BEFORE THE STATE WATER RESOURCES CONTROL BOARD

WATER RIGHT PHASE OF THE BAY-DELTA ESTUARY PROCEEDINGS

Consideration of Interim Water Rights Actions pursuant to Water Code Sections 100 and 275 and the Public Trust Doctrine to Protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

ADVERSE EFFECTS OF INCREASED SALINITY ON SUISUN MARSH BRACKISH WETLANDS

Presented by: Dr. Michael Josselyn, Professor of Biology at San Francisco State University

TESTIMONY of

THE NATURAL HERITAGE INSTITUTE, representing

Friends of the River
Natural Heritage Institute
Planning and Conservation League
San Francisco Baykeeper
Save San Francisco Bay Association
Sierra Club
United Anglers of California

and THE ENVIRONMENTAL DEFENSE FUND

EXHIBIT WRINT-NHI-12
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ADVERSE EFFECTS OF INCREASED SALINITY ON SUISUN MARSH BRACKISH WETLANDS

TESTIMONY OF
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JUNE 26, 1992

My name is Michael Josselyn. I am a Professor of Biology at San Francisco State University and a Fellow of the California Academy of Sciences. I have taught estuarine and wetland ecology at the University's estuarine research field station (Romberg Tiburon Center) since 1978. I have conducted research on the tidal marshes of San Francisco Bay with funding from the California Department of Fish and Game, the US Fish and Wildlife Service, and the San Francisco Bay Estuary Project. I have published numerous papers on this work including a book sponsored by the US Fish and Wildlife Service and the Army Corps of Engineers entitled: *San Francisco Bay tidal marshes: a community profile*. I also contributed to the San Francisco Bay Estuary Project *Status and Trends Report on Wetlands*. As President and Senior Associate with the firm of Wetlands Research Associates, Inc. located in San Rafael, I am currently the biological consultant for the San Francisco Bay Conservation and Development Commission.

I am testifying concerning the recent shift in tidal marsh communities within the Suisun Marsh as evidenced by changes in vegetative composition of existing brackish water marshes to more saline plant species. This testimony is based, in part, on earlier testimony prepared by me and presented by the San

Francisco Bay Conservation and Development Commission at the Bay-Delta hearings held by the State Water Control Board. In that testimony, I presented evidence concerning the acreage of tidal marsh that existed in Suisun Marsh that was not protected by D-1485 standards and discussed conclusions that I had reached concerning the necessary flows required to limit the landward intrusion of tidal salt marsh species into the brackish marshes of Suisun Marsh. Materials and exhibits submitted with that testimony are incorporated by reference within this testimony and will be reviewed as part of my oral testimony.

Brackish tidal marshes are a unique community within Suisun Bay. Approximately 10,000 acres of brackish tidal marshes can be found around the margin of Suisun Bay. Most are located either in the middle of the Bay (e.g. Ryer, Roe, and Seal Islands) or along the southern edge of the Bay. No other portion of California supports as extensive an area of brackish tidal marsh. This is due to the extensive low-lying lands surrounding Suisun Bay that are flooded daily by high tides. The values of this marsh community have been documented in previous testimony to the State Water Control Board by the Audubon Society including the rare and endangered species of plants and animals that are uniquely associated with this habitat type.

These communities are dominated by various bulrush species (*Scirpus* spp.), cattails (*Typha*), and, in some areas, by pickleweed (*Salicornia virginica*). The former two species are found at elevations ranging from mean tidal level (MTL) to mean higher high water (MHHW). The latter species is generally only found in the high marsh in areas infrequently inundated by tidal action. Bulrush and cattail are considered freshwater species and occur in areas where soil salinities are generally below 10 ppt for most of the year. Pickleweed is a halophyte or salt-loving species that can only compete where soil salinities routinely exceed 10 ppt throughout the year. In brackish tidal marshes, it is

generally found at the higher elevations where exposure and evaporation are greatest resulting in high soil salinities. Pickleweed is also found in the diked tidal marshes surrounding Suisun Bay when the applied water salinity is high. Much of the justification for extensive water control facilities within Suisun Marsh has been based on the need for the control of soil salinities to reduce areas dominated by pickleweed, a species considered less desirable for waterfowl.

On the other hand, the tidal salt marshes of San Pablo Bay are dominated by Pacific cordgrass (*Spartina foliosa*) at elevations similar to those where bulrushes grow in Suisun Bay and by pickleweed at elevations ranging from mean high water (MHW) to slightly above MHHW. As noted by Atwater and Hedel (1976), elevation and salinity are the principal factors controlling the distribution of tidal marsh plants in San Francisco Bay. In particular, they note that despite its ability to grow under freshwater conditions, Pacific cordgrass is restricted to areas where mean winter salinities are greater than 15 ppt and mean summer salinities greater than 20 ppt. Pacific cordgrass is absent in more fresh and brackish water areas because it cannot effectively compete against bulrushes and cattails.

The distribution of Pacific cordgrass can be used as an indicator of the increasing salinization of Suisun Bay. Reports of its extension into Suisun Bay have increased over the past 15 years as indicated in Table 1and Figure 1. While the coverage of this species at present is minor, it's inland spread indicates a long term shift in the salinity of Suisun Bay towards a system dominated by salt marsh species such as cordgrass and pickleweed.

This inland spread was confirmed by a field survey conducted under my supervision in June in this year. Surveys of Spartina foliosa were conducted in parts of Carquinez Strait and Suisun Bay on June 22 and 23, 1992. The shoreline surveys were done by walking, driving a car, or by boat along selected portions

of Carquinez Strait and Suisun Bay. Walking surveys were conducted along Southampton Bay (Benicia State Recreation Area) shoreline, east and west of the Benicia Marina, along tidal channels in the vicinity of the Benicia Marina, along the shoreline of the Martinez Marina, Antioch shoreline just north of California State Highway 160 and the shoreline of the Pittsburg Marina. A car survey was conducted along East Levee Road and Sherman Island Road on Sherman Island. A boat survey was conducted along the west end of Chipps Island, the south shoreline of Ryer Island, the north and east point of Roe Island, and the South shoreline of Seal Island.

Table 1. Westernmost distribution of *Spartina foliosa* in Suisun Bay.

Carquinez Straits	1976	Atwater et al (1979)
Benicia Marina	1986	Spicher (pers. comm.)
Peyton Slough	1988	Mendelssohn and Winfield (1988)
Seal Island	1992	This report

This survey showed that Spartina foliosa is well established along the Southampton Bay, Benicia State Recreation Area shoreline. It is also well established in the channels surveyed at the Benicia Marina but had a patchy distribution along the Benicia Marina shoreline. Spartina was found along the Martinez Marina shoreline and exhibited a patchy distribution there often growing among what appears to be dead Scirpus root systems.

Two small stands of S. foliosa were found along the south Seal Island shoreline. No Spartina was seen in Pittsburg, Antioch, on Sherman Island, Ryer Island or Roe Island.

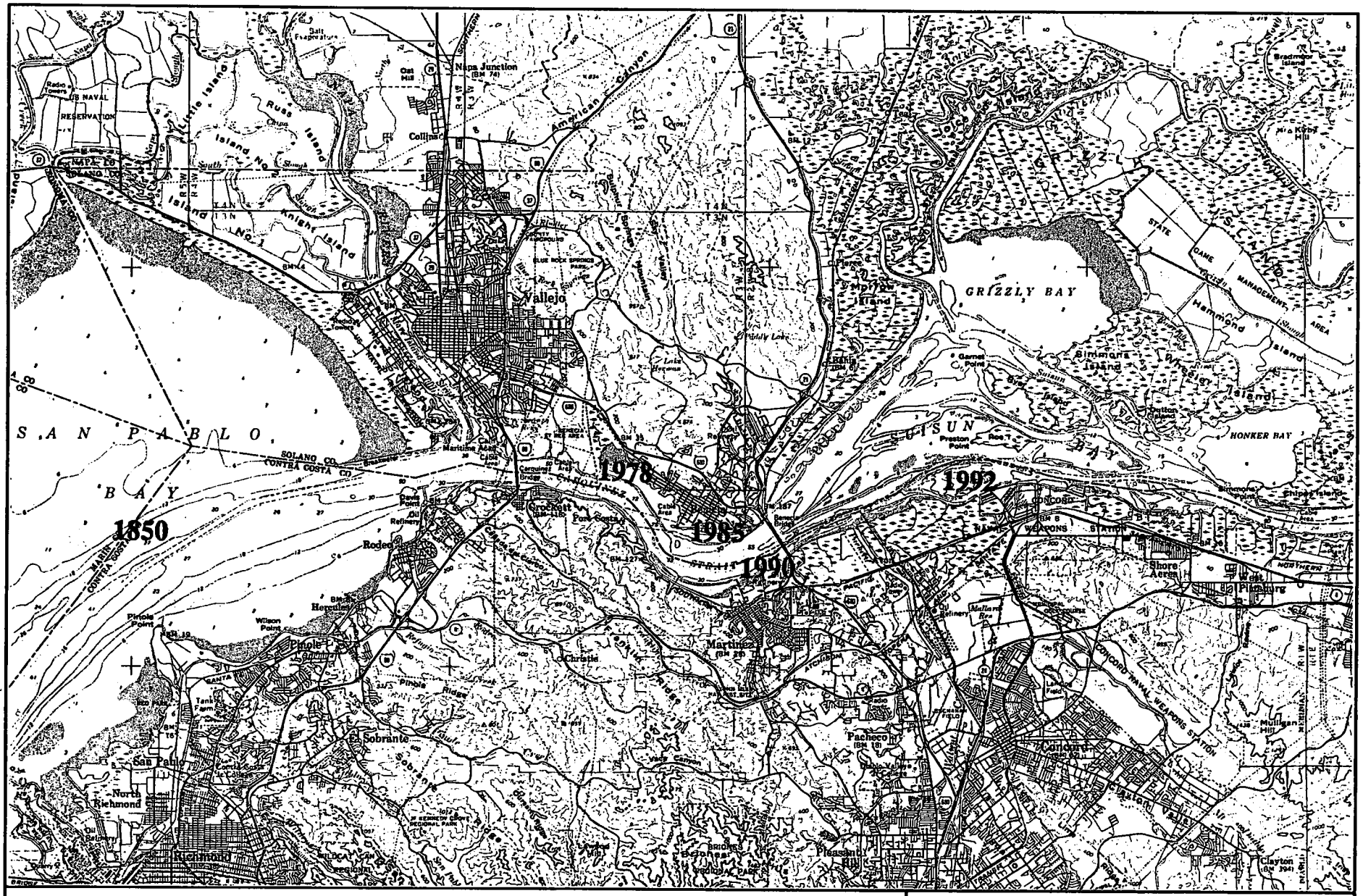
As demonstrated in previous testimony to the Board, the loss of brackish water marsh even when displaced by an equally valuable habitat such as salt marsh can still result in a significant ecological loss. The reason is that there is little available land for the replacement of brackish marsh habitat. As it is displaced towards the eastern end of Suisun Bay and the western portion of the Delta, there is no available low-lying topography for this habitat to colonize. Levees and subsidence have eliminated appropriate elevations for new brackish marsh to form in these areas. Overall, there would be a net loss of acreage of this habitat with an associated loss of species associated with this habitat.

Recent higher salinity levels in Suisun Bay are directly correlated with the occurrence of salt marsh plants in Suisun Bay. If, based on long-term records of the distribution of brackish marsh species, we expect to maintain this habitat throughout the remaining tidal marshes of Suisun Bay, salinity levels throughout the Bay should be maintained between 0 to 10 ppt during the months of January through April, and not rising above 17 ppt in late summer. Salinities in the higher part of this range will result in reduction in the productivity of brackish water species; however, it should be sufficient to retard the invasion of Pacific cordgrass and other salt marsh species (Atwater et al, 1979).

Atwater, B.F. and Hedel, C.W. 1976. Distribution of seed plants with respect to tide levels and water salinity in the natural tidal marshes of the northern San Francisco Bay estuary. USGS Open file report 76-389. 41pp.

Atwater, B.F., Conard, S.G., Dowden, J.N., Hedel, C.W. MacDonald, R.L., Savage, W. 1979. History, landforms, and vegetation of the estuary's tidal marshes. Page 347-386 in T.J. Conomos ed. San Francisco Bay: The urbanized estuary. Pacific Division, AAAS. San Francisco, CA

Mendelssohn, I.A. and Winfield, T.P. 1990. Assessment of initial effects of the Shell Oil Spill on the marsh vegetation. Prepared for ENTRIX, Inc. Walnut Creek, CA.



Distribution of *Spartina foliosa* in northern San Francisco Bay.

Wetlands Research Associates, Inc.