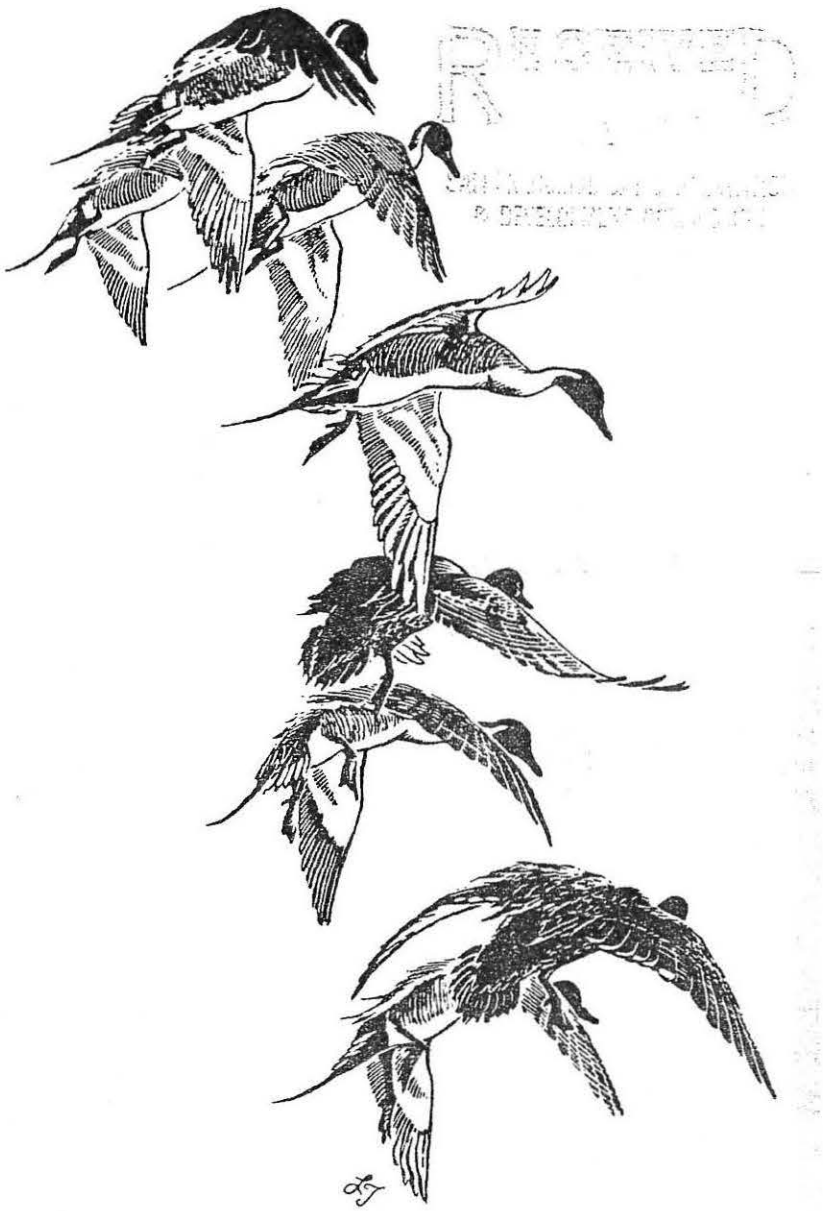
SUISUN resource conservation district



# The Suisun Marsh Management Program

# THE SUISUN RESOURCE CONSERVATION DISTRICT'S MANAGEMENT PROGRAM TO PRESERVE, PROTECT AND ENHANCE THE PLANT AND WILDLIFE COMMUNITIES WITHIN THE PRIMARY MANAGEMENT AREA OF THE SUISUN MARSH

The cooperation and assistance of the staffs of the following agencies is gratefully acknowledged:

California Department of Fish and Game

California Department of Water Resources

San Francisco Bay Conservation and Development Commission

County of Solano

Solano County Mosquito Abatement District

U.S. Fish and Wildlife Service

U.S. Soil Conservation Service

U.S. Water and Power Resource Service

This document was prepared with financial assistance from the U.S. Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the provisions of the Federal Coastal Zone Management Act of 1972, as amended, and from the San Francisco Bay Conservation and Development Commission under the provisions of the Suisun Marsh Preservation Act of 1977.

September , 1980

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# PART ONE

# THE MANAGEMENT PROGRAM

## I. INTRODUCTION

### A. AUTHORITY

The authority for the preparation of this program is provided by Sections 9962, 9963, 29003, 29401(d) and 29412.5 of the Public Resources Code (PRC).

### B. BACKGROUND

In the late 1960's, the Directors of the Suisun Resource Conservation District (SRCD) recognized the threat to the natural resources of the Suisun Marsh (the "Marsh") posed by the pressures of increasing urbanization in Solano County. Their first efforts to deal with this problem took the form of a conservation easement program which they proposed in 1970 to landowners on the periphery of the Marsh proper, now identified as the Primary Management Area (PMA). The program contemplated paying a landowner fifty cents per acre as an inducement for him to enter into a conservation easement agreement with the SRCD. Under the terms of the proposed agreement, the landowner would agree to keep his property in its present land use in purpetuity. The agreement would become a restriction in his land title and would carry over to any new owner if the property was sold. After three years of effort, it was evident that this approach would not be successful because:

1. The SRCD was unable to offer sufficient incentives to interest the landowners involved in participating; and,

2. The concept did not recognize the necessity for a buffer zone around the PMA to insulate it from the impacts created by the urbanization of adjacent areas.

In 1972, the California Department of Fish and Game (CDF&G) developed a Suisun Marsh Protection Plan which also called for preserving existing land uses within the Marsh proper and defined a buffer zone as a greenbelt exterior to the wetlands. This plan has served as the basis for the CDF&G's position with respect to all subsequent urban and industrial development proposals in the area.

In an effort to implement the land use control concept, in 1973 the SRCD and the CDF&G sponsored legislation which was ultimately enacted as SB 1981. This act defined a buffer zone around the PMA and precluded any development within it or the PMA until a long-range protection plan could be developed by the CDF&G and the San Francisco Bay Conservation and Development Commission (BCDC). The long-range plan was embodied in AB 1717 which was enacted in 1977.

Under the provisions of AB 1717, the BCDC has been given primary state responsibility for the implementation of the protection plan. In addition, the bill includes provisions relating to the local responsibility of the SRCD over habitat management practices in the Marsh.

C. AREA-WIDE DESCRIPTION

The Suisun Marsh is an 88,100 acre brackish water marsh located in Solano County immediately to the west of the Sacramento-San Joaquin Delta. Brackish water marshes are the most productive type of marsh and support the widest variety of marsh dependent wildlife. It is the largest marsh of this type in the United States and comprises almost one-sixth of the total area of Solano County. The Marsh is a principal wintering area for waterfowl of the Pacific Flyway and represents over 10% of the total remaining natural wetlands in California.

D. THE MANAGEMENT PROGRAM

Section 29401(d) of the PRC requires the SRCD to prepare a management program designed to; ". . . preserve, protect and enhance the plant and wildlife communities within the primary management area. . ." of the Marsh. Section 29102 of the PRC defines the PMA as; "tidal marsh, diked-off wetlands, seasonal marsh, water-covered areas, and lowland grasslands specified on the map identified in Section 16 of that chapter of the Statutes of the 1977-78 Regular Session enacting this division." For practical purposes, this means any land in the Marsh lying below the 5 foot contour line together with adjacent lowland grasslands which are generally between the 5 and 10 foot contour levels.

The management program seeks to meet its obligations by providing a wide variety of brackish water marsh habitat types within the PMA. The term "brackish water marsh" refers to wetlands

whose water supply has salinity levels in the range of 1,000 to 20,000 parts per million total dissolved solids. This vegetative diversity in turn will support a broad range of wildlife. The principal controllable factors affecting the type of plant communities within the PMA are length of submergence and root zone soil salinities. These are determined by water supply quality and management. Therefore, the management program of the SRCD concentrates on these two considerations.

The managed wetlands in the Marsh are managed on a seasonal schedule - that is, they are flooded in the fall to provide waterfowl habitat and hunting for both the private managed wetlands and those areas of the state land that are open to controlled public hunting. In the late winter and early spring they are alternately flooded and drained to leach out the salts which have accumulated in the soil, thus encouraging the brackish water plants that provide forage for waterfowl. During the summer, the ponds are drained and allowed to dry for the control of undesirable plants and mosquitoes and to allow maintenance of facilities.

The SRCD's program consists of the following principal elements:

I. A general management program including:

A) Development of a plan to provide a mitigative water supply to the managed wetlands within the PMA.

B) Development of a joint use facilities program.

C) Consideration of the land use and public access issues.

II. Development of individual water management programs for each privately owned managed wetland within the PMA.

III. Development of enforceable standards for diking, flooding, draining, filling and dredging of sloughs, managed wetlands and marshes within the PMA.

IV. Development of regulations to be adopted by the SRCD which will ensure effective water management on privately owned lands within the PMA.

These elements are described in detail in the following sections.

## II. GENERAL MANAGEMENT PROGRAM

### A. MITIGATIVE WATER SUPPLY

1) History up to 1978 - while the nature and diversity of the vegetation within the PMA is somewhat dependent upon local rainfall and run off from the Marsh watershed, the controlling factor is the quality of water available in the adjoining bays and tidal sloughs. Although there is no well-documented information on Marsh vegetation prior to the reclamation that followed the Gold Rush, we know that because of its position in the Sacramento/San Joaquin estuary, the quality of water must have varied seasonally and from year to year. Large

portions of land were submerged by high tides and limited areas of higher ground were innundated periodically by spring runoff. In the winter and spring fresh water from local and Central Valley flooding covered most of the Marsh, often for extended periods of time, diluting the saline water in the estuary well into the year. These changes in salinity of water supplied to the Marsh were certainly reflected in the variety and quantity of marsh vegetation.

After the Gold Rush, however, widespread reclamation of California's wetlands -- including the Suisun Marsh -- shifted control of much of the Marsh habitat to man. Beginning in 1850, levees were built in the Suisun Marsh to "reclaim" land for agricultural use and, by 1930, 44,600 acres had been developed. During this period, the generally good quality of the water available in the Marsh made the growing of beans, tomatoes, asparagus, corn and wheat both practical and profitable. But, by the early 1930's, commercial agriculture in the Marsh largely ceased because upstream water diversion and development had reduced freshwater outflows from the Sacramento/San Joaquin Delta resulting in greater tidal intrusion of highly saline water from San Francisco Bay. This, in turn, produced salt levels in the soils which exceeded the tolerance of commercial crops. Although current agricultural practices include some cattle grazing and limited dry farming of grain crops where suitable soils exist, most of the reclaimed marshland has been converted to private duck

clubs and state wildlife areas, both of which use the levee systems developed for agriculture as a management tool to provide habitat for wildlife.

In 1937, the U.S. Water and Power Resources Service (USWPRS) (formerly the U.S. Bureau of Reclamation) started construction of a series of water diversion and development projects known as the Central Valley Project (CVP). In 1961, the California Department of Water Resources (CDWR) started construction of a series of similar purpose facilities known as the State Water Project (SWP). By the late 1960's, the reduced Delta outflows resulting in part from these two projects had significantly increased salinity levels in the Marsh waters. This trend has continued to the present and during the 1977 drought, even though the projects supplemented the Delta outflow, salinity levels were so high that the production of waterfowl food plants was reduced by 80% in certain areas of the Marsh. Further reductions in Delta outflow are anticipated in the future as both project and nonproject upstream diversions increase. As this occurs, unless mitigative actions are undertaken to maintain the quality of the Marsh's water supply, the habitat in large areas of the Marsh will change to salt marsh type vegetation and its value to wintering waterfowl will be reduced up to 80%.

2) 1978 Decision of the State Water Resources Control Board - recognizing the local, state and national significance of the Marsh, the State Water Resources Control Board (SWRCB) adopted

Decision 1485 in August of 1978. This Decision directed the USWPRS and the CDWR to prepare a plan which identified ways to protect and, if possible, enhance the Marsh habitat. It also established interim water quality standards to partially protect the Marsh during the period preceding implementation of the new plan.

3) The agencies' plan - a draft plan to provide adequate quality water to most of the managed wetland areas of the Marsh was submitted to the SWRCB by the CDWR on October 1979. The plan proposes a combination of Delta outflow and physical facilities. In order to meet a set of water quality standards which would adequately protect the wildlife habitat on the managed wetlands in the PMA, the Decision also required implementation of the plan by October 1, 1984.

4) Impacts of the plan - under the proposed plan, the salinities of the rivers, bays and sloughs in the PMA will depend upon the amount of Delta outflow. As the anticipated increases in upstream uses occur, the duration of adequate quality springtime water will decrease, particularly in dry years. Such increases in tidal water salinity durations may result in the partial conversion of tidal marshes from stands of tule and bulrush to cordgrass and pickleweed. In addition, the habitat of the offshore islands - Roe, Ryer, Freeman and Snag - which are not served by the new water supply system may change from brackish water plant species such as alkali bulrush, lamb's quarter and brass buttons to salt marsh species such as cordgrass and pickleweed.

In the managed wetlands of the Marsh, the diversity of habitat is expected to increase. The plan proposes to provide water to the managed wetlands within the PMA of a quality which, with intensive management, will be adequate to grow alkali bulrush, lamb's quarter and brass buttons. In order to do this in the hard to reach areas, water of better quality will be available to certain other areas of the Marsh. To take advantage of the availability of less brackish water supplies in these areas, the SRCD has developed alternative water management schedules suitable for several types of plant families.

5) Water supply plan implementation - in order to obtain USWPRS participation in supplying the necessary quality water and funding and constructing the facilities needed to deliver that water to and distribute it within the Marsh, the SRCD is sponsoring federal legislation. Companion bills covering USPWRS involvement in the first phase of the plan have been introduced by Congressman Vic Fazio and Senator Alan Cranston.

The long term quality of the water supply available to the managed wetlands can be assured in several ways. The least reliable is by administrative decrees such as D 1485. The next best way is by state and federal legislative action and the strongest assurance of compliance lies in a legally binding contract between the interested parties. At the present time, the SRCD has entered into such a legally binding contract with the CDF&G and the CDWR covering the interim (until 1984) quality of the Marsh's water supply. The SRCD anticipates

signing a similar agreement covering the permanent water quality standards with the CDWR, the CDF&G and the USWPRS.

B. PRIVATE JOINT USE FACILITIES

The mitigative water supply system and the individual ownership management plans constitute the two most important elements of the overall management plan. There is, however, another factor which must be considered in developing a complete plan - the role of privately owned joint use facilities. Joint use facilities are water management facilities whose operation and/or maintenance affects the ability of two or more individual ownerships to manage their habitat effectively. When properly constructed, operated and maintained they provide cost effective optimum management capability to the individual ownerships with minimum habitat impact. When poorly constructed, operated or maintained, they adversely impact the management capability of several ownerships. Since these facilities are often not "owned" by anyone, the current level of operation and maintenance frequently leaves much to be desired. In other instances they may be operated and maintained by one of the landowners primarily for his own benefit without due regard to the impacts on his neighbors.

Typical joint use facilities include:

1. Levees providing water level control to more than one individual ownership.
2. Water control facilities (flap gates, weirs, etc.) serving more than one individual ownership.

3. Water supply or drainage ditches serving more than one individual ownership.

The exterior levees in the PMA are an excellent example of the significance of joint use facilities. A detailed analysis of the problem of joint use exterior levees is attached as Exhibit "A".

The problem posed by joint use of privately owned water transfer and management facilities is actually two problems - one of operation and the other of maintenance. With respect to operation, the SRCD intends to establish appropriate site specific regulations as part of the activity required under Section 9962 of the PRC. With respect to maintenance, the SRCD intends to encourage the landowners directly involved to form localized improvement or reclamation districts with assessment power to perform the work. These proposals will be further discussed in the Implementation element of the SRCD's component of the Local Protection Plan.

C. LAND USE AND PUBLIC ACCESS

1. Land forms -- the land form distribution within the PMA is broken down approximately as follows:

| | |
|---|---|
| Managed wetlands | 52,300 acres |
| Tidal wetlands | 6,300 acres |
| Rivers, Bays & Sloughs | 29,500 acres |
| TOTAL | 88,100 acres |

Due to natural accretion, the amount of tidal wetlands is gradually increasing, particularly around the edges of Grizzly and Honker Bays. With this exception, little change in land form is anticipated in the foreseeable future. In addition, the policies of the Suisun Marsh Protection Plan prohibit future conversion of tidal marshes or open water areas to managed wetland or agricultural status.

2. Present land ownership - the land ownership within the PMA is divided approximately as follows:

| | | |
|---|---|---|
| (a) State and federal (56.2%) | | |
| (i) | Rivers, bays and sloughs | 29,500 acres |
| (ii) | Tidal wetlands | 6,300 acres |
| (iii) | Managed wetlands | 13,700 acres |
| | Subtotal | 49,500 acres |
| (b) Private (43.8%) | | |
| (i) | Managed wetlands | 38,600 acres |
| | TOTAL | 88,100 acres |

The SRCD's authority is limited to those lands in private ownership.

3. Public access - comparing the acreage in state and federal ownership with that privately held, it is obvious that the amount of public access presently available is substantial but limited by seasonal restrictions and lack of funding for further development. In addition, the types of access are currently limited in variety. However, Section 29003(e) of the PRC provides that there is a need for

"Development and implementation of plans and policies to protect the Marsh from degradation by excessive human use." In Section 29008 - "The Legislature further finds and declares that the Suisun Marsh Protection Plan is a more specific application of the general, regional policies of the San Francisco Bay Plan prepared and administered by the San Francisco Bay Conservation and Development Commission pursuant to Title 7.2 (commencing with Section 66600) of the Government Code, and is an appropriate supplement to those policies because of the unique characteristics of the Suisun Marsh. Therefore, the Legislature declares that the appropriate policies of both the San Francisco Bay Plan and the Suisun Marsh Protection Plan shall apply within any area that is within the commission's jurisdiction, as defined in Section 66610 of the Government Code, and that is also within the Marsh, as defined in Section 29101 of this code, except where the San Francisco Bay Plan and the Suisun Marsh Protection Plan may conflict. <u>If a conflict occurs in a specific instance, the policies of the Suisun Marsh Protection Plan shall control</u>." (Emphasis added.) Section 29011 of the PRC provides that: "The Legislature further finds and declares that the Suisun Marsh is a fragile ecological system and that, in order to protect wildlife, many areas of the Marsh should not be subject to extensive human intrusion. Highest priority, therefore, should be given

to developing and maintaining opportunities for public access on land currently in, or in the future to be in, public ownership."

Because of these legislative provisions, the public access element of the SRCD's overall plan has emphasized implementation of Section 29009 of the PRC which provides that: "The Legislature further finds and declares that land within or adjacent to the Suisun Marsh.should be acquired for public use or resource management, or both, and facilities suitable for such purposes should be constructed thereon; if the land meets one or more of the following criteria: (a) It is suitable for passive recreational purposes such as fishing and nature observation and is located in the outer portions of the Marsh near population centers on existing transportation routes, such as State Highway Route 12. (b) It is suitable for the purpose of restoring areas to tidal action or to marsh or managed wetland conditions and such restoration cannot be required as a condition of private development. (c) It is suitable for providing additional wildlife habitat necessary to effective wildlife management, including consolidation of management units and improved public hunting opportunities. Acquisitions within this category should avoid privately owned property already managed as wildlife habitat unless offered for sale to the state."

Currently, the CDF&G is acquiring and developing the Hill Slough Wildlife Management Area in accordance with these provisions. This newly established area presently contains 1,112 acres south of Highway 12 at Grizzly Island Road and present plans envision enlargement of the area by additional acquisitions as they become available in the same general section of the Suisun Marsh.

In addition, studies are currently underway to identify non-wetland areas in the Marsh which could be converted to wetland status as mitigation for the loss of brackish marsh habitat on Ryer, Roe, Freeman and Snag Islands which is being caused by decreased Delta outflows.

These programs implement the provisions of Sections 29003(e), 29009 and 29011 of the PRC and the Recreation and Access Policies of the Suisun Marsh Protection Plan. They are also consistent with the Solano County portion of the San Francisco Bay Public Access Plan developed by the BCDC.

## III. INDIVIDUAL OWNERSHIP MANAGEMENT PROGRAMS

Section 29412.5 of the PRC requires the SRCD's component of the Local Protection Program to: "include a water management program for each managed wetland in private ownership within the primary management area and shall specify all necessary development related to such management." These programs must be reviewed by the CDF&G and certified by the BCDC. The

objectives and scope of these programs reflect the policies and provisions of the Suisun Marsh Protection Plan and are presented in detail in Exhibit "B".

Under a contract with the SRCD, the U.S. Soil Conservation Service (SCS) has prepared a water management program for each of the 138 individual private ownerships greater than 5 acres in size within the PMA which are managed primarily for wildlife purposes. These site specific detailed programs are the foundation of the management program. Due to funding limitations, plans have not been developed for the 16 ownerships which are managed for both wildlife and agricultural purposes or the 6 ownerships which are primarily agricultural. (Also see page 29)

In addition, the CDF&G has prepared a Marsh Management Manual as a step by step "how to" guide to assist the private landowners in implementing their individual management programs.

IV. DIKING, FLOODING, DRAINING, FILLING AND DREDGING STANDARDS

Section 29401(d) of the PRC requires the SRCD to develop "enforceable standards for diking, flooding, draining, filling and dredging of sloughs, managed wetlands and marshes" within the PMA. This task has been completed after consultation with the BCDC, the CDF&G, Solano County and the Solano County Mosquito Abatement District (SCMAD). These standards reflect the policies and provisions of the Land Use and Marsh Management Section of the Suisun Marsh Protection Plan, and are presented in detail in Exhibit "C".

V. REGULATIONS

Section 9962(a) of the PRC states; "The District shall issue regulations requiring compliance with any water management plan or program for privately owned lands within the primary management area . . ." To carry out the mandate of this section, the SRCD intends to adopt the following regulations after the BCDC has certified the SRCD's component of the Local Protection Program. Implementation of the actions called for by these regulations shall become mandatory in accordance with the provisions of Section II B (pages 28-31) of the Implementation Section of this Program.

1) Each private managed wetland ownership within the Primary Management Area shall be managed in conformity with the provisions and recommendations of the individual management program for that ownership, as approved by the Suisun Resource Conservation District and certified by the California Department of Fish and Game and the San Francisco Bay Conservation and Development Commission. It is the responsibility of the landowner of record to comply with the provisions and recommendations of the certified management program. If there is a change in land ownership, the new landowner assumes this responsibility. Proposals for modifications of certified programs shall be submitted by the landowners to the SRCD. The SRCD will treat such proposals as amendments to its

component of the Local Protection Program and will process them on an annual basis in accordance with the provisions of Section 29418 of the PRC.

2) The schedules for flooding and draining and the standards for diking, filling and dredging set forth in the Suisun Resource Conservation District's component of the Local Protection Program shall be complied with in implementing the provisions and recommendations of each certified individual management program. The facilities required to meet the schedules shall be maintained in a manner which will assure that they function properly. It is the responsibility of the landowner involved to see that this is done.

3) Where suitable physical facilities exist, each individual private ownership shall manage his property to include at least one leach cycle during the period between January 15th and March 15th each year. The post season drain does not constitute one leach cycle.

4) Each private landowner within the PMA shall report to the SRCD by February 1st of each year the action which he has taken during the preceding twelve months to implement his certified individual ownership management program.

5) Those private landowners on Grizzly, Simmons, Wheeler, Dutton, Hammond and Van Sickle Islands supplied with water from the Roaring River Unit of the Suisun Marsh Overall Water Supply Facilities shall agree among themselves within one year following adoption of this regulation by the SRCD which ownerships will receive water from Roaring River during the 10 day period commencing 20 days before and ending 10 days before the start of the duck season and which ownerships will receive water from Roaring River commencing 10 days before and ending the last day before the start of the duck season.

6) Those private landowners receiving water from, or discharging water to, joint use conveyance facilities which are not part of the Suisun Marsh Overall Water Supply Facilities shall enter into appropriate binding agreements with each other to assure that such joint use facilities are operated and maintained in such a way as to permit each landowner involved to comply with the provisions and recommendations of his certified management program.

7) Those private landowners receiving water from, or discharging water to joint use conveyance facilities which are part of the Suisun Marsh Overall Water Supply Facilities shall operate the installed water

management controls in such a way as to optimize facility effectiveness.

8) All private landowners within the Primary Management Area shall comply with the regulations of the Bay Area Air Quality Management District with respect to burning of vegetation within the Primary Management Area. Violation of such a regulation is a violation of the provisions of the Suisun Marsh Preservation Act.

9) At any time when abnormal conditions make it infeasible to comply with these regulations, the SRCD may waive or modify any regulation. "Abnormal conditions" are defined as fire, local flooding, excessive river stages, levee failure, unusual financial burdens and acts of God.

10) Further regulations which may from time to time become necessary to carry out the provisions of the Suisun Resource Conservation District's Management Program.

# PART TWO

# IMPLEMENTATION

## IMPLEMENTATION

Section 29401(d) of the PRC requires the SRCD to prepare a management program; ". . . designed to preserve, protect and enhance the plant and wildlife communities within the primary management area of the marsh. . ." The SRCD's program consists of the following principal elements:

I. General components of the management program including:

   1) Development of a plan to provide a mitigative water supply to the managed wetlands within the PMA.

   2) Development of a joint use facilities program.

   3) Consideration of land use and public access issues.

II. Development of individual water management programs for each privately owned managed wetland within the PMA.

III. Development of enforceable standards for diking, flooding, draining, filling and dredging of sloughs, managed wetlands and marshes within the PMA.

IV. Development of regulations to be adopted by the SRCD which will ensure effective water management on privately owned lands within the PMA.

Certain elements of the SRCD's Management Program can be readily put into operation. However, full implementation will require additional legislation and sources of funds. The following sections describe in detail present capabilities and additional needs.

I. GENERAL COMPONENTS OF THE MANAGEMENT PROGRAM

A. Marsh water supply - this element includes both delivery of adequate quality water to the Marsh and distribution within it to the intake structures of each individual ownership. Stage I of this program, known as the Initial Facilities, is currently under construction by the CDWR and is scheduled for completion by October 1, 1980. This timetable is in conformance with the conditions of the SWRCB decision D 1485. Also signed and in effect is a legally binding contract between the CDWR, the CDF&G and the SRCD which defines the scope of the work to be performed in constructing the Initial Facilities, the quality of the water which will be provided to the Marsh during the interim period until October 1, 1984, and the responsibility of the SRCD to see to it that the water is used efficiently.

While the CDWR has undertaken to construct the Initial Facilities entirely with its own funds, it is appropiate and equitable for the USWPRS to share in this expense. Accordingly, federal legislation (H.R. 4084) has been introduced in Washington which authorizes the USWPRS to join with the CDWR in

constructing the Initial Facilities and sharing the cost. The prospects for enactment of this legislation appear favorable and such a step would establish a highly desirable precedent with respect to construction of the Overall Facilities necessary for a Marsh-wide solution of the water quality problem.

With respect to a Marsh-wide water quality solution, the USWPRS regional office is submitting a draft of its feasibility level Overall Facilities plan (including an environmental statement) to the USWPRS headquarters in Washington for review and comment. Following headquarters approval, the refined draft will be released for public comment.

On October 1, 1979, the CDWR submitted a draft of a modified version of the USWPRS Overall Facilities plan to the SWRCB. The comment period on this plan closed November 5, 1979, and the final plan will be submitted to the SWRCB after the environmental review process is completed. This is expected to occur by August, 1980. A prompt decision to proceed with implementation of this plan will be necessary if the D 1485 October 1, 1984 deadline for completion of the Overall Facilities is to be met.

B. Joint Use Facilities:

1) Program preparation - no comprehensive inventory of existing or needed joint use facilities exists and it is highly desirable to develop one. Accordingly, the SRCD plans to request a proposal from the SCS covering the scope and costs of such a study. When this is received, it will be submitted

to the Legislature for inclusion in the 1981-82 budget as provided for in Section 15 of Chapter 1155 of the Statutes of 1977.

However, the Frost Lake and Van Sickle Island areas of the PMA have already been identified as requiring joint use facilities and a proposal has been obtained from the SCS covering the cost of planning these facilities. The SRCD intends to seek funding for this planning work as part of the 1981-82 state budget as provided for in Section 15 of Chapter 1155 of the Statutes of 1977.

In addition, several units of the Overall Facilities which have been proposed by the USWPRS and the CDWR will be joint use facilities. These include the Roaring River, Grizzly Island, Cordelia, Cygnus and Morrow Island Units and may include others. Design, construction, operation and maintenance of these facilities is the responsibility of the water agencies.

2) Program implementation - within two years after a plan is developed for each joint use facility, other than those constructed by the water agencies, compliance with Regulation #6 will become mandatory. Within one year after the joint use facilities constructed by the water agencies are functionally completed, Regulation #7 will become mandatory.

With respect to the problem of maintaining the joint use facilities known and designated as "exterior levees", the SRCD

has been successful in getting the scope of the U.S. Corps of Engineers' new authorized study on the potential impacts of tidal flooding in San Francisco Bay expanded to include the Suisun Marsh. It is anticipated that a product of this study will be a plan for providing adequate maintenance of exterior levees.

C. Land Use and Public Access - in conformity with the various provisions of the Suisun Marsh Preservation Act and the Suisun Marsh Protection Plan, the SRCD's general management program does not contemplate changes in land use or public access on the privately owned lands within the PMA and therefore no implementation is required.

II. INDIVIDUAL OWNERSHIP MANAGEMENT PROGRAMS

A. Program Preparation - the SCS is currently preparing individual management programs for 82 private ownerships within the PMA. This work is expected to be completed by December 31, 1979. However, these programs will not have an "engineering specification" level of detail because of the lack of data establishing the relationship of pond bottom elevations to high tide elevations. This relationship must be determined in order to properly size water inlet and outlet structures. The SCS has submitted a proposal in the amount of $45,700 to develop this data for these 82 ownerships. The CDWR has agreed to provide $23,000 and the BCDC has included the balance in its 1980-81 budget request. Field work is expected to start in April, 1980 and be completed by October, 1980 with the subsequent refinements to these management plans completed by December 31, 1980.

In addition, the increased level of detail now called for in the individual management programs requires upgrading of 56 existing management programs previously classified as "Acceptable". This work basically consists of establishing the pond bottom/high tide elevation relationships for these ownerships and refining their management programs. The SRCD intends to seek funding for this planning work as part of the 1981-82 state budget as provided for in Section 15 of the Chapter 1155 of the 1977 Legislative Statutes.

Lastly, there are 6 agricultural and 16 combination managed wetland/agricultural ownerships within the PMA for which individual management programs have not been prepared because of funding constraints. These plans will include recommendations which will optimize wildlife benefits compatable with the recommended agricultural practices. The SRCD intends to seek funding for this planning work as part of the 1981-82 state budget as provided for in Section 15 of Chapter 1155 of the 1977 Legislative Statutes.

B) Program Implementation - within 60 days after certification of the SRCD element of the Local Protection Program by BCDC, the SRCD will adopt the regulations contained in Section V of the Management Program (pages 18-21). However, mandatory compliance with these regulations by the private land owners within the PMA shall be in accordance with the following time table:

1. Regulations 5 and 8 - upon adoption by the SRCD.

2. Regulations 2, 3, 4 within 60 days after both of the following have occurred:

   a) Legislation providing authority for the SRCD to implement its Suisun Marsh Management Program has been enacted.

   b) The necessary operational funds have been provided to the SRCD in accordance with the provisions of Section 15 of the Suisun Marsh Preservation Act of 1977.

   c) A source of funding adequate to cover the SRCD's historical types of operating expense has been provided.

3. Regulation 1 - the following actions must occur prior to mandatory compliance with Regulation 1 by an individual private ownership:

   a) Legislation providing authority for the SRCD to implement its Suisun Marsh Management Program has been enacted.

   b) The necessary operational funds have been provided to the SRCD in accordance with the provisions of Section 15 of the Suisun Marsh Preservation Act of 1977.

   c) An engineering specification level plan of the type discussed in Section II A (pages 27-28) has been completed for that individual private ownership.

d) The CDWR and/or the USWPRS have entered into a legally binding contract with the SRCD requiring the water agency/agencies to:

i) comply with the post-1984 Marsh water quality standards specified by the SWRCB's Decision 1485.

ii) by October 1, 1984 construct the facilities required to provide a mitigative water supply for the Marsh including the water intake and discharge structures necessary to enable each individual landowner to flood and drain his property within 30 days where such facilities are necessary to achieve adequate levels of waterfowl food production, and the individual ownership management plans have been revised to reflect these changes.

After the above actions have occured, the private manager wetland ownerships within the PMA shall comply with Regulation 1 in accordance with the following schedule:

a) ownerships capable of operating in accordance with their individual management programs - 60 days or the following January 15th, whichever comes later.

b) All other ownerships - 4 years after enactment of legislation fully implementing the SRCD's Suisun Marsh Management Program.

C. Program Financing - each individual management program will identify "needed improvements" which are necessary to achieve desirable habitat values. The SRCD's regulations will require private landowner implementation of these improvements. In addition, each program will contain "optional improvements" whose implementation would optimize habitat values. In most cases, undertaking the "needed improvement" program or implementation of the "optional improvement" will require significant expenditures by the private landowners for both capital improvements and operation and maintenance expenses. To provide these funds, the SRCD proposes the following approach:

1. Capital Improvements

The adequacy of the water management facilities on the individual private ownerships in the Marsh varies tremendously. The "Suisun Marsh Study" published in 1975 by the SCS determined that at that time the condition of the facilities was as follows:

| Physical Feature | Condition (in percentage of ownerships) 1/ | | | |
|---|---|---|---|---|
| | Excellent | Good | Fair | Poor |
| Levees Exterior | 5 | 51 | 33 | 11 |
| Levees Interior | 2 | 56 | 30 | 12 |
| Ditches Main | 9 | 71 | 18 | 2 |
| Ditches Circulation | 2 | 53 | 40 | 5 |

1/ See Appendix 1 for definition of conditions.

In addition, it was determined that 60% of the private ownerships had water control structures such as inlet and outlet

gates which did not provide the desired capability of flooding and draining within a 30 day period. Since this data was collected, voluntary programs initiated by the individual landowners have significantly increased the number of ownerships with adequate water management facilities. Even so, it is evident that a substantial number of improvements are still necessary before all ownerships have adequate facilities, and the capital cost of these improvements will be significant. Since these improvements are mandated by AB 1717, and since the improved habitat values which will be obtainable upon their completion will provide a public benefit, the SRCD proposes that 50% of the cost of such facilities, other than those provided by the water agencies, be paid by the state. It also recognizes that the exact nature of the improvements cannot be fully determined until the pond bottom/high tide relationship of individual private ownerships is established, and proposes that the improvements found necessary when this determination is completed should qualify for such matching funds.

In addition, construction of these improvements in a timely manner may cause severe financial problems for certain landowners. To minimize this impact, the SRCD has considered three alternative courses of action:

a) Form an Improvement District covering the entire PMA. This course of action is based upon the premise that the SRCD would undertake any necessary improvements on the individual ownerships. To obtain the necessary funds, the

SRCD would include 50% of each year's capital improvement fund requirement in its annual budget and would assess the landowners for the balance on the basis of benefits received. Unfortunately, the nature of the problems vary so much from ownership to ownership that the determination of benefits is extremely difficult. In addition, such an approach raises a variety of legal questions and imposes liabilities and responsibilities on the SRCD which are undesirable. The SRCD therefore feels that this course of action is the least desirable of the alternatives available to it.

b) Obtain the necessary legislative authority to issue warrants and use the resulting funds to make long term, low interest loans to landowners secured by deeds of trust on the real property involved. The landowners would use the loan proceeds to cover their share of the cost of the improvements, and the SRCD would be providing a service which the landowner could take advantage of as he saw fit. The SRCD considers that this may be an acceptable course of action.

c) Provide assistance to private landowners in setting up local improvement or reclamation districts which would have the ability to make long term loans to individual landowners. The SRCD considers this an acceptable and, in fact, the preferable course of action.

Each individual private ownership management program also identifies "optional improvements" which would further enhance

the habitat on that ownership to the optimum level. To provide an incentive for the landowner to undertake these extra actions, the SRCD proposes that 50% of such costs also be paid by the state.

2. Management Operating Costs

In many instances, the individual management programs will call for not only better facilities but also improved management practices. In the 1975 SCS study, only 34% of the ownerships were following the recommended practices for improving the production of brackish water waterfowl food plants. Since then, additional landowners have adopted the recommended practices, but there is still a significant number of private ownerships whose management remains inadequate.

Operating and maintenance costs data for private ownerships in the Marsh is extremely scarce. The following information was developed by the SCS during its 1973 survey and is the best currently available:

OPERATION AND MAINTENANCE OF DUCK CLUBS
IN THE SUISUN MARSH - 1973 INVENTORY

| | Acres | ANNUAL COST Maintenance | Operation | Total | Cost/acre |
|---|---|---|---|---|---|
| 1 | 350 | $ -- | $12,000. | $12,000. | $34 |
| 2 | 1140 | 12,000. | -- | 12,000. | 11 |
| 3 | 300 | 2,000.** | | 2,000. | 7 |
| 4 | 100 | -- | 4,200. | 4,200. | 42 |
| 5 | 90 | 1,250. | -- | 1,250 | 14 |
| 6 | 320 | -- | 15,000.* | 15,000. | 47 |
| 7 | 470 | 16,500. | -- | 16,500. | 35 |
| 8 | 160 | 4,000. | -- | 4,000. | 25 |
| 9 | 200 | -- | 3,000. | 3,000. | 15 |
| TOTAL | 3130 | $35,750. | $34,200. | $69,950. | $22 (avg. |

*Includes caretaker
**Indicated taxes were additional

The SRCD's educated guess is that in 1973, the annual operating and maintenance cost for an inadequately maintained ownership was about $14/acre, and about $22/acre for an adequately managed property. Costs on certain ownerships, such as those with extensive amounts of exterior levees probably ran as high as $35/acre. Because of inflation, by 1980 the various per acre operation and maintenance costs are expected to be at least double.

From this information, it is obvious that the economic impact of upgrading operation and maintenance practices will be substantial and are likely to bear most heavily on those landowners who can least afford the additional costs. As a solution to this problem, the SRCD proposes the cost sharing program previously described, with the state contributing 50% of the funds.

In addition, landowners who want to optimize their habitat by adopting the optional management practices outlined in their management programs should be encouraged to do so. To provide such an incentive, the state funding previously discussed would be used to cover 50% of this type of operation and maintenance cost.

3. Individual Ownership Program Funding

To fund the program outlined in Sections 1 and 2, the SRCD proposes to sponsor future legislation providing for partial state funding of activities of this nature.

III. DIKING, FLOODING, DRAINING, FILLING AND DREDGING STANDARDS

The SRCD will adopt a regulation requiring that all activities of this nature on privately owned managed wetlands within the PMA be conducted in accordance with these standards.

IV. REGULATIONS

A. Administration - successful implementation of a substantial portion of the SRCD's overall management program will depend upon private landowner compliance with its regulations. The SRCD currently has no authority to enter onto private lands within the PMA to determine whether or not its regulations are being followed.

For those private landowners who participate in the proposed matching fund program, the completion "inspection" required before disbursement of the funds will effectively establish whether or not the ownership is in compliance. However, some landowners may not elect to participate in the cost sharing program. In those cases, the SRCD intends to act in an overseer role responding to any compliants which it receives concerning regulation violations. Upon being made aware that a violation may exist, it will discuss the matter with the landowner involved. If it is determined that a violation does exist, and the landowner involved refuses to take action within a reasonable time, the BCDC will be requested to take the appropriate steps under the provisions of Section 29610 and 29611 of the PRC. These sections provide that:

"29610. (a) Any person who intentionally or negligently violates any provisions of this division shall be subject to a civil fine of not to exceed five thousand dollars ($5,000).

(b) In addition to any other penalties, any person who intentionally and knowingly commences any development in violation of this division shall be subject to a civil fine of not less than fifty dollars ($50) and no more than five thousand dollars ($5,000) per day for each day in which such violation occurs.

(c) If any person negligently or intentionally violates a cease and desist order issued pursuant to Section 29601, then the penalties provided in subdivision (a) and (b) of this section shall not apply and the penalties provided in Section 66641 of the Government Code shall apply.

"29611. Except as provided in Section 818 of the Government Code, whenever a person has intentionally and knowingly violated any provision of this division, the commission may maintain an action, in addition to an action under Section 29610, for the recovery of exemplary damages. In determining the amount to be awarded, the court shall consider the amount of such damages necessary to deter further violations."

B. SRCD Financing - to enable the SRCD to implement the provisions of its management program, additional sources must be developed to provide the necessary operating funds. These

funding needs break down into monies required to cover the SRCD's normal historical operating expenses and those required to cover the incremental operating expenses incurred by the SRCD in carrying out its mandated Management Program.

1) Normal historical operating expenses - under the provisions of current law, the annual tax revenues available to the SRCD to cover its traditional types of operating expenses are less than $1,000 per year. At the present time, this income is supplemented by voluntary donations of approximately $20,000 per year. Such a situation is obviously undesirable. Accordingly, the SRCD proposes to obtain funds to cover its traditional types of operating expenses by applying for funding from the General Fund.

2) Incremental operating expenses incurred by the SRCD in carrying out its overall management program will be funded in the manner described the Suisun Marsh Preservation Act. The amount of funds required will, of course, depend upon the scope of the SRCD's activities. The following program with its attendant costs represents the SRCD approach to this subject:

a) General Management Program:

(i) Water supply facilities - the SRCD would assume the responsibility for operation and maintenance of the water supply facilities constructed by the water agencies. Operation would be done by SRCD personnel. Maintenance would be subcontracted out. Appropriate costs would be born by the water agencies.

(ii) Private joint use facilities - the local improvement or reclamation districts would be responsible for operation and maintenance of private joint use facilities and would coordinate their activities through the SRCD.

(iii) If the SRCD can obtain hold harmless agreements from the landowners in the various zones of benefits, SRCD personnel would oversee the maintenance of exterior levees in the PMA. Actual work would be performed by individual landowners, local reclamation or improvement districts, or subcontracted out by the SRCD.

b) Individual Management Programs:

The SRCD will determine whether or not an individual private ownership is making progress in implementing its management program and complying with SRCD regulations by one or more of the following methods:

(i) the annual report required by Regulation #4;

(ii) the annual inspection required for those private ownerships participating in a cost sharing program.

(iii) after enactment of legislation implementing the SRCD's Suisun Marsh Management Program, the SRCD will contract with the SCS to provide personnel who, in cooperation with the CDF&G and the SCMAD would contact the individual private landowners.

APPENDIX 1

DEFINITIONS OF CONDITION AND RESULTS

- Water Distribution (condition)

1. Excellent - Ditches developed for good water circulation; no vegetation, etc., to impede flow of water.

2. Good - Ditches generally in good shape, some vegetation or other conditions which do not allow unimpeded circulation of water.

3. Fair - Ditches overgrown with vegetation which impedes flow of water, or lack of circulation ditches in some areas.

4. Poor - Ditches overgrown with vegetation and/or lack circulation ditches in most areas and very little water circulation.

- Levees (condition)

1. Excellent - Low growing vegetation or rock rip-rap on sides of levees to prevent erosion, top of levee in good condition allowing vehicles to be driven on top and inspection, no muskrat burrows, cracks and levee not composed of high organic soils.

2. Good - Levees generally in good shape; may have some undesirable vegetation, but minor in extent; can drive on levee; some cracks or muskrat holes, but repairable with minor effort.

3. Fair - Numerous areas needing repair due to low spots; cracks or holes, vegetation overgrowth which prevents easy access for inspection and repair; some erosion occuring. Some seepage possibly due to organic content, holes near top, etc.

4. Poor - Levee overgrown with vegetation preventing access for inspection or repair, numerous holes, cracks, etc., allowing periods of uncontrolled water flow or potential for uncontrolled flooding without major repair.

EXHIBIT "A"

PROPOSED EXTERIOR LEVEE PROGRAM

The exterior levees in the Suisun Marsh present special maintenance problems. First, they are primarily levees that protect managed wetlands which provide unique brackish water habitat that is of importance to the public and the Pacific Waterfowl Flyway, and a levee failure on one ownership is likely to affect contiguous inland ownerships as well. Second, they are exposed to wind generated wave action and tidal erosion. Third, many levees are subjected to the significant wave action generated by boat traffic. Fourth, many of these areas are presently partially protected by tule berms. As increased exports of water from the Delta reduce Delta outflows, salinities in these areas will increase to a level where the tules are killed and the berms destroyed. Fifth, the cost of maintaining these levees will shortly reach a level where it is no longer within the financial capabilities of the landowners.

The District's proposed solution to this problem is a multifaceted one which is based upon the various sources of the problem. First, because of the extensive area of direct or indirect benefits, a marsh-wide entity would be most appropriate to provide levee maintenance. Specifically, an improvement district or districts which could be formed within

the Resource District would be suitable entities. That component of the levee maintenance costs attributable to normal wave or tidal action could thus be spread across the direct or indirect beneficiaries. Secondly, that component of the levee maintenance cost attributable to the Stockton/Sacramento Channel ship traffic should be funded by the Corps of Engineers as an O and M cost of their projects as mitigation for project effects. Thirdly, the state and federal water agencies should fund the cost of a study to: develop a salt tolerant vegetative berm (probably of cordgrass) to replace the prospective loss of tules berms. They also should fund the cost of establishing and maintaining this berm as an O and M cost of their Marsh water supply project.

EXHIBIT "B"

STATEMENT OF THE INTENDED OBJECTIVES AND SCOPE OF THE INDIVIDUAL PRIVATE OWNERSHIP MANAGEMENT PLANS

The intended objectives of these plans are:

1) To provide the private landowners within the Primary Management Area of the Suisun Marsh with a management tool which, if used effectively, will optimize the wildlife values of their lands.

2) To provide a basis on which the Suisun Resource Conservation District can establish regulations to be followed by the landowners which will improve marsh management practices within the limitations imposed by the quality of the water available to the landowners.

The scope of each plan will include:

1) A conservation plan map and legend.

2) A soils map and interpretive data.

3) The approximate elevation of the pond bottoms.

4) A summary of existing water control structures including location and description.

5) An analysis of flushing capability and any structural changes necessary to carry out the desired water management program.

6) An evaluation of the condition of the levees and ditches.

7) A vegetative survey including a determination of the percentage occurrence of desirable plants.

8) A water management schedule based upon an analysis of all of the above seven points.

9) Needed decisions and development necessary to carry out such management elements.

Each plan will contain "recommended" actions and practices necessary to achieve desirable habitat values. It is anticipated that the District will issue regulations requiring landowner compliance with these recommendations. In addition, each plan will contain "optional" actions and practices whose implementation would optimize habitat values.

Exhibit "C"

# SUISUN RESOURCE CONSERVATION DISTRICT STANDARDS COVERING DIKING, FLOODING, DRAINING, FILLING AND DREDGING OF TIDAL WATERS, MANAGED WETLANDS AND TIDAL MARSH WITHIN THE PRIMARY MANAGEMENT AREA OF THE SUISUN MARSH AS PROVIDED FOR BY SECTION 2900 et seq, OF THE PUBLIC RESOURCES CODE

## Section I - Title:

These standards shall be known as the Suisun Resource Conservation District (SRCD) Standards for diking, flooding, draining, filling and dredging of tidal waters, managed wetlands and tidal marshes within the Primary Management Area (PMA) of the Suisun Marsh (Marsh). These standards are established in accordance with the provisions of Section 29401(d) of the Public Resources Code (PRC).

## Section II - Definition:

1) Tidal waters are defined as open water areas within the PMA which are subject to daily tidal action.
2) Managed wetlands are defined as leveed areas within the PMA in which water inflow and outflow is artificially controlled, or in which waterfowl food plants are cultivated, or both, to enhance habitat conditions for waterfowl and other water-associated birds and wildlife.
3) Tidal marshes are defined as vegetated areas within the PMA which are subject to daily tidal action.

Section III - Purpose:

The purposes of these Standards covering diking, flooding, draining, filling and dredging are to preserve, protect and enhance the plant and wildlife communities within the PMA. By doing so, they will serve to protect the public interest through the development of wildlife habitat and prevention of mosquitoes. The improvement of the present water management practices called for by Sections 29003(b) and 29401(d) of the Suisun Marsh Preservation Act and the policies of the Land Use and Marsh Management Section of the Suisun Marsh Protection Plan will require the improvement of the water management facilities and procedures within the PMA. The standards and requirements of this element of the SRCD's component of the Local Protection Program specify how such improvements shall take place. They also meet the objective of minimizing activities in tidal marshes and waters.

Section IV - Scope:

These standards shall apply to all private activities undertaken on privately owned land within the PMA and are intended to supplement the provisions of any Solano County Grading and Erosion Control Ordinance within the PMA.

Section V - General Principles and Standards:

Diking, flooding, draining, filling and dredging activities shall be conducted so as to minimize any adverse effects on desirable plant and wildlife communities and to minimize the

potential for erosion and sedimentation. The following basic principles and standards shall serve as the minimum guidelines for the protection of plant and wildlife communities and the control of erosion and sedimentation:

1) Stripping or burning of vegetation, or other soil disturbance shall be done in a manner which will minimize adverse impacts on desirable plant and wildlife communities and control erosion and sedimentation.

2) Existing native vegetation shall be retained, protected, and supplemented wherever practical. Development shall be accomplished so that existing trees will be preserved whenever practical.

3) Exposure of soil to erosion by removal of vegetation shall be limited to the smallest area practical and for the shortest time practical. Soil exposure shall not exceed an area in which work can be completed during a single season to insure that soil stability is estalished well in advance of the rainy season. In general, relatively large scale soil disturbance such as discing, vegetation clearing by mechanical or chemical means, or pond bottom re-shaping shall be limited to not more than 30% of the area of an individual private ownership between April 1st and June 30th of a given year. Smaller projects such as structure removal or installation,

levee repair, or emergency projects may be done at any time.

4) Permanent control structures should be installed and final vegetation established as soon as practical.

5) Facilities shall be constructed in a manner which will minimize erosion and sediment deposition in adjacent waterways and wetlands.

6) Slopes, both cut and fill, shall not be steeper than 2:1 unless a thorough geological and engineering analysis indicates that steeper slopes are safe and appropriate erosion control measures are specified.

7) Cuts and fills shall not encroach upon existing watercourses, or constructed channels in a manner so as to adversely affect adjacent properties or the carrying capability of the watercourse.

8) Disposal of cleared vegetation and excavated materials shall be done in a manner which reduces the risk of erosion and sedimentation and shall conform to the provisions of these standards.

9) Diking, filling and dredging activities shall be conducted so as to minimize interference with critical wildlife activities such as nesting and breeding.

Section VI - Specific Principles and Standards:

A. TIDAL WATERS

1) Diking - before 1900 major areas of the PMA were leveed to isolate them from tidal action and to permit

the managed application of tidal waters for agricultural purposes. Under the policies of the Suisun Marsh Protection Plan, residual areas of tidal waters will remain in their current state. To assure that this happens, no new levee shall be constructed which isolates a water area, or portion thereof, that is currently subject to daily tidal action except in accordance with the provisions of a certified individual ownwership management plan, or with the permission of the appropriate permitting authorities.

2) Flooding and Draining - except as otherwise provided in this section, there shall be no action which interfers with unimpeded natural tidal action in any water area, or portion thereof, currently subject to it.

3) Filling - no filling of a water area, or portion thereof, which is currently subject to unimpeded natural tidal action shall be undertaken except in accordance with the provisions of a certified individual ownership management plan, or with the permission of the appropriate permitting authorities.

4) Dredging - no dredging of a water area, or portion thereof, which is currently subject to unimpeded natural tidal action shall be undertaken except as a source of material for levee maintenance or to keep open access channels to water inlet and outlet structures. Any dredging shall be performed in accordance

with the provisions of a certified individual ownership management plan, or with the permission of the appropriate permitting authorities. When dredging is undertaken it shall be done as provided in Section VI B 4, and all practical measures shall be used to minimize the loss of intertidal tule berms.

B. MANAGED WETLANDS

1) Diking -

a) new levee construction shall be limited to that specified in certified individual ownership management plans and shall conform to the specifications contained in Attachment "A". Proposals for other new levee construction shall be approved by separate marsh development permits as provided for in Section 29500 et seq. of the PRC.

b) renovation, restoration, repair and maintenance of existing levees shall conform to the specifications contained in Attachment "A".

2) Flooding and Draining - flooding and draining of managed wetlands within the PMA shall be done in accordance with one or more of the five water management schedules contained in Attachment "D" and identified more specifically in each certified individual ownership management plan. Alternative or modified water management schedules may be employed if approved

by SRCD after review by the Solano County Mosquito Abatement District (SCMAD), the California Department of Fish and Game (CDF&G) and the U.S. Soil Conservation Service (SCS), except that existing agricultural practices involving modified water management practices shall be permitted to continue. Any new ditches which are constructed in accordance with the provisions of a certified individual ownership management plan shall comply with the specifications contained in Attachment "B". Any new water control structures which are constructed in accordance with the provisions of a certified individual ownership management plan shall comply with the specifications contained in Attachment "C". Renovation and improvement of existing facilities shall be performed in accordance with the same specifications.

3) Filling - filling shall be limited to low areas that are presently deeply flooded and shall only be done to allow establishment and growth of emergent vegetation. Any filling to be done shall be included as an item or an addendum in a certified individual ownership management plan.

4) Dredging -

a) Dredge spoils from the construction of new ditches:

i) Main ditches - where practical, dredge spoil material shall be used for the maintenance of existing levees. Spoil material shall be deposited either on the crown or inboard side of the levee. Where the use of spoil material for existing levee maintenance is not practical, dredge spoils shall be considered as a source of material for filling low spots. If neither of the above disposal techniques is practical, spoil materials shall be sidecast along the edge of the ditch at a distance of not less than 4 feet from the edge of the ditch. Side cast soil material shall be placed in such a manner that it does not prevent water flow into or out of the ditch from the surrounding lands. To encourage the establishment of desirable vegetation, the height of the deposits of spoil material shall not exceed the water depth when the area is flooded to its normal depth.

ii) Spreader ditches - no special requirements.

b) Dredge spoils from the renovation or improvement of existing ditches:

i) Main ditches - spoil material shall be disposed of in the same manner prescribed in Section a) i above.

ii) Spreader ditches - no special requirements.

C. TIDAL MARSHES:

1) Diking - the policies of the Suisun Marsh Protection Plan provide that disturbance of tidal marsh shall be minimized. Therefore, there shall be no diking of tidal marsh areas except in conformance with the findings of the Protection Plan and the provisions of a certified individual ownership management plan, or with the permission of the appropriate permitting authorities.

2) Flooding and Draining - the policies of the Suisun Marsh Protection Plan provide that disturbance of tidal marsh shall be minimized. Therefore, activities which would affect the natural daily flooding and draining of existing tidal marshes shall be undertaken only in conformance with the findings of the Protection Plan and the provisions of a certified individual ownership management plan, or with permission of the appropriate permitting authorities.

3) Filling - in accordance with the policies of the Suisun Marsh Protection Plan, disturbance of tidal marsh shall be minimized. Therefore, filling of tidal marsh areas shall not be done except in conformance with the findings of the Protection Plan and the provisions of a certified individual ownership management plan, or with the permission of the appropriate permitting agencies.

4) Dredging - in accordance with the policies of the Suisun Marsh Protection Plan, disturbance of tidal marsh shall be minimized. Therefore, dredging of tidal marsh areas shall not be done except in conformance with the findings of the Protection Plan and the provisions of a certified individual ownership management plan, or for mosquito control as authorized by the SCMAD, or with the permission of the appropriate permitting authorities. Where practical, dredge spoils shall be used for the maintenance of existing levees. In other cases, dredge spoils should be disposed of in open waters.

ATTACHMENT "A"

SUISUN MARSH LEVEE SPECIFICATIONS

## SCOPE

This specification covers the design, construction and maintenance of levees in the PMA of the Suisun Marsh. Levees are embankments which protect managed wildlife habitat areas in the Suisun Marsh from uncontrolled flooding.

## DEFINITIONS

1. Exterior Levees - embankments which prevent uncontrolled flooding of marshland due to tidal action. The crown of these levees is normally about 9 feet above zero tide with a 12 foot top width.
2. Interior Levees - embankments which allow for management of water inside exterior levees. They are not exposed to tidal action. The crown of these levees is normally less than 4 feet above the natural ground with a top width of 10 feet.
3. Core - locally available material which is placed in a trench dug along the longitudinal axis of the levee.

## PURPOSE

1. Exterior Levees - the purpose of exterior levees is to facilitate water storage and control in order to promote wildlife habitat in the Marsh. Exterior levees are used to control tidal flow onto managed wetlands and prevent their uncontrolled flooding. They are used in conjunction

with interior levees, ditches, and water control structures to supply to or drain water from the land which they surround.

2. Interior Levees - the purpose of interior levees is to isolate specific areas within exterior levees for the purpose of providing those areas with individual control of water. They contain and control water used for ponding during the duck season and for leaching afterwards.
3. Cores - the purpose of installing a core is to eradicate existing animal channels in a levee and reduce water seepage through it.

## CONDITIONS WHERE THESE STANDARDS APPLY

Levees are usually built from spoil excavated from the inboard side of the levee or dredged from channels. The levee standards defined in this section should be used only on sites where:

1) The normal maximum water depth against an exterior levee does not exceed 7 feet above zero tide.

2) The maximum water depth against an interior levee does not exceed 3 feet above the natural ground.

3) The damage which is likely to result from a levee failure is low.

4) The area to be protected is used for wildlife habitat or agriculture and has minimal structural improvements.

Where one or more of the above conditions is exceeded, special design levee standards are required.

## DESIGN CRITERIA

A. Material - levee material shall be mineral or peat soils free of consolidated sod, roots, brush and other vegetative matter.

B. Placement - fill shall be placed so as to permit free drainage of surface water. The maximum fill height from the surface of the ground at start of construction for any one construction stage shall be five feet. If the designed height is greater than 5 feet, the levee shall be built in two lifts. Lumps and clods of earth shall be broken up by shaping or discing.

C. Cross Section -

1) New levees - the minimum standards for the construction of new levees shall be as follows:

a) Exterior levees:

i) The foundation shall be cleared and stripped of brush, trees, roots and other vegetation and debris. In soils containing excessive amounts of organic materials, a core trench shall be excavated to a minimum depth of 2 feet.

ii) The minimum top width shall be 12 feet.

iii) The minimum design water height (Hw in Figure 1) shall be 9 feet at zero tide.

iv) The minimum design side slope shall be 2:1 on both sides.

v) The minimum freeboard (Hf in Figure 1) shall be 2 feet; where wave action is expected, the freeboard shall be at least 3 feet.

vi) Existing tule berms on the outboard side of the levee shall be retained to the maximum extent practical.

vii) The minimum berm width between the inboard toe of the levee and the edge of any borrow ditch shall be 10 feet (See Figure 1). For levees having a design water depth of greater than 5 feet, a line drawn between the design water surface (Hw on Figure 1) and the toe of the levee shall not intersect the borrow ditch. In areas of organic soils, the minimum berm width shall be 25 feet.

viii) The minimum allowance for settlement (Hs in Figure 1) shall be 30% of the design height. If the levee must be in place and functional before natural settlement can take place, it shall be shaped or compacted by mechanical means. The levee shall be inspected to assure that the design cross section is obtained after settling.

ix) All new levees shall be constructed with a core.

x) Outboard faces shall be riprapped only in areas which are exposed to major wave action and are not protected by vegetative berms.

b) Interior levees:

i) The minimum top width shall be 10 feet.

ii) The maximum designed water height (HW in Figure 1) shall be 3 feet.

iii) The minimum design side slopes shall be 2:1 both sides.

iv) The minimum freeboard (Hf in Figure 1) shall be 1 foot. If the water depth is greater than 1 foot, the minimum freeboard shall be equal to the depth of the water.

v) The minimum allowance for settlement (Hs in Figure 1) shall be 30% of the design height. If a levee must be in place and functioning before natural settlement can take place, it must be shaped or compacted by mechanical means. The levee shall be inspected to assure that the design cross section is obtained after settling.

vi) All new levees shall be constructed with a core.

vii) No interior levees shall be riprapped.

2) Existing Levees - the minimum standards for the repair and maintenance of existing levees shall be as follows:

a) Exterior levees:

i) Exterior levee contours shall be restored to match the previously existing section. If the

previously existing cross section is not equal to or better than that described in (1), upgrading the levee to that standard should be considered.

ii) If the existing side slope is eroded beyond 1.5:1, the slope should be rebuilt to 2:1.

iii) Coring should be done only where required to repair damage from animal channels or eliminate seepage.

b) Interior levees:

i) Interior levee contours shall be restored to match the previously existing section. If the previously existing cross section is not equal to or better than that described in (1), upgrading the levee to that standard should be considered.

ii) If the existing side slope is eroded beyond 1.5:1, the slope should be rebuilt to 2:1.

iii) Coring should be done only where required to repair animal channel damage or eliminate seepage.

D. Repair of Leaking Levees and Restoration of Settled Levees -

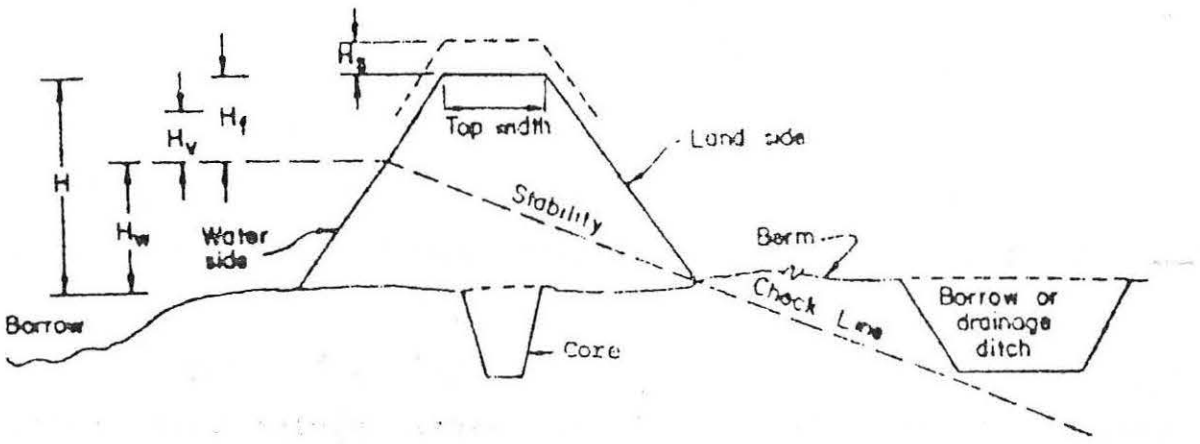
1) Levee disturbance shall be held to the minimum consistent with correcting the problems and special care shall be taken not to disturb levee footings.

2) Cores shall be a minimum of 2 feet deep, measured from the crown of the levee.

3) In areas where settling is known to be a problem, the height and width of the levee shall be minimized to reduce settling problems.

FIGURE I

SECTION THROUGH NEW LEVEES




The design height of the levee (H) will be the sum of the design high water storage ($H_w$), the added height ($H_v$) for wave action, if any, and the freeboard ($H_f$). The constructed height will include an allowance for settlement ($H_s$), which will depend on the foundation and material used in construction. The actual design high water stage should be based on the water surface profile.

ATTACHMENT "B"

SUISUN MARSH DITCH SPECIFICATIONS

## SCOPE

This specification covers the design, construction and maintenance of the ditches in the PMA of the Suisun Marsh.

## DEFINITIONS

1) Main ditches - (also called supply or circulation ditches) are water conveyance facilities whose purpose is to deliver water from intake structures located at the exterior levees to the ponds or to remove water from the ponds to the outlet structures located at the exterior levees. They include any spurs leading to the individual ponds.

2) Spreader ditches - (also called lateral or collector ditches) are water conveyance facilities whose purpose is to connect low spots within the ponds to the main ditches.

3) Ponds are any area that is under water when a managed wetland is flooded to normal shooting level. Ponds are not limited to open water areas or to a mowed (or otherwise intensively managed) area around an established blind.

4) Shooting level is the depth of water maintained in a managed wetland during the hunting season. Ideally it means a water depth of 8-12" which is preferred by most of the waterfowl using the Suisun Marsh.

## PURPOSE

The purpose of the ditch system is to permit pond water application and drainage within a 30-day period. They are used in conjunction with levees and water control structures to supply and drain water from the managed wetlands.

## DESIGN CRITERIA

1) Main ditches shall have:
   a) A minimum width of 2 feet.
   b) A minimum depth of 2 feet below the natural ground level.
   c) A side slope of 1.5:1 or flatter.
2) Spreader ditches shall have:
   a) A minimum width of 18 inches.
   b) A minimum depth of 12 inches below the ground level at the lowest portion of the service area in order to assure complete drainage.

## CONSTRUCTION CRITERIA

1) Construction shall be done in such a manner as to minimize its impact on plant and wildlife communities.
2) Spoils shall be disposed of as provided for in Section V B 4.

## MAINTENANCE CRITERIA

1) Obstruction by vegetation, debris and siltation shall be controlled so that the service area can be flooded and drained in no more than 30 days.

ATTACHMENT "C"

SUISUN MARSH WATER CONTROL SPECIFICATION GUIDE

## SCOPE

This specification covers the design, construction and maintenance of water control structures in the PMA of the Suisun Marsh.

## DEFINITIONS

1) Culvert - a corrugated steel pipe placed in a levee for the purpose of conveying water from one side of the levee to the other.

2) Flap Gate - A hinged wood or metal cover installed on the end of a culvert or redwood box designed to allow free water flow in one direction and prevent back flow in the other direction. In the free flow direction the size of the opening is controlled by the water pressure against the flap.

3) Lift Flap Gate - similar to a flap gate but with a winch and chain or other mechanism added to permit mechanical lifting of the flap and allowing a controlled amount of backflow to occur.

4) Slide Gate (also called a Screw Gate) - a wooden or metal cover which slides up and down in a frame attached to the end of a culvert or redwood box. It is raised and lowered by a screw mechanism which is

usually turned by hand. Water flow is equal in either direction and volume is determined by the degree of opening.

5) Slide/Flap Gate (also called a Screw/Flap Gate) - similar to a slide gate but with a flap gate added to prevent back flow.

6) Flashboard Box or Weir Box - a wooden box with grooved runs for inserting wood planks. The planks are placed, one on top of the other, to obtain the desired water height. Any excess water above this height will overflow over the boards and out through the box. The boards can be removed for complete water drainage.

7) Flashboard Riser - a length of corrugated metal pipe cut in half longitudinally and placed vertically on top of the inlet or outlet of a culvert. The riser is fitted with wood planks that can be placed, on top of the other, to the desired height. These function the same as that of a weir box.

## PURPOSE

The purpose of the water control structures is to admit water to, distribute water within, and remove water from the service area at the discretion of the landowner. They are used in conjunction with levees and ditches to supply and drain water from the managed wetlands.

## DESIGN CRITERIA

1) These structures shall be adequate in size, number, type and location to:
   a) Permit flooding and draining of the service area within a 30 day period.
   b) Permit maintenance of water depths not exceeding 12" above natural ground level during the hunting season.

2) Water control structures, except risers and weir boxes, shall be constructed of one or more of the following materials or their equivalent:
   a) Stainless steel.
   b) Plastic coated galvanized or alclad steel meeting the requirements of Interim Federal Specification WW-P-405.
   c) Asphalt coated galvanized or alcad steel meeting the requirements of Interim Federal Specification WW-P-405.

3) Exterior culverts shall be 12 gauge steel or heavier. Interior culverts shall be 14 gauge steel or heavier.

4) The bottom of an outlet structure shall be no higher than the bottom of the ditch which brings water to it, but not lower than 1.5 feet below 0.0 tide.

5) Outlet gates generally should have flashboard risers on the inboard side and a flapgate on the outboard side.

6) Inlet gates shall be of the sliding or screw type located on the outboard side and generally should have a flapgate on the inboard side.

7) Flashboard and weir boxes shall be constructed of any suitable rot resistant material.

## CONSTRUCTION CRITERIA

1) Excavation for any culvert shall conform to the lines and grades shown on any available drawings or as staked in the field, and as necessary for safe installation.

2) Culverts shall be installed in accordance with the manufacturer's recommendations unless otherwise specified. The culvert sections shall be joined with standard coupling bands unless otherwise specified. The culvert shall be firmly and uniformly bedded throughout its entire length. Back fill shall be accomplished in a manner that will not displace the culvert from the design grade or elevations shown on any drawings. Damaged coatings shall be repaired by appropriate methods.

3) Water control gates shall be installed according to the manufacturer's recommendations.

4) Backfill shall be to the lines and grades of the associated levees.

## MAINTENANCE CRITERIA

1) All water control structures shall be maintained in good working order, free of debris and silt.

2) Leakage shall be kept at the minimum practical and necessary repairs shall be made promptly.

3) Water passage capacities shall be maintained at levels which will permit a 30 day flood and drain cycle to be achieved.

ATTACHMENT "D-1"

RECOMMENDED MANAGEMENT FOR ALKALI BULRUSH

Alkali Bulrush has been found to have the highest overall use and selection values of the 35 food species records (Mall, 1969) in the Suisun Marsh.

The following Water Management Schedule has been developed to produce dominant stands of alkali bulrush and subdominant stands of other important waterfowl food plans such as fat-hen and brass buttons. This management practice somewhat retards the growth of other less desirable plants such as tules, cattails, pickleweed and saltgrass. To establish stands of alkali bulrush from seed in areas where it does not presently exist, the procedures set forth in the Department of Fish and Game bulletin entitled "Propagating Alkalo Bulrush" should be followed.

It is important to remember that the plant composition of the Suisun Marsh is related more to water management than any other single factor. The length of soil submergence and levels of salinity in the soil are factors which can be managed to maximize the production of waterfowl food plants. The schedule as presented here, is meant to be used as a guide to maintain optimum conditions for the production of alkali bulrush seed. For a more complete detailed discussion of the Water Management Schedule, see the California Department of Fish and Game Bulletin "Waterfowl Habitat Management in the Suisun Marsh".

Attachment "D-1", Cont'd.

Notice:

The Solano County Mosquito Abatement District (SCMAD) has participated in the preparation of this management plan and endorses this Water Management Schedule to minimize the production of mosquitoes. This plan is suitable for use on private managed wetlands and all other lands owned by public agencies managed as waterfowl habitat. In normal weather cycles it will limit the production of mosquitoes if water levels are managed properly. However, if adverse variations in water levels occur, SCMAD may take action to abate any production of mosquitoes pursuant to the procedures set forth in the California Health and Safety Code Sections 2274 et seq, whenever larvae and adult mosquitoes are found to be present in sufficient densities to warrant control procedures. Such action may be at the property owner's expense.

MANAGEMENT SCHEDULE

HUNTING SEASON

September - Begin filling ditches in September only if water can be circulated in the ditches without flowing into the ponds. The ditches must have a minimum width of 18" and a minimum depth of 24" to allow adequate circulation of the water. Do not flood any pond surface.

October - Flood the ponds as rapidly as possible to the desired shooting depth of 8-12 inches. Maintain

this water level for the duration of the duck hunting season. Circulate water through the ponds with the inlet and outlet gates set to allow maximum flow through all the ponds during the season. The SCMAD usually authorizes the flooding of ponds three weeks prior to the opening of the waterfowl season. Landowners will be notified each year of the exact date.

Nov.-Dec. - Continue to circulate.

LEACHING CYCLES

January - Begin draining the ponds at or before the end of the hunting season. Continue to drain the ponds until the water level in the ditches is 12" below the pond bottoms. This should be accomplished within 20 days. If this level is reached in less than 20 days, begin to reflood immediately.

February - The first drain should be completed by early February depending on rainfall and Delta outflow conditions.

Flood: Flood the fields and ponds to shooting depth, (approximately 8-12"). This should be accomplished within 10 days. Many ownerships can flood much faster than this. If shooting level is reached sooner than 10 days, begin to

drain immediately. If there is a problem lowering the water to a level 12" below the pond bottoms within 20 days, use any days saved during the flooding period to increase the length of the drain period. Flooding and draining should be accomplished within 30 days.

Drain: Repeat the drain as before making sure that the water level in the ditches has been drawn down 12" below the pond bottoms.

March-April - Repeat the Flood-Drain Cycle flooding to only 1/2 shooting level (approx. 4-6"). This cycle must be completed as quickly as possible. For mosquito prevention it is important that the pond bottom not be allowed to dry out prior to reflooding for the seed-set cycle. Ideally this drain cycle should be completed, the ponds reflooded and water levels stabilized and circulating prior to April 1. If significant numbers of mosquitoes are produced on clubs draining and flooding during April, aerial spraying by SCMAD may be necessary at the expense of the property owner.

SEED-SET CYCLE

April-June - As soon as the 2 leaching cycles have been completed, flood to 1/2 shooting level (approx.

4-6"). Stabilize at this level and continue circulating until summer drainage takes place. Be sure to maintain a constant water level in the ponds for the entire cycle. It has been shown that in order to achieve a good seed-set bulrush stands must be flooded during this period. As soon as bulrush seed-set has occurred, or not later than June 1, begin summer drainage.

MAINTENANCE

Summer - The summer drying period will retard the invasion of undersirable plants and will allow necessary maintenance and field work.

September - Mow to create open water areas. For a discussion of mowing techniques, see the Department of Fish and Game Bulletin: "Waterfowl Habitat Management in the Suisun Marsh".

ATTACHMENT "D-2"

RECOMMENDED MANAGEMENT FOR FAT HEN

Fat hen is an annual herb that is a prolific seed producer and a preferred waterfowl food plant. It grows best during the spring and summer on disturbed upland soils. Fat hen does not compete well with perennials and discing will be required every 4-5 years in order to maintain a dominant stand. Fat hen is recommended on clubs that are relatively level, that have firm, well drained soils and that have a manager to insure efficient Water Management. The following Water Management Schedule has been developed to produce a dominant stand of fat hen, while suppressing less desirable plants such as tules, cattails and saltgrass. The schedule may also support stands of brass buttons. Plant composition in the Suisun Marsh is related more to water management than any other single factor. The length of the soil submergence and salinity are factors which can be managed to maximize the production of waterfowl food plants.

The schedule as presented here, is meant to be used as a guide to maintain optimum conditions for the production of fat hen seed. For a more complete and detailed discussion of the Water Management Schedule, see the Department of Fish and Game Bulletin "Waterfowl Habitat Management in the Suisun Marsh".

Notice

The Solano County Mosquito Abatement District (SCMAD) has participated in the preparation of this management plan and

endorses this Water Management Schedule to minimize the production of mosquitoes. This plan is suitable for use on private managed wetlands and all other lands owned by public agencies managed as waterfowl habitat. In normal weather cycles it will limit the production of mosquitoes if water levels are managed properly. However, if adverse variations in water levels occur, SCMAD may take action to abate any production of mosquitoes pursuant to the procedures set forth in the California Health and Safety Code Sections 2274 et seq, whenever larvae and adult mosquitoes are found to be present in sufficient densities to warrant control procedures. Such action may be at the property owner's expense.

MANAGEMENT SCHEDULE

HUNTING SEASON

September - Begin filling ditches in September only if water can be circulated in the ditches without flowing into the ponds. The ditches must have a minimum width of 18" and a minimum depth of 24" to allow adequate circulation of the water. Do not flood any pond surface.

October - Flood the ponds as rapidly as possible to the desired shooting depth of 8-12 inches. Maintain this water level for the duration of the duck hunting season. Circulate water through the ponds with the inlet and outlet gates set to

allow maximum flow through all the ponds during the season. The SCMAD usually authorizes the flooding of ponds three weeks prior to the opening of the waterfowl season. Landowners will be notified each year of the exact date.

Nov.-Dec. - Continue to circulate.

LEACHING CYCLES

January - Begin draining the ponds at or before the end of hunting season. Continue to drain the ponds until the water level in the ditches is 12" below the pond bottoms. This should be accomplished within 20 days. If this level is reached in less than 20 days begin to reflood immediately.

February - The first drain should be completed by early February, depending on rainfall and Delta outflow conditions.

Flood: Flood the fields and ponds to shooting depth (approx. 8-12"). This should be accomplished within 10 days. Many ownerships can flood much faster than this. If shooting level is reached sooner than 10 days, begin to drain immediately. If there is a problem lowering the water to a level 12" below the pond bottoms within 20 days, use any days saved during the

flooding period to increase the length of the drain period. Flooding and draining should be accomplished within 30 days.

Drain: Begin final drain.

March - Allow the ponds to dry. Fat hen seedlings will become established only after the surface water has been removed.

MAINTENANCE

July-Sept. - About every 4-5 years, fat hen areas will need to be burned during the fall burn period and/or disced to remove plant litter, improve seed production and remove invading perennials.

September - Mow to create open water areas. For a discussion of mowing techniques, see the Department of Fish and Game Bulletin "Waterfowl Habitat Management in the Suisun Marsh".

ATTACHMENT "D-3"

RECOMMENDED MANAGEMENT FOR CULTIVATED CROPS

Watergrass:

Growing watergrass or Japanese millet for waterfowl food in the Suisun Marsh is recommended only in special cases since it requires summer flooding. In order to avoid potential mosquito problems caused by summer flooding, water management must be well-controlled and properly timed. Where water control is such that flooding and draining can be accomplished within seven days and can be initiated immediately when needed, watergrass and Japanese millet can be successfully grown. Watergrass will make a good volunteer stand the second year but Japanese millet must be planted annually. Japanese millet will stand somewhat hotter, drier, saltier conditions than watergrass. Neither, however, will tolerate salinities over 3 parts per thousand. In most areas of the PMA, inadequate summer water quality will prevent propagation of these crops in all but extremely wet years.

Notice:

The Solano County Mosquito Abatement District (SCMAD) has participated in the preparation of this management plan and endorses this Water Management Schedule to minimize the production of mosquitoes. This plan is suitable for use on private managed wetlands and all other lands owned by public agencies managed as waterfowl habitat. In normal weather cycles it will limit the production of mosquitoes if water

levels are managed properly. However, if adverse variations in water levels occur, SCMAD may take action to abate any production of mosquitoes pursuant to the procedures set forth in the California Health and Safety Code Sections 2274 et seq, whenever larvae and adult mosquitoes are found to be present in sufficient densities to warrant control procedures. Such action may be at the property owner's expense.

MANAGEMENT SCHEDULE

HUNTING SEASON

September - Begin filling ditches in September only if water can be circulated in the ditches without flowing into the ponds. The ditches must have a minimum width of 18" and a minimum depth of 24", to allow adequate circulation of the water. Do not flood any pond surface.

October - Flood the ponds as rapidly as possible to the desired shooting depth of 8-12 inches. Maintain this water level for the duration of the duck hunting season. Circulate water through the ponds with the inlet and outlet gates set to allow maximum flow through all the ponds during the season. The SCMAD usually authorizes the flooding of ponds three weeks prior to the opening of the waterfowl season. Landowners will be notified each year of the exact date.

Nov.-Dec. - Continue to circulate.

LEACHING CYCLE

January-April - Drain:

Sometime after the hunting season and before the first of April, drain the managed wetland areas to allow the ponds to dry for planting. Early draining will allow the ponds to be disced to control undesirable vegetation.

If heavy stands of cattails, tules, saltgrass, or pickleweed occur on the area to be planted, a seedbed must be prepared. To do this the soil should be plowed or disced two or three times and then harrowed.

SEEDING CYCLE

Seed should be broadcast on the dry ponds at 20-30 lbs. per acre. The seed can be harrowed lightly (no more than 1/4" deep) to prevent it from floating upon flooding. Then flood the pond until all the planted area is wet followed by a rapid water draw down to the mud flat stage. Leave the water off for one to two weeks to allow the establishment of seedlings. Before the ground has begun to crack and dry, initiate the first irrigation cycle.

Watergrass can also be broadcast by airplane over flooded or partially flooded ponds. When seeding flooded ponds, the seed must be presoaked overnight and then drained for an hour or two

before seeding. If watergrass seed is broadcast onto a flooded pond, the water should be allowed to recede to a mud flat stage for a week or two in order to give the seed a chance to germinate. As soon as the soil begins to dry, initiate the first irrigation cycle.

May-July - Growth and Maturation:

Seed maturation will take 60-80 days and require 3 to 4 irrigations. Each irrigation must be completed (both flooding and draining) within seven days. Keep the pond drained for about a week after each irrigation or until the soil begins to dry and crack - then reflood. Timing and control of irrigation is essential during this period to avoid problems with mosquito reproduction. Discing during the spring will encourage volunteer growth of watergrass and reduce competition from undesirable vegetation. For second year volunteer stands on ponds flooded during the spring, the ponds should be drained to the must flat stage and allowed to dry out for about 2 weeks (or until the soil begins to crack) to allow germination. Plants volunteering on areas dried out during the spring will need irrigation usually by late April or early May. If the plants turn a light green or yellowish color, the water is being held too high. Very dark green plants indicate that the pond needs water. Where alkali is present the tips of the blades may turn brown. Soil salinities can be reduced by flooding and draining several times during February and March,

as long as the water available for flooding is below 2 parts per thousand in salinity.

MAINTENANCE

August - September:

After the seed matures, the pond can be left dry until duck use is desired.

September:

Mow to create open water areas. For a discussion of mowing techniques, see the Department of Fish and Game Bulletin "Waterfowl Habitat Management in the Suisun Marsh".

ATTACHMENT "D-4"

RECOMMENDED MANAGEMENT FOR SMALL GRAINS

Barley:

The young sprouts, leaves and seeds of barley are utilized by many wildlife species including waterfowl, upland game, small mammals and songbirds. Planting barley in the fall rather than the winter and spring is recommended because it provides two food crops, green feed for the first winter and seed for the second. Planting two areas alternatively, each every other year, can provide an annual crop of both green feed and seed. Barley should be grown only on high unflooded ground on ownerships with time, equipment and personnel available to carry out the necessary cultivation practices. Barley should be planted only in relatively large acreages as geese generally are not attracted to small patches. Although barley is moderately salt tolerant, solid salinities should not exceed 3 parts per thousand.

MANAGEMENT SCHEDULE

BARLEY SEEDING RECOMMENDATIONS

| Variety | Rate | Time of Planting | Fertilizer |
|---|---|---|---|
| Briggs | 50-80 lbs./acre | Fall-Before Feb. 1 | 50# N |
| Kombar | 50-80 lbs./acre | Fall-Before Feb. 1 | 50# N |
| California Mariout 67 | 50-80 lbs./acre | Fall-Before March 1 | 50# N |
| California Mariout 72 | 50-80 lbs./acre | Fall-Before March 1 | 50# N |

CULTIVATION

| | | |
|---|---|---|
| Late Spring-Summer | - | Summer fallow - At the end of the summer work up the ground by plowing and discing to reduce weed competition and prepare a seedbed. |
| September-October | - | Plant the seed on a clean seedbed 1-2" deep. Drilling is preferable; however, broadcasting followed by harrowing to cover the seed is acceptable. |
| 1st Winter | - | Green feed is available for grazing waterfowl. |
| 1st Spring-Summer | - | Leave the seed unharvested for use by waterfowl during 2nd winter. |
| 2nd Winter | - | The seed is available for use by waterfowl. |
| 2nd Spring-Summer | - | Begin the sequence over again. |

ATTACHMENT "D-5"

RECOMMENDED MANAGEMENT FOR PERMANENT PONDS

The diversity of waterfowl habitat in the Suisun Marsh is increased by the occurrence of permanent ponds. However, permanent ponds, should remain a minor part of the marsh habitat because (1) they require specific conditions to provide optimum habitat and (2) other more intensive types of management can generally be carried out that provide higher yields of waterfowl food.

Notice:

The Solano County Mosquito Abatement District (SCMAD) has participated in the preparation of this management plan and endorses this Water Management Schedule to minimize the production of mosquitoes. This plan is suitable for use on private managed wetlands and all other lands owned by public agencies managed as waterfowl habitat. In normal weather cycles it will limit the production of mosquitoes if water levels are managed properly. However, if adverse variations in water levels occur, SCMAD may take action to abate any production of mosquitoes pursuant to the procedures set forth in the California Health and Safety Code Sections 2274 et seq, whenever larvae and adult mosquitoes are found to be present in sufficient densities to warrant control procedures. Such action may be at the property owner's expense.

MANAGEMENT SCHEDULE

Establishment:

1) Permanent ponds are recommended only in areas where at least 70% of the total permanent water area will be maintained year round at a minimum depth of 3-1/2 to 4 feet. This depth is necessary to limit the occurrence of cattails and tules and stimulate the production of desirable pondweeds.

2) Levees surrounding permanent ponds must have a shelf on which cattails and tules can become established to serve as a buffer against wave action.

3) Permanent ponds should be established only in areas where the gates and ditches can provide maximum water circulation without fluctuation in the water level.

Maintenance:

1) Set the gates to allow maximum circulation without changes in the water level. Maintain the circulation year around, but especially during warmer months (April-Sept.). Poor circulation during these months could increase salinity, mosquito reproduction, and the probability of botulism outbreaks.

2) Once every five years, completely drain the pond in February and keep it dry through September. This will control carp populations, allow oxidation of the sediment in the pond bottoms, thus releasing

nutrients, and allow for mowing or burning of undesirable vegetation. At this time an inspection of gates and levees should be undertaken by the landowner and needed repairs should be made by him.

Seeding of permanent ponds is not necessary since plants such as sago pondweed and widgeon grass should become established in the ponds naturally.