An Interagency Coordinated Program
for Wetland Water Use Planning
Central Valley, California

FINAL TASK FORCE REPORT

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US Bureau of Reclamation
US Fish and Wildlife Service
California Department of Fish and Game
Grassland Resource Conservation District

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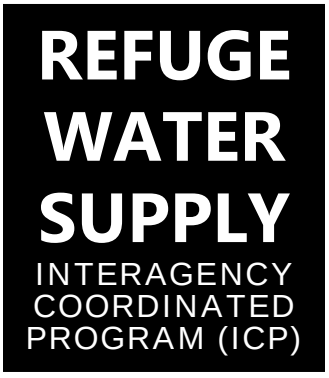


1. A GUIDE TO WETLAND HABITAT MANAGEMENT IN THE CENTRAL VALLEY

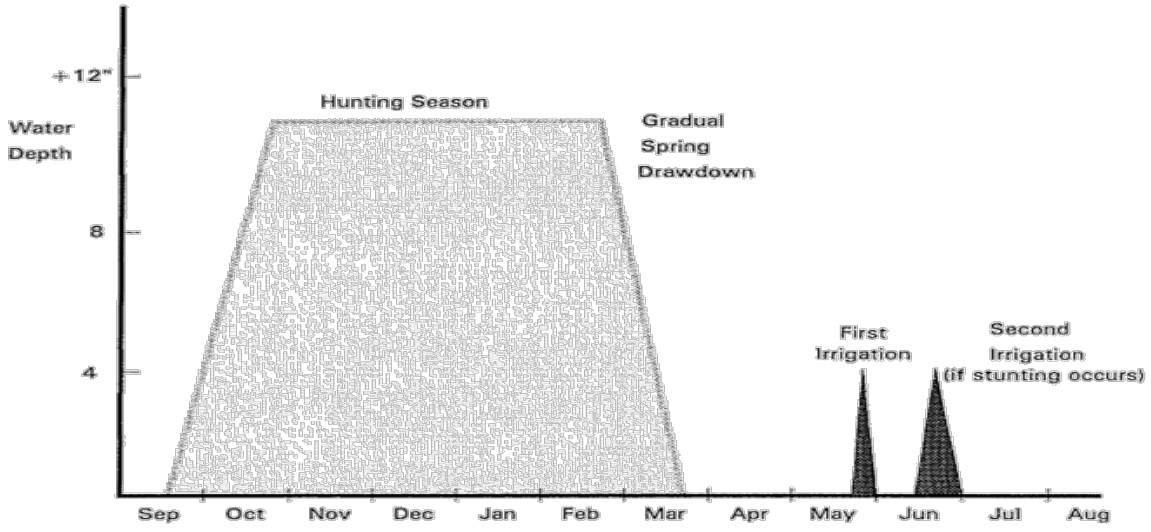
The CDFG Guide to Wetland Habitat Management in the Central Valley (Guide) divides Central Valley wetlands into two broad categories: moist-soil management (seasonal wetlands) and summer wetlands. The latter is subdivided into semipermanent wetlands and permanent marshes. Since seasonal wetlands generally are managed for migratory birds and summer wetlands for resident wildlife, this approach to classifying ecological types is an application-oriented system that takes as its starting point the most obvious end-products of refuge operations.

Seasonal Wetlands

The Guide is intended to provide managers, biologists, and private landowners with useful direction for the yearly operations of a wetland.

Seasonal wetlands offer a variety of food and cover plants to migratory waterfowl, e.g., watergrass, smartweed, swamp timothy, sprangletop, ammannia, chufa, burhead, beggarticks, annual atriplex, goosefoot, and brass buttons. The complexities of reconciling systems ecology of wetlands and the differing soil and water demands of a dozen menu items would be daunting. The Guide is intended to provide managers, biologists, and private landowners with useful direction for the yearly operations of a wetland, so these complexities are further reduced by the selection of three plants, watergrass, smartweed, and swamp timothy, as representing a balanced waterfowl diet. A program of moist-soil management is thereby reduced to three principal strategies, with the mix of those strategies left to the individual managers according to site-specific conditions. Conditions or variables affecting habitat management include soil texture (percent sand/silt/clay), which influences water percolation rates, and temperature and rainfall, which vary widely between regions. By managing for these “target” species a diversity of other wetland vegetation will also be produced.

Direction for applying water for fall flooding or irrigations is given by suggested depths and timing of flooding. Depth of flooding in a seasonal wetland is determined by a depth that makes available the greatest amount of waterbird foraging habitat, and is often affected by designedly uneven pond bottoms, soil types, and the target moist-soil plant. Since dabbling ducks cannot feed effectively in water depths greater than a foot, and shorebird feeding is best at even shallower depths, seasonal marshes are rarely flooded with more than a foot of water. In areas where wetland topography is essentially uniform, the recommended way of shifting a seasonal wetland to favor one species or another is by manipulating flooding and drawdown dates, and by irrigating the site during the dry season. Smartweed management requires an early spring drawdown and one or sometimes two irrigations before seeds develop; swamp timothy requires a later drawdown and a shallow “flash” irrigation one month after germination', and watergrass requires a late spring drawdown and one to three summer irrigations, which vary in depth and duration. Figure V-l displays the water management schedule for these options. Within these vegetation units the flood up and drawdown schedules are sometimes



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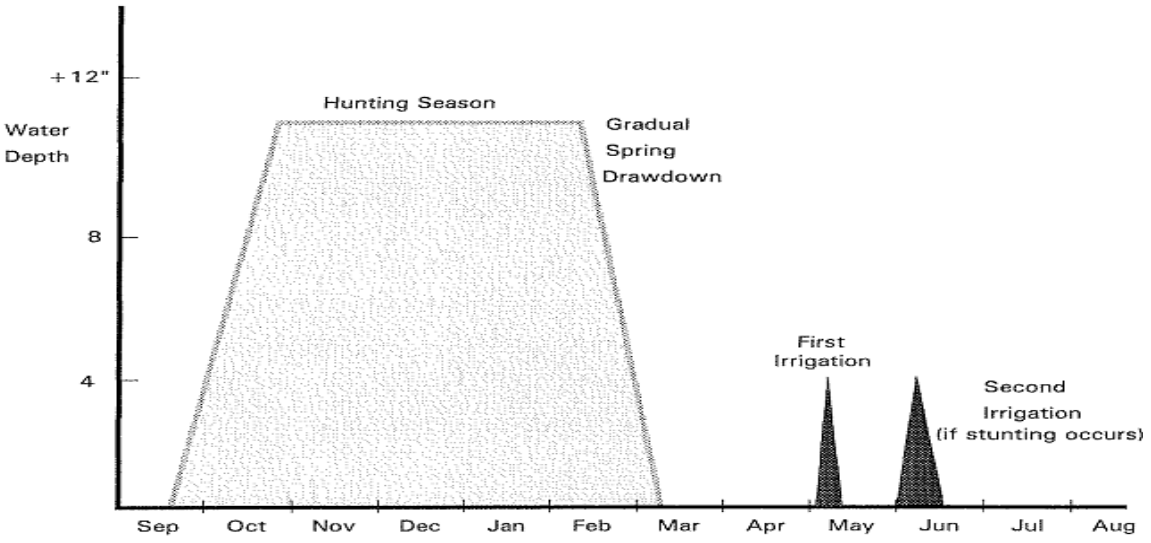
SOURCE: Smith et al. (1995)

Figure V-1a
Water Management Schedule
for Smartweed in the Sacramento Valley



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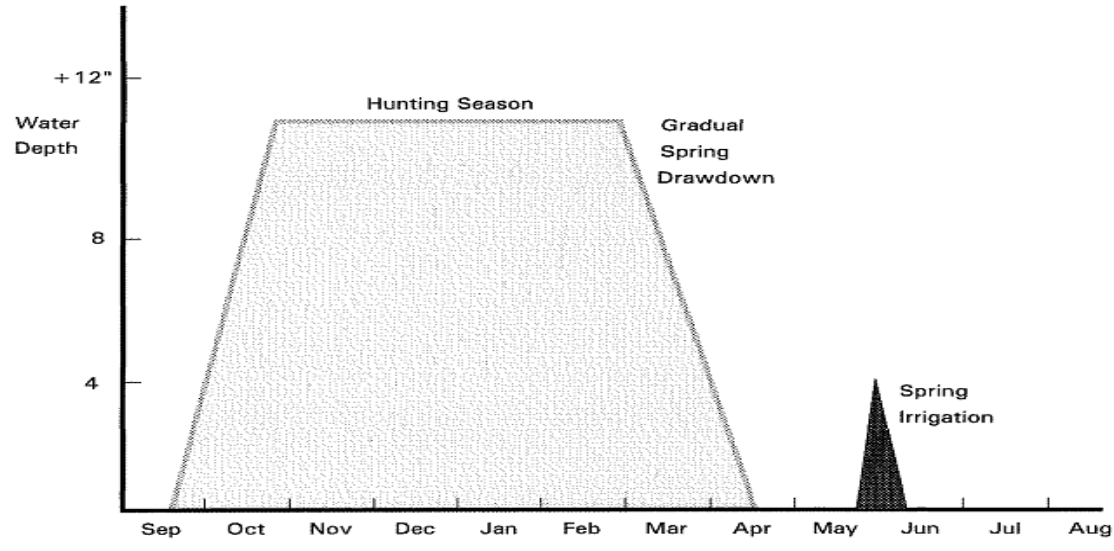
SOURCE: Smith et al. (1995)

Figure V-1b
Water Management Schedule
for Smartweed in the San Joaquin Valley



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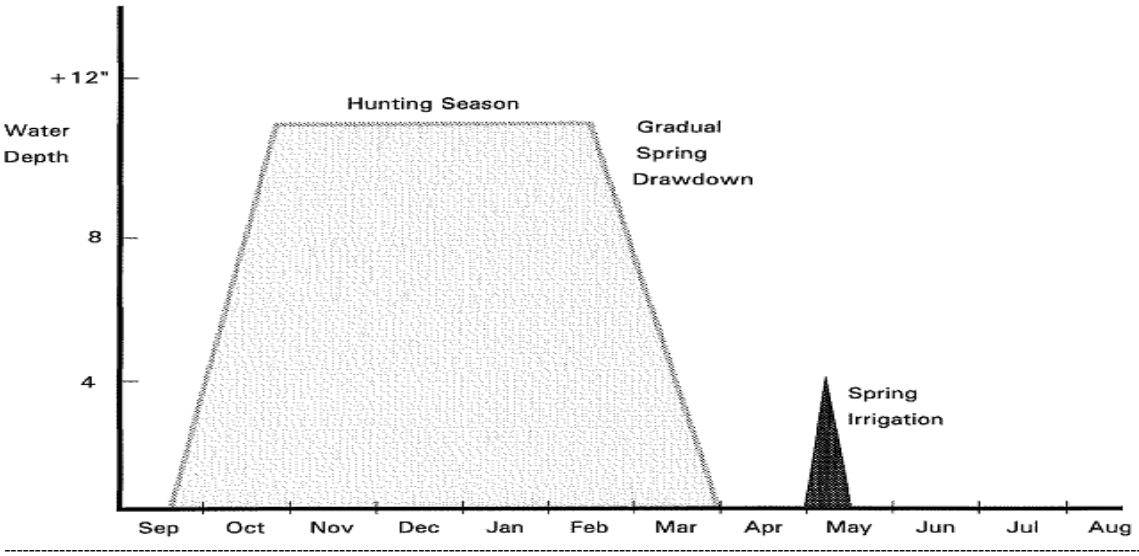
SOURCE: Smith et al. (1995)

Figure V-1c
Water Management Schedule
for Swamp Timothy in the Sacramento Valley



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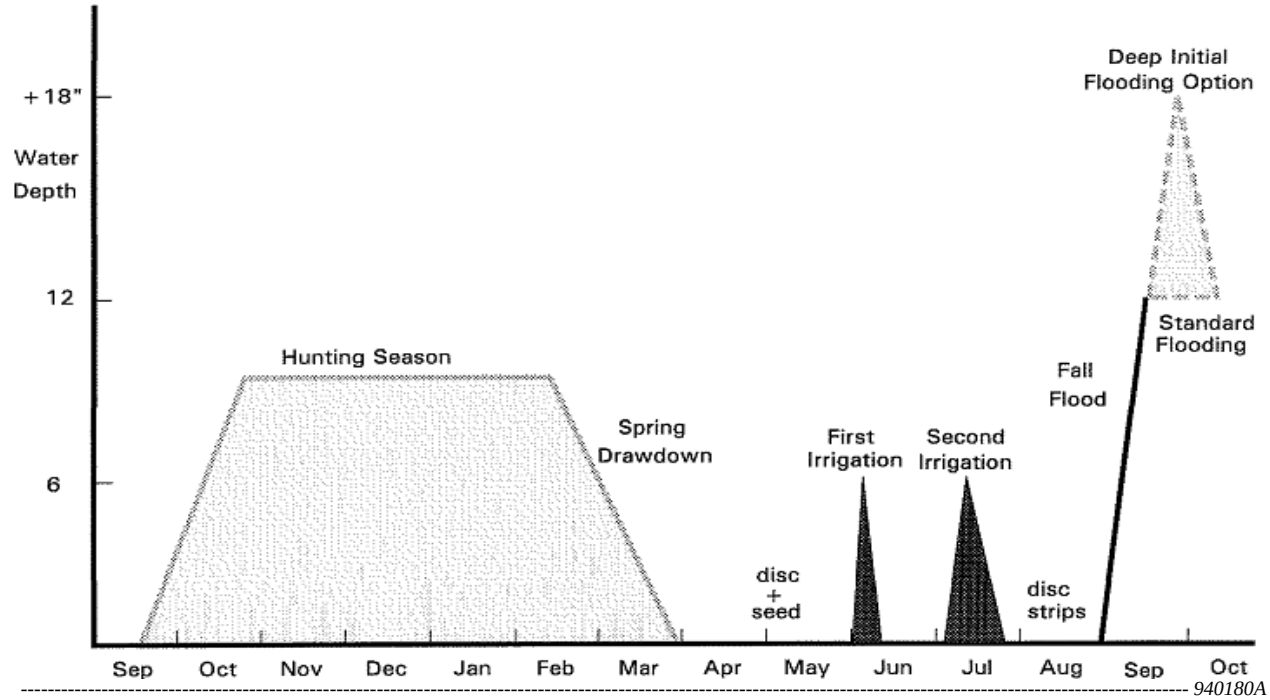
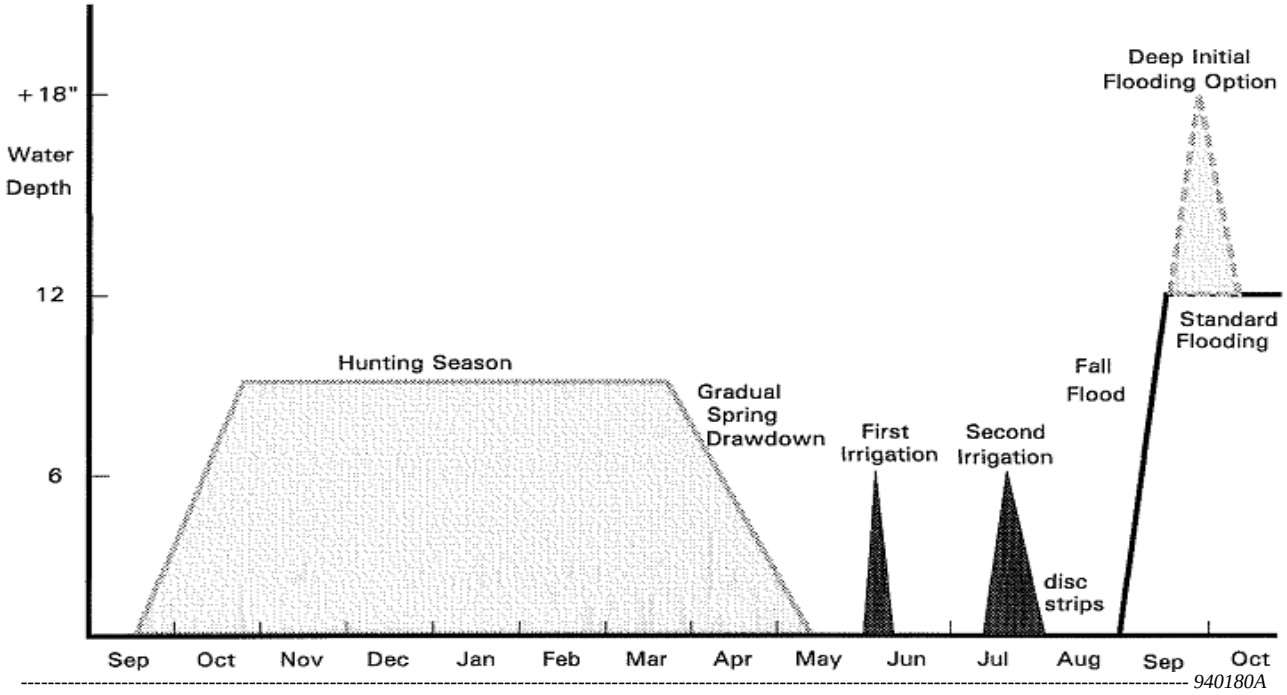
SOURCE: Smith et al. (1995)

Figure V-1d
Water Management Schedule
for Swamp Timothy in the San Joaquin Valley



SOURCE: Smith et al. (1995)

Figure V-1e
Water Management Schedule
for the Initial Establishment of Watergrass



SOURCE: Smith et al. (1995)

Figure V-1f
Water Management Schedule
for Maintaining Stand of Watergrass

adjusted to favor seed production or vegetative biomass, which provide different benefits to waterbirds. Increasing the vegetative biomass provides a delayed food source by amplifying invertebrate biomass the following winter (Severson 1987).

Permanent Marsh

Permanently flooded areas primarily are managed for resident wildlife and fisheries. The Guide points out that the Central Valley breeding duck population is much larger than it was believed to be in the 1950s and that the factor that ultimately limits the population of resident waterfowl may be the availability of high-quality brood-rearing habitat. More recent research (e.g., Mauser 1992,1994) suggests that the role of the permanent pond may be overstated for brooding waterfowl, nonetheless, the permanent ponds are widely used by other non-waterfowl species (e.g., the tricolored blackbird), as refugia for flightless ducks during the molt, by several non-game species such as white pelican and rails, and as fisheries habitat. The parameters of permanent marsh management are 5 to 25 acres, with water control set to provide a slow flow-through to offset the effects of evapotranspiration. The Guide recommends that permanent ponds occupy not more than 10 percent of the total WMA.

2. WATER MANAGEMENT STRATEGY FOR THE NATIONAL WILDLIFE REFUGES OF THE CENTRAL VALLEY OF CALIFORNIA

The Water Management Strategy (WMS), released in draft form in 1996, is a more comprehensive document. It is the latest in a series of federal publications dealing with refuge water issues, beginning with the Water Availability Study for California Wetlands (CH2M Hill 1978), through the 1989 Water Supply Investigation (USBR 1989), and responds to the terms of the CVPIA itself. It accepts the burden of wise water use by referring back to agency policy, that “managers of the National Wildlife Refuge system are expected to demonstrate the effectiveness of refuge management activities.”

Like the CDFG Guide, the WMS has a practical application in that it first explores the different habitat types under management. Habitat types differ slightly from the CDFG categories and also differ between refuge complexes. This is to be expected; as described in the previous section, a habitat type is by necessity a flexible concept for a manager who has the force of water at his or her command. These are “induced” habitats for the most part, and the most effective nomenclature is to call them by their function, which may vary depending on resource goal and local conditions. Brief summary descriptions of these WMS types are included below.

Seasonally Flooded Marsh

By far the most numerous and diverse of the WMS wetland habitat types, these units comprise about 70 percent of the wetland habitat base and are typically flooded from

early September through mid-April. Their diversity is the product of a variety of water depths which result in diverse patterns of plant species (vegetation) that, in combination, provide habitat for the greatest number of wildlife species throughout the course of a year. Through the fall and winter, seasonally flooded marshes are used by concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes, to name a few. In addition, a full complement of raptors prey on the waterbird prey. As water is removed in the spring, large concentrations of shorebirds utilize the shallow depth and exposed mudflats on their northern migration. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the spring and early summer. Flood-up in the fall makes this food available to early migrant waterfowl and other waterbirds.

Watergrass/Moist Soil

Comprising approximately 12 to 15 percent of the WMS wetland habitat base, these units are typically flooded from late August through early May. An irrigation is usually accomplished in mid-June to bring large quantities of watergrass, sprangletop, and smartweed plants to maturity. During these irrigation periods, these units are often utilized by locally-nesting colonial waterbirds (egrets, herons). Because this habitat type often results in thick monocultures, openings are disced or mowed prior to flood-up. Though not as diverse, once flooded these units provide an abundant food source for waterfowl at a very important (potential crop depredation) time of the year. In addition, a number of wading-bird species frequent them throughout the year.

Summer Water

Combined with permanent ponds, these habitats make up 5 to 10 percent of the WMS wetland base. During the summer growing season, water is often used to encourage growth in certain sparsely-vegetated units. Two water management strategies are employed: in some units, water removal will not take place until late July; in others, normal drawdown (April) is done, scheduled work is completed, and then the unit is flooded for the remainder of the year. Both practices serve to promote plant growth while providing habitat for "resident" wildlife during the hot summer months.

Permanent Ponds

Combined with summer water, these habitats make up 5 to 10 percent of the WMS wetland base and remain flooded throughout the year. Characterized by both emergent and submergent aquatic plants, these units provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and feeding areas for species like cormorants and pelicans. These units are drawn down every four to five years to recycle nutrients to increase their productivity and discourage carp populations.

Riparian Habitat

Comprised primarily of black willow, but with patches of sandbar willow and Fremont's cottonwood, riparian habitat occurs along Logan Creek and other managed waterways of the WMS area. Willows and cottonwoods also occur sparsely in and around some managed marsh units. Willows and cottonwoods provide nesting, roosting, and feeding habitat for passerine species and raptors, and shelter and screening for waterfowl. Deer, small mammals, and suck broods utilize creeks and water delivery systems during summer when most marsh units are dry.

Uplands

"Uplands" on the WMS planning area are mostly comprised of vernal pools and alkali meadows. Most plant species in these communities are natives and occur in a variety of patterns, which yield the most diverse vegetation on the Refuge. Nine Federal, State, and California Native Plant Society (CNPS) special status plant species occur in these habitats; as well as three special status invertebrates. During the wet season, cackling geese, wigeon, and coots graze on the depauperate grasses in the alkali meadows, and dabbling ducks and shorebirds feed in the vernal pools. Killdeer, stilts, and avocets nest in these habitats. Alkali meadows and vernal pools are the native, indigenous habitats of the Colusa Plains (Basis), once known as the "hard alkali gooselands", now, Sacramento NWR, Delevan NWR and Colusa NWR are virtually all that remain.

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The WMS, in its conclusion (Planned Monitoring/Evaluation Methods), acknowledges the responsibility of refuges to account for water used. It includes the following statement from its 1996 Report to Congress: “The refuges will report on the benefits that result from the water provided.” The Sacramento NWR complex has maintained a computerized database for the past 15 years (Mensik and O’Halloran 1990), tracking such unit attributes as habitat goals, control of exotic species, water delivery, and public use, which provides a sound basis for adaptive management.

3. GRASSLAND WATER DISTRICT WATER MANAGEMENT PLAN

The GWD’s draft Water Management Plan (WMP) is designed to provide a plan for the approximately 54,000-acres of privately owned wetlands within the Grassland RCD (Grassland Water District 1998). Not unlike the CDFG Guide and federal Water Management Strategy, the WMP seeks to provide a means for developing optimum wetland habitat, including a diversity of habitat types, to satisfy the life history requirements for as many species as possible. To help private landowners meet these

goals, the WMP provides guidelines for managing and enhancing wetland habitat in the RCD.

Due to water quality concerns, the GRCD does not use underground supplies, and has only two surface water sources: CVP water delivered under CVPIA, and local water supplied from creeks within the RCD. With these supplies, the WMP describes eight water management strategies which effectively encourage the production of waterfowl food and wildlife habitat, and meet the above objectives. These categories are described below, and include (within the WMP) the water demands of each.

Spring Maintenance

This is defined as the flood of lands for a longer period of time than necessary for waterfowl hunting. It provides habitat for migratory birds and resident wildlife, and stimulates plant germination.

Moist-Soil Plant Irrigation

This is generally done at varying, but shallow depths between March and August, to encourage growth of desirable waterfowl plant foods such as swamp timothy, smartweed and watergrass.

Summer Water Management

This is the practice of flooding lands during late spring and summer to improve conditions for nesting waterfowl and resident wetland dependent wildlife species. Areas managed for summer water provide habitat for breeding waterfowl pairs, and brood rearing.

Early Habitat Management

This involves an early (August to mid-September) flood up to provide a resting area and food source to waterfowl on early migration.

Fall Habitat Production

This strategy is currently practiced on the majority of RCD lands to provide habitat for the fall bird influx, and is similar to the federal Seasonally Flooded Marsh habitat designation. Approximately 75 percent of the District lands are flooded in late September and October, representing peak water usage by the District. Flooded areas are maintained at depths of 4 to 12 inches, or deeper depending upon topography.

The other regimes detailed in the WMP are Shallow Water Maintenance, which provides habitat for shallow water-feeding birds (foraging in less than eight inches of water; Salt Balance Management, the practice of applying freshwater to flush accumulated salts, and Irrigated Pasture, which produces food and cover in upland areas, and creates dense nesting habitat during the spring months for ground-nesting birds and mammals.

The WMP has a well-developed system for dealing with dry year habitat management priorities. In the section entitled *Current Management Practices* it lists a number of efficiency programs and standards, several of which were described at the beginning of this chapter. A summary of factors considered in defining water management units within the RCD is considered in some detail, and a series of best management strategies are presented based upon the USBR Criteria for Evaluating Water Management Plans (USBR 1992).

4. ADAPTIVE MANAGEMENT

Adaptive management means that one makes the best decision possible with the information available, recognizing that the decision may be revised as more information becomes available.

The principle of adaptive management introduced in the WMS report should apply equally to all the CVPIA wetlands and is implicitly or explicitly part of the guidance documents for State and federal managers summarized above. Adaptive management is a concept now common in natural resource planning, especially wetland management planning. In the early 1980s there was a vigorous debate in California about creating clear and measurable objectives for wetland performance.[1] The debate set the stage for the notion that complex natural systems must be managed as if the initial decision was itself a study. In the document National Wildlife Refuge System Objective Setting and the Adaptive Management Process, the USFWS explained it as follows: "… adaptive management means that one makes the best decision possible with the information available, recognizing that the decision may be revised as more information becomes available."

Optimum water management has never been available to Central Valley wetlands. To some extent, the efficiency of certain water use practices and the adequacy of full water supplies cannot be assessed until they have been routinely delivered and systematically used for a number of years. In the interim, however, the existence of uniform planning documents, such as the *Guide*, the *Water Management Plan* and the *Water Management Strategy* provide good consensus documents and a sound basis for management decisions now. This report presents them not as substitutes but as source documents for the Common Methodology for Water Use Planning presented in Chapter VII.

D. INTERNAL CONVEYANCE ISSUES AND MEASUREMENT OF DELIVERED WATER QUANTITIES

1. CONVEYANCE ISSUES

Water allocations and efficiency of use on-site are the most important components of this study. Movement of the water is almost equally important, and the facilities to do so are sometimes more constrained than the water supply. Usually "conveyance" is the term

[1] See, for example, Race, M.S. 1986. Wetlands restoration and mitigation policies: a reply. *Environmental Management* 10(5): 571-572.

used for transporting water to the refuges. There are several issues involving external conveyance; e.g., some water districts halt deliveries in the winter to perform canal maintenance. External conveyance problems (considered separately from water allocations) are, however, beyond the scope of this ICP report.

All wetland areas have multiple units, most with slightly different habitat goals and water scheduling. Sutter NWR has eight different drawdown dates for 28 different units; Grassland RCD is the unchallenged numerical leader in complex aggregations of wetlands, with over 160 components. The ability of refuges to move water between units was a concern to all the managers interviewed. Most needed new facilities (or major maintenance) and were in the planning or execution stages:

- Gray Lodge WMA had a study in progress on the feasibility of siphons between units.
- Sacramento NWR already has upgraded to a more efficient delivery system, utilizing $1.2 million in drought relief funding from Reclamation.
- Facilities improvements at Merced NWR are anticipated; these will move water more effectively and will require fewer work hours to operate. Estimated completion is one and a half years.

San Luis and Merced NWRs both reported their conveyance systems in reasonably good condition, but went on to say up to 25 percent of the total supply can be lost through conveyance leakage. Like any other water user, wetland managers need to move water onto or off a site on a certain date; they need to cleanse areas when disease breaks out or pollutants concentrate; they need to store or "stack" water when supplies and delivery are available, then manipulate their own internal supply. But the internal systems and canals themselves often support, by virtue of their inefficiency, a riparian assemblage of trees and shrubs that in turn support target resources—special status wildlife species, such as the yellow warbler, the yellow-billed cuckoo and western pond turtle, riparian-nesting and legally protected birds of prey, and special status plants, such as the slough thistle or rose mallow. The resulting situation is, as with many aspects of refuge management, a careful balancing of water use *efficiency* with water use *effectiveness***.**

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2. MEASUREMENT

Most managers interviewed for this ICP believe they could improve their ability to precisely measure water. In some cases this has been because refuges historically have not paid by unit of water used but only for conveyance. In others the complexity of delivery modes is a problem. At Los Banos WMA, for example, water is monitored in conjunction with four farmers and at a total of 11 turnouts. GWD currently uses several options that could be used by other managers, including current meters, rated gates, and computer programs designed to calculate flows.

With increased supplies there is more incentive to demonstrate that the water is being used effectively in internal conveyance systems, and CVPIA requires measurement of delivered supplies (external conveyance). Yet determining the amount of retrofitting required and reconciling costs with other budget needs can be difficult. In the matter of accurately measuring delivered water quantities, the Water Management Strategy referenced above cites a USFWS November 19, 1996, memo that calculated what it would cost the refuges to credibly monitor use. Retrofitting a fully functional water measurement and documentation system at the San Luis, Kern, and Sacramento NWR complexes would cost several hundred thousand dollars.

E. ALTERNATIVE SOURCES OF WATER

The 1989 Reclamation Investigations report was guardedly optimistic about the use of ground water to augment supplies:

> Although groundwater is generally not sufficient to provide the entire amount of refuge water, it could provide a supplemental supply as part of a conjunctive use program. By using surface water and ground water conjunctively, groundwater overdraft can be minimized and the total available supply will become more reliable...

Since 1989 at least four refuges have experimented with groundwater pumping to augment supplies. The results have been mixed, for a variety of reasons, from power availability for pumping (Grassland RCD) to high chromium levels (Sacramento NWR). There was, however, a willingness among managers to continue to consider groundwater as insurance against drought years, when supplies for all users would be cut back.

F. APPLICABILITY OF BMPS TO CENTRAL VALLEY WETLANDS

When water conservation measures are applied to a factory, home, or farm, approaches to implementation and criteria for success are not intuitively complex.

When water conservation measures are applied to a factory, home, or farm, approaches to implementation and criteria for success are not intuitively complex. Best management of water on a home might be to encourage low water demand landscaping (xeriscapes); in a factory, gray water reuse; on a farm, producing the same yield per acre with more efficient irrigation. The livable environment of a home and the profitability of a farm or industry are standards that can be measured. The homes sell on the real estate market, the goods and services are competitive.

The parallels with the operation of a wildlife refuge are highly problematic. The output of a federal refuge, by agency policy, might be

> To perpetuate the migratory bird resource
>
> and/or

> To provide an understanding and appreciation of fish and wildlife ecology and the human role in this environment and to provide refuge visitors with a high quality, safe, wholesome, and enjoyable recreational experience (Kern 1986).

The goals of a state wildlife management area might be equally general, and could include provisions, for example, to remove selenium contamination from water, vegetation, and soils, or to provide populations of sportfish species in permanent waters that will satisfy a majority of the recreational anglers.

The concept of best management practices (BMPs) has been in use for at least two decades, in various statutes, regulations, and procedural manuals, and it has been defined in a variety of ways. A recent definition for California water conservation comes from the *Memorandum of Understanding regarding Urban Water Conservation in California* (California Urban Water Conservation Council 1994):

> A best management practice means a policy, program, practice rule, regulation or ordinance or the use of devices, equipment, or facilities that meets either of the following criteria:
>
> (a) An established and generally accepted practice among water suppliers that results in more efficient use or conservation of water;
>
> (b) A practice for which sufficient data are available from existing water conservation projects to indicate that significant conservation or conservation related benefits can be achieved; that the practice is technically and economically reasonable and not environmentally or socially unacceptable; and that the practice is not otherwise unreasonable for most water suppliers to carry out.

The concept of thrifty use is readily comprehensible to wetland managers, particularly those who have dealt with severe water shortages through the early 1990s. Most would accept the above definition, with the term "wetland managers" replacing water suppliers. However, it is important to note that conservation on a wildlife refuge can have a very different meaning than conservation of water in agricultural or urban BMPs. Saving water with a low-flow shower head may be a good urban BMP; minimizing irrigations of swamp timothy may adversely impact wildlife feeding effectiveness or management of predators or endangered species.

The end result of a common methodology/best management practice therefore may be the same amounts of water used, but more ducks or geese wintering in the Central Valley, or a species removed from endangered status, or an improved visitor experience, or all three.

A conservation-related benefit in the refuge context may well result from substantially *increased* flow-through of maintenance water to decrease the potential of disease outbreaks. It would be extremely difficult to define what a "socially unacceptable" level of botulism would be. For these reasons, this report avoids use of the term BMP, except in a few narrowly defined areas where the practice can be adopted immediately and has no possible ecosystem detriment, such as improving communication among refuge managers and scientists. In Section VII the terms "common methodology" or "Effective Water Use Practice" are used. The intent is to make sure all State/federal and private

managers (under the Grassland RCD) have access to the same information and that they proceed through the same decision-making, planning, and budgeting steps to get the maximum resource benefits from every acre-foot of water. The end result of a common methodology/best management practice therefore may be the same amounts of water used but greater wetland habitat values for wildlife, more ducks or geese wintering in the Central Valley, or a species removed from endangered status, or an improved visitor experience, or all four.

G. INTERNAL ISSUES ON REFUGES

Public trust agencies, such as the California Department of Fish and Game and the US Fish and Wildlife Service, find themselves in a difficult position when attempting to account for the effectiveness of their actions. Some of these difficulties derive from their mission statements, as discussed in the previous section. In addition, any refuge is part of a larger bureaucracy, which in turn answers to a political structure and the public at large. Planning is legally subject to analysis and public involvement under the California Environmental Quality Act and California Endangered Species Act (CESA), at the State level, and under the National Environmental Policy Act and federal Endangered Species Act (FESA) at the federal level. The California Assembly may pass a resolution to double the number of waterfowl, or the parent agency may sign a joint agreement to cooperate in a nationwide waterfowl initiative. The same body may, at the same time, vote to reduce operations or maintenance funding.

No refuge manager operates autonomously, and, although no agriculturist does either, it is probably reasonable to state that the wetland managers have less discretion than most farmers. In the final analysis, public accountability and policy review processes are contributing reasons why most government agencies (or private entities managing natural resources) cannot be assessed through conventional cost-benefit analyses as is the case in the private sector, whether that cost is dollars per unit or acre-feet of water per unit produced.