		5.8	2,169	3078, 677	193,646	80,799	18,040	292,485	130
1667	Prospect	2.9	7.1	1,228	651, 677	259,955		20,705	280,660	230
800	Byron		9.7	6,933	3078	125,886	121,781	15,294	262,961	40
548	Terminous		16.1	10,470	3078, 651, 677	162,127	56,281	38,719	257,127	20
348	New Hope		18.6	9,300	651, 677	158,456	24,890	18,192	201,538	20
--	Brannan-Andrus	19.3	10.1	13,000	3078, 677	180,733		15,926	196,659	20
544	Roberts, Upper	10.6	4.4	8,260	3078, 677	76,690	101,300	6,953	184,943	20
2	Union West		16.2	12,580	3078, 651, 677	80,828	82,242	17,918	180,988	10
830	Jersey		15.6	3,471	677	69,737	65,000	41,607	176,344	50
2089	Stark	2.8	0.7	734	677	128,863	35,045	9,037	172,945	240
684	Roberts, Lower		16.0	10,600	3078, 651, 677	119,468	21,031		140,499	10
2024	Orwood		10.9	4,138	3078, 677	79,679	39,096	18,853	137,628	30
2040	Victoria		15.1	7,250	3078, 651, 677	124,147	5,057	5,050	134,254	20
2036	Palm		7.5	2,436	3078, 677	83,307	41,226	9,132	133,665	50
799	Hotchkiss		6.3	3,100	3078, 677	105,158			105,158	30
2113	Fay		1.6	100	651, 677	102,068			102,068	1,020
773	Fabian		18.8	6,530	677	88,893			88,893	10
2021	Mildred		7.3	998	3078, 677	74,788			74,788	70
524	Roberts, Middle	6.1	3.7	13,687	3078, 677	50,536	5,460	3,885	59,881	<10
2058	Pescadero	6.7	8.3	8,500	677	50,087	7,827		57,914	10
--	Bethel		11.5	3,500	3078, 677	41,749	1,583		43,332	10
2110	McCormack-Williamson		8.8	1,654	677	22,458			22,458	10
1	Union, East	1.0	13.0	9,622	677	18,126			18,126	<10
2086	Canal Ranch		7.5	2,996	677	15,241			15,241	10
554	Walnut Grove	1.0	1.2	400	758	2,381			2,381	<10
1007	Naglee Burke		8.3	6,090	677	1,535			1,535	<10
	TOTAL - 48	74.8	499.9	255,010		$65,036,084	$26,543,111	$5,789,261	$97,368,456	

1 Table includes federal, state, and local money spent for emergency work in the Sacramento-San Joaquin Delta between 1980-1986.

2 Federal Disaster No. 3078 - February 1980
No. 633 - September and October 1980
No. 651 - December and January 1981-82
No. 669 - August 1982
No. 677 - November through March 1982-83
No. 758 - February 1986

3 Based on information provided by the Office of Emergency Services on February 9, 1987.

4 Includes funds used by the Corps of Engineers to close the 1980 levee breaks.

Table 3

EMERGENCY WORK EXPENDITURES ON NONPROJECT LEVEES, 1980-1986,
RANKED BY TOTAL COST PER ACRE[1]

R.D. No.	District Name	Project Levee Mi.	Non-Project Levee Mi.	Acres	Federal Disaster Nos.[2]	FEMA Expended[3]	NDAA Expended[3]	Local Expended	Total Expended	$/Acre
2026	Webb		12.8	5,490	3078, 651, 677	$14,537,483[4]	$ 6,845,801	$ 581,719	$21,965,003	$4,000
2059	Bradford		7.4	2,051	3078, 651, 677	371,550	5,658,293	487,906	6,517,749	3,180
2023	Venice		12.3	3,220	3078, 651, 677	6,528,288	1,491,777	825,011	8,845,076	2,750
2025	Holland		10.9	4,060	3078, 651, 677	6,655,112[4]	1,836,778	176,528	8,668,418	2,140
2030	McDonald		13.7	6,145	3078,651,677,669	9,315,210	1,579,880	1,465,667	12,360,757	2,010
2111	Dead Horse		2.6	211	3078, 677	134,664	255,122	16,807	406,593	1,930
2065	Veale		5.7	1,298	3078, 651, 677	1,555,659	714,749	45,908	2,316,316	1,780
2113	Fay		1.6	100	651, 677	102,068			102,068	1,020
563	Tyler	12.2	10.7	8,583	3078, 677, 758	5,806,350	1,738,249	56,054	7,600,653	890
2037	Rindge		15.7	6,834	3078, 651, 677	4,342,152	971,115	719,410	6,032,677	880
756	Bouldin		18.0	6,006	3078, 651, 677	2,349,581	2,103,137	287,656	4,740,374	790
2072	Woodward		8.8	1,822	3078, 677	952,327	215,877		1,168,204	640
2038	Jones, Lower		8.8	5,894	633, 651, 677	2,753,768	427,632	501,870	3,683,270	620
1607	Van Sickle		3.8	1,058	651, 677	264,501	326,386	31,075	621,962	590
2041	Medford		5.9	1,219	3078, 651, 677	378,793	105,597		484,390	400
2027	Mandeville		14.3	5,300	3078, 651, 677	1,048,887	562,761	64,335	1,675,983	320
1601	Twitchell	2.5	9.3	3,516	3078, 677	967,881	12,178	19,537	999,596	280
2089	Stark	2.8	0.7	734	677	128,863	35,045	9,037	172,945	240
1667	Prospect	2.9	7.1	1,228	651, 677	259,955		20,705	280,660	230
38	Staten		25.4	9,173	3078, 651, 677	1,652,450	201,283	89,663	1,943,396	210
2029	Empire		10.5	3,430	3078, 651, 677	404,375	221,272	27,700	653,347	190
2044	King		9.0	3,260	3078, 651, 677	302,043	161,109	19,239	482,391	150
2028	Bacon		14.3	5,625	3078, 677	467,443	259,121	73,651	800,215	140
2042	Bishop		5.8	2,169	3078, 677	193,646	80,799	18,040	292,485	130
2039	Jones, Upper		9.3	6,259	3078,633,677	726,121			726,121	120
2033	Brack		10.8	4,873	3078, 651, 677	296,481	166,376	60,214	523,071	110
341	Sherman	9.7	9.8	9,937	3078, 677	808,423			808,423	80
2021	Mildred		7.3	998	3078, 677	74,788			74,788	70
830	Jersey		15.6	3,471	677	69,737	65,000	41,607	176,344	50
2036	Palm		7.5	2,436	3078, 677	83,307	41,226	9,132	133,665	50
800	Byron		9.7	6,933	3078	125,886	121,781	15,294	262,961	40
799	Hotchkiss		6.3	3,100	3078, 677	105,158			105,158	30
2024	Orwood		10.9	4,138	3078, 677	79,679	39,096	18,853	137,628	30
--	Brannan-Andrus	19.3	10.1	13,000	3078, 677	180,733		15,926	196,659	20
348	New Hope		18.6	9,300	651, 677	158,456	24,890	18,192	201,538	20
544	Roberts, Upper	10.6	4.4	8,260	3078, 677	76,690	101,300	6,953	184,943	20
548	Terminous		16.1	10,470	3078, 651, 677	162,127	56,281	38,719	257,127	20
2040	Victoria		15.1	7,250	3078, 651, 677	124,147	5,057	5,050	134,254	20
--	Bethel		11.5	3,500	3078, 677	41,749	1,583		43,332	10
2086	Canal Ranch		7.5	2,996	677	15,241			15,241	10
773	Fabian		18.8	6,530	677	88,893			88,893	10
2110	McCormack-Williamson		8.8	1,654	677	22,458			22,458	10
2058	Pescadero	6.7	8.3	8,500	677	50,087	7,827		57,914	10
684	Roberts, Lower		16.0	10,600	3078, 651, 677	119,468	21,031		140,499	10
2	Union West		16.2	12,580	3078, 651, 677	80,828	82,242	17,918	180,988	10
1007	Naglee Burke		8.3	6,090	677	1,535			1,535	<10
524	Roberts, Middle	6.1	3.7	13,687	3078, 677	50,536	5,460	3,885	59,881	<10
1	Union, East	1.0	13.0	9,622	677	18,126			18,126	<10
554	Walnut Grove	1.0	1.2	400	758	2,381			2,381	<10
	TOTAL - 48	74.8	499.9	255,010		$65,036,084	$26,543,111	$5,789,261	$97,368,456	

1 Table includes federal, state, and local money spent for emergency work in the Sacramento-San Joaquin Delta between 1980-1986.

2 Federal Disaster No. 3078 - February 1980
No. 633 - September and October 1980
No. 651 - December and January 1981-82
No. 669 - August 1982
No. 677 - November through March 1982-83
No. 758 - February 1986

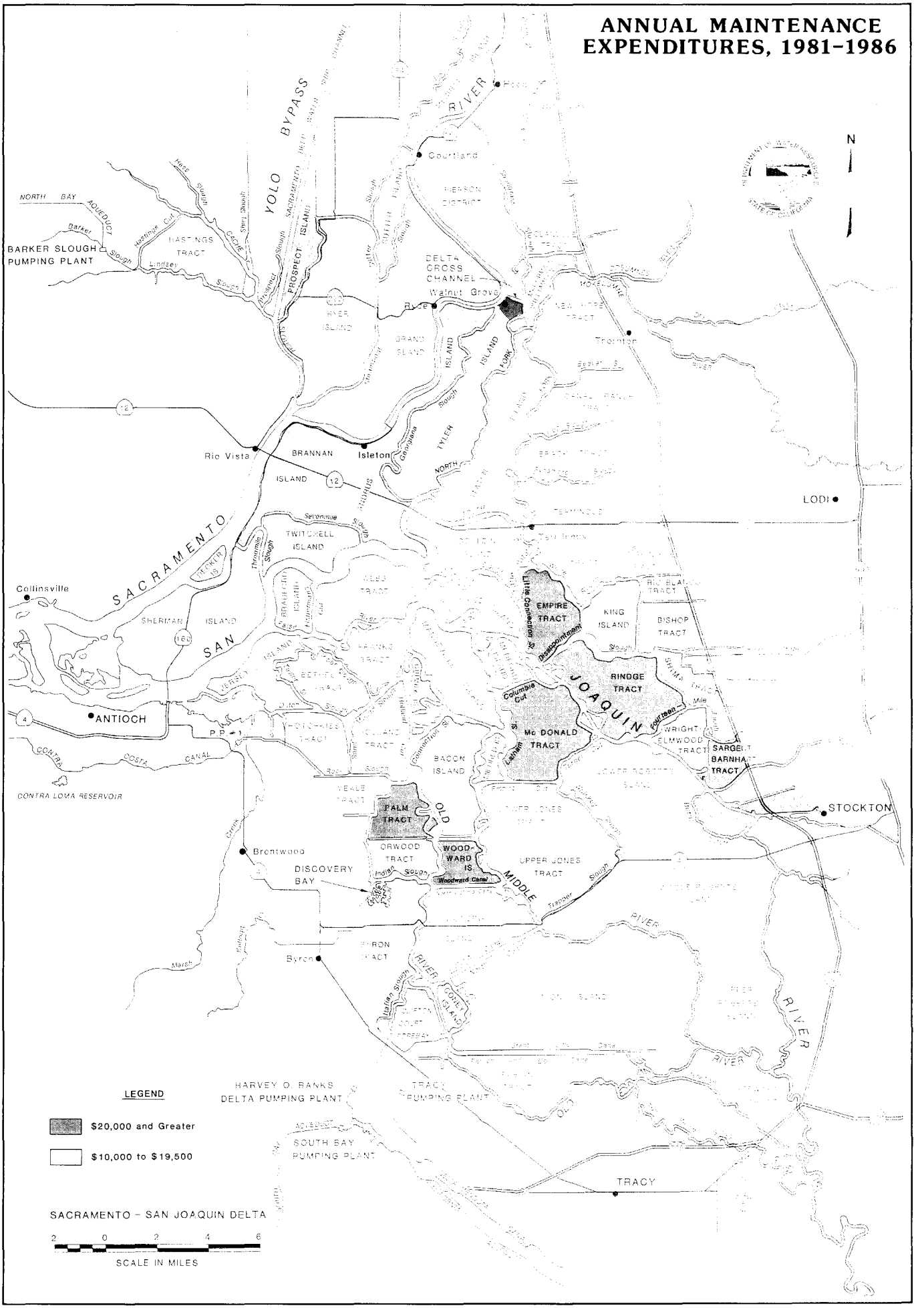
3 Based on information provided by the Office of Emergency Services on February 9, 1987.

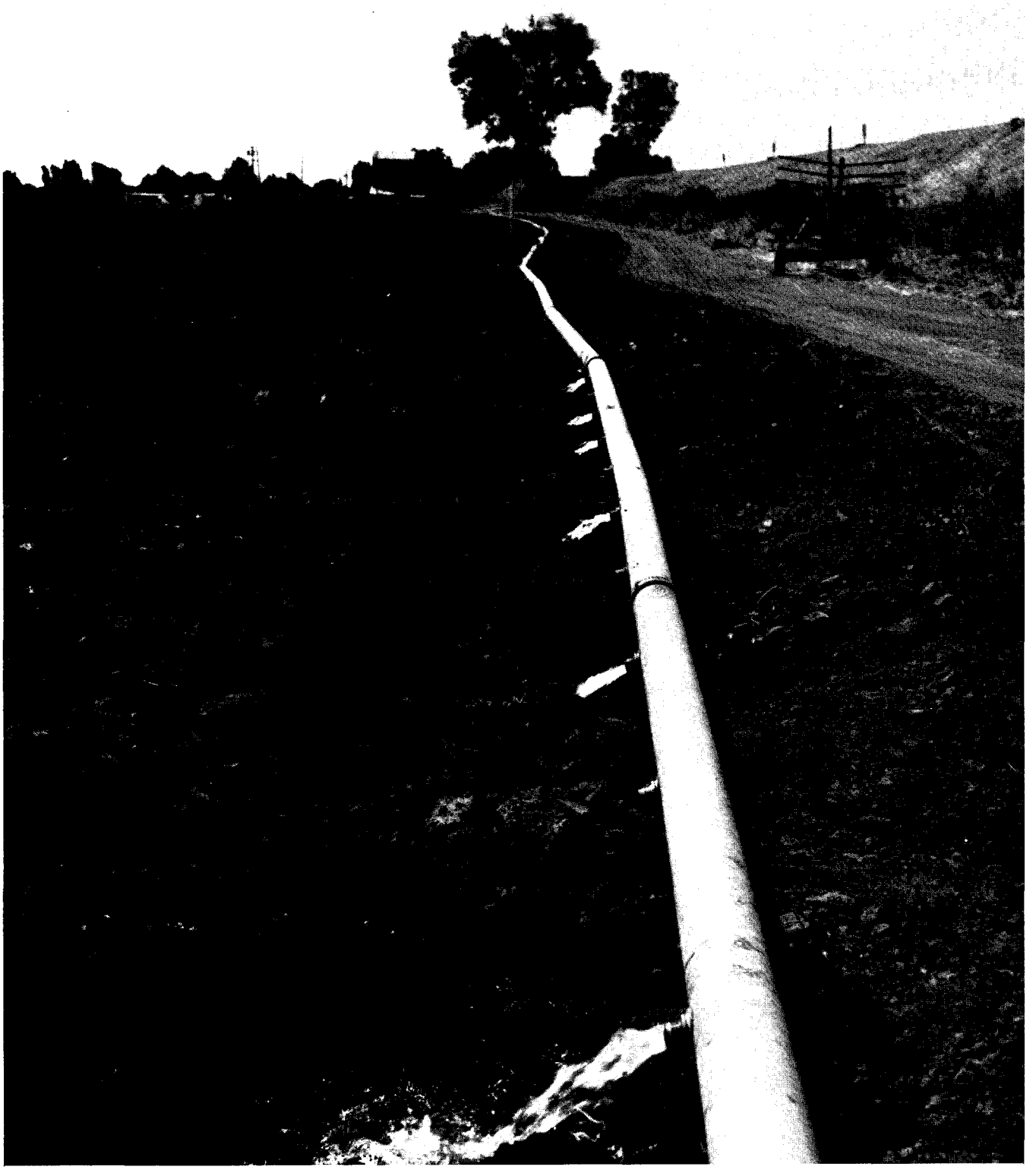
4 Includes funds used by the Corps of Engineers to close the 1980 levee breaks.

Table 4

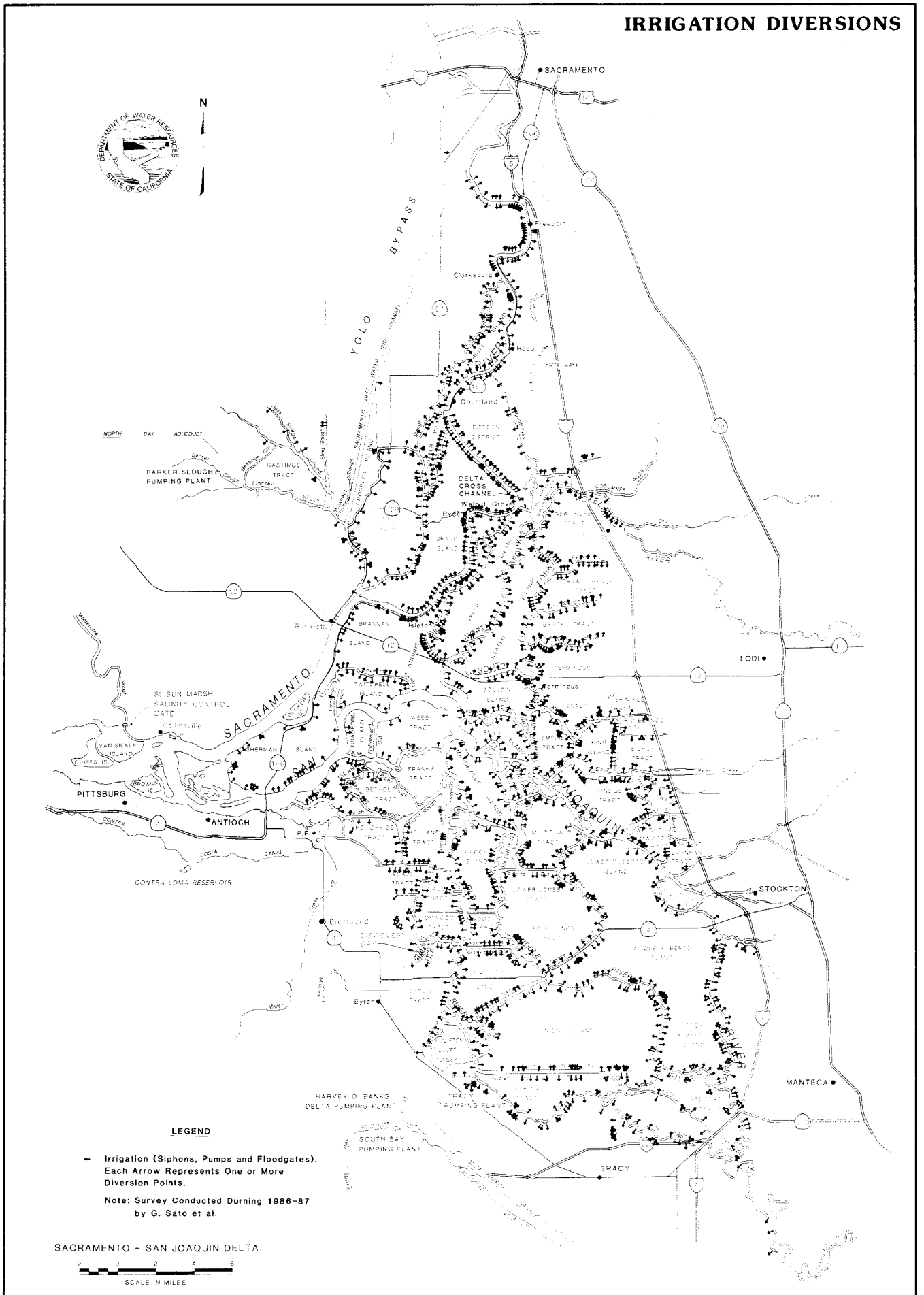
ANNUAL LEVEE MAINTENANCE, 1981-86,
RANKED BY TOTAL COST PER MILE

R.D. No.	District Name	Project Levee Mi.	Non-Project Levee Mi.	Acres	State Subventions	Local Share State Subventions	Total	No. of Years in Program	Cost per Mile Per Year in Program
2074	Sargent Barnhart	1.5	2.8	1,214	$ 134,303	$ 318,374	$ 452,677	1	$ 161,670
2116	Holt Station		0.4	37	7,881	9,370	17,251	1	43,130
828	Weber		1.2	660	22,558	23,757	46,315	1	38,600
2037	Rindge		15.7	6,834	566,859	1,144,888	1,711,747	3	36,340
2030	McDonald		13.7	6,145	1,073,091	1,376,892	2,449,983	5	35,770
2113	Fay		1.6	100	43,827	85,276	129,103	3	26,900
2036	Palm		7.5	2,436	76,842	100,313	177,155	1	23,620
554	Walnut Grove	1.0	1.2	400	24,678	31,523	56,201	2	23,420
2072	Woodward		8.8	1,822	373,031	439,965	812,996	4	23,100
2029	Empire		10.5	3,430	335,399	617,375	952,774	4	22,690
2117	Coney		5.4	935	77,943	131,128	209,071	2	19,360
1601	Twitchell	2.5	9.3	3,516	341,608	533,578	875,186	5	18,820
563	Tyler	12.2	10.7	8,583	454,671	552,386	1,007,057	5	18,820
--	Brannan-Andrus	19.3	10.1	13,000	366,672	558,008	924,680	5	18,310
2044	King		9.0	3,260	95,674	220,783	316,457	2	17,580
1667	Prospect	2.9	7.1	1,228	152,408	296,865	449,273	4	15,820
2090	Quimby		7.0	769	82,546	107,818	190,364	2	13,600
800	Byron		9.7	6,933	204,762	310,645	515,407	4	13,280
2114	Rio Blanco		4.0	705	69,308	132,823	202,131	4	12,630
2115	Shima		6.6	2,394	118,175	199,236	317,411	4	12,020
2028	Bacon		14.3	5,625	354,231	481,589	835,820	5	11,690
2042	Bishop		5.8	2,169	106,204	148,660	254,864	4	10,990
2119	Wright-Elmwood		6.8	2,121	31,600	39,852	71,452	1	10,510
2024	Orwood		10.9	4,138	236,296	331,441	567,737	5	10,420
2039	Jones, Upper		9.3	6,259	161,529	215,683	377,212	4	10,140
2089	Stark	2.8	0.7	734	8,496	12,131	20,627	3	9,820
548	Terminous		16.1	10,470	179,307	256,386	435,693	3	9,020
--	Bethel		11.5	3,500	193,895	294,356	488,251	5	8,490
544	Roberts, Upper	10.6	4.4	8,260	27,560	38,564	66,124	2	7,510
2041	Medford		5.9	1,219	63,162	109,448	172,610	4	7,310
2040	Victoria		15.1	7,250	83,142	244,893	328,035	3	7,240
1607	Van Sickle		3.8	1,058	23,185	30,784	53,969	2	7,100
2111	Dead Horse		2.6	211	13,911	21,901	35,812	2	6,890
2025	Holland		10.9	4,060	58,939	91,356	150,295	2	6,890
2027	Mandeville		14.3	5,300	180,173	295,880	476,053	5	6,660
524	Roberts, Middle	6.1	3.7	13,687	10,123	13,822	23,945	1	6,470
2023	Venice		12.3	3,220	54,656	100,791	155,447	2	6,320
38	Staten		25.4	9,173	193,896	408,751	602,647	4	5,930
2038	Jones, Lower		8.8	5,894	62,116	91,338	153,454	3	5,810
799	Hotchkiss		6.3	3,100	38,502	69,013	107,515	3	5,690
684	Roberts, Lower		16.0	10,600	80,356	182,590	262,946	3	5,480
1007	Naglee Burke		8.3	6,090	24,425	65,726	90,151	2	5,430
2033	Brack		10.8	4,873	59,238	98,735	157,973	3	4,880
756	Bouldin		18.0	6,006	118,078	221,400	339,478	4	4,720
2110	McCormack-Williamson		8.8	1,654	31,735	50,835	82,570	2	4,690
2118	Little Mandeville		4.5	376	6,192	10,692	16,884	1	3,750
2	Union West		16.2	12,580	98,802	197,787	296,589	5	3,660
2021	Mildred		7.3	998	9,042	17,591	26,633	1	3,650
773	Fabian		18.8	6,530	14,795	51,456	66,251	1	3,520
2059	Bradford		7.4	2,051	17,422	34,478	51,900	2	3,510
341	Sherman	9.7	9.8	9,937	34,333	65,668	100,001	3	3,400
2026	Webb		12.8	5,490	11,929	24,728	36,657	1	2,860
1	Union, East	1.0	13.0	9,622	31,377	77,603	108,980	3	2,800
348	New Hope		18.6	9,300	50,735	142,037	192,772	4	2,590
2086	Canal Ranch		7.5	2,996				0	0
830	Jersey		15.6	3,471				0	0
2065	Veale		5.7	1,298				0	0
TOTAL	57 Local Agencies	69.6	530.3	255,721	$ 7,291,618	$11,728,968	$19,020,586		$811,320

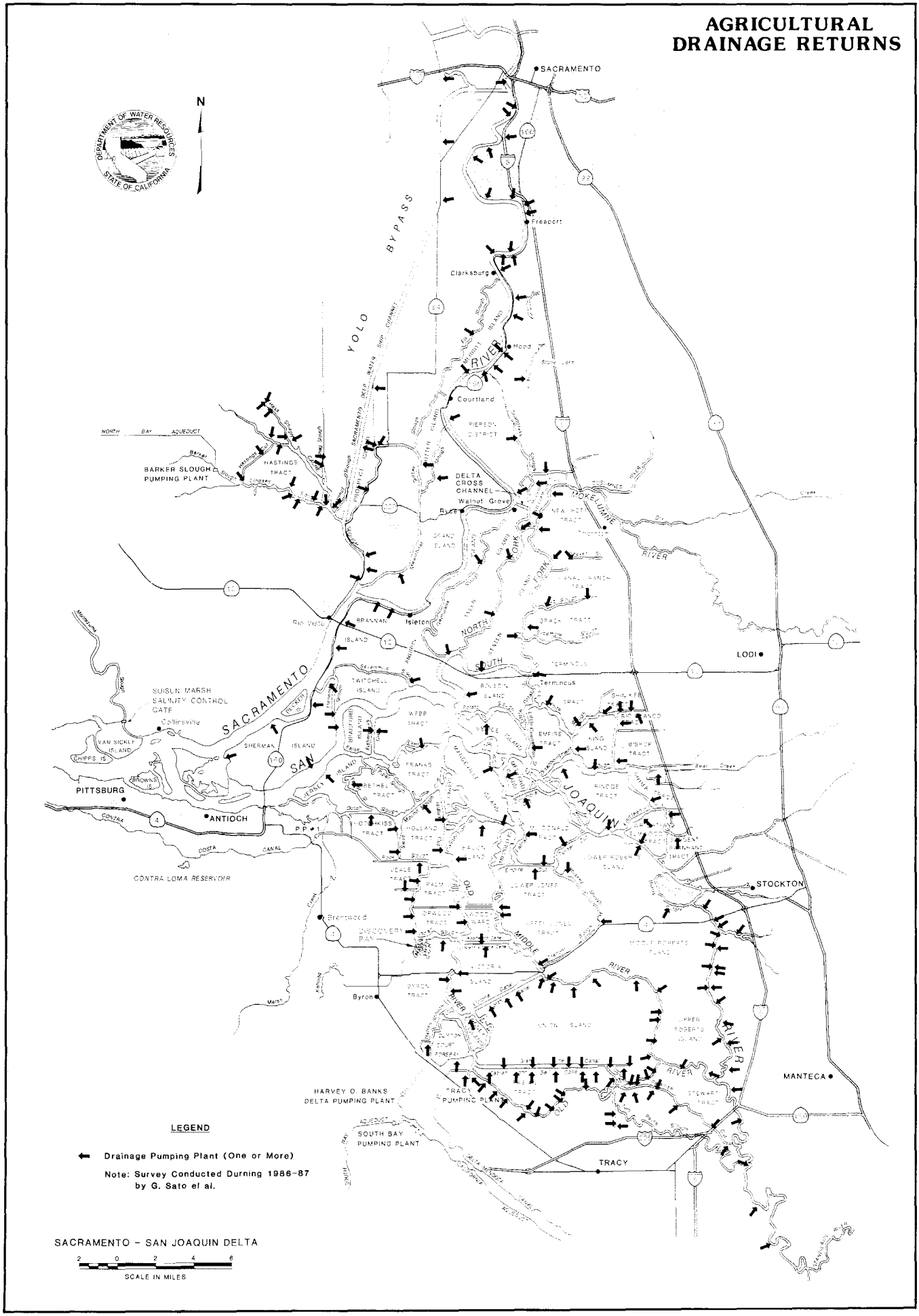

ANNUAL MAINTENANCE EXPENDITURES, 1981-1986
N
YOLO BYPASS
SACRAMENTO RIVER
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
PROSPECT ISLAND
COURTLAND
WALNUT GROVE
DELTA CROSS CHANNEL
RIVER ISLAND
GRAND ISLAND
ISLAND FORK
TRACY
RIO VISTA
BRANNAN ISLAND
ISLETON
LODI
TWITCHELL ISLAND
COLLINSVILLE
SHERMAN ISLAND
SAN JOAQUIN
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
RINDGE TRACT
Mc DONALD TRACT
WRIGHT ELMWOOD TRACT
SARGENT BARNHART TRACT
ANTIOCH
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
BACON ISLAND
PALM TRACT
OLD
MIDDLE
STOCKTON
BRENTWOOD
DISCOVERY BAY
ORWOOD TRACT
WOODWARD IS
UPPER JONES TRACT
BYRON
BYRON TRACT
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
LEGEND
$20,000 and Greater
$10,000 to $19,500
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

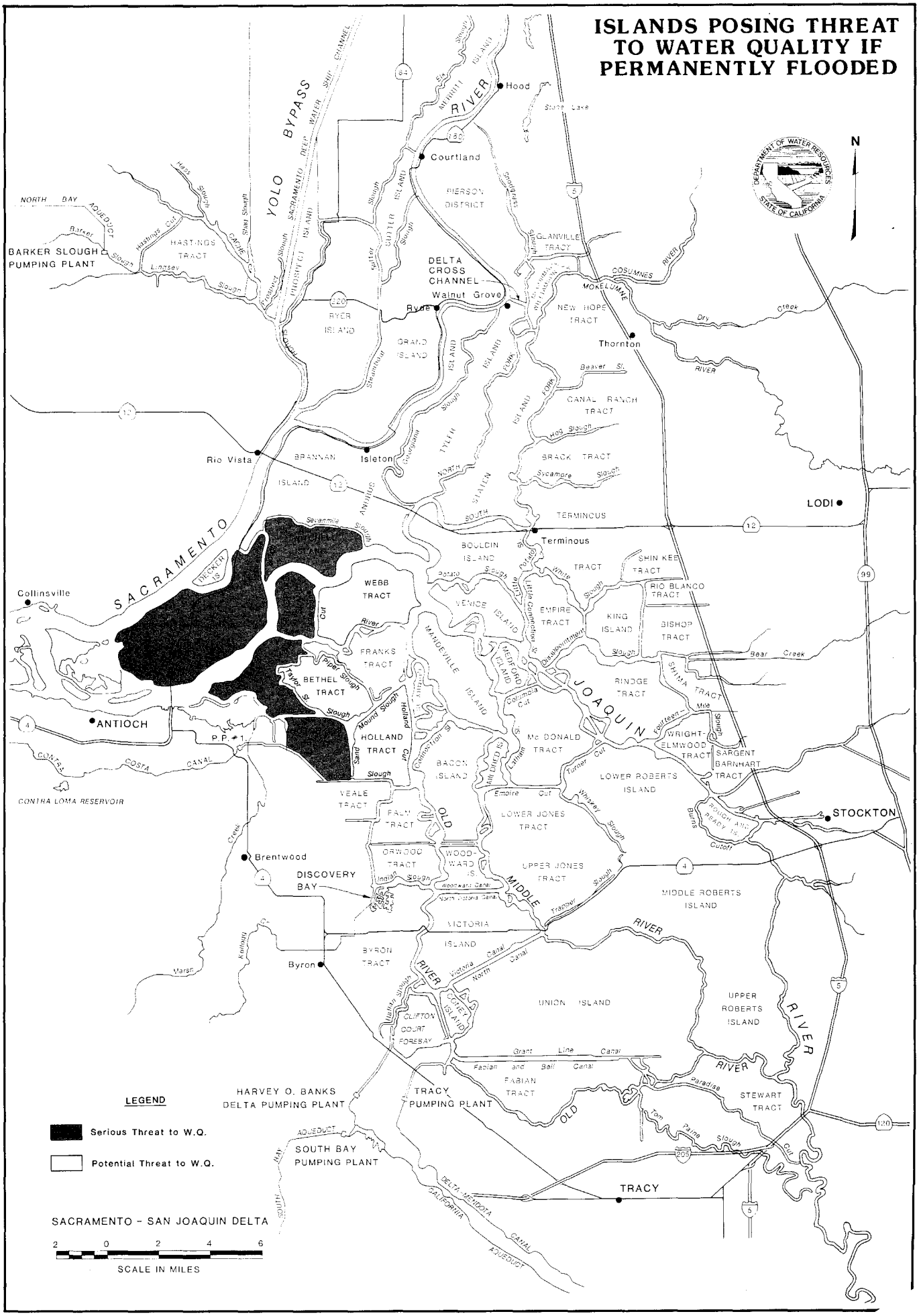


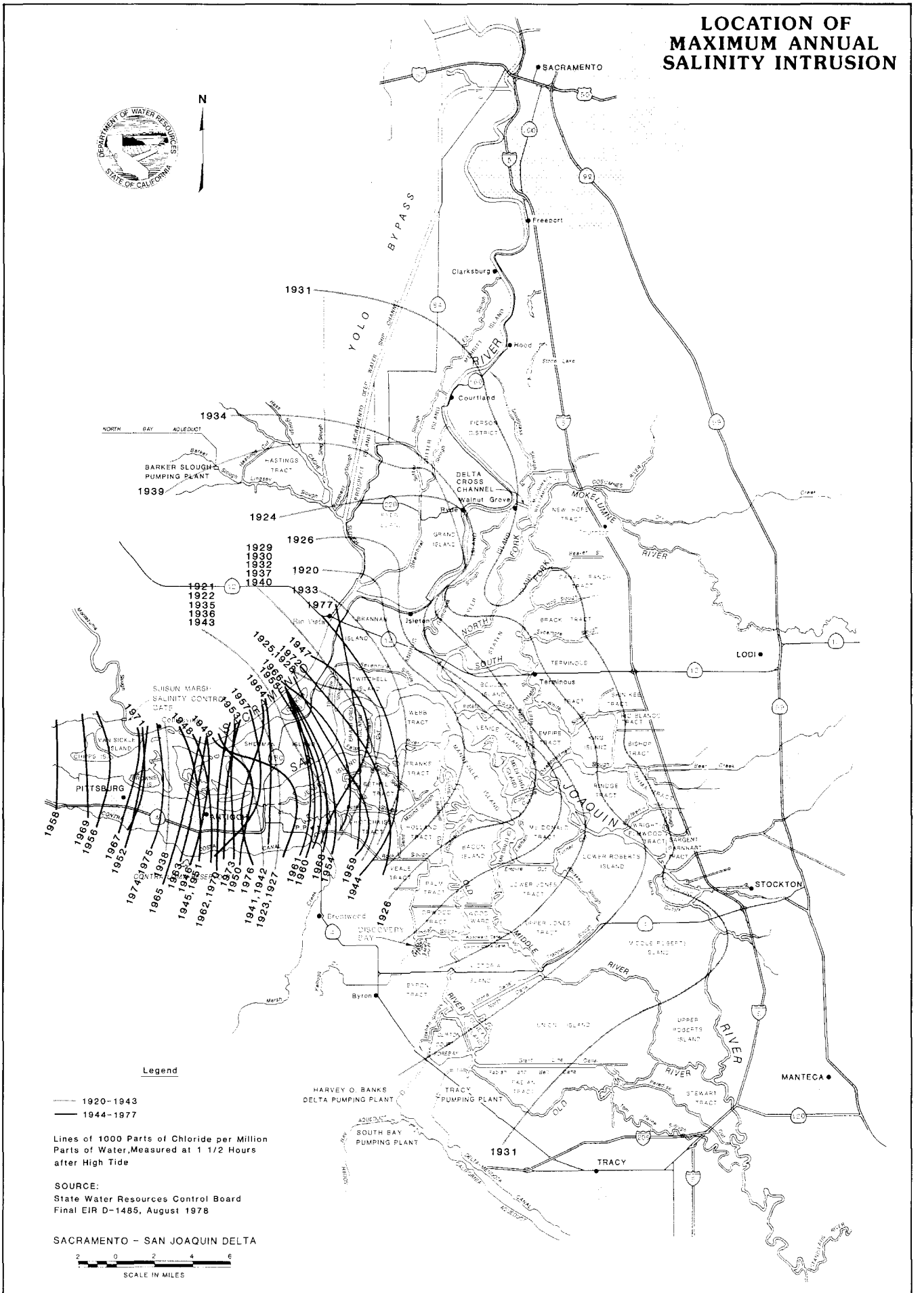
Good quality irrigation water is readily available in Delta channels. On many islands, water can be siphoned by pipes through the levee, because the channel water level is always higher than the land surface. However, drainage must be pumped back to the channel.


IRRIGATION DIVERSIONS
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
N
SACRAMENTO
YOLO BYPASS
Freeport
Clarksburg
Hood
RIVER
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
DELTA CROSS CHANNEL
Walnut Grove
Isleton
BRANNAN ISLAND
LODI
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO
SAN JOAQUIN
SHERMAN ISLAND
SAN SICKLE ISLAND
CHIPPS IS.
BROWNS IS.
PITTSBURG
ANTIOCH
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
Pittsburg
STOCKTON
Byron
MANTECA
HARVEY O. BANKS DELTA PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
LEGEND
← Irrigation (Siphons, Pumps and Floodgates). Each Arrow Represents One or More Diversion Points.
Note: Survey Conducted Durning 1986-87 by G. Sato et al.
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

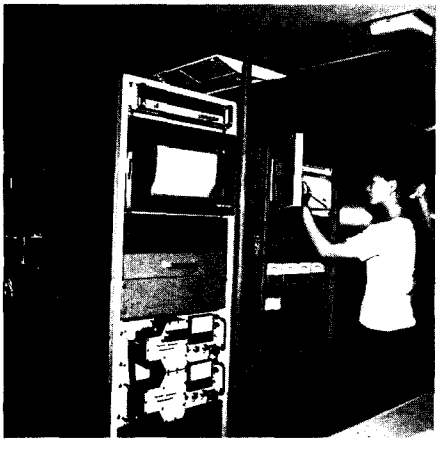
Agriculture is the number one industry in the Delta, with about 520,000 acres in production. Fruit, corn, sugar beets, and tomatoes are just a few of the crops. Agriculture grosses an average of $375 million annually for Delta farmers.


AGRICULTURAL
DRAINAGE RETURNS
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
SACRAMENTO
Freeport
Clarksburg
YOLO BYPASS
Hood
Courtland
SACRAMENTO RIVER
NORTH BAY AQUEDUCT
BARKER SLOUGH
PUMPING PLANT
HASTINGS TRACT
DELTA CROSS CHANNEL
Walnut Grove
MOKELUMNE RIVER
Isleton
BRANNAN ISLAND
NORTH FORK MOKELUMNE RIVER
LODI
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SUISUN BAY
SAN JOAQUIN RIVER
VAN SICKLE ISLAND
CHIPPS IS.
BROWNS IS.
PITTSBURG
ANTIOCH
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
STOCKTON
OLD RIVER
MIDDLE RIVER
Brentwood
Byron
MANTECA
HARVEY O. BANKS
DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY
PUMPING PLANT
TRACY
LEGEND
Drainage Pumping Plant (One or More)
Note: Survey Conducted Durning 1986-87
by G. Sato et al.
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES


ISLANDS POSING THREAT TO WATER QUALITY IF PERMANENTLY FLOODED
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
SACRAMENTO
YOLO BYPASS
MOKELUMNE RIVER
COSUMNES RIVER
Hood
Courtland
Walnut Grove
Ryde
Thornton
Rio Vista
Isleton
Terminous
LODI
Collinsville
ANTIOCH
Brentwood
Byron
STOCKTON
TRACY
BARKER SLOUGH PUMPING PLANT
NORTH BAY AQUEDUCT
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
DISCOVERY BAY
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
DELTA-MENDOTA CANAL
OLD RIVER
MIDDLE RIVER
UPPER ROBERTS RIVER
HASTINGS TRACT
RYER ISLAND
GRAND ISLAND
DELTA CROSS CHANNEL
PIERSON DISTRICT
GLANVILLE TRACT
NEW HOPE TRACT
CANAL RANCH TRACT
BRACK TRACT
BRANNAN ISLAND
TERMINOUS
BOULDIN ISLAND
SHIN KEE TRACT
RIO BLANCO TRACT
WEBB TRACT
VENICE ISLAND
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
FRANKS TRACT
MANDEVILLE ISLAND
MEDFORD ISLAND
BETHEL TRACT
HOLLAND TRACT
RINDGE TRACT
SHIMA TRACT
Mc DONALD TRACT
WRIGHT-ELMWOOD TRACT
SARGENT BARNHART TRACT
LOWER ROBERTS ISLAND
BACON ISLAND
VEALE TRACT
PALM TRACT
LOWER JONES TRACT
ORWOOD TRACT
WOODWARD IS.
UPPER JONES TRACT
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
BYRON TRACT
UNION ISLAND
CLIFTON COURT FOREBAY
FABIAN TRACT
STEWART TRACT
LEGEND
Serious Threat to W.Q.
Potential Threat to W.Q.
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES


LOCATION OF MAXIMUM ANNUAL SALINITY INTRUSION
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
SACRAMENTO
Freeport
Clarksburg
Hood
Courtland
Walnut Grove
Ryde
Isleton
Terminous
LODI
STOCKTON
MANTECA
TRACY
Byron
Brentwood
PITTSBURG
ANTIOCH
BARKER SLOUGH PUMPING PLANT
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
SUISUN MARSH SALINITY CONTROL GATE
DELTA CROSS CHANNEL
YOLO BYPASS
SACRAMENTO RIVER
MOKELUMNE RIVER
SAN JOAQUIN RIVER
OLD RIVER
MIDDLE RIVER
NORTH FORK
SOUTH FORK
1931
1934
1939
1924
1926
1929
1930
1932
1937
1940
1920
1933
1977
1921
1922
1935
1936
1943
1925
1928
1947
1955
1956
1957
1953
1964
1948
1949
1971
1958
1969
1967
1952
1975
1938
1963
1946
1945
1951
1962
1970
1973
1950
1976
1941
1942
1923
1927
1961
1960
1968
1954
1959
1944
1926
1931
Legend
1920-1943
1944-1977
Lines of 1000 Parts of Chloride per Million Parts of Water, Measured at 1 1/2 Hours after High Tide
SOURCE:
State Water Resources Control Board
Final EIR D-1485, August 1978
SACRAMENTO - SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

The floating laboratory **San Carlos** allows Department of Water Resources personnel to monitor Delta water quality on a regular basis, as well as in special situations such as flood or drought.



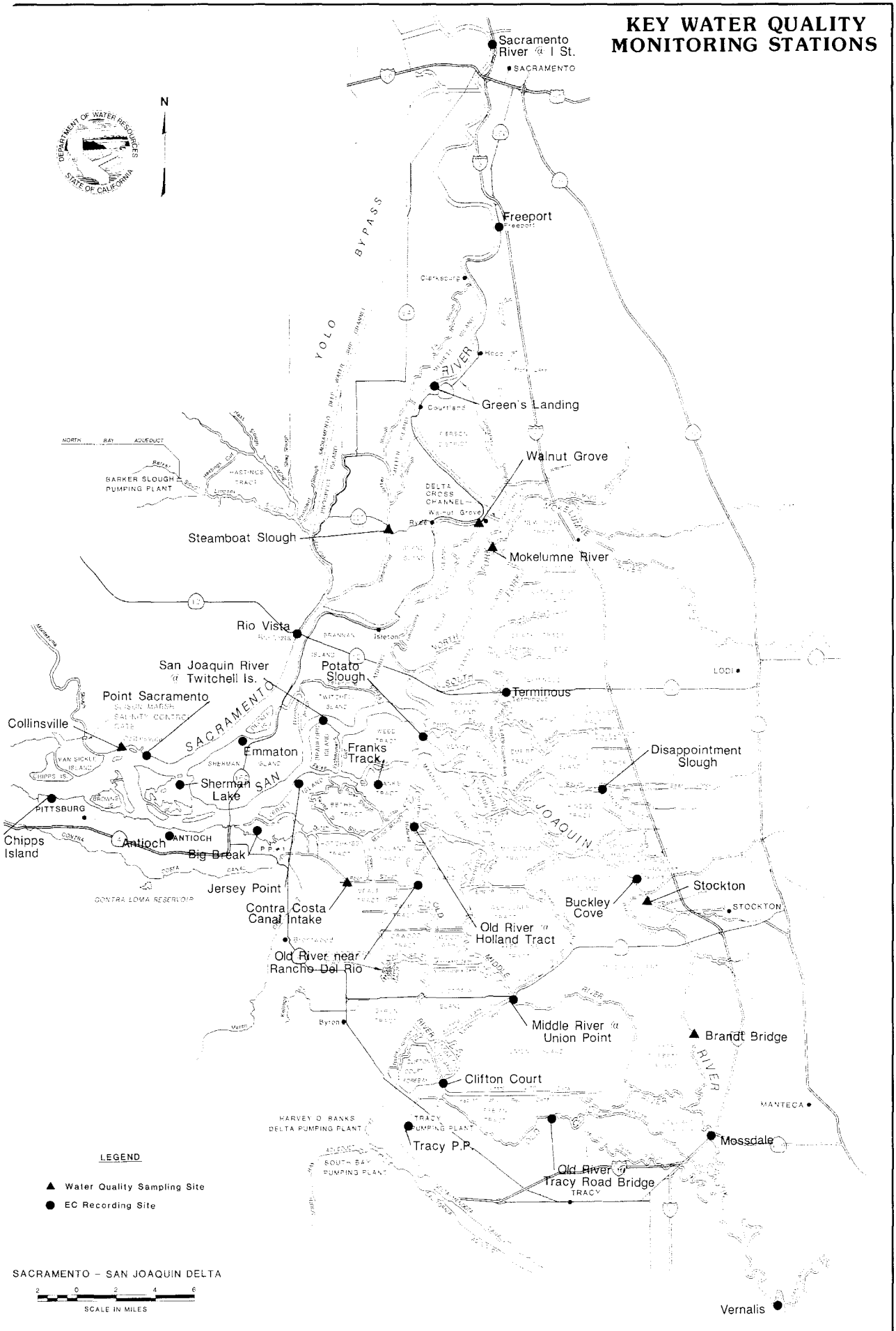
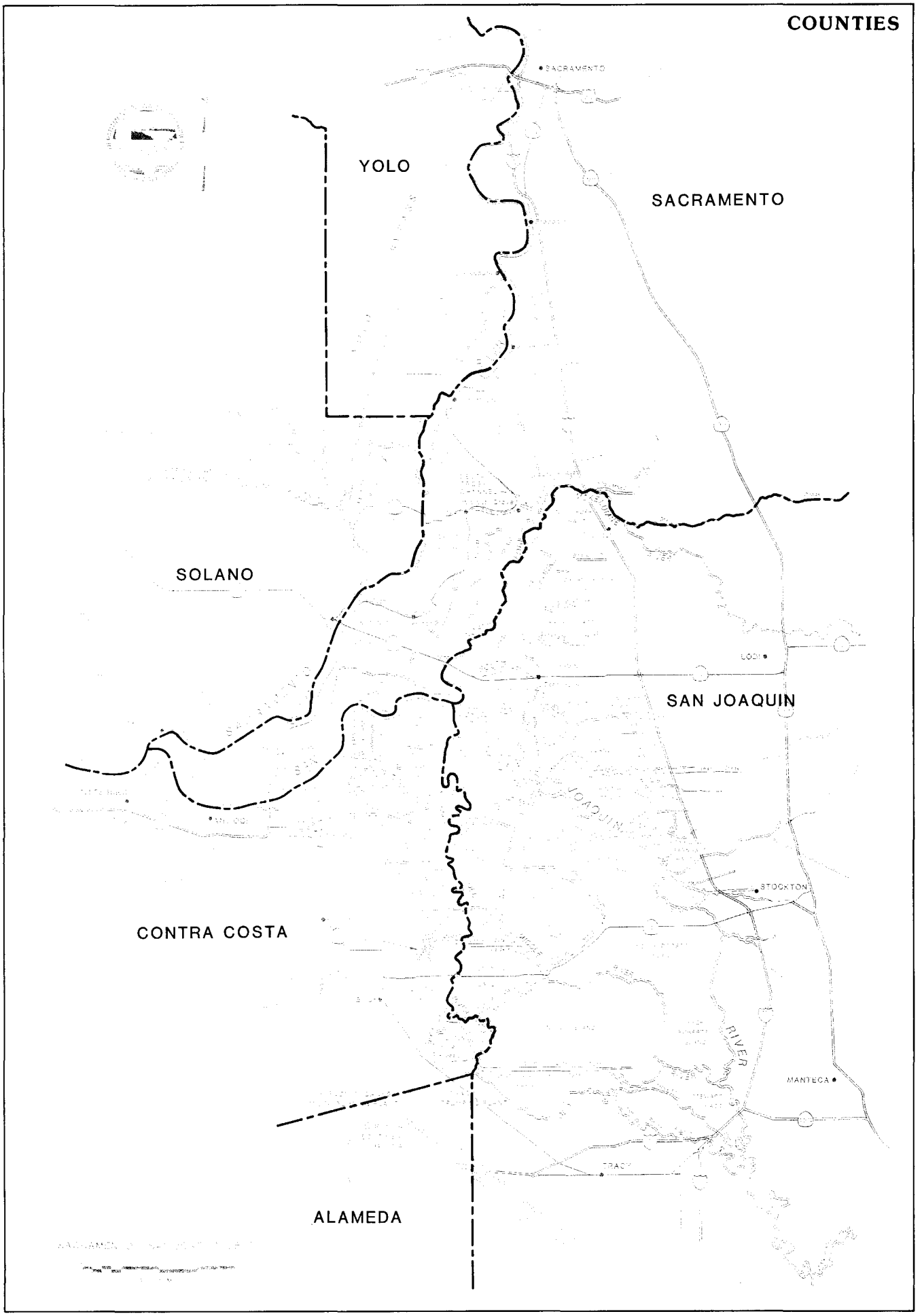
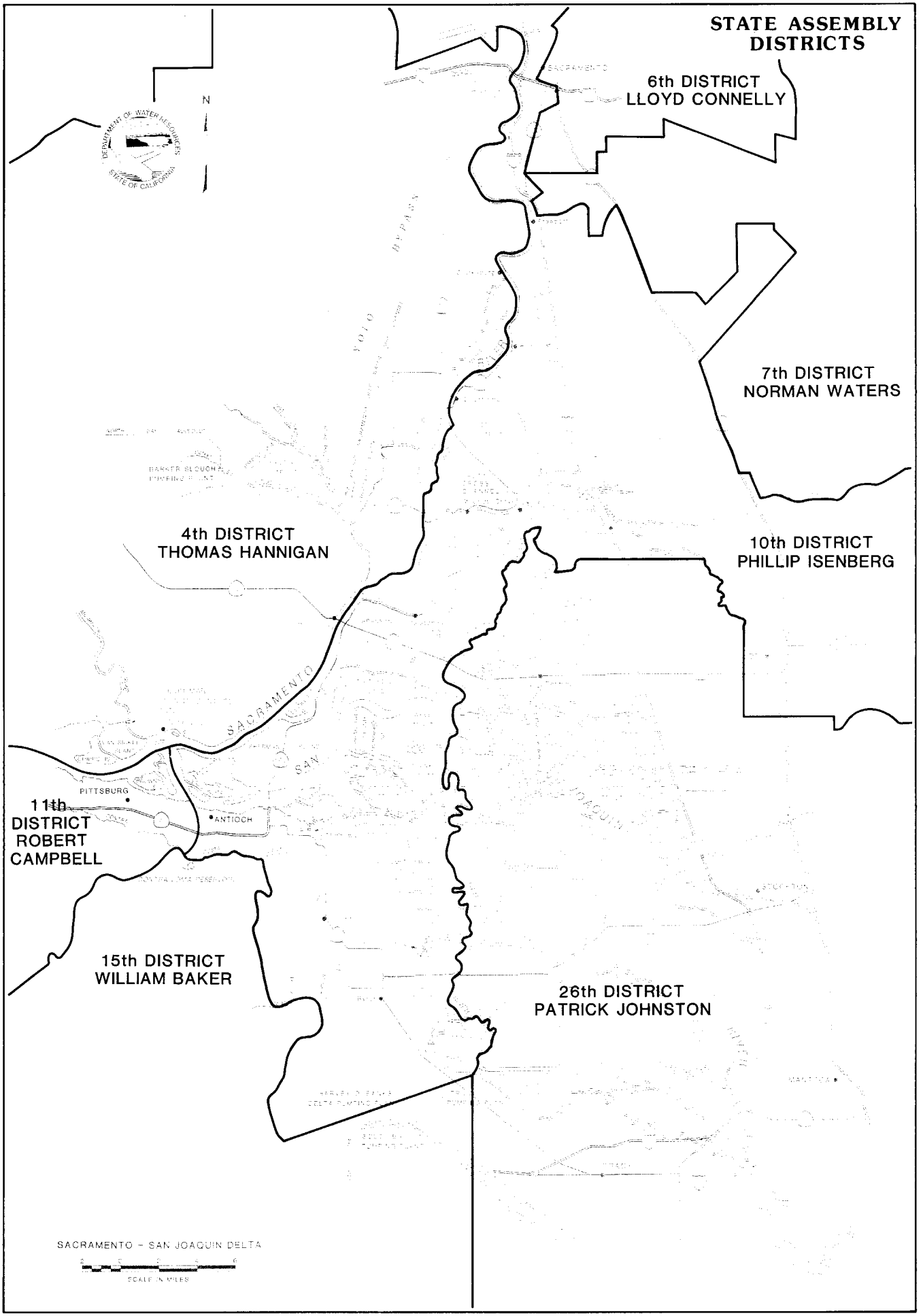
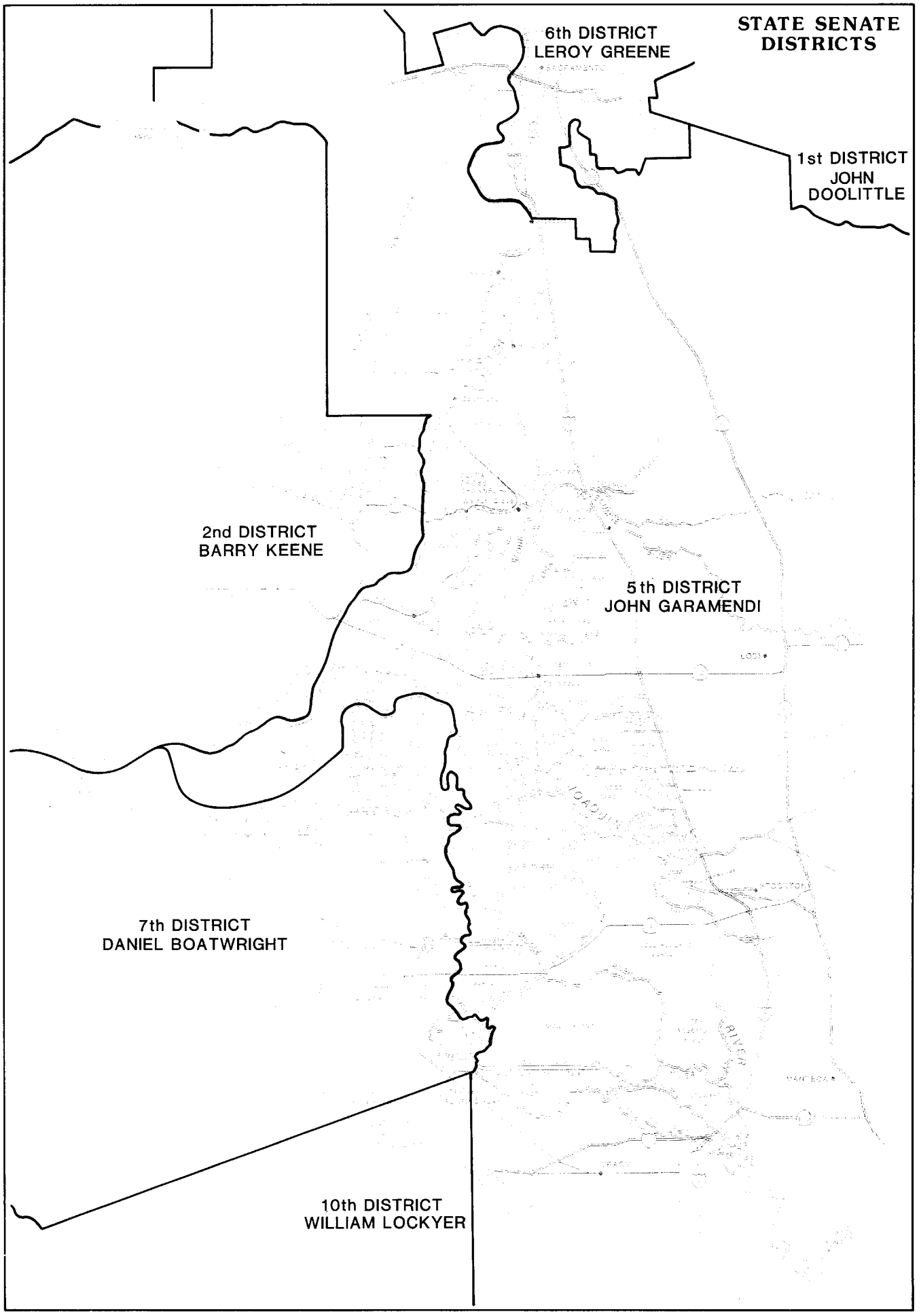

KEY WATER QUALITY MONITORING STATIONS
Sacramento River @ I St.
SACRAMENTO
N
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
Freeport
YOLO BYPASS
RIVER
Green's Landing
Walnut Grove
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Steamboat Slough
Mokelumne River
Rio Vista
San Joaquin River @ Twitchell Is.
Potato Slough
Terminous
LODI
Point Sacramento
SACRAMENTO
SAN JOAQUIN
Collinsville
Emmaton
Franks Tract
Disappointment Slough
Sherman Lake
PITTSBURG
Chipps Island
Antioch
ANTIOCH
Big Break
Jersey Point
CONTRA LOMA RESERVOIR
Contra Costa Canal Intake
Old River @ Holland Tract
Buckley Cove
Stockton
STOCKTON
Old River near Rancho Del Rio
Middle River @ Union Point
Brandt Bridge
Clifton Court
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
Tracy P.P.
MANTECA
Mossdale
Old River @ Tracy Road Bridge
TRACY
Vernalis
LEGEND
▲ Water Quality Sampling Site
● EC Recording Site
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Figure 32


COUNTIES
YOLO
SACRAMENTO
SOLANO
SAN JOAQUIN
CONTRA COSTA
ALAMEDA
STOCKTON
MANTECA
RIVER


STATE ASSEMBLY DISTRICTS
6th DISTRICT
LLOYD CONNELLY
7th DISTRICT
NORMAN WATERS
10th DISTRICT
PHILLIP ISENBERG
4th DISTRICT
THOMAS HANNIGAN
11th DISTRICT
ROBERT CAMPBELL
15th DISTRICT
WILLIAM BAKER
26th DISTRICT
PATRICK JOHNSTON
N
SACRAMENTO
YOLO BYPASS
PITTSBURG
ANTIOCH
SACRAMENTO - SAN JOAQUIN DELTA
SCALE IN MILES


STATE SENATE DISTRICTS
6th DISTRICT
LEROY GREENE
1st DISTRICT
JOHN
DOOLITTLE
2nd DISTRICT
BARRY KEENE
5th DISTRICT
JOHN GARAMENDI
7th DISTRICT
DANIEL BOATWRIGHT
10th DISTRICT
WILLIAM LOCKYER

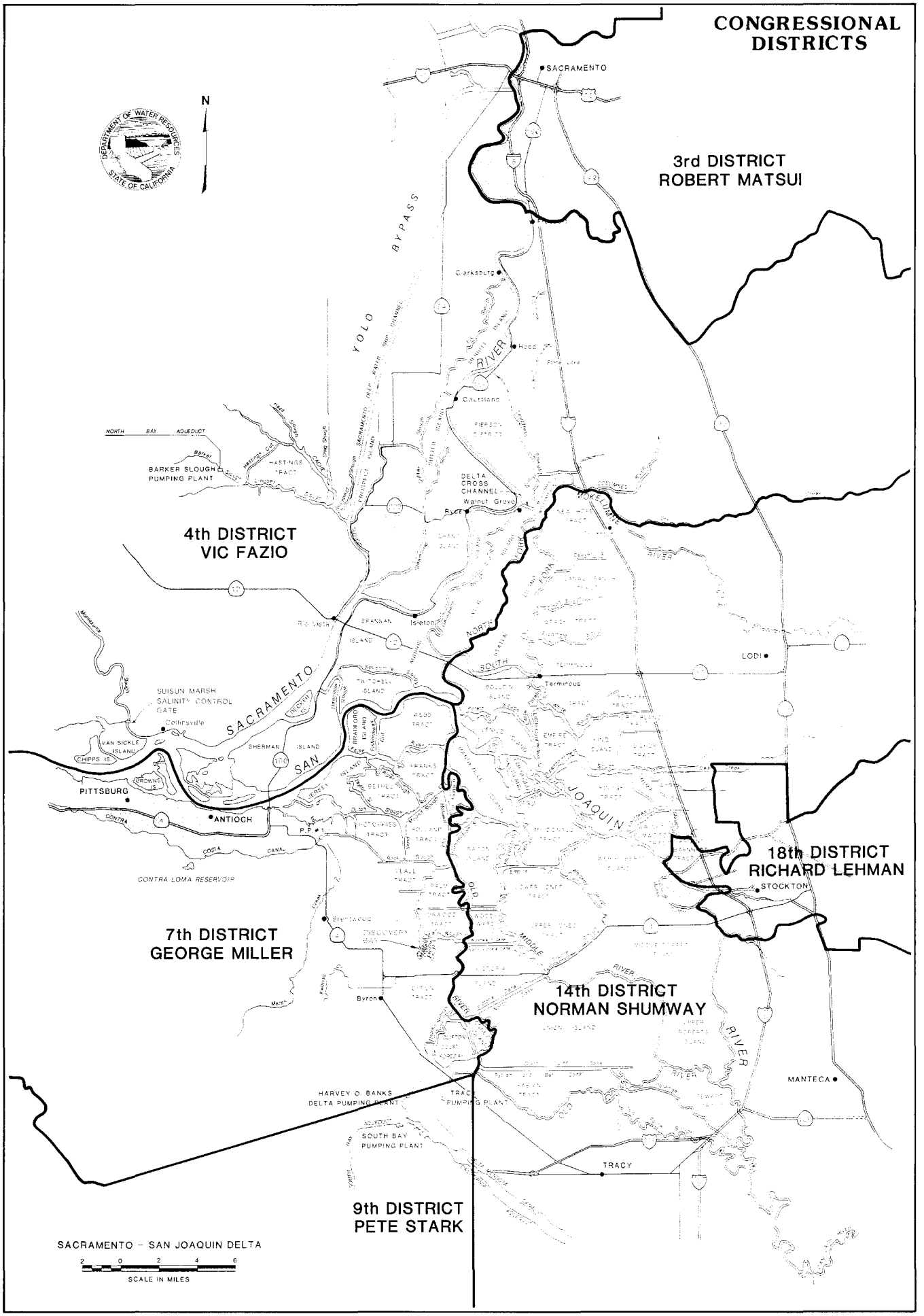

CONGRESSIONAL DISTRICTS
N
DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA
SACRAMENTO
3rd DISTRICT
ROBERT MATSUI
YOLO BYPASS
Clarksburg
RIVER
Hood
Courtland
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
4th DISTRICT
VIC FAZIO
Isleton
NORTH FORK MOKELUMNE
LODI
SOUTH
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO
SAN
VAN SICKLE ISLAND
CHIPPS IS.
BROWNS IS.
SHERMAN ISLAND
PITTSBURG
ANTIOCH
P.P. 1
CONTRA COSTA CANAL
CONTRA LOMA RESERVOIR
JOAQUIN
18th DISTRICT
RICHARD LEHMAN
STOCKTON
7th DISTRICT
GEORGE MILLER
Brentwood
DISCOVERY BAY
OLD
MIDDLE
RIVER
Byron
14th DISTRICT
NORMAN SHUMWAY
MANTECA
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
SOUTH BAY PUMPING PLANT
TRACY
9th DISTRICT
PETE STARK
SACRAMENTO – SAN JOAQUIN DELTA
2 0 2 4 6
SCALE IN MILES

Table 5

DELTA STATISTICS

Demography

Population: 200,000
Counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano, Yolo
Incorporated Cities Entirely Within the Delta: Antioch, Brentwood, Isleton, Pittsburg, Tracy
Major Cities Partly Within the Delta: Sacramento, Stockton, West Sacramento
Unincorporated Towns and Villages: 14

Geography

Area (acres):		
	Agriculture	520,000
	Cities and Towns	35,000
	Water Surface	50,000
	Undeveloped	133,000
	Total Acres	738,000

Levees (miles):	
Project	165
Direct Agreement	110
Nonproject	825
Total Miles	1,100

Rivers Flowing Into the Delta (These plus their tributaries carry 47% of the State's total runoff):
Sacramento, San Joaquin, Mokelumne, Cosumnes, Calaveras

Diversions Via Aqueducts Through or Around the Delta:
San Francisco Public Utilities Commission
East Bay Municipal Utility District

Diversions Directly From the Delta:
Western Delta Industry
City of Vallejo
1,800+ Agricultural Users
Contra Costa Canal
State Water Project
Central Valley Project

Economy

Valuation (1980):	
Land	$1,600,000,000
Pipelines	100,300,000
Marinas	100,000,000
Roads	68,000,000
Gas Wells	26,900,000
Railroads	11,000,000
Utilities	1,300,000
Total	$1,907,500,000

Agriculture:
Average Annual Gross Value = $375 million
Main Crops: Corn, Grain and Hay, Sugarbeets, Alfalfa, Pasture, Tomatoes, Asparagus, Fruit, Safflower

Recreation:	
User-Days Annually	12 million
Registered Pleasure Boats	82,000
Commercial Recreation Facilities	116
Public Recreation Facilities	22
Private Recreation Associations	22
Berths	8,534
Docks	119
Launch Facilities	27

Transportation: Interstate Highways 5, 80, 205
State Highways 4, 12, 160
Railroads: Southern Pacific, Western Pacific, Atchison, Topeka & Santa Fe; Sacramento Northern
Deepwater Ship Channels to Sacramento and Stockton transport 6 million tons of cargo annually.

Fish and Wildlife

Birds	200 species	Reptiles	15 species
Mammals	45 species	Amphibians	8 species
Fish	45 species	Flowering Plants	150 species

Major Anadromous Fish: Salmon, Striped Bass, Steelhead Trout, American Shad, Sturgeon

STATE WATER RESOURCES DEVELOPMENT BOND ACT

The State Water Resources Development Bond Act (also known as the Burns-Porter Act ratified at the General Election, November 8, 1960, authorized the sale of $1,750,000,000 of general obligation bonds to assist in financing the initial facilities of the State Water Resources Development System which are now known as the State Water Project. The facilities of the State Water Project are described in Water Code Section 12934(d). The pertinent provisions relating to the Sacramento-San Joaquin Delta are:

Section 12934(d). . .

(2) An aqueduct system which will provide for the transportation of water from a point or points at or near the Sacramento-San Joaquin Delta to termini in the Counties of Marin, Alameda, Santa Clara, Santa Barbara, Los Angeles and Riverside, and for delivery of water both at such termini and at canal-side points enroute, for service in Solano, Napa, Sonoma, Marin, Alameda, Contra Costa, Santa Clara, San Benito, Santa Cruz, Fresno, Tulare, Kings, Kern, Los Angeles, Ventura, San Bernardino, Riverside, Orange, San Diego, San Luis Obispo, Monterey, and Santa Barbara Counties.

Said aqueduct system shall consist of intake and diversion works, conduits, tunnels, siphons, pipelines, dams, reservoirs, and pumping facilities, and shall be composed of a North Bay aqueduct extending to a terminal reservoir in Marin County; a South Bay aqueduct extending to terminal reservoirs in the Counties of Alameda and Santa Clara; a reservoir near Los Banos in Merced County; a Pacheco Pass Tunnel aqueduct from a reservoir near Los Banos in Merced County to a terminus in Pacheco Creek in Santa Clara County; a San Joaquin Valley-Southern California aqueduct extending to termini in the vicinity of Newhall, Los Angeles County, and Perris, Riverside County, and having a capacity of not less than 2,500 cubic feet per second at all points north of the northerly boundary of the County of Los Angeles in the Tehachapi Mountains in the vicinity of Quail Lake and a capacity of not less than 10,000 cubic feet per second at all points north of the initial offstream storage reservoir;. . .

(3) Master levees, control structures, channel improvements, and appurtenant facilites in the Sacramento-San Joaquin Delta for water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions.

DELTA PROTECTION ACT

The Delta Protection Act was enacted in 1959 at the same session of the Legislature at which the Burns-Porter Act was enacted.

12200. The Legislature hereby finds that the water problems of the Sacramento-San Joaquin Delta are unique within the State; the Sacramento and San Joaquin Rivers join at the Sacramento-San Joaquin Delta to discharge their fresh water flows into Suisun, San Pablo, and San Francisco Bays and thence into the Pacific Ocean; the merging of fresh water with saline bay waters and drainage waters and the withdrawal of fresh water for beneficial uses creates an acute problem of salinity intrusion into the vast network of channels and sloughs of the Delta; the State Water Resources Development System has as one of its objectives the transfer of waters from water-surplus areas in the Sacramento Valley and the north coastal area to water-deficient areas to the south and west of the Sacramento-San Joaquin Delta via the Delta; water surplus to the needs of the areas in which it originates is gathered in the Delta and thereby provides a common source of fresh water supply for water-deficient areas. It is, therefore, hereby declared that a general law cannot be made applicable to said Delta and that the enactment of this law is necessary for the protection, conservation, development, control and use of the waters in the Delta for the public good.

12201. The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand agriculture, industry, urban, and recreational development in the Delta area as set forth in Section 12200, Chapter 2, of this part, and to provide a common source of fresh water for export to areas of water deficiency is necessary to the peace, health, safety, and welfare of the people of the State, except that delivery of such water shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code.

12202. Among the functions to be provided by the State Water Resources Development system, in coordination with the activities of the United States in providing salinity control for the Delta through operation of the Federal Central Valley Project, shall be the provision of salinity control and an adequate water supply for the users of water in the Sacramento-San Joaquin Delta. If it is determined to be in the public interest to provide a substitute water supply to the users in said Delta in lieu of that which would be provided as a result of salinity control no added financial burden shall be placed upon said Delta water users solely by virtue of such substitution. Delivery of said substitute water supply shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code.

12203. It is hereby declared to be the policy of the State that no person, corporation or public or private agency or the State or

the United States should divert water from the channels of the Sacramento-San Joaquin Delta to which the users within said Delta are entitled.

12204. In determining the availability of water for export from the Sacramento-San Joaquin Delta no water shall be exported which is necessary to meet the requirements of Sections 12202 and 12203 of this chapter.

12205. It is the policy of the State that the operation and management of releases from storage into the Sacramento-San Joaquin Delta of water for use outside the area in which such water originates shall be integrated to the maximum extent possible in order to permit the fulfillment of the objectives of this part.

SACRAMENTO-SAN JOAQUIN DELTA LEVEES

The State in 1976 adopted a conceptual plan for improvement of Delta levees which is contained in the Water Code Chapter 3, Sections 12225 to 12227.

12225. The plan for improvement of the Sacramento-San Joaquin Delta levees, as set forth in Bulletin No. 192 of the Department of Water Resources, dated May 1975, is approved as a conceptual plan to guide the formulation of projects to preserve the integrity of the delta levee system.

12226. The department may prepare detailed plans and specifications for the improvement of the levees or levee segments specified in Section 12225.

12226.1. The department shall report on its recommendations to the Legislature concerning the improvement of the levees specified in Section 12225, including, but not limited to, recommendations concerning construction, cost sharing, land use, zoning, flood control, recreation, fish and wildlife, habitat, and aesthetic values. The department shall submit interim reports to the Legislature concerning the status of the delta levees program on or before January 15 of each year beginning in 1978, with the final report on its recommendations to be made on or before January 15, 1980.

12226.2. The department may proceed immediately with the improvement of a pilot levee project which the department determines, after a public hearing, is in critical need of improvement and which is highly susceptible to failure in the absence of such immediate improvement. Prior to commencing such improvement, the department shall enter into an agreement with a local agency whereby the local agency will bear at least 20 percent of the cost of the improvement.

12227. This chapter shall be known and may be cited as the "Nejedly-Mobley Delta Levees Act".

DELTA LEVEE MAINTENANCE SUBVENTIONS PROGRAM

In 1973, the Legislature passed Senate Bill 541 (also known as the Way Bill, Chapter 717, Statutes of 1973), which provides State financial assistance to Delta agencies for maintaining and improving nonproject Delta levees for flood protection of Delta islands.

12980. Definitions

As used in this part:

(a) "Board" means The Reclamation Board.

(b) "Delta" means the Sacramento-San Joaquin Delta as described in Section 12220.

(c) "Local agency" means any city, county, district, or other political subdivision of the state which is authorized to maintain levees.

(d) "Nonproject levee" means a levee in the delta which is not a project facility under the State Water Resources Law of 1945.

12981. The Legislature hereby finds and declares that the delta is endowed with many invaluable and unique resources and that these resources are of major statewide significance. The Legislature further finds and declares that the delta's uniqueness is particularly characterized by its hundreds of miles of meandering waterways and the many islands adjacent thereto, that, in order to preserve the delta's invaluable resources, which include highly productive agriculture, recreational assets, fisheries, and wildlife environment, from the physical characteristics of the delta should be preserved essentially in their present form, and that the key to preserving the delta's physical characteristics is the system of levees defining the waterways and producing the adjacent islands. However, the Legislature recognizes that it may not be economically justifiable to maintain all delta islands.

12982. The Legislature further finds and declares that while most of the delta's levees are privately owned and maintained they are being subjected to varied multiple uses and serve to benefit many varied segments and interests of the public at large, and that as a result of the varied multiple uses of such levees, added maintenance costs are being borne by adjacent landowners.

12983. The Legislature further finds and declares that there is an urgent need for a higher degree of levee maintenance and rehabilitation generally throughout the delta and that the state has an interest in providing technical and financial assistance for delta levee maintenance and rehabilitation.

The Legislature also finds and declares that, because of the instability of delta soils, the effect of winds, tides, and floodflows, and the unique problems of erosion, seepage, and subsidence, the same security against levee failure and flooding cannot be achieved by protective works in the delta as in areas less vulnerable to these problems. Although the rehabilitation and maintenance of delta levees is an important undertaking, a significant risk of levee failure will still persist.

The purpose of the state's approval of plans and inspection of works, which duties are set forth in this part, is to ensure that subvention funds are properly expended and that delta levees are effectively rehabilitated and maintained, and the state does not thereby assume any responsibility for the safety of any delta levee against failure.

12984. The department shall develop and submit to the board, for adoption by the board, criteria for the maintenance and improvement of nonproject levees. The criteria shall vary as required to meet specific conditions and shall be multipurpose in nature, and include environmental considerations, when feasible. The criteria shall embody and implement the short-term mitigation plan set forth in the "Flood Hazard Mitigation Plan for the Sacramento-San Joaquin Delta", prepared by the department for the Office of Emergency Services, dated September 15, 1983, and as it may be subsequently amended.

12985. Prior to adoption of any such criteria, the board shall hold public hearings and may revise the criteria as it determines necessary.

12986. It is the intention of the Legislature to reimburse from the General Fund an eligible local agency pursuant to this part for costs incurred in any year for the maintenance or improvement of nonproject levees as follows:

(a) No costs incurred shall be reimbursed if the entire cost incurred per mile of levee is one thousand dollars ($1,000) or less.

(b) Fifty percent of any costs incurred in excess of one thousand dollars ($1,000) per mile of levee shall be reimbursed.

(c) The maximum total reimbursement from the General Fund shall not exceed two million dollars ($2,000,000) annually.

12987. Local agencies maintaining nonproject levees shall be eligible for reimbursement pursuant to the provisions of this part upon submission to and approval by the board of plans for the maintenance and improvement of such nonproject levees, including plans for the annual routine maintenance of such levees, in accordance with the criteria adopted by the board. Such plans shall also be compatible with the plan for improvement of the delta levees as set forth in Bulletin No. 192 of the department,

dated May, 1975, and as approved in Section 12225, and shall include such provision for protection of the wildlife habitat as the board deems proper. Such plans shall also take into account the most recently updated Delta Master Recreation Plan prepared by the Resources Agency. Upon approval of such plans by the board, the local agencies shall enter into an agreement with the board to perform the maintenance and improvement work, including the annual routine maintenance work, specified in such plans. In the event that applications for state funding in any year exceed the state funds available, the board shall apportion the funds among those levees or levee segments that are identified by the department as most critical and beneficial, considering the needs of flood control, water quality, recreation, and wildlife.

12988. Upon the completion in any year of the maintenance or improvement work, including annual routine maintenance work, as specified in the plans approved by the board, the local agency shall notify the department, and the department shall inspect the completed work. The department, upon completion of such inspection, shall submit to the board a report as to its findings. Upon a finding that the work has been satisfactorily completed in accordance with the approved plans, the board shall certify for reimbursement any costs incurred in excess of five hundred dollars ($500) per mile of levee, if the entire cost incurred per mile of levee is not in excess of one thousand dollars ($1,000), and shall certify for reimbursement 50 percent of any costs incurred per mile of levee if the entire cost incurred per mile of levee is greater than one thousand dollars ($1,000).

12989. The department shall conduct at least one annual inspection of every levee for which maintenance or improvement costs have been reimbursed pursuant to this part. In addition, the department shall inspect nonproject levees of local agencies for the purpose of monitoring and ascertaining the degree of compliance with, or progress toward meeting, the standards in the Flood Hazard Mitigation Plan, as set forth in Section 12984.

The local agency shall cooperate with the department in the conduct of these inspections, including the provision of reasonable access over local agency lands and easements.

12990. Whenever the department finds that the annual routine maintenance work specified in the plans approved by the board is not being performed in accordance with the agreement entered into between the local agency and the board, the department may establish a maintenance area in accordance with the provisions of Chapter 4.5 (commencing with Section 12878) of Part 6 of this division, as nearly as the same may be applicable, except that the work to be performed shall be the routine annual maintenance work for the nonproject levee as specified in the plans approved by the board. Upon the formation of a maintenance area, the department shall thereafter annually maintain the nonproject levee in accordance with such plans and subject to the provisions of

Chapter 4.5 (commencing with Section 12878) of Part 6 of this division, as nearly as the same may be applicable.

12991. The board is authorized to make, from time to time, such rules and regulations as may be necessary to carry out, and as are consistent with, this part.

WATERSHED PROTECTION LAW

Water Code Sections 11460 to 11463 set forth restrictions and limitations to protect the reasonable water requirements of water needs of the watershed wherein water originates. The Burns-Porter Act (Water Code Section 12931) declares the Delta to be part of the Sacramento River watershed.

11460. In the construction and operation by the department of any project under the provisions of this part a watershed or area wherein water originates, or an area immediately adjacent thereto which can conveniently be supplied with water therefrom, shall not be deprived by the department directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein.

11461. In no other way than by purchase or otherwise as provided in this part shall water rights of a watershed, area, or the inhabitants be impaired or curtailed by the department, but the provisions of this article shall be strictly limited to the acts and proceedings of the department, as such, and shall not apply to any persons or state agencies.

11462. The provisions of this article shall not be so construed as to create any new property rights other than against the department as provided in this part or to require the department to furnish to any person without adequate compensation therefore any water made available by the construction of any works by the department.

11463. In the construction and operation by the department of any project under the provisions of this part, no exchange of the water of any watershed or area for the water of any other watershed or area may be made by the department unless the water requirements of the watershed or area in which the exchange is made are first and at all times met and satisfied to the extent that the requirements would have been met were the exchange not made, and no right to the use of water shall be gained or lost by reason of any such exchange.