Elodea - p 16

acreages sprayed - Summarized on p 26

37

336

SW

1993

SUMMARY OF OPERATIONS

WATER HYACINTH CHEMICAL CONTROL PROGRAM

February 1994

California Department of Boating and Waterways

TABLE OF CONTENTS

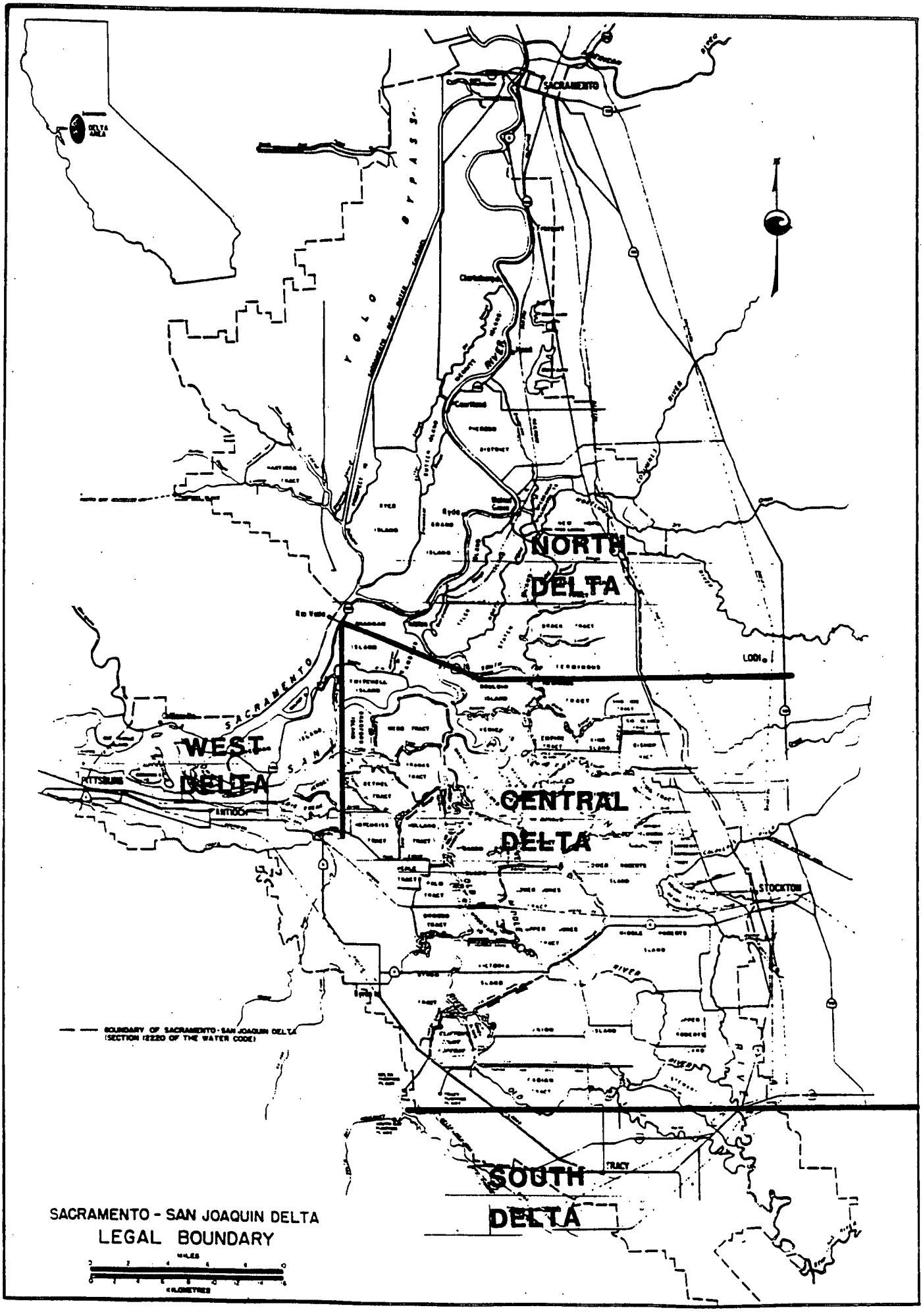
SUMMARY SHEET

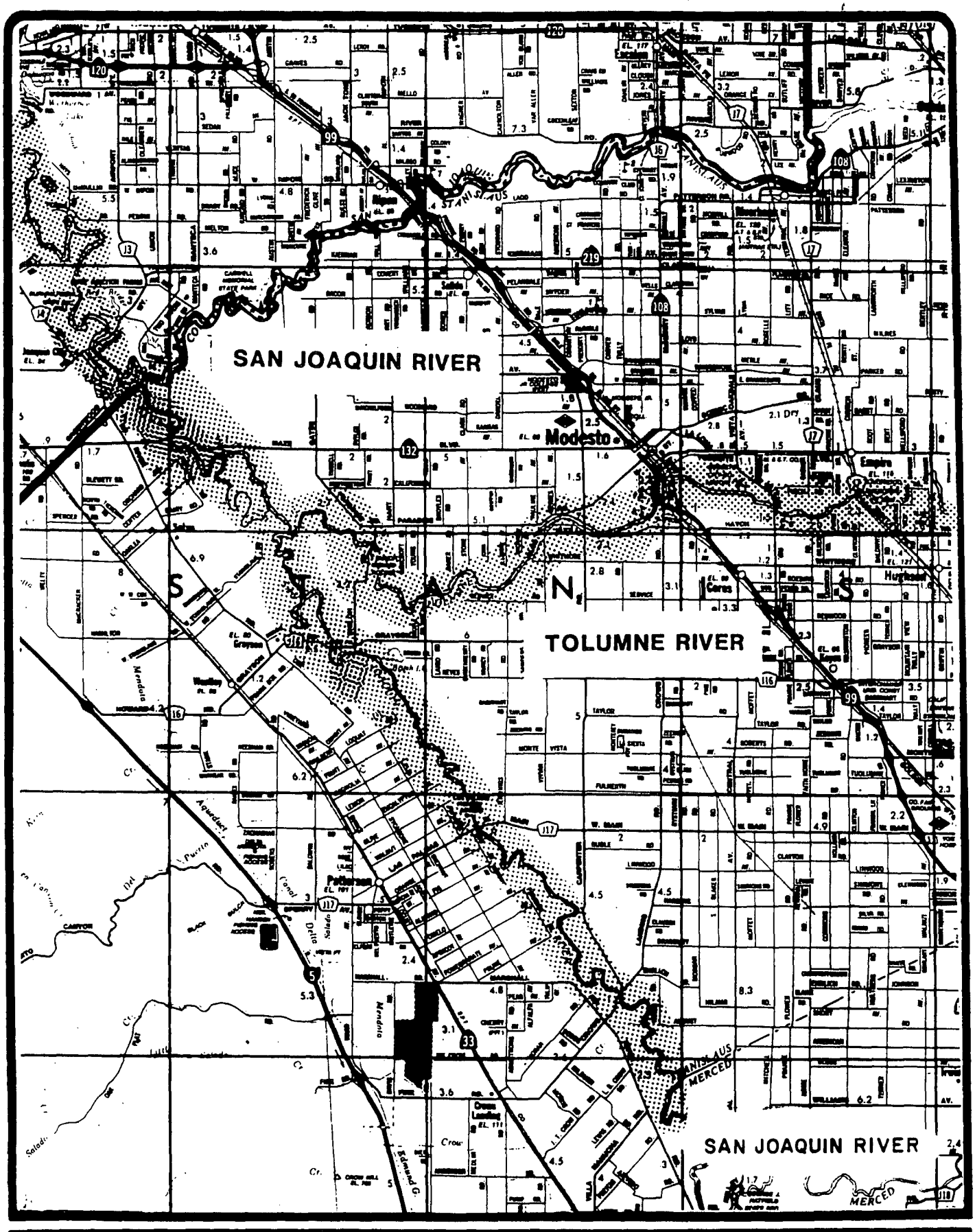
1993 WATERHYACINTH CHEMICAL CONTROL REPORT

- 1505 acres of waterhyacinth were treated in 1993. 797 acres in 1992, 349 acres in 1991, 698 acres in 1990, 849 acres in 1959, 633 acres in 1988, 384 acres in 1987, 227 acres in 1986, 166 acres in 1985, 243 acres in 1984, and 507 acres in 1983 (the first year of the abatement program).

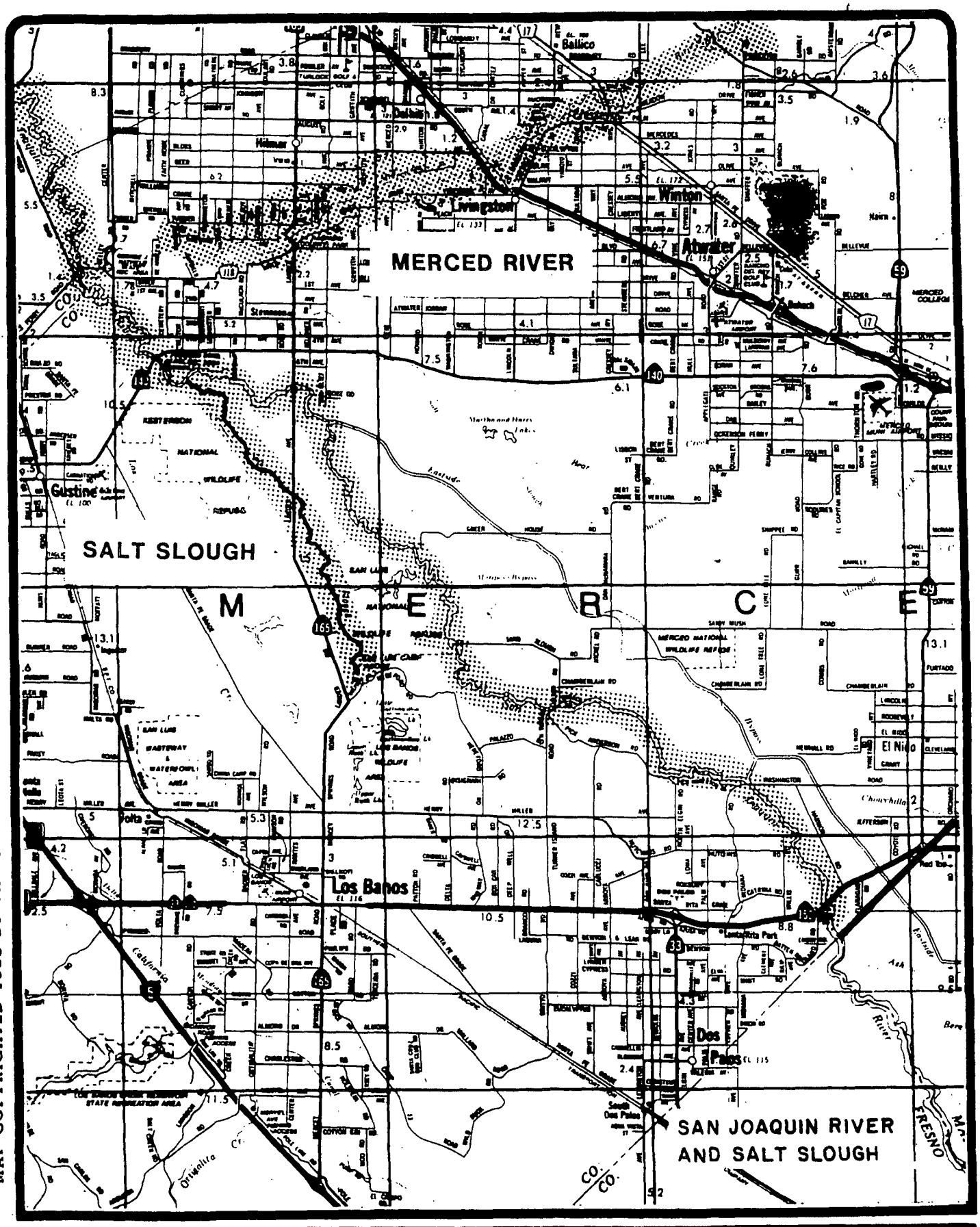
- Of the 1505 total acres of waterhyacinth treated in 1993, 987 were in the "Central Delta", 155 acres in the "San Joaquin River" area, 145 in the "Tuolumne River", 18 acres in "Salt Slough", 38 acres in "Snodgrass Slough", 108 acres in the "West Delta", and 52 acres in the "Enclosed area".

- Based on 1993 year's results, we anticipate that our applicator teams will: 1) put a very heavy early emphasis on the Central Delta, San Joaquin River and Tuolumne River to keep the bio-mass under control and to limit the amount of acres needing treatment in these areas in 1994; and 2) Maintain control over the West Delta, Salt Slough, and North Delta.


SACRAMENTO
NORTH DELTA
WEST DELTA
CENTRAL DELTA
SOUTH DELTA
STOCKTON
TRACY
LODI
SACRAMENTO
SAN JOAQUIN
BOUNDARY OF SACRAMENTO-SAN JOAQUIN DELTA
(SECTION 12220 OF THE WATER CODE)
SACRAMENTO - SAN JOAQUIN DELTA
LEGAL BOUNDARY
MILES
KILOMETRES



DATE 1993	STATE OF CALIFORNIA		RESOURCES AGENCY
	BOATING	FACILITIES	DIVISION
DRAWING NUMBER	SOUTH DELTA WATER HYACINTH TREATMENT AREA		
SHEET NUMBER 1 OF 2			



DATE
1993

DRAWING NUMBER

SHEET NUMBER
1 of 2

STATE OF CALIFORNIA — RESOURCES AGENCY
BOATING — FACILITIES — DIVISION

SOUTH DELTA
WATER HYACINTH
TREATMENT AREA

I. INTRODUCTION

On April 21, the 1993 waterhyacinth control effort began when the first application was made.

The year 1993 was unusual in that it was the first year in over six years of normal or above rainfall. This year the "abnormal" rainfall had significant effects on the waterhyacinth problem. First of all, it washed surplus plants from the upstream channels into the Delta where it created a major problem by early summer, and it also appeared to trigger unprecedented seed growth. This seed growth occurred so early in the season and so rapidly that it became impossible to stay ahead of the problem with the personnel available.

The unusual amount of precipitation and early hot weather resulted in waterhyacinth problems in areas throughout the Delta, even in areas that had been waterhyacinth free for many years. In the West Delta, Sherman Lake, Dupont Pond, West Island and Big Break, areas that have not required treatment for two to three years became a problem this year.

We believe this area had high chloride content in the water which prevented seed growth and survival of plants inadvertently washed or blown into these areas.

One advantage the precipitation did bring was that it resulted in higher upstream water depths which allowed us to work shallow areas earlier in the season, but unfortunately it also washed plants back into areas where they couldn't survive during low water years.

II. CONTROL PLAN AND ACTIVITIES - OVERVIEW

In 1993, the emphasis of the Waterhyacinth Program was to maintain the Delta and increase our efforts in the Tuolumne and Upper San Joaquin rivers, and attempt to "push" the material downstream by eliminating all large areas and prevent washed-out material from reinfesting the Delta waterways.

This year we were able to obtain five individuals from the California Conservation Corps. These people were untrained in the use of pesticides, and we were unable to send them out as individual control teams.

Between the time we were able to obtain this assistance and when we were able to get them licensed and fully trained, we had lost three of the five individuals.

Unfortunately, we were unable to follow our original plan. By starting with untrained staff, we were unable to put our crews out as individual crews until they were adequately trained and licensed to safely apply herbicides. This was not accomplished until late June.

By the latter part of June and early July, the waterhyacinth problem in the Delta became serious. During the remaining part of the summer, we expended the majority of our efforts trying to stay up with the growth in those areas we felt would have an economic impact.

In many areas in the Delta, very little if any treatments were done until after the Labor Day weekend. During the months of April, May, and June, only 38 applications were made during this time period.

A. **CENTRAL DELTA**

The Central Delta received the majority of the control team's effort in 1993.

With the slow start early in the season, which has always been the key to maintaining control of the waterhyacinth, by mid-July there were several areas in the Delta that had significant amounts of material. The middle of the river received very little attention until August, with the area between Union Point South to Old River remaining blocked all year.

Victoria Canal was severely impacted before we were able to begin our treatment and almost became completely blocked in one section. Unfortunately, after this area was treated, we believe large amounts broke loose and drifted toward the Bureau of Reclamation's pumping plant near Tracy and may have been physically removed at its trash removal site.

Also, Latham Slough and upper middle river were severely impacted before any significant control effort could be directed into the area.

The total area treated in the Central Delta was 987 acres. This is almost twice the total area ever treated in the Central Delta areas in the history of the program.

B. **ENCLOSED WATER BODIES**

The total acreage treated in enclosed water bodies was almost 53 acres in 1993. This total acreage could have been significantly higher if time and trained personnel had been available. Several years ago, Tom Paine Slough became

severely impacted and was added to our list of enclosed water bodies as a control area. The reasoning for this classification is that late in the fall, as irrigation slows or has stopped, the Pescadero Irrigation District opens the gates into Sugar Cut and large amounts of material are washed out into the upper area of Old River, reinfesting the entire area and compounding the problem. This year we treated seven acres in this area but should have treated several times this acreage. By fall, the canal became totally plugged between the California Bridge and the El Rancho Bridge which made it impossible to get through the slough to the opening into Sugar Cut. This area is difficult to treat because of the heavy irrigation demand.

Another area that became impacted was Lake Natoma, south of highway 50, and although receiving two applications became almost totally covered by fall. This area is critical because material is able to move under highway 50 into Lake Natoma where it can spread down the American River into the Sacramento River. Two years ago the material did get under the highway, but we believe it was removed before it could migrate downstream.

In 1994, more effort will have to be directed toward several enclosed water bodies that were not properly controlled in 1993.

C. **WEST DELTA**

The acreage treated in the West Delta is up significantly from the previous two years when no treatments were necessary. This year a total of 108-1/2 acres were treated, and again,

more acres could and should have been treated if time and trained personnel had been available.

In the preceding two years, we believe the high chloride content of the water in the West Delta area eliminated the waterhyacinth problem.

We had anticipated being able to stay on top of the waterhyacinth problem in this area because of the elimination of the threat during the drought period. However, it appears at this time, a significant effort may again be necessary in 1994 to prevent the problem from getting out of control because significant amounts of material were washed into this area in the fall of 1993 and early spring of 1994. This, combined with the lowered chloride content of the water, could produce a significant problem.

D. **SOUTH DELTA**

The South Delta area consists of four separate reporting areas: San Joaquin River, south of Mossdale Crossing; Tuolumne River; Salt Slough; and the Merced River. (Merced river acreage is reported through the Merced County Agricultural Commissioner's Office, report attached.)

In 1993, minimal effort was directed into the South Delta with the exception of the Merced River.

Because of the problems in the Delta, the only effort that could be made in this area was, hopefully, enough to prevent major problems in 1994.

The majority of the effort was expended in resort areas and

water extraction points which are primarily concentrated downstream from the Tuolumne River.

Although 319 acres were treated in this area, the San Joaquin River, south of the Tuolumne River, had very little if any treatment and the Tuolumne River was last treated in July.

The material grew so rapidly in Circle Lake, just above Mossdale, that within two weeks after treatment there was more material than before the treatment.

1. **San Joaquin River**

   During the drought years, the Upper San Joaquin River was extremely shallow, full of snags and sand bars. This made it extremely difficult and time consuming to work in this section of the river.

   In early 1993, this situation had changed due to the runoff from further down the valley, and shallow areas above the Mossdale crossing were treated for the first time in several years. (Unfortunately, some areas where the hyacinth could not survive because of the dry conditions now have hyacinth again.)

   Later in the summer, the water depth had diminished and left very shallow areas no longer accessible by boat. These areas quickly became filled to capacity and will require early treatment in early 1994, if control is again to be established.

2. **Tuolumne River**

   In a typical year the material in the Upper Tuolumne and

Merced rivers generally has started to regrow earlier than the material in the Delta area.

Although 1993 was not a "typical" year, the material did start its regrowth from the winter dormancy early and in April, we started the Tuolumne River area treatment program and continued into December treating 145.5 acres during this period.

The Upper Tuolumne River has had gravel extraction operations throughout most of its length above the City of Modesto, which have created some large, deep areas where, even under extremely low water flows, we can float boats. However, between these areas, there are typically long, shallow, rocky ruffles which only have 1 to 2 inches of water. These areas require the equipment to be pulled through them. This, of course, is hard on the equipment, personnel, and slows the downstream progress dramatically.

This summer the Department of Fish and Game did extensive fish spawning rehabilitation work in the areas just below the town of Le Grange, which consists of long shallow working areas. This will preclude traversing this area with a boat in all but during high water periods, and will require finding new ingress and egress points above and below this area.

Earlier in the 1993 season, the high flow condition made early treatment efforts easy because we were able to float through this area without the necessity of dragging

our equipment.

Unfortunately, the heavy flows also washed a large amount of material out of this area into the San Joaquin River and into the Delta which required higher acreage treatments in the Central Delta area.

The high flow conditions and early applications in the Tuolumne reduced the biomass to a low enough level that application late in the summer was unnecessary.

We were unable to eliminate this material before fall, and large amounts of this material washed into the Delta. This required several days of concentrated effort in the deep water channel below the city of Stockton to treat this material and prevent it from being transported throughout the Delta area.

3. **Salt Slough**

The Salt Slough area has been under a limited control effort for several years. This program has been effective in preventing the spread of material downstream and infesting other areas.

However, this year (1993) a larger volume of material was found in this area than in the past.

In previous years, the only equipment we were able to utilize was small boats which are not as efficient as airboats. This year (1994) an attempt will be made to develop launching in key areas where an airboat can gain access.

The total acreage treated in this area was approximately 18 acres.

In the spring of 1994, additional efforts will have to be made in this area to reduce the amount of material and prevent the spread of waterhyacinth downstream through Salt Slough into the San Joaquin River.

4. **Merced River**[1]

The control program for the Merced River was conducted by the Merced County Agricultural Commissioner's staff.

The county, with support from the Department of Boating and Waterways, was able to utilize one team most of the year to maintain control of the problem and expend more time in backwater areas previously untreated.

In previous years, the county had utilized the efforts of two teams to gain control.

The county was able to treat the area from highway 59 to the San Joaquin River six times, and the area from Crocker-Huffman Dam to highway 59 three times.

The main thrust of the county's effort was to eliminate fish migration problems caused by large mats, and reduce the impact to agricultural and recreational activities. This goal has been obtained.

E. NORTH DELTA

In 1993, the North Delta Abatement Program consisted of three

[1] County report appended.

spray passes through the area which resulted in 38.5 acres being treated.

The first pass is September consisted of 26.25 acres, 10.75 acres in October, and then a late season spray-survey which resulted in only 1.5 acres being treated. This decline in acres through the season was due to a timely respray schedule.

In the previous two years this area had not required any chemical control measures. However, due mainly to the lack of certified personnel, it required three applications to bring this area back into control because we were unable to treat the area early in the spray season.

Hopefully in 1994 we will be able to treat this area early in the season and be successful in reducing the total acreage needing treatment.

III. COORDINATION ACTIVITIES

Each year the members of the Waterhyacinth Task Force meet and review the previous year's program to determine if changes to the protocol is necessary to maintain the high safety and environmental standards.

This year, as in previous years, the cooperation and coordination from the Task Force members has been excellent and greatly appreciated.

The cooperation, coordination and technical assistance of the Agricultural Commissioners and their staff on a daily basis through the "Notice of Intent" process has been outstanding.

The Bureau of Reclamation continues to support the field operation by providing staff and equipment.

IV. Field Operations-Summation

Our control efforts for 1993 began on April 21 and the program was stopped on December 10, after several days of inclimate weather which precluded field application.

This year a total of 217 applications were made, of which the largest number of applications made was made during the month of November.

Early in the season, we were unable to put individual teams into the field because they were untrained and unlicensed to safely handle and apply herbicides. Because of this we were unable to eliminate a significant amount of on? material before the rapid growth started.

Over the past nine years, the total number of applications varies each year depending upon the number of teams available and the weather, with the majority of the applications occurring in San Joaquin County.

This year, although the amount of material was the greatest we have experienced in many years, we were able to minimize damages to the Delta industries.

Again in the past, Weedar 64^{R} has been the primary herbicide used in the Waterhyacinth Program with a limited amount of Rodeo^{R}. The 2,4-D product has continued to be effective in controlling waterhyacinth at a rate of two pounds of active ingredient per acre in 200 gallons of water.

By observing safe application procedures and utilizing appropriate drift retardants, the control teams have avoided injury to agricultural commodities.

Field equipment consisted of 14 and 19 foot outboard propelled vessels and one air boat.

During the early summer, we were able to field only one boat most of the time. In July, we were able to begin putting the second boat into the field, and the total number of monthly applications increased to a maximum of 42 applications made in November.

The spread of Elodia throughout the Delta is starting to reduce the efficiency of the control effort. In many areas, it has become so thick and has spread into deeper water which prevents the efficient use of propeller driven craft by continually plugging the water intakes of the engines.

In many areas, it is necessary to clean the intakes every few boat lengths which seriously reduces the efficiency of the application team.

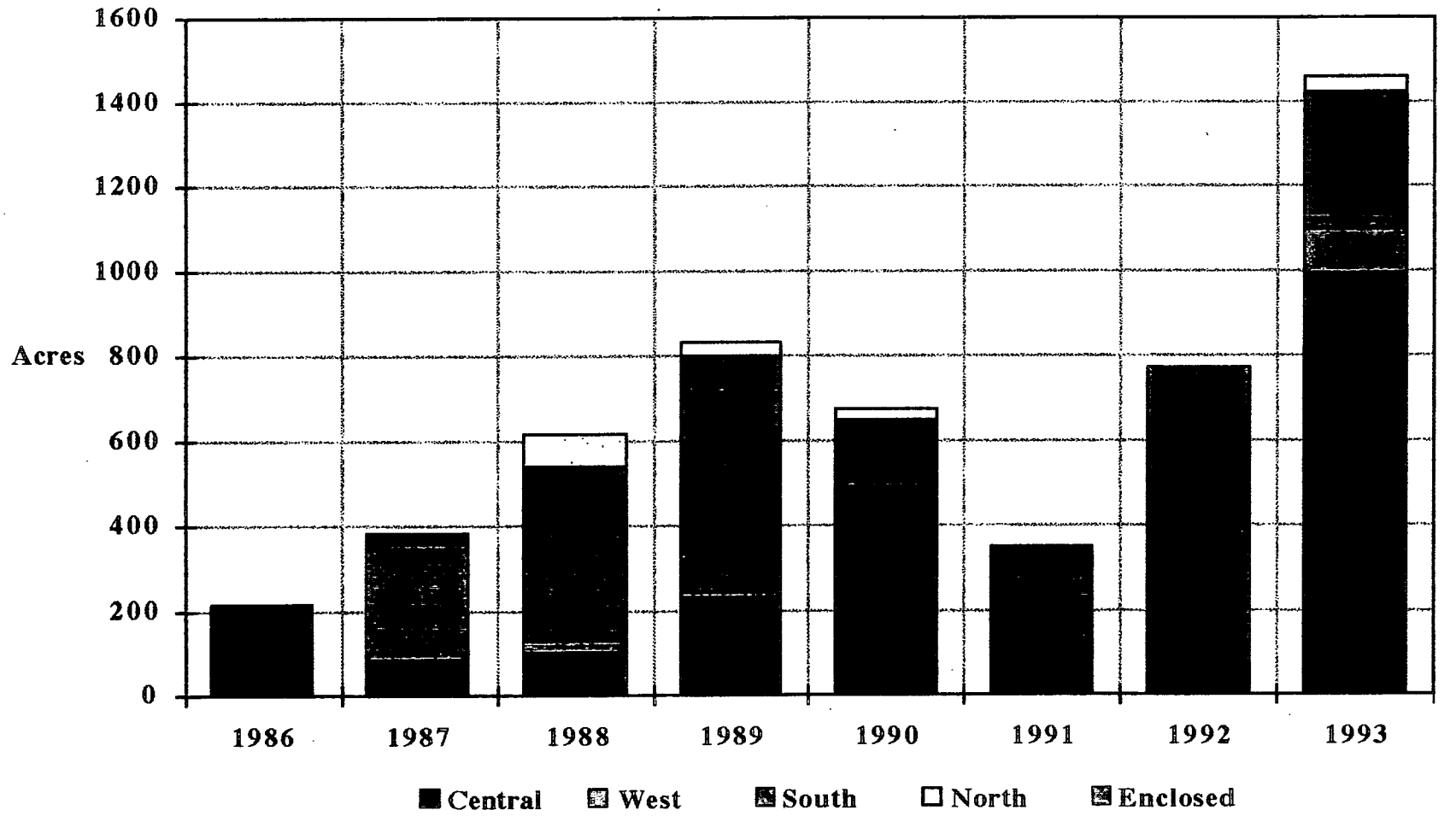
V. Water Analysis

The U.S. Department of Agriculture, ARS, Dr. Anderson and his staff at Davis, provided the required water collection and analysis.

The results of the water analysis in almost all areas indicate very little residue or none detected.

Only three samples for the entire year exceed 1.63 PPB with almost all samples below one part per billion.

TREATED ACREAGE OF WATER HYACINTH



APPENDIX A

Table I

TABLE I

NUMBER OF ACRES TREATED IN 1993

CENTRAL DELTA

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
DUTCH SLOUGH	0	0	0	0	0	0	3.5	0	0	3.5
WHITE SLOUGH	0	2	0	7	15	23.75	0	25.5	0	73.25
LITTLE POTATO SLOUGH	0	0	0	4	9.5	20	0	10.5	0	44
SAN JOAQUIN RIVER	0	34.5	18	31.75	16	43.25	31.25	2	0	176.75
FOURTEEN MILE SLOUGH	0	3	0	7	2	0	0	0	0	12
TURNER CUT	0	0	1.5	0	2	0	0	0	4.75	8.25
MIDDLE RIVER, MID	0	0	0	0	0	0	0	0	0	0
LATHAM SLOUGH	0	0	0	0	5	6.5	15.75	33.25	0	60.5
WOODWARD CANAL	0	0	0	0	0	21	0	0	0	21
RAILROAD CUT	0	8	0	0	0	0	14.25	0	0	22.25
SHEEP SLOUGH	0	0	0	0	0	0	0	0	0	0
CONNECTION SLOUGH	0	0	0	0	0	21.75	0	5.5	0	27.25
WHISKEY SLOUGH	.5	0	3	0	1.5	0	0	0	0	5.00
OLD RIVER	0	0	4.75	10	52.25	0	14.25	54.5	45	180.75
FALSE RIVER	0	0	0	0	0	0	0	0	0	0
PIPER SLOUGH	0	0	.50	0	3	0	4.25	0	0	7.75
SAND MOUND SLOUGH	0	0	.75	0	6	0	3.5	8	0	18.25
FISHERMANS CUT	0	0	0	9	0	0	0	0	0	9
PIXLEY SLOUGH	0	0	0	0	0	0	0	0	0	0
HOLLAND CUT	0	0	4.5	0	0	0	0	9.5	0	14
WERNER DREDGE CUT	0	0	0	0	0	0	0	0	0	0

TABLE I (con'd)

NUMBER OF ACRES TREATED IN 1993

CENTRAL DELTA

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
SEVEN MILE SLOUGH	0	0	0	5.50	1.5	0	0	0	0	7
DISAPPOINT-MENT SLOUGH	0	0	0	6	0	0	6	0	0	12
MIDDLE RVR. LOWER	0	11.5	10.25	0	55.50	19	17	0	0	113.25
MIDDLE RVR. UPPER	0	0	10.75	0	1.50	39.5	0	5	19.75	76.50
POTATO SLOUGH	0	0	0	0	0	0	0	0	0	0
VICTORIA CANAL	0	0	0	0	0	53.75	0	0	0	53.75
HONKER CUT	0	0	0	2	0	0	4.75	1.5	0	8.25
SUGAR CUT	0	0	0	0	0	0	0	0	0	0
GRANTLINE CANAL	0	0	0	1	5	0	0	21	0	27
LITTLE CONNECTION SLOUGH	0	.5	0	0	0	0	0	0	0	.5
EMPIRE CUT	0	0	0	0	0	0	5.5	0	0	5.5
									SUB-TOTAL	**987.25**

TABLE I (con'd)

NUMBER OF ACRES TREATED IN 1993

CENTRAL DELTA

ENCLOSED WATERBODIES

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
TRAPPER SLOUGH	8	0	5	0	0	0	0	0	0	13.00
UPLAND CANAL	0	0	0	0	0	4.25	0	0	0	4.25
KING ISLAND SLOUGH	0	0	0	0	0	0	0	0	0	0
HILDEBRAND SLOUGH	0	0	0	10	0	0	0	0	0	10
WALTHALL SLOUGH	0	6.5	0	0	0	0	0	0	0	6.5
TOM PAINE SLOUGH	4	0	0	1.75	0	0	0	1.25	0	7
HAMMER SLOUGH	0	0	0	0	0	0	0	0	0	0
RHODE ISLAND	0	0	0	0	0	0	0	0	0	0
GRINDSTONE JOE'S	0	4	0	2	0	0	0	0	0	6
LAKE NATOMAS	0	3	3	0	0	0	0	0	0	6
									SUB-TOTALS	**52.75**

TABLE I (con'd)

NUMBER OF ACRES TREATED IN 1993

WEST DELTA

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
SHERMAN LAKE	0	0	3	0	23.5	0	6	0	0	32.5
DUPONT POND	0	0	13.75	0	12	0	5	0	0	30.75
WEST ISLAND	0	0	0	0	0	0	0	0	0	0
DONLON ISLAND	0	0	0	0	10.5	0	5	0	0	15.5
BIG BREAK	0	0	3	0	6	0	7.25	0	13.5	29.75
									SUB-TOTAL	**108.5**

SOUTH DELTA

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
SAN JOAQUIN RIVER South Mossdale	0	0	35.25	16	0	0	48	56	0	155.25
TUOLUMNE RIVER	18.5	37	0	90	0	0	0	0	0	145.5
SALT SLOUGH	3	0	0	11.5	0	3.5	0	0	0	18
									SUB-TOTAL	**318.75**

TABLE I (con'd)

NUMBER OF ACRES TREATED IN 1993

NORTH DELTA

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
SNODGRASS SLOUGH	0	0	0	0	0	26.25	10.75	0	1.5	38.5
									SUB-TOTAL	38.5

CENTRAL DELTA	SUB-TOTAL	987.25
ENCLOSED WATERBODIES	SUB-TOTAL	52.75
WEST DELTA	SUB-TOTAL	108.50
SOUTH DELTA	SUB-TOTAL	318.75
NORTH DELTA	SUB-TOTAL	38.50
	GRAND TOTAL	1505.75

APPENDIX B

Table II

TABLE II

COMPARISON OF WATERHYACINTH ACREAGE TREATED 1988-1993

DELTA WATERWAYS

	1988 ACREAGE CENTRAL	1989 ACREAGE DELTA	1990 ACREAGE	1991 ACREAGE	1992 ACREAGE	1993 ACREAGE
EMPIRE CUT	0	0	0	0	0	5.50
LITTLE CONNECTION SLOUGH	0	0	0	0	10	.50
HONKER CUT	0	0	0	5.5	0	8.25
OLD RIVER (ALL SECTIONS)	4	8.5	84.75	4.25	31.5	180.75
WHITE SLOUGH	16	76.25	24	12.5	24	73.25
SAN JOAQUIN RIVER, DEEP WATER CHANNEL	8.5	41	66.5	4	119	176.75
DISAPPOINTMENT SLOUGH	0	0	4	0	64	12.00
SAND MOUND SLOUGH	2.5	4	30	.25	3.5	18.25
MIDDLE RIVER, MID-SECTION	8.75	19	50	2.75	15	00
DUTCH SLOUGH	.75	0	3	0	4	3.50
RAILROAD CUT	5.50	4	13	.25	1.5	22.25
FOURTEEN MILE SLOUGH	13.00	8	53.5	1	18	12.00
HOLLAND CUT	1.00	2	8.0	.5	10.5	14.00
SHEEP SLOUGH	0	0	0	0	0	0
LITTLE POTATO SLOUGH	1.25	9	12.25	.5	0	44.00
FRANK'S TRACT	0	0	0	0	0	0
WHITE SLOUGH, UPPER	0	0	0	0	0	0
BISHOP CUT	0	0	0	0	0	0
GRANT LINE CANAL	0	0	5.5	.25	0	27.00
SALMON SLOUGH	0	0	0	0	0	0
PIPER SLOUGH	0	0	18	0	2	7.75
TAYLOR SLOUGH	0	0	0	0	0	0
CONNECTION SLOUGH	0	4	6	0	3.5	27.25
MIDDLE RIVER, UPPER	1.50	0	19	2.75	4	76.50

TABLE II (Con'd)

COMPARISON OF WATERHYACINTH ACREAGE TREATED 1988-1993

Delta Waterways

	1988 ACREAGE	1989 ACREAGE	1990 ACREAGE	1991 ACREAGE	1992 ACREAGE	1993 ACREAGE
LATHAM SLOUGH	.75	6	5.5	.25	3	60.50
EMERSON SLOUGH	0	0	0	0	0	0
SEVEN MILE SLOUGH	4	3	13.75	0	6	7.00
VICTORIA CANAL	0	14	03.75	0	4.5	53.75
MIDDLE RIVER, LOWER	.75	21.75	5	0	6	113.25
WHISKEY SLOUGH	1.25	2	11	0	11.5	5.00
POTATO SLOUGH	4.25	.75	7.5	0	11.5	0
SUGAR CUT	0	0	17.25	6.25	0	0
ITALIAN SLOUGH	0	0	0	0	0	0
MOKELUMNE RIVER	0	0	0	0	0	0
FRENCH CAMP SLOUGH	0	0	0	0	0	0
WERNER CUT	1.50	1.5	.5	0	0	0
FALSE RIVER	12	.5	24	0	0	0
TURNER CUT	0	.25	0	0	0	8.25
COLUMBIA CUT	0	0	0	0	0	0
WOODWARD CANAL	0	2	0	0	0	21.00
INDIAN SLOUGH	0	0	0	0	0	0
FISHERMAN CUT	3.25	3.5	0	0	21.5	9.00
PIXLEY SLOUGH	8.75	0	0	0	0	0
CENTRAL SUB-TOTALS	99.25	229.50	492.50	35.50	375.50	987.25

TABLE II (con'd)

COMPARISON OF WATERHYACINTH ACREAGE TREATED 1988-1993

WEST DELTA

	1988 Acreage	1989 Acreage	1990 Acreage	1991 Acreage	1992 Acreage	1993 Acreage
SHERMAN LAKE	9.25	4.5	0	0	0	32.50
DUPONT POND	6.25	2	0	0	0	30.75
WEST ISLAND	3	1	0	0	0	0
DONLON ISLAND	3.75	1	0	0	0	15.50
BIG BREAK	9.50	6.75	14.50	0	0	29.75
WEST SUB-TOTALS	31.75	15.25	14.50	0	0	108.50

SOUTH DELTA

	1988 Acreage	1989 Acreage	1990 Acreage	1991 Acreage	1992 Acreage	1993 Acreage
SAN JOAQUIN RIVER - South Mossdale	3695	283.00	43.00	18.50	210.00	155.25
TUOLUMNE RIVER	28.50	258.00	93.00	294.50	187.00	145.50
SALT SLOUGH	6	7.50	1.50	0	0	18.00
SOUTHERN SUB-TOTAL	403.50	548.50	137.50	313.00	397.50	318.75

NORTH DELTA

	1988 ACREAGE	1989 ACREAGE	1990 ACREAGE	1991 ACREAGE	1992 ACREAGE	1993 ACREAGE
SNODGRASS SLOUGH	79.5	38.5	33	0	0	38.50
NORTHERN SUB-TOTAL	**79.5**	**38.5**	**33**	**0**	**0**	**38.50**

CENTRAL DELTA SUB-TOTALS	**9.25**	**229.50**	**452.50**	**35.50**	**375.50**	**987.25**
WEST DELTA SUB-TOTAL	**31.75**	**15.25**	**14.50**	**.00**	**0**	**108.50**
SOUTH DELTA SUB-TOTAL	**403.50**	**548.50**	**137.50**	**313.00**	**387.50**	**318.75**
NORTH DELTA SUB-TOTAL	**79.50**	**38.00**	**33.00**	**.00**	**.0**	**38.50**
WATERWAY GRAND TOTAL	***614.00***	***831.25***	***677.50***	***348.50***	***773.00***	***1453.00***

H:fac5;nata.doc

APPENDIX C

Table IIa

TABLE IIA

COMPARISON OF WATERHYACINTH ACREAGE TREATED 1988-1993

IN THE ENCLOSED WATERBODIES

	1988 ACREAGE	1989 ACREAGE	1990 ACREAGE	1991 ACREAGE	1992 ACREAGE	1993 ACREAGE
GRINDSTONE JOE'S	0	0	4.50	.50	12.00	6.00
TRAPPER SLOUGH	0	0	0	0	0	13.00
WALTHALL SLOUGH	6.00	2.00	16.00	.50	0	6.50
SHERMAN LAKE		RECLASSIFIED	TO	WATERWAYS		
HILDERBAND SLOUGH	0	0	0	0	6.50	10
RHODE ISLAND	1.00	1.25	.50	0	2.00	0
UPLAND CANAL	0	14.50	0	0	0	4.25
HAMMERS SLOUGH	12.25	0	0	0	0	0
KING ISLAND SLOUGH	0	0	0	0	0	0
LAKE NATOMAS	0	0	0	0	0	6.00
ENCLOSED WATERBODIES SUB-TOTAL	19.25	17.75	21.00	1.00	24.50	52.75
DELTA WATERWAYS SUB-TOTAL	614.00	831.25	677.50	348.50	773.00	1453.00
GRAND TOTAL	**633.25**	**849.00**	**698.50**	**349.50**	**797.50**	**1505.75**

APPENDIX D

1993 Field Protocol

Protocol for Monitoring 1993 2,4-D Applications
for Control of Waterhyacinth in the Sacramento Delta

I. BACKGROUND

During Spring and Summer since 1983 through 1992 water samples have been taken in the Sacramento Delta. Analysis of over these samples showed that levels of 2,4-D did not approach or exceed 100 ppb. Most samples contained no detectable 2,4-D, a few contained 5-15 ppb. In addition, fixed-station samples were taken almost daily at the Tracy pumping plant. Except for a few no detectable levels of 2,4-D have been found. It may be concluded that similar operations (i.e.: similar rates and areas sprayed) would produce similar results, that is, no impairment of water quality and no levels even near the 100 ppb Federal maximum allowable.

Protocol for 1993

The ability to control waterhyacinth with 2,4-D and without any associated significant 2,4-D residues in Delta water has been established. The daily intensive monitoring conducted in 1985 will not be repeated in ~~1993~~, but a reduced level is useful to document compliance with allowable levels of 2,4-D. To meet this need, two types of samplings will be conducted. Fixed stations at three locations and one spot check using 1983 protocols during operational application of 2,4-D.

A. *Fixed Station:

1. Tracy Pumping Plant - Samples to be taken Monday, Wednesday, & Friday in duplicate, 8-9 a.m.

2. Oakley - Highway 4 & Contra Costa Canal:
(Leonard Celoni) Samples to be taken Monday, Wednesday, & Friday in duplicate, 8-9 a.m.

3. Antioch Water Intake Samples will be taken Monday, Wednesday, & Friday as above <u>when water is taken for potable use</u>.

*Note: All samples will be composited and split into duplicate bottles.

Only samples from Mondays and Fridays at each location will be analysed by ARS in Davis. All samples will be stored 30 days for future analysis if needed.

B. Spot Checks: Full Monitoring, pre-, post-treatment per 1985 protocols.
One during the first two weeks of spring operations.
NOTE: If more than 3 contiguous acres are sprayed, routine monitoring will be conducted (i.e.: pre, post-treatment).

C. 1993 2,4-D Analysis protocols.

1. Sampling containers and sample sites.
At each fixed station or spot-check site, 2 15-ml water sample will be collected from a large (1 l) sample, place in a plastic 20 ml screw-capped vial and frozen until analysis.

2. Analysis for 2,4-D.
A commercially available immunoassay systems (Ohmicron, Newtown, PA) will be used to determine presence and level of 2,4-D in each water sample.

3. Assay Protocol and Description. (See attached)

D. Action Criteria:

1. Fixed Station: If any duplicate samples averaging over 20 ppb, operations will be suspended until the source is found or until it is shown not to be the result of operational spraying.

2. Spot Monitoring: If any duplicate post-treatment samples average over 50 ppb, operations will be suspended until adjustments are made to reduce this below 50 ppb.

II. RESPONSIBILITY FOR MONITORING:

USDA/ARS-Davis will collect (or receive) and analyze the samples from the fixed stations.

USDA/ARS-Davis will conduct spot-monitoring using ARS and UCD cooperative employees and will analyze samples within 48 hours. Ten percent of samples will be sent to a commercial analytical laboratory for confirmaiton of results.

III. REPORTING RESULTS OF MONITORING:

USDA/ARS-Davis will report all results in writing to the California Department of Boating and Waterways biweekly, or immediately if levels of 2,4-D exceed criteria. (See II. c.1., 2.).

WATERHYACINTH CONTROL PROGRAM

1993 OPERATION PLAN

It is the intent of the program to control the infestation of waterhyacinth in the Delta while minimizing off-target impacts and preventing degradation of the existing water quality.

I. AREA SELECTION

The entire Delta region that is impacted with waterhyacinths, or as much as is physically and financially possible, will be treated as early in the spring as possible to preclude problems with the agricultural community. The Delta area will be subdivided into application sites which vary in length from 2 to 5 miles.

II. PERMIT APPLICATION

The permit for each county and the Notices of Intent for each application will be obtained by the Department of Boating and Waterways.

III. CHEMICAL APPLICATION COORDINATION

No chemical will be applied, regardless of permit requirement, without first getting the concurrence of the agricultural commissioner for the area to be treated. On boundary waters, both commissioners must give prior concurrence.

IV. WATER QUALITY MONITORING

Water quality monitoring shall be conducted in accordance with the established procedures. Monitoring will be conducted for both 2,4-D and Diquat.

V. CHEMICAL APPLICATION

a] Equipment. The application equipment must have sufficient volume and pressure to apply chemical control agents to large areas as well as fringe areas. Before any equipment is utilized, it must be approved by the agricultural commissioner of the county of application.

b] Site Application. Within each site selected, no more than three (3) contiguous acres at label rate shall be treated. After treating a maximum of three acres at label rate, of contiguous mats, a minimum of one site must be left untreated before beginning another treatment area.

The untreated sites may not be treated before two tidal changes have occurred or until the following day in a non-tidal area.

c] For the 1993 season, no herbicide applications by the State shall be made in the following areas:

1. One mile upstream of the intersection of Old River and Rock Slough;

2. One mile downstream of the intersection of Old River and Rock Slough; and
3. One mile south of the intersection of Rock Slough and Werner Dredge Cut.

For the 1993 season, herbicide applications at the southerly end of Sand Mound Slough south of Sam's Harbor shall only be made on an outgoing tide and then only after checking the tidal gate at the intersection of Sand Mound Slough and Rock Slough. If the gate appears to be free of debris, then spraying is permitted. If the gate is blocked, call the Agricultural Commissioner at (510) 646-5250 and report the blockage. Do not treat the area until the gate is functioning.

d] Application Technique. All applications to nursery areas must be from the edges toward the outlet area of the nursery.

In dead end sloughs larger than one acre that are completely covered with hyacinth, no more than one-half of the area can be treated at one time.

Care must be exercised to reduce non-target damage. Applications shall be directed to the target plant; riparian and agricultural vegetation shall be avoided.

Drift and sticker control agents will be required in accordance with label requirements. Drift will be prevented from reaching agricultural crops and riparian vegetation; any time this cannot be assured, no treatment shall be made.

VI. SPILLAGE CONTROL

All undiluted herbicides carried in the watercraft shall be in five gallon containers or smaller, with only one container of any one herbicide open at any given time. A marker buoy, with anchor line attached, and tracer dye shall be carried at all times to mark any herbicide spill and to monitor water movement at the spill site.

All herbicide containers shall be securely fastened together and attached to a line and float.

As soon as possible, the applicator/monitor team shall provide notification to the agricultural commissioners and other appropriate agencies via the emergency notification procedure.

VII. AERIAL APPLICATION

Aerial application will be allowable in the Sherman Lake area. Any application will be coordinated with the Department of Fish and Game.

1993 OPERATION PLAN CONTINUES....

VIII. EMERGENCY NOTIFICATION

THE APPLICATOR/MONITORING TEAM MUST REPORT ANY SPILLAGE TO THE APPROPRIATE COUNTY AND STATE AGENCIES AS QUICKLY AS POSSIBLE. THE INFORMATION SHALL INCLUDE EXACT LOCATION OF THE SPILL, TOTAL VOLUME SPILLED AND IDENTIFICATION OF THE HERBICIDE SPILLED.

[The appropriate entities as indicated below will be notified.]

SPILLAGE - EMERGENCY NUMBERS

COUNTY

Agricultural Commissioner
CONTRA COSTA COUNTY
(510) 646-5250

Contra Costa Occupational
Health Services
(510) 646-2286

Contra Costa Water District
(510) 674-8000
(510) 689-7921 - After 5 p.m.

Agricultural Commissioner
MERCED COUNTY
(209) 385-7710

Merced County Public Health
(209) 385-7710

Agricultural Commissioner
SACRAMENTO COUNTY
(916) 366-2003

Sacramento County Public Health
Hazardous Materials
(916) 386-6160

STATE

Office of Emergency Services
(916) 427-4990

Department of Health Services
(510) 540-2158

Department of Boating and Waterways
(916) 445-9657

Department of Fish and Game
(916) 355-0136

Regional Water Quality Control Board
(916) 255-3101

ANY RESIDUE OVER 20 PPB

Department of Boating and Waterways
(916) 445-9657

Regional Water Quality Control Board
(916) 255-3101

Agricultural Commissioner
SAN JOAQUIN COUNTY
(209) 468-3300

San Joaquin County Public Health
(209) 468-3400

Agricultural Commissioner
SOLANO COUNTY
(707) 421-7465

Solano County Office of Emergency Services
(707) 421-6330

Agricultural Commissioner
STANISLAUS COUNTY
(209) 525-4610

Stanislaus County Public Health
(209) 525-4150

ADJACENT LANDOWNERS/OPERATORS AND THEIR CONTACT TELEPHONE NUMBERS SHOULD BE AVAILABLE AT THE COUNTY AGRICULTURAL COMMISSIONER'S OFFICE BEFORE APPLICATION IS MADE FOR EACH SITE SELECTED.

IX. PRESS INQUIRIES

All inquiries from the press will be answered by and shall be directed to **Don Waltz** or **Larry Thomas** at **(916) 445-9657.**

APPENDIX E

1993 Water Analysis

Samples Collected in the Field from 7/29/93 to 9/22/93

Location of Sample	Sample	Date Collected	ppb 2,4-D
Tuolumne River	Beg A	29-Jul-93	7.63
Tuolumne River	Beg B	29-Jul-93	6.97
Tuolumne River	Mid A	29-Jul-93	12.69
Tuolumne River	Mid B	29-Jul-93	12.1
Tuolumne River	End A	29-Jul-93	58
Tuolumne River	End B	29-Jul-93	44.7
Paridise Point-Bishop Tract and Telephone Cut intersection	Beg A	22-Sep-93	0.82
Paridise Point-Bishop Tract and Telephone Cut intersection	Beg B	22-Sep-93	1
Paridise Point-Around middle of White Slough	Mid A	22-Sep-93	0.73
Paridise Point-Around middle of White Slough	Mid B	22-Sep-93	0.85
Paridise Point-Around Y of White Slough	End A	22-Sep-93	1.05
Paridise Point-Around Y of White Slough	End B	22-Sep-93	0.79

*=number falls below detection limits

Date anlayzed: August 11 and September 23, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 35.11 (8/11), 34.06 (9/23)

2,4-D DATA FROM ROCK SLOUGH/FISH SCREEN

DATE COLLECTED	PPB 2,4-D
28-May-93	0.47 *
4-Jun-93	0.34 *
11-Jun-93	0.98
18-Jun-93	0.31 *
25-Jun-93	0.48 *
2-Jul-93	0.38 *
9-Jul-93	0.42 *
16-Jul-93	0.39 *
23-Jul-93	0.41 *
30-Jul-93	0.36 *
6-Aug-93	0.22 *
13-Aug-93	0.44 *
20-Aug-93	0.65 *
27-Aug-93	0.61 *
3-Sep-93	0.37 *
10-Sep-93	0.39 *
17-Sep-93	0.42 *
24-Sep-93	0.37 *
1-Oct-93	0.38 *
8-Oct-93	0.31 *
15-Oct-93	0.47 *
22-Oct-93	0.36 *
5-Nov-93	0.39 *
12-Nov-93	0.55 *
17-Nov-93	0.58 *
3-Dec-93	0.51 *
17-Dec-93	0.51 *

* Number falls below detectable limits

Samples collected from Rock Slough - 5/28/93 to 8/6/93

Date Collected	ppb 2,4-D
28-May-93	0.47 *
4-Jun-93	0.34 *
11-Jun-93	0.98
18-Jun-93	0.31 *
25-Jun-93	0.48 *
2-Jul-93	0.38 *
9-Jul-93	0.42 *
16-Jul-93	0.39 *
23-Jul-93	0.41 *
30-Jul-93	0.36 *
6-Aug-93	0.22 *

* = number falls below detectable limits

Date analyzed: August 11, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 39.35 ppb

Samples collected from Rock Slough/Fish Screen - 11/17/93 to 12/17/93

Date Collected	ppb 2,4-D
17-Nov-93	0.58 *
3-Dec-93	0.51 *
17-Dec-93	0.51 *

* = number falls below detectable limits

Date analyzed: January 10, 1994

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.29 ppb

2,4-D DATA FROM TRACY PUMPING PLANT

DATE COLLECTED	PPB 2,4-D	DATE COLLECTED	PPB 2,4-D	DATE COLLECTED	PPB 2,4-D
3-Jan-93	0.63 *	28-Jun-93	0.43 *	10-Sep-93	0.6 *
1-Feb-93	0.57 *	30-Jun-93	0.32 *	10-Sep-93	0.54 *
5-Feb-93	0.75 *	2-Jul-93	0.36 *	20-Sep-93	0.49 *
8-Feb-93	0.58 *	7-Jul-93	0.34 *	22-Sep-93	0.52 *
10-Feb-93	0.64 *	9-Jul-93	0.38 *	27-Sep-93	0.44 *
12-Feb-93	0.65 *	12-Jul-93	0.36 *	29-Sep-93	0.83
16-Feb-93	0.64 *	14-Jul-93	0.34 *	1-Oct-93	0.76
18-Feb-93	0.65 *	16-Jul-93	0.3 *	6-Oct-93	0.61 *
22-Feb-93	0.68 *	19-Jul-93	0.22 *	11-Oct-93	0.69 *
24-Feb-93	0.78	21-Jul-93	0.31 *	13-Oct-93	0.86
26-Feb-93	0.5 *	23-Jul-93	0.66 *	24-Oct-93	0.65 *
2-Mar-93	0.69 *	26-Jul-93	0.35 *	25-Oct-93	0.64 *
3-Mar-93	0.65 *	28-Jul-93	0.35 *	27-Oct-93	0.53 *
5-Mar-93	1.07	30-Jul-93	0.45 *	3-Nov-93	0.52 *
10-Mar-93	0.58 *	2-Aug-93	0.38 *	5-Nov-93	0.52 *
15-Mar-93	0.63 *	4-Aug-93	0.39 *	15-Nov-93	0.41 *
17-Mar-93	0.96	6-Aug-93	0.37 *	17-Nov-93	0.82
19-Mar-93	0.94	11-Aug-93	0.29 *	19-Nov-93	0.66 *
22-Mar-93	1	11-Aug-93	0.59 *	22-Nov-93	1.14
24-Mar-93	0.96	13-Aug-93	0.42 *	24-Nov-93	1.63
26-Mar-93	0.6 *	13-Aug-93	0.49 *		
29-Mar-93	1.2	16-Aug-93	0.6 *		
31-Mar-93	0.92	16-Aug-93	0.97		
2-Apr-93	0.73	18-Aug-93	0.62 *		
5-Apr-93	0.77	18-Aug-93	0.47 *		
7-Apr-93	0.82	20-Aug-93	0.63 *		
26-May-93	0.26 *	20-Aug-93	0.65 *		
28-May-93	0.32 *	23-Aug-93	0.54 *		
1-Jun-93	0.4 *	23-Aug-93	0.49 *		
2-Jun-93	0.65 *	25-Aug-93	0.69 *		
4-Jun-93	0.27 *	25-Aug-93	0.82		
7-Jun-93	0.25 *	30-Aug-93	0.45 *		
9-Jun-93	0.27 *	30-Aug-93	0.82		
11-Jun-93	0.38 *	1-Sep-93	0.51 *		
14-Jun-93	0.34 *	1-Sep-93	0.45 *		
16-Jun-93	0.41 *	3-Sep-93	0.59 *		
18-Jun-93	0.35 *	6-Sep-93	0.46 *		
21-Jun-93	0.26 *	6-Sep-93	0.83		
23-Jun-93	0.31 *	8-Sep-93	0.9		
25-Jun-93	1.09	8-Sep-93	0.83		

* Number falls below detectable limits

Samples collected from the Tracy Pumping Plant 1/93 to 4/7/93

Date	ppb 2,4-D Rep A	ppb 2,4-D Rep B
3-Jan-93	0.63 *	0.62 *
1-Feb-93	0.59 *	0.54 *
5-Feb-93	0.66 *	0.83
8-Feb-93	0.56 *	0.59 *
10-Feb-93	0.56 *	0.72
12-Feb-93	0.43 *	0.86
16-Feb-93	0.65 *	0.62 *
18-Feb-93	0.62 *	0.67 *
22-Feb-93	0.75	0.60 *
24-Feb-93	0.53 *	1.02
26-Feb-93	0.66 *	0.34 *
2-Mar-93	0.75	0.62 *
3-Mar-93	0.69 *	0.60 *
5-Mar-93	1.05	1.08
10-Mar-93	0.58 *	0.57 *
15-Mar-93	0.63 *	no sample
17-Mar-93	0.99	0.93
19-Mar-93	0.94	no sample
22-Mar-93	0.93	1.07
24-Mar-93	0.9	1.02
26-Mar-93	0.56 *	0.64 *
29-Mar-93	1.05	1.34
31-Mar-93	0.92	no sample
2-Apr-93	0.69 *	0.76
5-Apr-93	0.71	0.83
7-Apr-93	0.92	0.72

* = number falls below detectable limits

Date analyzed: June 28, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.79 ppb

Samples collected from the Tracy Pumping Plant - 5/26/93 to 8/6/93

Date Collected	ppb 2,4-D	Date Collected	ppb 2,4-D
26-May-93	0.29 *	19-Jul-93	0.55 *
28-May-93	0.42 *	21-Jul-93	0.67 *
31-May-93	0.6 *	22-Jul-93	0.84
2-Jun-93	0.62 *	26-Jul-93	1.01
4-Jun-93	0.63 *	28-Jul-93	0.75
7-Jun-93	0.54 *	30-Jul-93	0.69 *
9-Jun-93	0.69 *	2-Aug-93	0.58 *
11-Jun-93	0.45 *	4-Aug-93	0.7
14-Jun-93	0.51 *	6-Aug-93	1.57
16-Jun-93	0.46 *		
18-Jun-93	0.9		
21-Jun-93	0.6 *		
23-Jun-93	1.09		
25-Jun-93	0.58 *		
28-Jun-93	0.71		
30-Jun-93	1.51		
2-Jul-93	0.65 *		
5-Jul-93	0.82		
7-Jul-93	0.58		
9-Jul-93	0.69 *		
11-Jul-93	0.87		
14-Jul-93	1.12		
16-Jul-93	1.16		

* = number falls below detectable limits

Date analyzed: August 11, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 35.11 ppb

Samples collected from the Tracy Pumping Plant - 8/11/93 to 9/10/93

Date Collected	ppb 2,4-D	
11-Aug-93	0.59	*
13-Aug-93	0.49	*
16-Aug-93	0.97	
18-Aug-93	0.47	*
20-Aug-93	0.65	*
23-Aug-93	0.49	*
25-Aug-93	0.82	
30-Aug-93	0.82	
1-Sep-93	0.45	*
6-Sep-93	0.83	
8-Sep-93	0.83	
10-Sep-93	0.54	*

* = number falls below detectable limits

Date analyzed: September 23, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.06 ppb

Samples collected from the Tracy Pumping Plant - Misc. samples

Date Collected	ppb 2,4-D
24-Oct-93	0.65 *
22-Nov-94	1.14
24-Nov-93	1.63

* = number falls below detectable limits

Date analyzed: January 10, 1994

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.29 ppb

2,4-D DATA FROM PUMPING PLANT # 1

DATE COLLECTED	PPB 2,4-D	DATE COLLECTED	PPB 2,4-D	DATE COLLECTED	PPB 2,4-D
26-May-93	0.26 *	31-Aug-93	0.41 *	8-Dec-93	0.49 *
28-May-93	0.32 *	1-Sep-93	0.34 *	10-Dec-93	0.45 *
1-Jun-93	0.4 *	3-Sep-93	0.27 *	13-Dec-93	0.49 *
2-Jun-93	0.65 *	8-Sep-93	0.51 *	15-Dec-93	0.47 *
4-Jun-93	0.27 *	10-Sep-93	0.63 *	17-Dec-93	0.49 *
7-Jun-93	0.25 *	13-Sep-93	0.67 *	20-Dec-93	0.67 *
9-Jun-93	0.27 *	15-Sep-93	0.27 *	20-Dec-93	0.58 *
11-Jun-93	0.38 *	17-Sep-93	0.27 *	22-Dec-93	0.53 *
14-Jun-93	0.34 *	20-Sep-93	0.39 *		
16-Jun-93	0.41 *	22-Sep-93	0.5 *	* Number falls below	
18-Jun-93	0.35 *	24-Sep-93	0.49 *	detectable limits	
21-Jun-93	0.26 *	27-Sep-93	0.28 *		
23-Jun-93	0.31 *	29-Sep-93	0.3 *		
25-Jun-93	1.09	1-Oct-93	0.27 *		
28-Jun-93	0.43 *	4-Oct-93	0.28 *		
30-Jun-93	0.32 *	6-Oct-93	0.34 *		
2-Jul-93	0.36 *	8-Oct-93	0.27 *		
7-Jul-93	0.34 *	11-Oct-93	0.28 *		
9-Jul-93	0.38 *	13-Oct-93	0.33 *		
12-Jul-93	0.36 *	15-Oct-93	0.39 *		
14-Jul-93	0.34 *	18-Oct-93	0.41 *		
16-Jul-93	0.3 *	20-Oct-93	0.23 *		
19-Jul-93	0.22 *	22-Oct-93	0.39 *		
21-Jul-93	0.31 *	25-Oct-93	0.37 *		
23-Jul-93	0.66 *	27-Oct-93	0.37 *		
26-Jul-93	0.35 *	29-Oct-93	0.39 *		
28-Jul-93	0.35 *	1-Nov-93	0.26 *		
30-Jul-93	0.45 *	3-Nov-93	0.34 *		
2-Aug-93	0.38 *	5-Nov-93	0.41 *		
4-Aug-93	0.39 *	8-Nov-93	0.24 *		
6-Aug-93	0.37 *	10-Nov-93	0.45 *		
9-Aug-93	0.35 *	12-Nov-93	0.3 *		
11-Aug-93	0.5 *	15-Nov-93	0.61 *		
13-Aug-93	0.4 *	17-Nov-93	0.54 *		
16-Aug-93	0.49 *	19-Nov-93	0.55 *		
18-Aug-93	0.43 *	22-Nov-93	0.45 *		
20-Aug-93	0.52 *	29-Nov-93	0.55 *		
23-Aug-93	0.36 *	1-Dec-93	0.48 *		
25-Aug-93	0.48 *	3-Dec-93	0.41 *		
27-Aug-93	0.42 *	6-Dec-93	0.59 *		

Samples collected from the Pumping Plant # 1 - 5/26/93 to 8/6/93

Date Collected	ppb 2,4-D	Date Collected	ppb 2,4-D
26-May-93	0.26 *	19-Jul-93	0.22 *
28-May-93	0.32 *	21-Jul-93	0.31 *
1-Jun-93	0.4 *	23-Jul-93	0.66 *
2-Jun-93	0.65 *	26-Jul-93	0.35 *
4-Jun-93	0.27 *	28-Jul-93	0.35 *
7-Jun-93	0.25 *	30-Jul-93	0.45 *
9-Jun-93	0.27 *	2-Aug-93	0.38 *
11-Jun-93	0.38 *	4-Aug-93	0.39 *
14-Jun-93	0.34 *	6-Aug-93	0.37 *
16-Jun-93	0.41 *		
18-Jun-93	0.35 *		
21-Jun-93	0.26 *		
23-Jun-93	0.31 *		
25-Jun-93	1.09		
28-Jun-93	0.43 *		
30-Jun-93	0.32 *		
2-Jul-93	0.36 *		
7-Jul-93	0.34 *		
9-Jul-93	0.38 *		
12-Jul-93	0.36 *		
14-Jul-93	0.34 *		
16-Jul-93	0.3 *		

* = number falls below detectable limits

Date analyzed: August 11, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 39.35 ppb

Samples collected from the Pumping Plant # 1 - 8/9/93 to 9/13/93

Date Collected	ppb 2,4-D
9-Aug-93	0.35 *
11-Aug-93	0.5 *
13-Aug-93	0.4 *
16-Aug-93	0.49 *
18-Aug-93	0.43 *
20-Aug-93	0.52 *
23-Aug-93	0.36 *
25-Aug-93	0.48 *
27-Aug-93	0.42 *
31-Aug-93	0.41 *
1-Sep-93	0.34 *
3-Sep-93	0.27 *
8-Sep-93	0.51 *
10-Sep-93	0.63 *
13-Sep-93	0.67 *

Samples collected from Rock Slough/Fish Screen - 8/13/93 to 9/10/93

Date Collected	ppb 2,4-D
13-Aug-93	0.44 *
20-Aug-93	0.65 *
27-Aug-93	0.61 *
3-Sep-93	0.37 *
10-Sep-93	0.39 *

* = number falls below detectable limits

Date analyzed: September 23, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.06 ppb

9/17/93 12/22/93

Samples collected from the Pumping Plant # 1 - ~~9/15/93 to 12/15/93~~

Date Collected	ppb 2,4-D	
17-Nov-93	0.54 *	
19-Nov-93	0.55 *	
22-Nov-93	0.45 *	
29-Nov-93	0.55 *	
1-Dec-93	0.48 *	
3-Dec-93	0.41 *	
6-Dec-93	0.59 *	
8-Dec-93	0.49 *	
10-Dec-93	0.45 *	
13-Dec-93	0.49 *	
15-Dec-93	0.47 *	
17-Dec-93	0.49 *	
20-Dec-93	0.67 *	800 am
20-Dec-93	0.58 *	1130 am
22-Dec-93	0.53 *	

* = number falls below detectable limits

Date analyzed: January 10, 1994

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 34.29 ppb

Samples collected from Antioch - 6/15/93 to 7/7/93

Date Collected	ppb 2,4-D	
15-Jun-93	0.4	*
16-Jun-93	0.38	*
17-Jun-93	0.31	*
18-Jun-93	0.3	*
19-Jun-93	0.48	*
20-Jun-93	0.31	*
21-Jun-93	0.38	*
22-Jun-93	0.34	*
23-Jun-93	0.35	*
24-Jun-93	0.35	*
25-Jun-93	0.32	*
28-Jun-93	0.45	*
29-Jun-93	0.38	*
30-Jun-93	0.46	*
1-Jul-93	0.51	*
2-Jul-93	0.4	*
6-Jul-93	0.42	*
7-Jul-93	0.4	*

* = number falls below detectable limits

Date analyzed: August 11, 1993

Assay: Omicron 2,4-D ELISA Kit

Technician: S. Fellows

Internal control: Expected - 35 ppb ± 7 Actual - 35.11 ppb

APPENDIX F

Merced River Report

1993 SUMMARY OF WATER HYACINTH CONTROL PROJECT BY THE MERCED COUNTY DEPARTMENT OF AGRICULTURE

In November of 1993, the Department completed its eighth consecutive year of chemical control of Water Hyacinth, Eichornia crassipes, in Merced County. The last five years an intensive treatment effort has been in place. This aquatic weed, in the past, had severely impacted the two main waterways of Merced County, i.e. Merced River and, to a lesser degree, the San Joaquin River. The weed had literally turned the waterways into a solid green mass of weed growth with little flowing water evident.

Financial assistance has been provided to Merced County from The Resources Agency of California through an agreement with the California Department of Boating and Waterways since 1990. The agreement has directed funds to the Merced County Department of Agriculture for labor and support needs to chemically treat the rivers.

In 1992, funding supported two, two-person application crews at a cost of $35,876, mileage expenses of $2,280, and parts/supplies of $1,040. The year was the most successful in the continued reduction of water hyacinth in the Merced River with very little evident at season's end.

For 1993, the Department of Boating and Waterways renewed the agreement with the County under the same terms and conditions. Merced County treated a total of 716.5 net acres, using 165.3 gallons of herbicide treatment material. The treatment period started on May 6th and ended November 24th. Total time expended in the program for the year amounted to 2,141.5 hours, along with 11,602 vehicle miles. Labor costs were $18,157, mileage expenses $2,433, and parts/supplies $222 (see Attachment I).

Assessment of 1993 Program

Due to the heavy winter rainfall, ending the six year drought and near filling of Lake McClure, the heavy flows of water down the Merced River Channel significantly helped clean and clear it of debris. The high water for much of the spring into summer kept our treatment crew out of the river above Highway 59 until July. It also allowed the use of a flat bottom boat for all treatment work; our "barrel boats" were not used. There was one log jam near the Hagerman Park (J-14) bridge, but no other blockages along the 43 mile main channel.

Only one, two-person boat crew was used this year. Higher water levels and flow made navigation of the river the easiest since beginning this project. There were no equipment problems.

The main channel of the Merced River was treated six times from Highway 59 to the San Joaquin River and three times from the Crocker-Huffman Dam to Highway 59. Water Hyacinth growth and evidence was significantly reduced from the prior year. Side channels and infested ponds adjacent to the river were treated several times. These are about cleaned up. One channel along the S/S bluff from Crocker-Huffman to "G" Grade Road presents a problem due to tree and brush overgrowth. It would be a good area for biological control efforts and establishment of such predators. A specially equipped helicopter using an experimental spray system and material has been discussed for use in areas with limited access by boat.

With respect to the Water Hyacinth weed, the Merced River is cleaner than it has been in over twelve years. There should not have been a problem with migrating salmon getting up or down the river this year. The high water flow and "pulse" flows at critical times by the Merced Irrigation District, working cooperatively with the Department of Fish and Game, was extremely beneficial to the fish.

The San Joaquin River and Salt Slough were treated during October and November in areas known to have Water Hyacinth growth. Two treatments were made to most areas, some by boat and some with a spray truck from the stream banks.

The plan for 1994, as long as we continue to receive the resources and support as in the past, is to continue as this year using a one boat crew to treat the entire Merced River Channel from Crocker-Huffman Dam to the San Joaquin River at least five times. We would continue to work on all areas off the main channel until cleaned up. The San Joaquin River and Salt Slough will be treated as needed until cleared of Water Hyacinth.

Summary

This year was by far the most successful year in our effort to control/eradicate Water Hyacinth from the Merced River and adjacent areas, as well as in other important Merced County waterways. Our work has almost eliminated the "seed source" going to Delta channels and opened the river channels to allow growers and the general public trouble-free access. We are confident the treatment program and open main channel has greatly contributed and improved the survival and migration of both the fry and yearling salmon releases up stream and those mature adults returning to spawn.

With continued support from other agencies, the Merced County Agricultural Department will continue a strong program in 1994 and subsequent years until Water Hyacinth has been eliminated /eradicated from our waterways. As predicted, it appears that after five years of vigorous treatment, we have this weed under control and can soon eliminate it.

We estimated in the beginning that it would take a two to five year concentrated effort to rid the river of Water Hyacinth; we are on target. After next year, we should be able to settle into a maintenance-only program with little treatment required.

TREATMENT MATERIAL	YEAR	ACRES TREATED NET/GROSS	AMOUNT USED (GALLONS)	MILES	HOURS
2,4-D (Weedar 64)	1993	716.5/1438.5	165.3	11,602	2,141.5
	1992	1,960.5/2,920	448.0	16,109	4,442.0
	1991	827.0/1,326	298.4	14,403	3,750.5
	1990	1,215.5/1,687	286.2	9,611	1,789.8
	1989	883.6/10,984	209.0	5,753	1,213.0
	1988	137.5/432	85.7	—	207.5
	1987	144.5/1,546	45.7	—	332.0
	1986	98.5/495	25.3	—	225.0
Diquat	1993	0	0.0	0	0.0
	1992	0	0.0	0	0.0
	1991	0	0.0	5	3.0
	1990	25/46	12.25	447	42.8
	1989	70/122	17.5	763	126.0
	1988	-	-	-	16.5
	1987	-	-	-	16.5
	1986	69/220	24.5	-	210.5
Rodeo	1993	0	0.0	0	0.0
	1992	0	0.5	0	0.0
	1991	0	0.0	105	26.5
	1990	614/901	160.0	6,767	1,505.5
	1989	1,436.6/2,128.5	339.6	8,820	1,583.0
	1988	40.5/125.3	8.3	-	78.0
	1987	.5/1	0.4	-	4.5
	1986	-	-	-	-
All Surfactants	1993		119.75	0	0.0
	1992		262.7	0	0.0
	1991		189.4	0	0.0
	1990		189.0	65	38.7
TOTALS					
All Herbicides	1993	716.5	165.3	11,602	2,141.5
	1992	1,960.5	448.5	16,109	4,442.0
	1991	827*	298.4*	14,513	3,780.0
	1990	1,854.5*	458.95*	16,920	3,376.8
	1989	2,390.2	566.1	15,336	2,922.0
	1988	178	94.0	-	302.0
	1987	145	46.1	-	353.0
	1986	167.5	49.8	-	435.5

*Includes Boating and Waterways limited work on the Merced River (materials and acres)