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Chapter 12 Sacramento-San Joaquin Delta Region

Setting

Geographical Overview. The Sacramento-San Joaquin Delta and Suisun Marsh (Delta) are at the confluence of the Sacramento River and San Joaquin River basins, which drain about 40 percent of California (URS, 2007). The Delta covers approximately 1,315 square miles (Figure 12-x Sacramento-San Joaquin Delta and Suisun Marsh) in portions of six California counties and is part of the largest estuary on the West Coast of the United States. The Delta is the major source of California's water supply and an ecological treasure, as well as the intersection to a variety of businesses, transportation corridors, utilities, and recreation.

PLACEHOLDER: Figure 12-x Sacramento-San Joaquin Delta and Suisun Marsh

[Use figure from Delta Vision at page 23]

Historical Overview. Prior to 1850, the Delta was essentially a broad expanse of tidal islands with marshes and natural channels. Large portions of these islands were submerged daily by the high tides, while larger tracts of land were submerged during seasonal high tides and winter flood events. By the mid-1860s, settlers had built levees and turned marshland into grazing and farming lands. Farming on a commercial scale became a way of life in the Delta. However, increasing salinity and land subsidence caused most agricultural activities in the Suisun Marsh to fail; they were replaced by duck clubs, which were the singular reason for the existing rail alignment across the marsh. The 1870s and 1880s saw the arrival of commercial fisheries that introduced nonnative species—striped bass and American shad. As decades passed, commerce grew, and ocean shipping began using Delta ports to transport goods between California and foreign markets. Along with international shipping came invasive aquatic species unintentionally carried to the Delta in the ballast water of these vessels.

Most Delta levees originate from early reclamation efforts. They have been improved in various locations using a variety of methods, resulting in a system with variations in the ability to withstand natural forces. The island and tract interiors are becoming lower at rates depending on soil composition and management, in effect raising the levees and increasing the stress on them. Delta floods originate from levee failure, often caused by the combination of high river inflows, high tide, and high winds, but also occurring in fair weather due to rodent damage, piping, foundation movement, or other cause.

By 1951, with completion of the Delta-Mendota Canal, the Delta was forever changed. The federal Central Valley Project (CVP) for moving water to California's Central Valley farms was the start of large-scale water supply infrastructure that would, with the addition of the State Water Project (SWP) and other smaller projects, evolve into today's water delivery system.

Current Situation. The Delta faces many challenges including the following:

- Pelagic or open water fish have been declining in abundance. Intensive research was initiated to determine the causes of decline and several factors have been identified such as lack of suitable habitat, competition with invasive species, toxicity and water operations. The complexity of the issue has made solution elusive.

- For the most part, the Delta's levees are un-engineered dirt structures that have weathered erosion for 150 years. The Delta lies near major faults. On the basis of research conducted by the US Geological Service and other scientists, there is a high probability of an earthquake striking the Bay region before 2032. Levee failure could result in the need to shut down exports from the Delta.
- The Delta is home to more that 250 non-native species. Invasive species now dominate all habitats accounting for 95 percent or more of the biomass. All aspects of the ecology of the Delta have been altered by invasive species. The changes are impacting important and protected native species.
- Over the last 100 years, sea level at the Golden Gate bridge has risen on average about 0.08 inches per year and now is about 7 inches higher than 1920. Projection of continued rise present a serious problem for the Delta, most of which has subsided between 5 to 25 feet below sea level.
- Flooding is a near-annual event in the Delta and can cause overtopping and erosion of levees. As climate changes, storm runoff is likely to become more intense and more precipitation falling in the mountains as rain rather than snow. Average winter flows to the Delta are expected to become larger, which could increase flooding.
- California's population may hit 60 million by 2050 and 90 million by 2100 and the combined population of the Delta counties are expected to more than double by 2050. This growth will change the nature and timing of demand for water and result in more wastewater and urban runoff into the Delta. Increasing population will increase pressure for urban development with subsequent conversion of agricultural lands and further extension of urban lands encircling and encroaching upon the Delta.

Despite these challenges, the Delta could continue to thrive. There are a number of activities currently underway to address these challenges and will ultimately play a role in the area's future water supply and exports, water quality, ecosystem and flood protection. Some of these activities follow:

- Delta Risk Management Strategy - evaluating Delta issues primarily from the perspective of the risks from levee failures and ways to reduce those risks. http://www.drms.water.ca.gov/;
- CALFED Ecological Restoration Program Conservation Strategy -The Conservation Strategy is a biological view of how the Delta could be configured to restore historic form and function to the maximum extent. http://www.delta.dfg.ca.gov/erpdeltaplan/.
- Delta Vision - the Blue Ribbon Task Force has developed a vision (November 30, 2007). http://deltavision.ca.gov/ . update with strategic plan;
- Bay Delta Conservation Plan - a comprehensive conservation plan for the Delta designed to protect and restore at-risk species. http://resources.ca.gov/bdcp/;
- State Water Resources Control Boards – outline results of final plan. http://www.waterrights.ca.gov/baydelta/strategic_workplan.htm.
- The Habitat Management, Preservation, and Restoration Plan for Suisun Marsh (Suisun Marsh Plan) http://iep.water.ca.gov/suisun/ ;
- Pelagic Organism Decline - Interagency Ecological Program evaluating the potential causes of the decline of pelagic organisms in the Delta http://www.science.calwater.ca.gov/pod/pod_index.html; and
- Central Valley Project Operating Criteria and Plan Biological Opinions - The NOAA Fisheries 2004 Biological Opinion concluded that the OCAP would not jeopardize listed salmon and steelhead species. Similarly, the Fish and Wildlife Service's 2005 Opinion indicates that the

current CVP and SWP project operations and certain planned future actions will not jeopardize the continued existence of the Delta smelt or adversely modify its critical habitat. In response to a lawsuit, NRDC v Kempthorne, Judge Wanger ruled that the FWS' Opinion was "unlawful and inadequate" partially because it "does not provide a reasonable degree of certainty that mitigation measures will take place". The Service is preparing a new Biological Opinion. http://www.fws.gov/sacramento/es/delta_smelt.htm. Judge Wanger also ruled on the NOAA Fisheries opinion, invalidating the opinion for many of the same reasons as the Delta smelt case. A hearing is ongoing to address interim remedies until a new biological opinion is issued. URL

PLACEHOLDER: Box 12-x Acronyms and Abbreviations Used in this Chapter

Watersheds

The Delta watershed covers 40 percent of the state (Figure 12-x Sacramento-San Joaquin Delta watershed). (Figure 12-x).

PLACEHOLDER Figure 12-x Sacramento-San Joaquin Delta watershed

[Use figure from Delta Vision at page 35 see if the color of Tulare Basin can be changed]

Almost all of California's major rivers converge on the Sacramento-San Joaquin Delta as tributaries of the Sacramento, California's largest river, or the San Joaquin River. Entering the Delta separately and becoming tributary within the region are the Cosumnes, Mokelumne, and Calaveras Rivers, the Yolo Bypass, and numerous smaller creeks and sloughs. The Sacramento River is the single outlet, to Suisun Bay. (Table 12-x Flood parameters for principal streams Sacramento-San Joaquin Delta region). For more on these watersheds, see the Sacramento (Chapter 6) and San Joaquin (Chapter 7) Regional Reports (URLs).

Table 12-x Flood parameters for principal streams, Sacramento-San Joaquin Delta region

Stream	Location	Mean annual runoff (taf)	Peak stage of record (ft)	Peak discharge of record (cfs)
Sacramento R	at Freeport	17,270	129.6[1]	117,000
San Joaquin R	near Vernalis	3,308	34.9[1]	79,000
Cosumnes R	at Michigan Bar	362	18.5	93,000
Mokelumne R	at Woodbridge	403[2]	29.6	27,000
Yolo Bypass	near Woodland	2,340[3]	34.9	374,000
Putah Cr	near Winters	349[2]	30.5	81,000

1 Different date than peak discharge
2 Most recent but less than period of record
3 Water Years 1946-1977

Ecosystems

The Delta is the ecological hub of the Central Valley (ERPP, 2000). It is a floodplain estuary that connects river to ocean and land to water (Healey and Mount, 2000). Estuaries are subject to tidal influence, mixing salt, brackish, and fresh water at different locations according to seasonal river flows and tides (Delta Vision, 2007). Historically, the Delta consisted of hundreds of miles of tidally influenced sloughs and channels and hundreds of thousands of acres of marsh and

overflow land. At one time, the Delta supported hundreds of species, including the grizzly bear, tule elk, and gray wolf. As land reclamation took place and levees were built, the ecosystem changed. More than 90 percent of the marshland was converted to farms (and more recently, urban uses). The Suisun Marsh is an important wintering and nesting area for waterfowl using the Pacific Flyway. The marsh also serves as a critical link for anadromous fish and is thought to be an important nursery for fish (URS, 2007). The grizzly bear and gray wolf no longer reside in the Delta, but a population of tule elk has been established in the Suisun Marsh. The numbers of birds using the Delta have declined as well, although changes in cropping patterns have allowed populations of some species to increase (URS, 2007).

All aspects of the ecology of the Delta have been significantly and, in most cases, irrevocably altered by introduced (non-native) invasive species. Introduced species now dominate all habitats within the Delta. The effects of most introduced species on the Delta ecosystem are unknown. Some introduced species are also invasive: they spread rapidly, take over habitats, and displace natives. Among the introduced species of the Delta, the most visible is the aquatic weed *Egeria densa*, which often chokes low-velocity channels in the central and southern Delta and reduces water turbidity (Resources Agency, 2007). Two clams from Asia dominate the benthos of the Delta: the Asian clam, *Corbicula fluminea* is most abundant in freshwater and the overbite clam *Corbula amurensis* is abundant in brackish to saline water. Striped bass and largemouth bass, both deliberate introductions, are not only among the most abundant fish of pelagic and nearshore habitats, they are also predatory and probably have a negative effects on natives (Nobriga, et. al., 2007).

Another invasive species water hyacinth *Eichhornia crassipes* showed up in California more than 100 years ago. The water hyacinth is an attractive plant, with shiny green leaves and delicate lavender flowers. However, this extremely prolific aquatic weed can quickly spread into a dense floating mat of vegetation. If allowed to spread, the area covered by water hyacinth will double in 18 days, effectively cutting off oxygen to any organism in the water. It can also clog water pumps. Water hyacinth was first reported in California in 1904 in a Yolo County slough. It spread gradually for many decades, and was reported in Fresno and San Bernardino Counties in 1941 and in the Delta in the late 1940s and early 1950s. There were increased reports of water hyacinth in the Delta region during the 1970s, and by 1981, water hyacinth covered 1,000 acres of the Delta, and 150 of the 700 miles of waterways (U.S. Army Corps of Engineers 1985).

Floodplain estuaries are among the most productive ecosystems on the planet. The high productivity associated with floodplain estuaries is driven by the intimate relationship between land and water (Healey and Mount, 2007). However, compared to other estuaries, the Delta has very low levels of productivity in both the Suisun Marsh and the lower Delta (Baxter et. al., 2008). The Interagency Ecological Program (IEP), in a recent study, looked at three categories of food production issues in the estuary: food availability, the co-occurrence of fish and food sources, and food quality (Baxter et. al., 2008).

Box 7-x Pelagic Organism Decline

> Abundance indices calculated by the Interagency Ecological Program (IEP) through 2007 suggest recent marked declines in four pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay). These fishes include delta smelt which is listed under State and federal Endangered Species acts and the longfin smelt being considered for listing under these Acts. Although several species show evidence of long-term declines, the recent low levels were

unexpected given the relatively moderate winter-spring flows of the past several years. In response to these changes, the IEP formed a Pelagic Organism Decline ("POD") work team to evaluate the potential causes of the decline. Their work is ongoing. A recent synthesis of their efforts can be found at: http://www.science.calwater.ca.gov/pdf/workshops/POD/IEP_POD_2007_synthesis_report_031408.pdf

Climate

The Delta has a mild Mediterranean climate where summers are virtually rainless. The majority of the region's precipitation falls from December through March. Monthly rainfall can come all on the same day during winter storms. In the winter, after the rains begin, a thick ground fog (tule fog) settles in the Delta. This phenomenon is named after the tule grass wetlands of the Central Valley. The region receives on average 14 to 20 inches of annual precipitation, depending on location, but the climate allows for a much wider variation from year to year. Summertime temperatures are attenuated, particularly in the evenings, by the prevailing winds from the west. Average July temperatures are slightly higher in the east compared to the western Delta. Temperatures rarely reach freezing in the winter and tend to be no lower than the mid to low 40s.

Mean annual temperatures averaged over the Delta region have increased a little over 2°F over the last 100 years, based on the Western Regional Climate Center's California Climate Tracker http://www.wrcc.dri.edu/monitor/cal-mon/SAC_DELTA_REGION.html. This trend is based on stations from a wider area than just the Delta. Individual stations near the coast and through Carquinez Straits have actually exhibited a trend toward decreasing daily maximum temperatures during summer, which may be attributable to warmer Central Valley conditions pulling more cool air through that area during summer (J. E. Gonzalez et.al. 2007).

Demographics

Overview. Like the Delta ecosystem, the demographics for the region are interdependent upon the adjacent counties. Portions of the California Delta are in six counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo.

Population. There are 14 towns and villages in the Primary Zone of the California Delta and 6 in the Secondary Zone (see information under "Current Land Use"). The Delta Protection Commission lists the population of the region at 515,264, based upon the 2000 Census. (Delta Protection Commission, http://www.delta.ca.gov/pdf/Sacto-SanJoaqin_fact.pdf) Accessed January 28, 2008.

Indicate population in primary and in secondary zones if possible. Will get trends from DWR. Use DOF #s

Urbanization is occurring in the Delta, mostly in the Secondary Zone. (Figure 12-x Potential Project Proposals in the Delta) State population and households are both projected to increase by about 40 percent by 2030. Population in the Delta is projected to increase from about 26,000 to 67,000 and households will increase from 11,000 to 27,000. None of this growth is expected to be in the protected Primary Zone of the Delta. A large share of this growth is associated with expansion of the Stockton metropolitan area and growth in the Sacramento-Stockton corridor onto Bishop, Sargent Barnhart, Stewart, and Shima Tracts (Patterson, 2007). The demographics of the Suisun Marsh are currently stable. The Suisun Marsh Preservation Act precludes

development in the primary marsh and significantly limits development in the secondary marsh. The permanent resident population in the primary marsh is less than 100 people, with a concentration on Grizzly Island Wildlife Area headquarters and resident managers on the private waterfowl hunting clubs. There may be an additional 50 full time residents in the secondary marsh, living in historical farmhouses and residents on the upland areas around the marsh. (Chappell, 2008)

PLACEHOLDER Figure 12-x Potential Project Proposals in the Delta

Figure 2 from land use context memo

tribes occurring in the Delta. Tribal communities at LaGrange, Knights Ferry, Lathrop (by Mossdale)

include environmental justice issues, especially subsistence fishing

Local and State Economics. The Delta Protection Commission (DPC) reports that the Delta economy in 1994 represented 1.5 percent ($10.6 billion) of personal income in California and 1.8 percent of employment (249,000 jobs). The entire Delta generated $21.2 billion in output during 1994. Manufacturing is the largest sector, producing $4.5 billion worth of goods. This is followed by trade (wholesale and retail), which generates $3-billion in output, and services, which create $2.9 billion in output. In-Delta agriculture contributes a little less than $1 billion annually to the region. Exports of goods from the region are $5.6 billion, and intermediate sales to local industries are $4.8 billion (URS, 2007).

An evaluation of more recent data, (Mann, 2007), reported that the primary Delta includes about 1000 business with sales ranging from $500 million to $1 billion per year. Looking more broadly at areas protected from a 100-year flood (Protected Region) within the legal Delta and Suisun Marsh there are an estimated 15,900 business having sales of some $35 billion annually. DWR, 2006, estimates that the annual value of Delta agricultural production over the 1998 to 2004 period averaged $680 million in 2005 dollars.

The Delta region is important to the State because it includes vital transportation and conveyance facilities. It contains highways, railroads and shipping routes, natural gas storage and transmission facilities, electric transmission pathways, and gasoline product distribution pipelines (Mann, 2007). Most importantly, the Delta is a key conduit of the state's water supplies for both urban and agricultural uses. Approximately two thirds of the state's population live and work in urban areas that receive at least some of their water supply from the Delta, and the Delta provides one quarter of the State's total urban water supply (Mann, 2007).

Still need to identify trends.

Land Use Patterns

Overview. The Delta does not exist as a region unto itself. As noted previously, the Delta is made up of six counties: Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo. The Delta area totals approximately 1,315 square miles or about 841,000 acres (Figure 12-x Land use in Delta).

PLACEHOLDER Figure 12-x Land use in Delta

(see Delta Vision memo that focuses on Delta-Suisun lands and the counties in Delta-Suisun)

Need a figure similar to what is in the Delta Vision Land use context memo that focuses just on the Delta-Suisun lands and the counties in the Delta-Suisun].

Historical land use. Prior to 1850, the Delta was essentially a broad expanse of water-based habitat and natural channels. Large-scale reclamation of the Delta for agriculture began in 1868 and by 1900 most of the lands with mineral-organic soils, around the Delta's exterior, were reclaimed. The final period of Delta reclamation occurred between 1900 and 1920 on lands in the Delta's interior. The result of these reclamation efforts is largely what is seen as the Delta today - approximately 700 miles of meandering waterways and 1,100 miles of levees protecting over 538,000 acres of farmland, homes and other structures.

Historically, the Suisun Marsh consisted of 68,000 acres of tidally-inundated islands separated by sloughs. Diking of Suisun Bay, primarily for livestock grazing, began around the mid-1860s. Shortly thereafter the first duck clubs were established around the marsh ponds. By the early 1900s, livestock grazing was giving way to other agricultural activities. Eventually, increasing salinity and land subsidence caused agricultural activities to fail and be replaced by duck clubs. Levees originally constructed for farming are now an integral part of the infrastructure of the duck clubs. (URS, 2007) The land use in the Marsh has been very stable since the early 1970's. The original Suisun Marsh Preservation Act was passed in 1974.

Current land use. The Delta is dominated by highly productive agricultural land. The main crops grown in the Delta are corn, alfalfa, pasture, tomatoes and grapes. Figure 12-x depicts irrigated crops in the Delta and changes in those crops over the years. Changes in land use including native vegetation and urban areas are noted a little later in the text.

PLACEHOLDER Figure 12-x [illustrate acres in irrigated crops]

Small communities and historic legacy towns within the Delta's Primary Zone serve as social and service centers for surrounding farms. These communities include: Clarksburg, Courtland, Hood, Locke, Ryde, and Walnut Grove. A small portion of Rio Vista lies within the Primary Zone. Some communities within or just outside the Secondary Zone are the incorporated city of Isleton and portions of Stockton, Pittsburg, Antioch, Oakley, Sacramento, and West Sacramento. (URS, 2007).

The balance of the Marsh is predominantly privately owned, with 150 individual waterfowl hunting clubs and numerous upland parcels for cattle grazing. DFG owns nearly 15,300 acres of managed and tidal wetlands (Chappell, 2008). Urban encroachment has not occurred within the "Marsh", but conflicts and pressures are occurring with the increasing urbanization and industrialization up to the edges of the Suisun Marsh secondary management area.(Chappell, 2008).

Stone Lakes NWR is located in southern Sacramento County. The approved refuge is 17,640 acres. (http://www.fws.gov/stonelakes/). The Cosumnes River Preserve is located in Southern Sacramento and northern San Joaquin Counties. The Preserve encompasses more than 46,000 acres. (http://www.cosumnes.org/). The Vic Fazio Yolo Wildlife Area is located within the Yolo Bypass. The Wildlife Area currently includes 16,000 acres (http://www.yolobasin.org/wildlife.cfm). All three areas have similar goals of protecting and enhancing imperiled Central Valley fish and wildlife habitats.

The Stockton and Sacramento Deep Water Ship Channels were constructed in 1933 and 1963, respectively. The Stockton channel is 35 feet deep and can handle 55,000-ton class vessels with

full loads. The Sacramento ship channel is 30 feet deep (URS, 2007). Data on recent tonnage is provided by the California Association of Port Agencies. Recent volume was 0.7 and 2.9 million metric tons in Sacramento and Stockton, respectively (CAPA, 2005) (Mann, 2007).

Land use changes. Table 12-x depicts changes in land use in the Delta between the late1950s and the present. In addition to changes in crops, the amount of urban and native lands has increased in the Delta while agricultural lands have decreased. Similarly, Table 12-x illustrates recent land use changes that have taken place in the Suisun Marsh.

PLACEHOLDER Table 12-x Land use in the Delta, 1950s to present

PLACEHOLDER: Table 12-x Recent land use changes in the Suisun Marsh

Regulatory. The Delta was given a legal boundary (Section 12220 of the Water Code) in 1959 with the passage of the Delta Protection Act (Figure 12-x Primary and secondary zones including Suisun Marsh). Anticipating the potential effects of urban development on the Delta, the original Act was refined in 1992 to provide primary and secondary zones within the previously defined legal Delta. The Primary Zone (about two-thirds of Delta area) was intended to remain relatively free from urban and suburban encroachment to protect agriculture, wildlife habitat, and recreation uses. Urban development in the Secondary Zone (the remaining one-third) was intended to include an appropriate buffer zone to prevent impacts on the lands in the Primary Zone.

The California legislature recognizing the threats to the Suisun Marsh from potential residential, commercial, and industrial developments, and the need to preserve this unique wildlife resource for future generations passed and the Governor signed in September 1974, the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974. The Act directed the San Francisco Bay Conservation and Development Commission (BCDC) and the Department of Fish and Game to prepare the Suisun Marsh Protection Plan. The Suisun Marsh Protection Plan includes a primary management area (Figure 12-x) and a secondary management area that includes approximately 22,500 acres of significant buffer lands. The BCDC has land use and development permitting authority in the Primary management area.

PLACEHOLDER: Figure 12-x Primary and secondary zones in Delta and Suisun Marsh

Of the six Delta counties, two (South San Joaquin Habitat Conservation Plan (HCP) and East Contra Costa HCP have approved HCPs that include land banking and other programs to set aside Delta land for conservation. Other counties currently have HCPs under development (Solano, Sacramento and Yolo). The Bay Delta Conservation Plan, also under development, will:

- Provide the basis for permits under federal and state endangered species laws for the activities covered by the plan;
- Streamline permitting for projects covered by the plan;
- Provide for a comprehensive habitat conservation and restoration program for the Delta;
- Provide new sources of funding and new methods of decision-making for ecosystem improvements; and
- Provide for an adaptive management and monitoring program that will guide decision making during implementation, be grounded in the best available science, and enable the plan to adapt as conditions change. Resources Agency, http://resources.ca.gov/bdcp/docs/Brochure.pdf Accessed August 12, 2008.

Regional Water Conditions

[This section presents an overview of the current status of water resources in the region and unique sub-regions, including key implications derived from the regional water portfolio.]

Tribal issues. [Develop tribal content: total sq-miles of federal tribal trust lands. Large reservations (e.g, Tule River , Round Valley, Hoopa, and the Riverside/San Diego area tribes) should be noted. This info can come from the Bureau of Indian Affairs GIS data which we have, or by contacting the nearest BIA office. BLM also maps these and other categories of federal lands.]

Environmental Water

A diverse set of conditions in the Delta helped shape a unique ecosystem from which hundreds of aquatic species, many endemic to the system, evolved. Reclaiming and maintaining the Delta for agriculture, urban areas, transportation corridors and utilities and managing the Delta as a water conveyance and supply system altered many of these conditions in ways that continue to challenge management of the system.

Since development within the Delta began, operation and management of the water conveyance and supply system has continually. History suggests that many of the management adjustments and changes that have been made over the years within the Delta have fallen short in addressing the environmental or water quality concerns these actions were designed to resolve.

Requirements of the State Water Resource Control Board (SWRCB) and the biological opinions for endangered species largely determine regulatory requirements for water quality, flow and operations in the Delta and Suisun Marsh. On occasion, the SWRCB requirements are preceded by requirements set by other agencies such as the Fish and Wildlife Service. For example, in their middle 90's Delta Smelt/Sacramento Splittail Biological Opinions, the Service set CVP and SWP operational criteria which were ultimately folded into the State Board's D-1641.

The SWP and the CVP coordinate project operations to maintain the standards established by D-1641 and the biological opinions, by releasing water from upstream reservoirs for Delta outflow requirements, by curtailing export pumping at the SWP Banks and CVP Tracy Pumping Plants during specified time periods and meeting salinity standards in the Suisun Marsh. Most recently, Judge Wanger ruled that the FWS' 2005 OCAP Biological Opinion was "unlawful and inadequate" partially because it "does not provide a reasonable degree of certainty that mitigation measures will take place". Judge Wanger ruled on the NOAA Fisheries Opinion, regarding salmon and steelhead species, invalidating the Opinion for many of the same reasons as the Delta smelt case. It is expected that the operational criteria set in the new Opinions will eventually be folded into SWRCB standards.

The CALFED Program established the Environmental Water Account in 2000 as a way to protect fish species by flexibly managing the timing of exports from the California Delta. This "real-time" operation allows the SWP and CVP export pumps to be curtailed when fish are present and to operate when the fish are not in danger.

The Ecosystem Restoration Program (ERP) Conservation Strategy for the Delta and Suisun Marsh Planning Area provides leadership for conservation and restoration in the Delta and Suisun Marsh. It is developed by DFG in collaboration with U.S. Fish and Wildlife Service and National Marine Fisheries Service. The strategy reflects changing knowledge, conditions, and understanding of the system, and is intended to facilitate coordination and integration of actions

among all resource planning, conservation, and management decisions affecting the Delta and Suisun Marsh.

The purpose of the Bay-Delta Conservation Plan (BDCP) is to create a stable regulatory framework to both conserve at-risk native species and natural communities in the Delta and provide water supply reliability for people The BDCP will examine how to improve the design and operation of the State and Federal Water Projects over both the short term and the long term and implement a major program for restoring and managing habitats within the Delta.

Water Supplies

Surface Water. The largest source of water for the Delta is the Sacramento River, which transports about 18.3 million acre-feet into the Delta in an average year. Additional flows from the Yolo Bypass and the San Joaquin River bring in an average of 5.8 million acre-feet, with precipitation adding about another 1 million acre-feet. The watershed of the Delta is a source of water supplies for much of the state. Water supply includes not only the water used by farms, cities, and businesses, but the flows in the rivers and channels that support the ecosystem. Some of the water entering the Delta is diverted out of channels for use within the Delta, a larger portion is exported for uses in areas outside the Delta, and most flows to the San Francisco Bay and the ocean. Freshwater flows in the Delta are typically much less than those caused by tides. Twice a day, Pacific Ocean tides move into and out of the Delta. The average incoming and outgoing tidal flow is about 177,000 cubic feet per second. This contrasts with an average freshwater outflow of about 30,000 cfs.

The Suisun Marsh is a brackish marsh. Salinities vary seasonally with higher salinities in the summer and fall, and lower salinities in the winter and spring. There is always an east to west salinity gradient in the Suisun Marsh. During periods of local rainfall numerous creeks provide fresh water inflow to the northern areas of the marsh, seasonally decreasing the salinities of these regions. These creeks are: Denverton, Union, Laural, Ledgewood, Suisun, Green Valley, Jameson Canyon and American Canyon. (Chappell, 2008)

Groundwater. Groundwater supplies within the primary zone of the Delta are continually recharged due to flows in Delta channels and the soft, deep soils of Delta islands. The water table is relatively shallow, especially because many of the islands have subsided. A number of groundwater basins/subbasins touch on the secondary zone including: Sacramento Valley/Solano Subbasin; San Joaquin Valley/Eastern San Joaquin and Tracy Subbasins; and the Suisun-Fairfield Valley Basin Groundwater levels in most basins have declined. However, levels in the Suisun-Fairfield basin have generally remained stable since 1970. The Eastern San Joaquin Subbasin has been characterized as severely overdrafted with significant depressions east of Stockton and Lodi. Groundwater levels fluctuate with droughts, development, delivery of surface waters to the region, and periods of "wet" years (DWR, 2003).

In general, groundwater quality throughout most of the region is suitable for some urban and agricultural uses with only local impairments. The primary constituents of concern are high TDS, nitrate, boron, chloride and organic compounds(DWR, 2003). According to the San Joaquin County Public Works Department (2004), groundwater extraction in the Eastern San Joaquin Subbasin has increased the flow of saline water from the west. There is a concern that the eastward migration of saltwater will degrade portions of the basin rendering the groundwater unsuitable for urban and agricultural purposes.

Water Balance. A water balance is a good way to get an overview of the major flows into and out of the Delta. Three recent years 1998 (wet year), 2000 (average year), and 2001 (dry year) serve to help demonstrate typical fluctuations in Delta in-flows/outflows among years with different rainfall amounts (Figure 12-x Delta inflows/outflows for years 1998, 2000, and 2001). During these years, the water system was generally operated under the same rules as today. Some observations that can be made by looking at these three types of water years are:

- In-Delta consumptive use is similar most years
- Water export quantities show more variability but still are in a relatively narrow range
- The widest variability from year to year occurs in the outflow from the Delta. Net outflow to the bay/ocean in a wet year can be many times the outflow during a dry year.
- Water diversions and exports are a larger portion of the Delta inflow during a dry year

PLACEHOLDER: Figure 12-x Delta inflows/outflows for years 1998, 2000, and 2001

[See graphic in S&T report page 18. add note that Other =Cosumnes and Mokelumne also in 2005 water plan]

The historical records show even larger flow ranges than represented in Figure 12-x. For example, during water year 1983 (October 1982 through September 1983), more than 60 million acre-feet (maf) of water passed through the Delta to the San Francisco Bay. During water year 1977, only about 5 maf passed through the Delta to the bay.

Water Rights. Riparian water rights are entitlements to water that are held by owners of land bordering natural flows of water. A landowner has a right to divert a portion of the flow for reasonable and beneficial use on their land within the same watershed. Natural flows do not include return flows from use of groundwater, water stored and later released (e.g., by the SWP or CVP for Delta export) or water diverted from another watershed.

Appropriative rights are held in the form of conditional permits or licenses from the State Water Resources Control Board. The State Water Board authorizes and regulates diversion and export of water from the Delta by the SWP and CVP. The State Water Board first issued water rights permits to Reclamation for the operation of the CVP in 1958 (Water Rights Decision 893 and to DWR for operation of the SWP in 1967 (D-1275 and D-1291). Several municipal, industrial and many agricultural users also divert water from the Delta under riparian and appropriative rights (Jones and Stokes 2005).

The following general overview of groundwater rights in California can be found on the Water Boards' website at http://www.waterrights.ca.gov/html/wr_process.htm . In most areas of California, overlying land owners may extract percolating ground water and put it to beneficial use without approval from the State Board or a court. California does not have a permit process for regulation of ground water use. In several basins, however, groundwater use is subject to regulation in accordance with court decrees adjudicating the ground water rights within the basins.

The California Supreme Court decided in the 1903 case Katz v. Walkinshaw that the "reasonable use" provision that governs other types of water rights also applies to ground water. Prior to this time, the English system of unregulated ground water pumping had dominated but proved to be inappropriate to California's semiarid climate. The Supreme Court case established the concept of overlying rights, in which the rights of others with land overlying the aquifer must be taken into

account. Later court decisions established that ground water may be appropriated for use outside the basin, although appropriator's rights are subordinate to those with overlying rights.

Tribal issues. [Develop tribal content: Is this where pending water rights issues would be discussed? BIA knows what tribal water rights proceedings are in progress, for example Tule River Tribe (Tulare County).]

Water Uses

Surface Water. Water use in the Delta region is mostly agricultural. Irrigation water is taken directly from the channels and sloughs through approximately 1,800 diversions, which together divert up to 5,000 cfs during peak summer months. Most of these diversions are not screened to exclude fish and consist of pipes that pass over the levees.

Most Delta farms use water taken directly from Delta channels under riparian and appropriative water rights, and drainage water from the islands is pumped back into the Delta waterways. In 2000, Delta agriculture used about 1.3 million acre-feet of water to irrigate about 476,000 acres of crops (Tully and Young 2007). In-Delta residential water is generally drawn through private wells or provided through community public water systems, such as the Contra Costa Water District. The remaining portion of water in the Delta is either used by the various forms of evapotranspiration or contributes to Delta outflow, through which it can provide wildlife habitat and salinity control benefits. Recreation water uses do not have a large affect on the Delta water balance, but are still important in the Delta, with an estimated 12 million "user days" recorded each year for recreation purposes (Mitchell, 2007).

Most Suisun Marsh managed wetlands begin flooding in the fall around October 1st in preparation for the fall migration of waterfowl. At the end of waterfowl season, water manipulation for habitat development may continue on through July. Typically the water remaining in the wetlands is drained in June or July to allow vegetative growth and to perform routine maintenance activities during the summer work season. (Chappell, 2008)

Power plants at Antioch and Pittsburg are cooled with water diverted from the Delta. Combined, the two power plants pumps can divert 3,240 cfs (URS, 2007). The SWP's North Bay Aqueduct (NBA) and the CVP's Contra Costa Canal deliver water to Bay Area cities. In 2004, the SWP diverted a total of 53,203 acre-feet into the NBA (DWR, 2005). Contra Costa Water District, withdraws about 126 thousand acre-feet in an average year (URS, 2007).

The federal C.W. "Bill" Jones Pumping Plant (formerly the Tracy Pumping Plant) can export about 4,600 cfs, primarily to CVP agricultural land south of the Delta. It also supplies some water to urban areas and to wildlife refuges. The SWP's Banks Pumping Plant has a physical export capacity of 10,500 cfs, but is currently permitted to generally divert only up to 6,680 cfs from the Delta into the pumping plant's Clifton Court Forebay. Diversions, first by the CVP in the 1950s and then the SWP starting in the 1960s have steadily increased over the years. (Figure 12-x In-Delta diversions and exports) The SWP provides water primarily to urban areas, but also supplies some water for agricultural uses. The SWP has contracts to divert 4.2 maf annually. The CVP has contracts to divert 3.3 maf annually from the Delta. The projects generally are not able to deliver their full contract amounts because the projects are also operated for Delta water quality requirements and fish protections. On average, the projects together export about 5 maf annually. (URS, 2007).

PLACEHOLDER: Figure 12-x In-Delta diversions and exports from page 19 of S&T.

Groundwater. There is little known about groundwater use from the basins within the Delta's secondary zone with the exception of the East San Joaquin Subbasin. Various estimates place groundwater use in the East San Joaquin subbasin at 730,000 to 800,000 acre feet per year (DWR, 2003). The CALFED Programmatic EIS/EIR (2000) estimated that average annual groundwater withdrawals range from 100 to 150 thousand acre- feet in upland areas of the Delta.

Water Quality

The Delta is a source of drinking water for more than 23 million Californians, which underscores the importance of carefully managing a wide range of water quality issues in the region. In recognition of the importance of the drinking water to California and the challenges facing the Delta (see "Setting, Current Conditions page 12-2), the Central Valley, San Francisco and State Water Resources Control Boards collectively developed a strategic workplan that prioritizes actions, establishes time schedules for implementing actions, and identifies existing and needed resources. The workplan was adopted by the State Board on XXXX. URL

Salinity. Discharges of the Sacramento River and San Joaquin River into the Sacramento-San Joaquin River Delta constitute the mass emissions from the Central Valley into the Sacramento-San Joaquin River Delta. The Sacramento River constitutes the majority of the flow into the Delta system, with the San Joaquin River contributing a much smaller amount of flow. The Sacramento River Hydrologic Basin is estimated to provide over two millions tons of salt while the San Joaquin River supplies just under one million tons of salt to the Delta.

Estimates of net movement of salt out of the Delta into the San Francisco Bay are difficult as the water becomes brackish from seawater intrusion. Net freshwater outflow is Delta water (mass emissions from the Sacramento, San Joaquin, and other Delta inflows that are not consumptively used in or exported from the Delta). Significant quantities of both salt and water are diverted from the Delta system. The California Aqueduct exports about a million tons of salt and the Delta Mendota Canal exports about nine hundred thousand tons of salt. The North Bay Aqueduct and the Contra Costa Canal export four thousand tons and 41 thousand tons of salt, respectively.

The Central Valley Water Board has gathered stakeholders to form a salinity policy group to work on solutions to the Central Valley salinity problem. The goal of the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) efforts is to maintain a healthy environment and a good quality of life for all Californians by protecting the State's water.

Solutions to control salinity will need to be incorporated into the Water Board's Basin Plans[1]. Basin plan amendments that the Board might consider include: restrictive discharge limits, requirements to conduct studies, implementation of treatment measures or projects to manage salt, and potentially prohibition of certain discharges. Design, construction, and operation of infrastructure necessary to control salinity will be expensive. In the meantime, the Water Board's have been including requirements in permits and waste discharge requirements to study ways to reduce salt loads.

Pesticides. The Central Valley Water Board Toxic Hot Spots Clean-up Plan (California Water Code section 13394) identified diazinon from orchard dormant spray runoff in the entire Delta,

[1] The Central Valley Regional Water Quality Control Board has adopted two basin plans to cover the Central Valley: (1) The Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins, and (2) The Water Quality Control Plan for the Tulare Lake Basin.

diazinon and chlorpyrifos from urban stormwater runoff in Morrison Creek in the City of Sacramento and Mosher Slough, 5 Mile Slough, the Calaveras River, and Mormon Slough in the City of Stockton and chlorpyrifos from irrigation tailwater in French Camp Slough, Duck Slough, Paradise Cut and Ulatis Creek as toxic hotspots in the Delta. The Central Valley Water Board has adopted amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) to incorporate control programs for pesticides in the Delta. However, pesticide impairments have been identified for other Delta Waterways that still need to be addressed. Some of the pesticide impairments are from legacy pesticides, such as DDT. The Central Valley Water Board's Irrigated Lands Regulatory Program (ILRP) implements the basin plan amendments and addresses the agricultural sources of pesticide impairments. The ILRP addresses all water quality issues in irrigation and storm water runoff from about seven million acres of irrigated lands, from near-desert to temperate rainforest climates, hundreds of crop types, and tens of thousands of individual farming operations.

Another source of pesticides to the Delta is urban runoff. The stormwater permits for the Sacramento and Stockton urban areas include requirements to develop and implement pesticide pollution prevention plans. Many of the pesticide impairments are due to chlorpyrifos and diazinon. The recent ban on residential uses of chlorpyrifos and diazinon should reduce the potential for water quality impacts from these pesticides in urban areas.

Nitrates. The primary sources of nitrate in groundwater are application of nitrogen fertilizers, disposal or reuse of animal waste at confined animal production facilities, and disposal of human sewage either in community sewer systems or individual sewer systems (septic systems).

A 1988 State Water Board report to the State Legislature on Nitrate in Drinking Water (SWRCB, 1988) reported that 10 percent of the samples in STORET (the USEPA database) were above the primary Maximum Contaminant Level (10 mg/L nitrate as nitrogen). A geographical depiction of wells with levels of nitrate above background (greater than 4.5 mg/L nitrate as nitrogen) showed the highest densities in the Central Valley are primarily around population centers and concentrated animal confinement areas (e.g. feedlots and dairies). DWR's Bulletin 118 notes that nitrate is one of the most frequently exceeded constituents in public supply wells.

The Central Valley Water Board adopted general waste discharge requirements in May 2007 to control the discharges from the 1550 existing milk cow dairies in the Central Valley. The Central Valley Water Board found that many dairies in the region have impacted groundwater quality with salt and nitrates. As of July 2008, there were sixteen dairies with about 12,000 cows in the Sacramento-San Joaquin Delta Region.

The Central Valley Water Board has prohibited discharge in problematic service areas. In the Sacramento-San Joaquin Delta Region, the Central Valley Water Board has adopted two prohibitions of discharge from individual sewage disposal systems. Currently, both areas are served by community sewage systems. Which ones?

Mercury. The Sacramento-San Joaquin Delta is downstream of mercury mining activities in the Coast Ranges and gold mining activities that used mercury to amalgamate gold in the Sierras. Mercury mine waste enters the Delta from mine-impacted Coast Range creeks such as Cache, Putah and Marsh Creeks. On the Sierra side, principal gold mining areas that discharged mercury were the Yuba, Bear, Cosumnes, Stanislaus, Tuolumne and Merced Rivers. About 98% of identified total mercury loading to the Delta comes from tributary inputs; within-Delta sources (wetland and open water habitat sediments, municipal and industrial wastewater, agricultural drainage, and urban runoff) are a very small component of overall loading.

Methylmercury is the most toxic form of mercury and accumulates in successive levels of the food chain. Within-Delta methylmercury sources contribute 42% of the average annual methylmercury inputs to the Delta. The Central Valley Water Board has identified the Delta as impaired due to mercury levels in fish and the Central Valley Water Board Toxic Hot Spots Clean-up Plan (California Water Code section 13394) identified mercury in the entire Delta as a toxic hotspot. The Central Valley Water Board is developing a methylmercury control program for the Delta. The Delta has been identified as impaired and the Office of Environmental Health and Human Assessment has issued fish consumption advisories due to mercury levels in fish.

Toxic Hot Spots. The Bay Protection and Toxic Cleanup Act requires regulatory attention to prevent the creation or maintenance of toxic hot spots hotspots. In 2001, the Regional Water Board Toxic Hot Spots Clean-up Plan (California Water Code section 13394) identified the following toxic hotspots in the Delta:

- Mercury in the entire Delta and the Cache Creek watershed including Clear Lake
- Low dissolved oxygen concentrations in the San Joaquin River in the vicinity of the City of Stockton
- Diazinon from orchard dormant spray runoff in the entire Delta
- Diazinon and chlorpyrifos from urban stormwater runoff in Morrison Creek in the City of Sacramento and Mosher Slough, 5 Mile Slough, the Calaveras River, and Mormon Slough in the City of Stockton
- Chlorpyrifos from irrigation tailwater in French Camp Slough, Duck Slough, Paradise Cut and Ulatis Creek.

The following toxic hotspot was identified in Suisun Bay:

- Silver, cadmium, copper, selenium, zinc, polychlorinated biphenyls, chlordane, dichlorodiphenyldichloroethylene, and pyrene impacts to aquatic life in Peyton Slough

In addition, there is concern that a number of emerging contaminants could impact beneficial uses such as heavy metals and other naturally occurring elements, pharmaceuticals and endocrine disrupting compounds, and blue-green algae blooms. Sources of these contaminants include agricultural, municipal and industrial wastewater, and urban stormwater discharges, discharges from wetlands and channel dredging activities.

explain what Best Management Practices are in place and working, and what needs to be developed.

describe the cooperation between the many entities that have water quality responsibilities in the Delta

discuss water quality standards for retention and detention.

discuss separate systems for runoff and sewage

what other water quality problems does wastewater contribute to, such as ammonia and phosphorus (used in cleaning cycle), nutrients

violations on San Joaquin River that continue to feed into Delta (boil water), water from Stanislaus being used to try and correct Delta

salinity: ag drainage, wastewater, and brine disposal issues; desalination demonstration plant at Tracy

salinity: San Joaquin County and USGS study; data from San Joaquin County groundwater management plan and IRWMP

poor quality of local water supply; everyone looks to the Sacramento River for better quality water, while the San Joaquin River brings salt loading

improperly abandoned natural gas wells are affecting water quality by serving as a conduit that transfers water between the upper and lower aquifers

where is treated wastewater factor? e.g. Manteca discharge into San Joaquin River – is this considered supply? (response: is a return to prime supply)

water quality impacts from floods

need funding for monitoring of dissolved oxygen, removal of selenium and boron; identify data gaps
economic values of water quality from Mann 2007

Project Operations

Delta Facilities. The Central Valley Project (CVP) is composed of 20 reservoirs with a combined storage capacity of more than 11 maf, 11 power plants, and more than 500 miles of major canals and aqueducts. CVP Delta facilities include the Contra Costa Canal (CCC), the C.W. "Bill" Jones Pumping Plant, the Delta Mendota Canal (DMC) and the Delta Cross Channel Canal (DCC) (Figure 12-x Location of SWP and CVP facilities in the Delta-Suisun). The CCC and DMC convey water from the Delta to Contra Costa County and the DMC and San Luis Service Areas. The DCC is a controlled diversion channel between the Sacramento River and Snodgrass Slough. The C.W. "Bill" Jones Pumping Plant's diversion capacity is about 4600 cubic feet per second (cfs) during the irrigation season and slightly less the rest of the year.

PLACEHOLDER Figure 12-x Location of SWP and CVP facilities in the Delta-Suisun

The State Water Project (SWP) is composed of 17 pumping plants, 8 hydroelectric power plants, 32 storage facilities, and more than 660 miles of aqueducts and pipelines. SWP facilities in the Delta include the North Bay Aqueduct (NBA), Clifton Court Forebay (CCF), John E Skinner Fish Facility, the Harvey O. Banks Pumping Plant, the Suisun Marsh Salinity Control Gates (SMSCG), several Suisun Marsh distribution systems (Roaring River and Morrrow Island and up to 4 temporary barriers in the south Delta). The NBA conveys water to Napa and Solano Counties. Maximum pumping capacity is 175cfs. The CCF, Skinner Fish Facility and Banks pumping plant, divert and convey water to SWP service areas south of the Delta including the South Bay. Daily diversions into the CCF are governed by an agreement with the Corps. The current permitted daily diversion capability of the CCF is 6680cfs. The SMSCG are operated to meet marsh water quality standards. The Suisun Marsh water distribution systems are designed to provide lower salinity water to public and private managed wetlands and to discharge drainage water. Three of the temporary rock barriers are designed to improve water levels and circulation for agricultural diversions while the other is designed to improve fish passage success for salmon. How successful is it in passing fish? – Check w/ Pat Brandes (FWS) in Stockton in late September.

Operational Criteria. The Delta is subject to many State and federal laws, agreements, opinion, etc. that are designed to protect water quality, wetlands, anadromous and native fisheries, migratory birds and threatened and endangered species. Table 12-x is a listing of several of these operational criteria.

PLACEHOLDER Table 12-x Actions affecting CVP and SWP operation in the Delta

The following provides an overview of several of the actions affecting CVP and SWP operations in the California Delta:

- Coordinated Operations Agreement: The CVP and SWP release previously-stored water into the Delta where they re-divert the stored water and also divert natural flow to users mainly south and west of the Delta. The CVP and SWP use the Delta as a common conveyance facility. Reservoir releases and Delta exports must be coordinated to ensure that each project achieves its share of water supplies and bears it share of obligations to protect resources.

- Suisun Marsh Preservation Agreement: The SWRCB's D-1485 directed the CVP and SWP to develop a plan to protect Suisun Marsh resources. An agreement was signed in 1987 with the goal to mitigate the effects of the CVP and SWP operations and other upstream diversions on water quality in the marsh.

- Endangered Fish Species Biological Opinions**:** The general decline of several fish, the Delta smelt and spring-run and winter-run salmon in particular, generated much concern resulting in a series of biological opinions from the NOAA Fisheries and USFWS. These opinions ultimately established requirements to be met by the SWP and CVP to protect these species. These included requirements for Delta inflow and outflow, DCC gate closure and reduced export pumping. Many of these fish protection requirements were incorporated into the 1995 WQCP (follows).

- 1995 Water Quality Control Plan and Decision-1641: The 1995 Plan incorporated several changes recommended by the EPA, NOAA Fisheries and USFWS to the objectives for salinity and endangered species protection. D-1641 implements the objectives in the 1995 Bay-Delta Plan and it imposes flow and water quality objectives to assure protection of beneficial uses in the Delta. In essence, the requirements in D-1641 address standards for fish and wildlife protection, M&I water quality, agricultural water quality and Suisun Marsh salinity. The decision added new provisions for X2, export/info ratio and the VAMP. Meeting the standards was accomplished through changes in the water rights of the CVP, SWP and others. The SWRCB also granted conditional changes to the point of diversion for the CVP and SWP, in the southern Delta, with D-1641 and approved a petition to change places and purposes of use in the CVP.

- Environmental Water Account: The Environmental Water Account (EWA) was implemented as a major fish protection program as part of the CALFED Program. The EWA is a cooperative water management program, the purpose of which is to provide protection to fish species of the Delta-Suisun without reducing water delivery reliability for water users.

influence of court decisions (e.g. Paterno) to flood folks,

Water Governance

More than 200 public agencies—federal, state, regional, and local—dot the Delta and Suisun Marsh waterways and claim partial responsibility for governance, planning, facilities, or resource protections that utilize and safeguard the ecosystem. These diverse public agencies, and the legal requirements that guide them, form a complicated patchwork of governance with a complex history and an uncertain future (Manatt, 2007). figure on page 33 of status and trends report.

The Delta water management governance structure is a complex network of interacting laws and agencies each with overlapping goals and mandates. In some cases, the laws and agencies that

shape Delta water management are directed at general Delta protection while other laws and agencies are directed at protecting resources within, or services dependent upon, the Delta. The goals and objectives of these laws and agencies are not always aligned and the result is a complicated interplay of governing structure and regulations (Manatt, 2007). Table 12-x shows some of the many laws that govern how water is developed, transported, and used from and in the Delta. [Water Governance Context Memo, pg. 3; use table from context memo. Or operations table in Project Operations].

PLACEHOLDER: Table 12-x Laws that govern how water is developed, transported, and used in the Delta

Table 12-x (Partial listing of jurisdictions/authority governing water in Delta) is a partial listing of the more than 200 local, State, and federal agencies that have some jurisdiction and authority in governing water in and through the Delta. [Water Governance Context Memo, pg. 3; use table showing institutions and agencies from context memo.]

PLACEHOLDER: Table 12-x Partial listing of jurisdictions/authority governing water in Delta

In its document Our Vision for the Delta, the Delta Vision Blue Ribbon Task Force recommended that the policymaking about California water resources be the longstanding constitutional principles of "reasonable use" and "public trust. The Task Force stated that these principles are particularly important and applicable to the Delta (Delta Vision, 2007).

The reasonable use doctrine states the State of California's water officials and the courts may limit a water rights holder who is wasting water, using water unreasonably, or employing an unreasonable method of was use or diversion (Delta Vision, 2007).

The public trust doctrine states that certain natural resources, including water, tide and submerged lands, the beds and banks of navigable rivers, and fish and wildlife resources, are owned by the pubic and held in trust for present and future generations of Californians (Delta Vision, 2007).

The Task Force recommends that policymakers use these twin constitutional principles when determining between conflicts in water governance and competing values (Delta Vision, 2007).

In August 2008, the Task Force released its third strategic plan draft, outlining its recommendations to carry out its vision. A new governance structure was one of its recommendations, and the Task Force presents two strategies to address that issue.

One strategy calls for a multi-part governance structure that would create several new entities: a California Delta Ecosystem and Water Council, a California Delta Conservancy, a California Water Utility, a Delta Operations Team, and a Delta Science and Engineering Board. The Task Force also is recommending changes or enhancements in authority for some existing state entities, like the Delta Protection Commission.

The second strategy is for the proposed California Delta Ecosystem and Water Council to oversee developing and carrying out a new plan, dubbed the "California Delta Ecosystem and Water Plan" (CDEW). The Task Force recommends that this be the plan for integrated resource management and adaptive management of the Delta, based on California's Coast Management Program developed under the Coastal Zone Management Act (CZMA).

Work is continuing as the Task Force refines their recommendations. The final Task Force report is due October 31, 2008.

Flood Management

To flood folks

discuss the nexus between floods and water quality

return islands to natural habitat

list all studies that are the Delta resources—include what is about to be done and what could be done

Tom Zuckerman has a white paper on flood management

Historic Floods

Levee failures are not rare in the Delta. Each of the 70 islands has flooded at least once since reclamation. Between 1930 and 1969, 18 islands or tracts flooded in a total of 28 events.

Andrus Island 1972 – only failure to result in significant seawater intrusion. During the January-February 1980 storms, a combination of high tides and flood-level flows caused breaches in and rapid deterioration of private levees. Approximately 11,300 acres of agricultural land were inundated on Webb and Holland Tracts and Prospect and Dead Horse Islands. In September 1980, an Old River levee failed causing the 5,200-acre Lower Jones Tract to flood.

Heavy storms in October and November 1981 raised river levels, leading to another failure of the Prospect Island levee and failure of Little Franks Tract, 200 acres, in December 1981. High water on the Cosumnes River in January 1982 breached private levees, flooding farmland and damaging roads and bridges. These areas flooded again when the Cosumnes rose in February 1982. In August 1982, the McDonald Island levee failed, inundating 5,800 acres of farmland.

High tides and winds in November 1982 contributed to the failure of Venice Island. In January 1983 levees also failed at Mildred Island, Shima Tract, Fay Island, Little Frank's Tract, and Prospect Island. Bradford Island failed in December 1983.

In February 1986 record high tides and record Sacramento River inflow both occurred, leading to failure of Tyler and Dead Horse Islands and McCormack-Williamson and New Hope Tracts.

The January 1997 storms caused one of the worst floods of the century. McCormack-Williamson Tract and Dead Horse Island levees failed again. Particularly high flows in the San Joaquin River led to failure of a levee at Mossdale, flooding that area and Stewart Tract, and the nearby Paradise Cut levee breach flooded the Pescadero District.

In June 2004, the Lower Jones Tract levee failed, inundating the island. The storms of late December 2005 again brought high tides and high runoff.

Flood Hazards

To flood folks:
where would catastrophic [levee] failures be addressed in the report? it needs to be covered.
SB5 and future levels of protection
consequences for system and exports - dependent on how upstream flood systems are operating

Throughout the Delta, levees originally constructed from material dredged from adjacent channels and since improved in various places, hold back river and tidal waters. These levees are

subjected to damage from rodents, piping, and possibly foundation movement. These effects may lead to sudden failure at any time of the year.

Winter storms bring both high inflows and windy conditions. In combination with annual and daily high tides, this may cause waves to wash over and damage Delta levees, potentially leading to failure. When an island floods, the fetch is increased to the full width of the island. The waves may cause extensive damage to unprotected interior levee slopes.

Institutions

Federal levees in the Delta are projects of the Corps of Engineers. A total of 211 miles are part of the Sacramento River Flood Control Project. These federal levees are sponsored by California's Central Valley Flood Control Board and maintained by local agencies.

Separate Corps of Engineers projects are the Sacramento River Deep Water Ship Channel and its appurtenant levees, and the Stockton Deep Water Ship Channel. Private Delta levees are supported by State subvention programs administered by DWR.

Emergency response is provided under the Standardized Emergency Management System (SEMS) in order of available resources by local agencies, county emergency management organizations, OES regions, and OES headquarters, with the DWR Flood Operations Center and the Corps of Engineers supporting throughout. The Corps of Engineers facilitates recovery of federal facilities; local and private facilities, housing, business, and infrastructure depends on local resources, State programs, and the allocation of event-specific federal or State funds.

Existing Flood Damage Reduction Measures

To flood folks:
project and non-project urban levees
FEMA and State decertification and impacts on communities
reservoir operations
valley spill-over areas (recharge floodplains)
floodwater bypass, San Joaquin County
Levees and related pumping systems are the only type of flood protection works in the Delta.

Constructed Flood Protection Facilities

Protecting the 51 islands and tracts in the region are 462 miles of private levees and 211 miles of Federal levees. These improvements provide flood protection of varying degree. Federal levees in the northern Delta are on the Sacramento River, Steamboat, Miner, Elk, Georgiana, Thirteen Mile, Cache, and Lindsey Sloughs. The southern Delta's federal levees are on the San Joaquin, Calaveras and Old Rivers, Bear Creek, Paradise Cut, and French Camp Slough. In general, these levees pre-date federal participation and are generally of the same original construction as the private levees, though many miles have been improved.

The flood control and multipurpose reservoirs of the Sacramento and San Joaquin River systems contribute to flood protection in the Delta. For tabulation of these reservoirs, see Chapter 6, "Sacramento River Hydrologic Region" and Chapter 7, "San Joaquin River Hydrologic Region."

The California Data Exchange Center provides access to an extensive array of telemetered hydrometeorological gages via its internet facility. For more information, see Chapter 1, "State Summary".

Flood Governance

The Central Valley Flood Control Board has adopted designated floodways on the Cosumnes and Mokelumne Rivers from their confluence upstream to the region's boundary.

All six counties within the region regulate floodplain development with countywide zoning ordinances. Additionally, all counties have adopted Hazard Mitigation Plans, which discuss and recommend several structural and nonstructural methods for reducing flood damages. General plans for all counties provide strategic goals for minimizing future flood risks in the context of increasing development and population growth.

Floodplain mapping is underway within the Delta on the Sacramento and San Joaquin Rivers in conjunction with the effort in the Sacramento River and San Joaquin River Areas. For more information, see Chapter 6, "Sacramento River Region" and Chapter 7, "San Joaquin River Region."

Five counties and two cities participate in the National Flood Insurance Program Community Rating System. In 2006, Solano County and Stockton were in CRS Class 8, Alameda County was in Class 7, Contra Costa County, San Joaquin County, and Sacramento were in Class 6, and Sacramento County was in Class 5.

Emergency Procedures

Under the Standardized Emergency Management System (SEMS), initial emergency response is made by the maintaining agency. When its resources are exhausted, the county emergency management organization provides support. Additional support if necessary is coordinated by one of four regional offices of the Office of Emergency Services. Through the OES region and OES headquarters, help can be obtained from any State agency. OES coordinates with federal agencies and private organizations as well. The DWR Flood Operations Center is normally called early in the event to facilitate information flow and provide field situation analysis and flood fight expertise. Severe situations that require OES involvement may also require emergency response by the Corps of Engineers, which is obtained by request of DWR. Table 12-x is a listing of specific response organizations.

Recovery after a moderate flood event may also involve the funding and construction services of the Corps of Engineers if the facilities are parts of federal projects. Availability of resources to repair local and private facilities, remove flood waters, and restore housing, business, and infrastructure often depends on the severity of the event and the allocation of event-specific federal or State funds.

Table 12-x Flood emergency response organizations, Delta Region

Responder	Level	Comment
Bethel Island Municipal Improvement District	1	Bethel Island, Conta Costa County
Brannan Andrus Levee Maintenance District	1	Brannan-Andrus Island, Sacramento County
Reclamation Districts 799, 800, 830, 2024, 2025, 2026, 2036, 2059, 2065, 2090, 2117, 2122	1	Delta islands and tracts in Contra Costa County
Reclamation Districts 3, 341,349, 551, 554, 556, 563, 1002, 1601, 2110, 2111	1	Delta islands and tracts in Sacramento County
Reclamation Districts 1, 2, 38, 346, 404, 524, 544, 548, 684, 756, 773, 828, 1007, 1614, 2021, 2023, 2027, 2028, 2029, 2030, 2033,	1	Delta islands and tracts in San Joaquin County

Responder	Level	Comment
2037, 2038, 2039, 2040, 2041, 2042, 2044, 2058, 2062, 2072, 2074, 2089, 2090, 2107, 2113, 2114, 2115, 2116, 2118, 2119		
Reclamation Districts 501, 1607, 1667, 2060	1	Delta islands and tracts in Solano County
Reclamation District 150	1	Merritt Island, Yolo County
Emergency Services units of the 11 cities in the region	1	Any emergency
Emergency Services units of the 6 counties in the region	1 or 2	Any emergency, and by request from level 1 responders
Office of Emergency Services, Inland Region	3	Any emergency, Sacramento, San Joaquin, and Yolo Counties, by request of county
Office of Emergency Services, Coastal Region	3	Any emergency, Alameda, Contra Costa, and Solano Counties, by request of county
U.S. Army Corps of Engineers	3	Specified water-related emergencies, by request of DWR
Department of Water Resources	2	Flood Operations Center, flood fight and Corps liaison
California Conservation Corps	3	Personnel and equipment for flood fight
Department of Forestry and Fire Protection	3	Personnel and equipment for flood fight
Office of Emergency Services	4	All emergencies, entire hydrologic region, by request of OES Region

Relationship with Other Regions

Covering only about 1 percent of California's area, the Delta contributes much more to the state than one might expect from its size. Most importantly, the State's economy is inextricably bound with the Delta economy. About 13 percent of the state's water flows into the Delta in an average year (Delta Vision, 2007). In turn, a large part of the State is dependent upon water exported from the Delta to meet much of its agricultural and urban needs. The Delta is a key conduit of the state's water supplies. Approximately two thirds of the state's population live and work in urban areas that receive at least some of their water supply from the Delta. Similarly, about 2.5 million acres of agricultural land are irrigated with exported water. On average, the CVP and SWP together export about 5 maf annually (URS, 2007). The Bay, San Joaquin, Tulare and South Coast Regions receive the lion's share of the exported water. In addition to providing water for farms, homes, and industry, water exported from the Delta provides significant water supplies to California's vital wetlands.

Finally, the Delta region is important to the State because of its vital transportation and conveyance facilities, ecosystem functions and a wide range of recreational opportunities. The Delta contains highways, railroads and shipping routes, natural gas storage and transmission facilities, electric transmission pathways, and gasoline product distribution pipelines. Eighty percent of the state's commercial fishery species live in or migrate through the Delta. In addition, the Delta provides world renowned boating, hunting, fishing and nature viewing opportunities, with 12 million user days annually.

There are a number of Integrated Regional Water Management Plans (IRWMP) that include the CALFED goals and objectives for the Delta in their plans. Some, like the American River Basin Plan, do not mention the Delta by name, but acknowledge that their water supply goals and objectives are consistent with the larger statewide goals and objectives outlined by the CALFED Program. Others, like the Cosumnes, American, Bear, and Yuba Region (CABY) IRWMP and the Sacramento Valley IRWMP, explicitly tie specific goals, objectives and actions to helping

meet the CALFED goal of improving the Delta. These actions include water conservation, water quality improvement, and ecosystem restoration.

Control of flooding in the Delta is strongly dependent on operation of the upstream reservoirs in the Sacramento River and San Joaquin River Regions. DWR coordinates closely with the Corps of Engineers and operators of these reservoirs. All parties participate in daily operators' conferences sponsored by DWR's Flood Operations Center.

As noted in the "Setting" discussion, there are a number of initiatives being undertaken, the outcome of which, will affect both the Delta Region and regions across the state. Most, if not all, of these activities will have a role in developing the region's as well as other region's response strategies for meeting future water supplies and exports, water quality, ecosystem and flood protection.

discuss more the interaction between mountain counties and the Delta - what are the upstream use effects on Delta water supply-see Delta vision reports?

Regional Water and Flood Planning and Management

[This section discusses (1) the status of Integrated Regional Water Management (IRWM) and other regional plans, highlighting key challenges and accomplishments; and (2) regional response strategies for meeting future water demands and quality standards, adapting to climate change, and achieving sustainability.]

[Develop tribal content: Major issues that involve tribes may already be included, e.g, TROA, Mono Lake, and Klamath River, etc. Name tribal governments involved, as involved agencies also are named.]

The Delta region is made up of six counties (Alameda, Contra Costa, Sacramento, San Joaquin, Solano and Yolo) each with its own General Plan for future development and conservation efforts. Further, the Region is part of 6 Integrated Regional Water Management Plans (American River Basin, East Contra Costa, Mokelumne, Amador and Calaveras, Sacramento Valley, Solano County and Yolo County). In addition to the General Plan and IRWMP efforts, a number of initiatives are underway in the Delta including Delta Vision, CALFED Bay-Delta Program, Bay-Delta Conservation Plan and Suisun Marsh Management Plan.

General Plans County general plans list land use and economic development goals and objectives. For the five counties URLs that have jurisdiction in the Delta Region, their goals and objectives are very similar for the region: provide flood protection and public safety; slow urbanization on prime agricultural land; preserve ecological and habitat resources; enhance transportation including Highway 16, ports, and waterways; and provide and protect water resources, including water quality, diversions, groundwater, and controlled exports

Integrated Regional Water There are no IRWMPs written specifically for the Delta Region. although IRWMPs for large watersheds like the Sacramento River and the Cosumnes, American, Bear, and Yuba Rivers include Delta issues in their plans. Not surprisingly, the IRWMPs share many of the themes mentioned in the general plans. The most common and prevalent themes are water quality and flood control.

The IRWMPs that include strategies and objectives for the Delta are: American River Basin; Cosumnes, American, Bear and Yuba (CABY); Madera County; Mokelumne, Amador, Calaveras; Sacramento Valley; and Yolo County. URLs

The Yolo County IRWMP lists several specific actions for areas in the Delta. Actions include foundational efforts such as monitoring water quality or subsidence, mercury remediation in the Cache Creek system and Yolo Bypass, Clarksburg levee improvement, and Sutter Slough erosion control, to mention a few.

Three other Delta related issues most common in these IRWMPs are levee system improvement, new or enlarged surface storage, and upstream ecosystem restoration. Land use, and its accompanying water use, is another aspect explored in the IRWMPs. In many cases, the IRWMPs see land use and changes in water use as potentially impacting both quality and flow to the Delta.

Emerging issues such as the impact of climate change, including greenhouse gas emissions, are conspicuous by their absence in many of the current IRWMPs. This is likely because there was not much known about the potential impacts of climate change at the time most of these plans were written.

Flood management provisions in IRWMPs: information to be supplied later.

Delta Vision –Executive Order S-17-06 established a Blue Ribbon Task Force and directed the Task Force to "develop a durable vision for the sustainable management of the Delta" with the goal of "…managing the Delta over the long term to restore and maintain identified functions and values that are determined to be important to the environmental quality of the Delta and the economic and social well being of the people of the state." The Vision http://deltavision.ca.gov/ is complete and the Strategic Plan will be available in late 2008.

CALFED Bay-Delta Program - The mission of the CALFED Bay-Delta Program http://www.calwater.ca.gov/index.aspx is to develop and implement a long-term, comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Sacramento – San Joaquin Bay-Delta system.

Bay-Delta Conservation Plan – The BDCP http://resources.ca.gov/bdcp/ is a collaborative effort by state and federal agencies and stakeholder groups to develop a conservation plan for the Delta aimed at addressing the current conflict between the protection of at-risk fish species and water supply. While the BDCP will focus on the fish/water supply issues in the context of broad ecosystem protection principles, it will also address water conveyance alternatives, habitat restoration and management, other ecological problems including invasive species and toxic pollutants.

Suisun Marsh Plan - The Habitat Management, Preservation, and Restoration Plan for Suisun Marsh (Suisun Marsh Plan) http://iep.water.ca.gov/suisun/ will develop, analyze, and evaluate potential environmental benefits and impacts resulting from various actions while restoring habitat for tidal marsh-dependent sensitive species. Alternative plans are currently undergoing environmental review.

Drought and Flood Planning

[Note: drought text will be "by others"]

The Sacramento Area Flood Control Agency (SAFCA) goals are protection against the 100-year flood as soon as possible and eventually against the 200-year flood. The agency can finance and manage flood control projects.

The San Joaquin Area Flood Control Agency was created to construct the Flood Protection Restoration Project, consisting of floodwall and levee improvements, new levees, floodway widening and detention basins. The agency can finance and manage flood control projects.

FloodSAFE California is a strategic initiative of the Department of Water Resources. FloodSAFE is guiding the development of regional flood management plans, which will encourage regional cooperation in identifying and addressing flood hazards. The plans will emphasize multiple objectives, system resiliency, and compatibility with State goals and IRWMPs.

The Sacramento River Flood Control Project includes levees on the Sacramento River, levees on some tributaries, and leveed bypasses.

The San Joaquin River Flood Control System includes levees on the San Joaquin River, levees on the adjacent reaches of some tributaries and distributaries, and leveed bypasses

San Joaquin River Group Authority –refer to San Joaquin Regional Report (Chapter 7) URL.

Delta Mendota Canal Recirculation Feasibility Study- refer to San Joaquin Regional Report (Chapter 7) URL.

San Joaquin County groundwater banking program & IRWMP
COMP study
five-county Joint Planning Authority for emergency planning response – DWR to be involved
DPH has regional inventory of permitted wells (Joe Spano)
Mokelumne River Forum (San Joaquin, Amador, Calaveras counties and East Bay MUD and MORE WATER project – stormwater capture and reuse of floodflows for recharge or in-lieu recharge

Are the following to be described as above and then accomplishments and challenges or just challenges or?

emerging contaminants such as endocrine disruptors
monitoring and analysis; are we monitoring for the right things?
alternative energy and PUC mandate of 20% renewables
delivery component: operational costs relative to desal and moving water from one region to another; operating cost of drinking water and ag water for north-of-Delta and south-of-Delta

Accomplishments

General Plans A major accomplishment is that all five Delta Counties agreed to include a Delta Region element in their revised, or soon to be updated, general plans. The Delta Protection Commission (DPC) recommended that Delta counties include this element in their general plans, using the DPC's Land Use and Resources Management Plan as a guide. Another accomplishment is that the five counties, along with the Department of Water Resources and DPC, are developing a comprehensive flood emergency response plan that addresses both the technical (e.g., levee repair) and sociological (e.g., evacuations) aspects of Delta floods. All counties are also engaged in various climate change efforts to address the potential effects changes in timing and intensity of water flow may have in the Delta.

IRWMP The IRWMPs list a wide range of strategies they intend to use to accomplish the goals and objectives. These strategies range from water conservation and recycling, best management practices for agriculture and urban areas, and watershed management to reduce containments or

large amounts of sediment from entering the waterways. Conjunctive use of ground and surface water is another strategy to help with both water quality and water flow objectives for the Delta.

Many plans conscientiously connect the various on-going or planned projects that member agencies are doing with the larger regional and statewide goals. Flood protection and preparedness accomplishments include building storm water retention basins and creating regional disaster plans. Other listed accomplishments include developing off-stream or groundwater storage, restoring level channel capacity by eradicating *Arundo donax*, improving water supply pipelines, carrying out inter-regional conjunctive use projects, and enlarging existing reservoirs.

Delta Vision The Task Force completed the Vision (November 30, 2007) and set out 12 integrated and liked recommendations. http://deltavision.ca.gov/. In their "2-Page Vision Summary", the Task Force stated that "An integrated solution is vital as the Delta cannot be "fixed" by any single action. Nor can California's water needs be met by any single action. No matter what policy choices are made, Californians must also change their relationship toward the environment and water. Conservation must become the next great cause toward quality of life, following in the footsteps of energy conservation. Delay in any of the important areas discussed in this vision will only make California's water problems and the Delta's ecosystem woes worse over the next decades."

Discuss Strategic Plan when finished.

CALFED Program The CALFED agencies have worked together to invest approximately $2.5 billion and stakeholders have invested many billions more in a wide variety of actions within the Delta, in the upstream watersheds, and in the water service areas, primarily in the Bay Area and southern California. A hallmark of the CALFED Program has been the development and integration of sound scientific information into all CALFED activities and decisions. The report entitled Program Performance Assessment, 2007, prepared by the Bay-Delta Public Advisory Committee's Program Performance and Financing Subcommittee, contains an overview of Program progress during Stage 1, http://www.calwater.ca.gov/content/Documents/meetings/2007/06-21-07Item_9A_Prog_Perf_BDPACProgramAssessment.pdf.

Bay Delta Conservation Plan The BDCP process began in late 2006, and concluded 2007 with agreement on the most promising approach for achieving its goals of conservation and water supply: Develop and analyze environmentally friendly ways to move water through and/or around the Delta.

Suisun Marsh Plan Accomplishments for Suisun Marsh – update as process unfolds

Drought and Flood Planning

To flood folks
San Joaquin Flood Control and Water Conservation District
Stockton Metropolitan Area Flood Control projects

- Improvement to Delta levees has proceeded mostly piecemeal in response to failures and flood threats. An exception is the improvement of the Sacramento River levees. Major accomplishments are:

- Construction of upstream reservoirs outside the Delta region. See Chapter 6, "Sacramento River Region", and Chapter 7, "San Joaquin River Region."
- Construction of the levees beginning in the early years of the 20th century.
- Dredging and realignment of the Sacramento River in the early years of the 20th century.
- Deepening and realignment of the San Joaquin River starting prior to 1950.
- Improvement of various private levees with State funding support beginning in the 1990s.
- Establishment of SAFCA, 1989.
- Establishment of SJAFCA, 1995.
- Improvement of the Sacramento River Levees in the early 21st century.

(Note: drought text will be "by others")

Challenges

General Plans tbd

IRWMP The primary challenge is to water supply, specifically, how to handle conflicts between water agencies, both within a region and outside of the region. Urbanization in areas upstream of the Delta presents an additional challenge because water use in areas of origin is likely to increase; this urbanization presents an additional challenge to water quality since more rural areas may not have adequate wastewater treatment facilities. Mercury contamination and sediment control is another challenge for upstream regions.

The challenges listed in these IRWMPs are a subset of those besetting the Delta: conflicts between water users in different parts of a region, sediment control, infrastructure, habitat restoration, mercury contamination, flood management, water exports outside of the region, and urbanization. While most IRWMPs acknowledge that their region has a role to play in meeting the statewide goals for the Delta, as expressed in the CALFED Programmatic EIS/EIR, few have specific objectives or actions addressing those goals. The Yolo County IRWMP, however, is the exception.

Delta Vision The Blue Ribbon Task Force cautioned that delaying or selecting some elements of this Vision while ignoring others would lead to failure. They concluded "that a comprehensive vision, together with integrated and linked actions, is the key to success. They went on to say, "The Delta cannot be *fixed* by any single action. Nor can water needs be met by any single action. No matter what policy choices are made, we Californians are compelled to change the ways we behave toward the environment and water. Delay in any of the important areas discussed in this vision will only make problems worse over the next decades." Update when strategic plan is finished.

CALFED Program The continued Pelagic Organism Decline (POD), existing risks to Delta levees, and projected future conditions (sea level rise, subsidence, invasive species, population growth and climate change) are all challenges facing the Delta.

Bay-Delta Conservation Plan To come from BDCP

Suisun Marsh Plan - update as process unfolds

Drought and Flood Planning

- Reconstruct all Delta levees to a base level of protection meeting the PL 84-99 Standard.
- Enhance flood protection beyond the base level of protection on levees that have particular importance in the system for protecting water quality, the ecosystem, life and personal property, agricultural production, cultural resources, and local and statewide infrastructure.
- Develop and implement best management practices to control and reverse subsidence.
- Enhance the emergency management response capability of local, State, and federal agencies to rapidly respond to levee emergencies.
- Quantify the risks to Delta levees from earthquakes, floods, seepage and subsidence, evaluate the consequences, and develop a strategy and recommendations to minimize the threat of catastrophic levee failure.
- Maintain and improve watershed conditions in support of flood protection and subsidence control.
- Perform watershed assessment, planning, monitoring, and performance measurement to obtain information in support of flood protection and subsidence control.

(Note: drought text will be "by others")

Looking to the Future

Future Scenarios

[Develop tribal content: Mention if something pending in tribal water rights. Tribal water rights that have not been quantified could be the sleeping giant throughout the western states. As tribes look to the future of their communities, their own economic survival may be played out in water rights proceedings. Some may simply buy from wholesale or retail water agencies.]

to flood folks
seismic impacts on conveyance canals

Climate Change

[Flood text to come from flood team:]

- **Subject: Corps** Climate Study for the Comprehensive Study in 2008-09 (no source-pending), Precipitation Studies, USACE Sea Level Study (USACE 2001)
- **Source:** DFM Hydrology Staff (Tom Christiansen), reference to SS, (USACE 2001).

[Concentrate on text regarding projected regional impacts due to sea level rise. General discussion in Volume 1 under uncertainties and risks.]

discuss what can be done regarding carbon sequestration
where "should" the saline front be?
flooding will last longer with sea rise

Global Climate Change – Sea Level Rise. Except for the range of daily tidal fluctuations, sea level is often viewed as static, with little or no long-term change. However, over the last 100 years, the sea level at California's Golden Gate has been rising by an average rate of about 0.08 inches per year. Mean sea level now sits about 0.6-foot higher than it did in 1920. (Figure 12-x Golden Gate annual average and 19-year mean tide levels)

PLACEHOLDER: Figure 12-x Golden Gate annual average and 19-year mean tide levels

[See Fig in S&T, Page 40]

Current estimates by the Intergovernmental Panel on Climate Change indicate that sea level will rise by about 0.6 foot to 1.9 feet over the next 100 years, with a possible added 0.5 foot if the rates of Greenland ice melt increases. Some estimates, which include ice-dynamic changes in the West Antarctic and Greenland ice sheets and growing amounts of greenhouse gases, show even more dramatic sea level rise of about 10 feet by the year 2100. However, there is a great deal of uncertainty regarding predictions of the extent and rate of ice sheet melting. Short-term and episodic increases in water levels in the Delta-Suisun include high river flows, ocean/atmosphere phenomena such as El Niño, storm surge, barometric high tides, and high astronomical tides. When combined with longer-term sea level rise described above, the Delta-Suisun could be overwhelmed.

Before reclamation, the Delta-Suisun could naturally expand and contract to adjust to sea level changes. In its current configuration, the Delta-Suisun is unable to self-adapt to sea level rise because its levees have fixed the channel and island locations in place. The rise in sea level will also increase the flooding potential on all the tributaries entering the Delta-Suisun by raising upstream levels. There has been relatively little scientific assessment of the regional impact of sea level rise on the Delta-Suisun. Because the Delta-Suisun is tidally influenced, water will become saltier, especially in the Suisun Marsh and western Delta.

Regional Climate Change – More Winter Flooding. California's climate is expected to become warmer during this century. Climatologists have documented changes in California's climate during the latter half of the 20th century.

Storms are likely to become somewhat more intense with higher snow lines causing more winter precipitation falling in the mountains as rain rather than snow. Average winter floodflows to the Delta are likely to become larger in the future. The change in rain/snow mix, particularly in the northern Sierra Nevada, is predicted to shift the timing of peak runoff in the Central Valley earlier toward the winter. This would potentially lead to declines in spring and summer inflows and Delta water quality.

- Increased salinity, most notably in the western Delta
- More concentrated agricultural return flows and urban wastewater discharges, particularly if there are lower summer flows in the San Joaquin River

Based on current trends, the biggest risk to the agricultural and urban water diversions comes from sea level rise and the resulting increase in salinity in addition to increased risk of levee failures from continued subsidence, seismic events, and flooding from more severe storms. If there is an effort to maintain current water quality standards, more flushing water will be required from upstream reservoirs, leaving less water for water supply. In addition, increased storm intensity from climate change may require adjustments to flood control reservations. The changes in reservoir operations and the reduced snowmelt could reduce water supply reliability. Increases in water temperature may hurt spawning and recruitment success of native fishes.

Response Strategies

[Text to be written; Describe response strategies for challenges associated with CALFED Program, Delta Vision, Bay-Delta Conservation Plan, Suisun Marsh Preservation Agreement/CALFED Charter, IRWM's and Delta/Suisun component of the general plans for the 6 Delta/Suisun counties.]

Best Management Practices, for both agriculture and residential use

desalination plants
non-point source pollution strategies
septics – Merada
capture more through-water
need better communication with local NGO's to let them know about regional planning efforts and to incorporate their efforts into the regional plan: "people talk to people, agencies talk to agencies, but agencies don't talk to people"

Drought and Flood Planning

Flood operation of reservoirs on the major tributaries of the Sacramento River and the San Joaquin River has traditionally focused on flow management in the tributary itself. Control points are generally between the dam and the mouth of the tributary, with little direct control on the main stem of the river. In recent years, reservoir operators have coordinated through the DWR Flood Operations Center to minimize damage. The 1998 flood highlighted the need for coordination and control on the main river. One way to approach the task of formalizing the needed procedures is to negotiate agreements among the principal parties, which may involve consideration of forecast coordinated operations and changes to the individual reservoir operating rules.

In the 1997 flood event, local governmental agencies expended reserves of materials and funds to meet the challenges of flood fights. There was expectation that the State would reimburse some of the expense, and the State ultimately repaid certain expenditures. However, actual lines of responsibility were not clear and lengthy negotiations preceded the State payments. DWR should establish emergency flood response agreements with all potential flood fight partners. These EFRAs should define responsibility for response and for payment of response costs.

Implementation Next Steps

look at the Contra Costa County Marina and Recreational Boating report for some good ideas about how to deal with water quality issues
fees—who pays [for the water, the clean up, etc.]? will water rates rise? what are people willing to pay for?
better monitoring and data sharing, coordination, and collaboration – e.g. DFG, Boating and Waterways, Regional Boards, SWAMP, DPH (wastewater)

Drought and Flood Planning

- To begin the process of formalizing better control of the San Joaquin River, consultation should begin among the Corps of Engineers, DWR, and the various reservoir operators. An initial step would be joint funding of a study to determine optimum methods of regulation.
- DWR should consult with flood responders willing to participate in drafting a model EFRA.
- DWR should continue supporting Delta levee improvement through the Delta Levee Maintenance Subventions Program and the Delta Levee Special Flood Control Projects Program.
- Subsidence research should continue on Twitchell Island and begin studies on Sherman Island.
- Formulation of an emergency preparedness, management, and response plan for the Delta should continue.
- The CALFED Bay-Delta Delta Risk Management Study should be continued in order to examine ways to reduce or mitigate the risks that have been identified.

Water Portfolios from 1998–2005