AQUATIC RESOURCE PROGRAM REPORT

5. Floodplain management alternatives for reduction in invasive aquatic species

This section contains only a brief synopsis of our recommendations for managing floodplains to favor native invertebrates (5A) and fishes (5B). The basis for the recommendations is given in our extensive reports in section 3. Basically, alien fishes are a problem on the floodplain, while alien invertebrates are not.

5A. Floodplain Management Alternatives for Reduction in Invasive Invertebrates

Abstract

Our recommendations for reducing the abundance of non-native invertebrates follow many of the guidelines described for non-native fishes. Few introduced species were found on the Cosumnes River Floodplain, although analogous floodplain habitats such as the Yolo Bypass further towards San Francisco Bay reinforce our recommendations. We found the red swamp crayfish *Procambarus clarkii* in significantly higher numbers in agricultural sloughs (Wood Duck Slough) surrounding the floodplain. Habitats that like this permit the buildup of large populations of non-native species, in contrast to the seasonally flooded. However, at present, the threat of invasion by non-native invertebrates is minimal relative to that posed by non-native fishes. From the single species on this floodplain and with comparisons with other sites, the recommendations for fishes that emphasize the importance of restoring floodplains that are seasonally dry also apply to invertebrates.

Introduced species represent one of the most important threats to the health of aquatic systems. Many freshwater systems are highly invaded by fishes, many of which were introduced to enhance sport fishing (OTA 1993). Introduced species represent some of the most daunting obstacles to habitat restoration and in many areas make restoring native species very difficult if not impossible. Wetland systems in other habitats can be heavily invaded and the San Francisco Bay and Delta have received hundreds on nonnative species (Carlton and Cohen 1995). However, much less is known

about the level of invasion by invertebrates in freshwater wetlands and nothing at all up until this study about non-native species in floodplain systems such as the one on the Cosumnes River, where only three species of alien invertebrates have been recorded so far (Table 1).

Table 1. Alien invertebrates recorded from the Cosumnes River floodplain.

Taxonomic Group	Common Name	Scientific Name	Habitat Distribution	Ecological Impacts
Mollusca: Bivalvia	Freshwater Asian clam	*Corbicula fluminea*	River only, not in floodplain	Unknown
Crustacea: Decapoda	Siberian prawn	*Exopalaemon modestus*	One record from Cosumnes floodplain	Unknown
Crustacea Decapoda:	Red swamp crayfish	*Orconectes virilus*	Common in floodplain, rivers, sloughs	Unknown

Records for invasive invertebrates for all but the largest and most obvious species are unknown. It is difficult to make a reliable guess about any if not all aquatic insects, for which data on the species identity is sufficiently uncertain that determining if something if native or not is very hard. Although introduced fishes are prominent features of the floodplain ecosystem, our information suggests that non-native invertebrates with few exceptions are not present on the floodplain. We have worked with systematic experts to identify cryptic or potential introductions of non-native crustacean zooplankton (excepting copepods, which are in process) and have not found any evidence for non-native zooplankton in this ephemeral habitat.

Unfortunately, there are no appropriate floodplain habitats on the Mokelumne available for comparison of the invasive invertebrate fauna, unlike the data for fishes.

With regards to the upper watersheds of both the Cosumnes and the Mokelumne, there are no reliable data regarding the introduced status of the aquatic insects. There are some data for mosquitoes with aquatic larvae because of the human health concerns, yet there are no records of non-native mosquito species from the floodplain area (G. Yoshimura, Sacramento MVCB, pers. comm.).

Floodplains can potentially be areas of high mosquito larvae abundance because of the lack of fish predators, and the Cosumnes River Preserve is also protected from particular kinds of insect abatement. Generally mosquito densities are higher in the forested areas than in the open floodplain habitats, most likely because of the higher densities of adult mosquitoes in the forest.

An additional insight into the management strategies that would likely reduce the abundance of introduced species in the Cosumnes floodplain would involve a comparison with other "floodplain habitats" in the region. The Yolo Bypass harbors several additional introduced species and of course maintains a much larger body of permanent water on a year-around basis. There are other physical difference including greater tidal amplitude and closer proximity to the highly invaded San Francisco Bay.

The only non-native invertebrate that is regularly found on the CFP is the red swamp crayfish, *Procambarus clarkii,* and only juveniles are found in seasonally flooded areas. High densities of adults can be found, however, in surrounding agricultural sloughs (see Section 3).

Conclusions

The degree of invasion of the floodplain by invertebrate groups is nearly inconsequential when compared with the invasion of by alien fishes. The lack of any large biomass of non-native invertebrates suggests that the impacts of non-native invertebrates are negligible on the system. While there are habitats in the region with significant numbers of non-native invertebrates, and the river itself harbors additional invaders, floodplain habitats are at present comparatively uninvaded. The fact that much or most of the floodplain is dry for some part of the year is apparently sufficient to prevent the colonization and/or establishment of most alien invertebrates. Therefore it seems likely that the strategies for floodplain management proposed for native fishes should also benefit native invertebrates that thrive in floodplain habitats.