Executive Summary of April 8, 2004
Adaptive Management Working Group Meeting

Lessons from Existing Tidal Marsh Sites in the Delta

Michelle Orr presented a proposed conceptual model for the Dutch Slough site as well as results of the earlier Breach study, providing examples of re-created tidal marsh fragments from around the Delta. Some of her key points were:

- "What you build is what you get:" The re-created or re-flooded sites seem to change very little after an initial period of vegetation.
- Vegetation: Initial period of rapid colonization at mid to high intertidal elevations, followed by slow expansion.
- Sedimentation: Slow, cannot be relied upon to raise subsided surfaces to elevations at which marsh vegetation will establish.
- Channels: Formation through tidal scour (high uncertainty) or excavation. Maintenance through tidal scour.

Salinity

In-channel salinities at Dutch Slough are not high enough to significantly deter egeria densa or native fishes, but with certain marsh plain designs it may be possible to influence marsh plain salinities through a combination of poor drainage, evaporation, and management of water on to the poorly drained areas. Localized patches of marsh plain salinities would very likely influence plant type and would probably favor native plants. Maximum annual in-channel salinities are nearly always less than 1 ppt even in dry years.

Formation of Small Dendritic Channels

It will be difficult if not impossible to create a relatively dense network of steep banked, low-ordered channels thought to be favored by juvenile salmon in a freshwater marsh plain restored with soft mineral sediments. Soft mineral sediments are more likely to erode, forming gently sloped banks and shallow channels prone to colonization by tules. It may, however, be possible and beneficial to test some engineering techniques to create steep banked channels or otherwise prevent tule colonization of low-order channels.

Distinction between Low Marsh Plain, High Marsh Plain, and Floodplains

There was significant discussion and questions about the respective benefits of varying wetland types for native fishes. The group debated potential benefits and costs associated with creating low marsh plain, high marsh plain, and floodplain/riparian habitats. Si Simenstad reported that juvenile salmon only use unvegetated channel habitats in tidal marshes of the northwest, but other members of the AMWG questioned whether juvenile salmon and splittail may also use inundated floodplain or low marsh where tule

vegetation would be relatively transparent to tidal flows. The question is important because restoring high marsh will cost far more than restoring low marsh and may come at the cost of grading down higher floodplain elevations. Regardless of the specific habitat function, the AMWG generally agreed that all marsh types provided important food sources for target fish species and that habitat diversity was an important attribute of any restored system. There seemed to be an interest among several AMWG members that the experimental design should test the relative fish benefits of these various wetland habitat types.

SAV Issues

It is not realistic to control SAV colonization with high velocities. SAV occurs in many marsh channels with high velocities.

The negative impacts of SAV on native fish populations are partially related to how SAV deters fish access to tidal marsh habitats. Marsh edge habitats bordered by large banks of SAV (Venice Cut) are dominated by exotic fish species. Marsh edge habitats with less SAV along the edge had higher numbers and proportions of native fish. The hypothesis is that fish that have to migrate through large banks of egeria are subjected to higher levels of predation and are less likely to utilize the marsh habitats.

Data on fish use of SAV habitat is from marsh edges, not from within marsh habitats. There is little to no data on native fish utilization of tidal channels with exotic SAV. The presumption is that they are better than wide expanses of SAV, and that tidal marsh with tidal channels is beneficial to native fish not withstanding SAV.

There is a difference between native SAV and non-native SAV, but there is little data on the relative benefits of the two types of SAV for native fish. Since native SAV harbors prey resources consumed by exotic fish, some presume that native SAV also harbors exotic fish. Nevertheless, native SAV is preferable to exotic SAV, and improving the competitive advantage of native SAV may be an effective strategy for limiting exotic SAV.

Limitations and Flaws of the Conceptual Model and Experimental Design Proposed by the CBDA Delta Habitats Group

The AMWG concluded that the conceptual model and experimental design proposed by the CBDA Delta Habitats Group was deficient and flawed in a few important respects.

Limitations of the Conceptual Model

- The model assumes that velocities will significantly reduce SAV, which is not consistent with AMWG observations in the Delta.
- The model assumes that it will be possible to create or restore dendritic channel geomorphology preferred by native fish, which is a large uncertainty.

- The model does not distinguish between different marsh plain and floodplain elevations and their respective benefits for native fish or inhibition of exotic species.
- The model does not encompass the unique opportunities to create other habitats beneficial to fish at Dutch Slough, such as the Marsh Creek delta and riparian habitat.
- The model assumes that sedimentation will be the dominant process contributing to marsh plain accretion and ignores the potential for marsh plain accretion from tule growth, and overstates the potential for accretion from sedimentation.

Problems with the Experimental Design
The experimental design proposes 3 treatments for comparison, but there is some question whether some of these treatments would yield ecological benefits or new information.

- Treatment 1, no intervention: At Dutch Slough this treatment would most likely result in large areas of shallow water infested with egeria densa. Even though some additional information about fish utilization of such a habitat could be gained, the AMWG generally agreed that we do not need to create more of this habitat type to gain more information. There are plenty of these types of habitats in the Delta already.
- Treatment 2, fill to intertidal elevation – no channel excavation: The vigorous growth of tules in fresh water would allow them to rapidly colonize the entire marsh plain, greatly diminishing the prospect for formation of small channels or a high-order channel network. Not confident that channels would form under this treatment.
- Treatment 3, fill marsh plain to intertidal elevation – excavate channels: This treatment is most likely to succeed, but it is unlikely that steep, vertical banked channels would form in soft fill sediments, increasing the likelihood that small channels will be colonized by tules.

Focus on Highest Priority Goals/Commitments and Attributes to Achieve Those Goals in Order to Focus the Development of Conceptual Models and Experimental Design

Bruce Herbold suggested and the AMWG generally agreed that we should focus the conceptual model on measurable variables that influence target fish species and mercury methylation. He suggested a focus on a limited number of measurable outcomes: Chinook salmon growth and survival; splittail growth, survival, and reproduction; delta smelt reproduction; and mercury methylation. The AMWG then developed rough conceptual models that identified several of the key habitat attributes that influence these measurable outcomes. These are depicted in Figures 1-5.

Relative Prioritization of Ecological and Experimental Goals

A number of AMWG members questioned whether experimental research goals should take priority over ecological benefits. Representatives from the CBDA and the Coastal Conservancy stated that they expected significant ecological benefits from the project but were also hoping to develop the Dutch Slough Project as a showcase for active experimental design. Ideally, the project should be able to yield both ecological benefits and experimental research benefits. The AMWG seemed to be agree that promising restoration opportunities such as restoring the Marsh Creek delta should be pursued regardless of their impacts on the experimental design of the project.

Scale of Restoration and Experimentation

Large-scale restoration and experimental plot sizes are best for restoring and testing geomorphic processes. Phil Williams estimated that at least 200 acres was necessary to create a 3-4 order dendritic tidal marsh. Smaller scale restoration treatments and experimental plots create more opportunity for biological experimentation. Ideally, we can design the project to test smaller scale biological questions within the framework of a large-scale geomorphic restoration and experiment.