

Yolo Bypass Aquatic Food Web Fact Sheet

November 7, 2011

How does the aquatic food web change throughout a flood event?

In the course of a Yolo Bypass flood event, temporary aquatic habitat is formed as river water enters the floodplain, creating hydrologic variability and habitat complexity that is not found in the Sacramento River. As the quantity and variability of aquatic habitat available increases, the numbers and different types of organisms changes, and food availability to aquatic organisms increases. As organisms feed, energy works its way through the food web, and downstream in the Yolo Bypass.

These patterns of change are not closely defined. Initially terrestrial detritus (dead organic material) becomes swept up in floodwaters and may be the dominant source of organic matter available. While this is the most abundant source of organic matter available, it is not readily incorporated into the food web (Sobczak et al. 2002).

Phytoplankton are primary producers, and make up the base of the Yolo Bypass food web. The amount of phytoplankton is estimated by measuring the amount of chlorophyll *a* per volume of water. The Yolo Bypass has higher levels of chlorophyll *a* than the Sacramento River due to longer residence times, warmer temperatures, and increased amount of shallow water habitat (Sommer et al. 2004). Chlorophyll *a* levels are generally low during floodplain inundation (while river water is entering the floodplain), followed by rapid growth as floodwaters slow and spread across the floodplain. Highest levels are recorded during descending hydrographs, when water is draining from the floodplain (Schemel et al. 2004; Sommer et al. 2004).

Zooplankton (plankton that are animals) are primary consumers that feed primarily on phytoplankton (Muller-Solger et al. 2002), though they may also eat detritus, microorganisms, and other zooplankton. Copepods are an example of zooplankton that are an important source of food for fish in the Yolo Bypass. Copepods are also benefit from longer residence time and enhanced phytoplankton growth, and are collected at higher levels in the Yolo Bypass than in the Sacramento River during descending hydrographs (Sommer et al. 2004). According to a Cosumnes River-based study, zooplankton biomass in a floodplain can peak up to 10 days after river inflow ceases (Grosholtz and Gallo 2006). Levels of copepods typically show an opposite (inverse) relationship to Yolo flow (Sommer et al. 2004).

Still larger organisms, midges (Chironomids) are an important food source for juvenile salmon migrating through the Yolo Bypass floodplain (Sommer et al. 2001). One species of Chironomid in the Yolo Bypass emerges from flooded Yolo Bypass soils within days of when they are wetted. Permanent (perennial) ponds and inflowing creeks are not major sources of this organism (Benigno and Sommer 2008). There may be substantial differences in chironomid production on different land use types and in areas of different

flood frequency (Benigno and Sommer 2008). Preliminary indications are that emergence of Yolo Bypass Chironomids from naturally inundated soils is greater than from long-wetted soils such as rice paddies. Chironomid density in floodwaters seems to increase with Yolo flow (Sommer et al. 2004). Chironomid larvae emerge from sediment within a few days of rewetting, and drift densities in flowing floodwaters peak about two weeks after initial inundation (Benigno and Sommer, 2008).

And what do juvenile fish eat? Chironomids if they can get them. When the Yolo Bypass is inundated, chironomids can comprise over 90% of juvenile salmon's diets (Sommer et al. 2001). Zooplankton represent a supplemental food source in Yolo Bypass (Sommer et al. 2001). Higher densities of chironomids and warmer water temperatures improve young salmon growth in the Yolo Bypass (Sommer et al. 2001). Young splittail, another native fish, also consume chironomids (Moyle et al. 2004).

What's the best flow depth for native fish that use the Yolo Bypass?

Fish of different species and life stages use areas with different water depths, velocities, and vegetation patterns at different times. As fish grow, and often throughout the day and night, fish tend to choose different places to be (Sommer et al. 2008). Water 0 to 6 ft deep is commonly referred to as "shallow water habitat" and this supports native fish that use seasonally flooded lands in the Yolo Bypass. Being in very shallow areas may put fish more at risk of predation by birds, for example, but there are tradeoffs with temperature, food production, and avoidance of bigger predatory fish that don't swim into the very shallow areas.

How much does decay of vegetation factor into the food web?

Decomposition of plant matter within the Yolo Bypass may not be readily available during most flood events because temperatures are too cold to promote rapid plant decay and flooded duration is short. Longer periods when plants are underwater, or plants from further upstream that have been held in flooded fields while conditions were still warm, for example, may contribute some of the lowest level of "fish food" to the web. Vegetation in the Bypass may be more important to the aquatic food web during a flood event by offering habitat for fish to hide in.

What temperatures do juvenile salmon like best?

Higher densities of chironomids and warmer water temperatures enhance young salmon growth in Yolo Bypass (Sommer et al. 2001). Favorable temperature ranges for juvenile salmon are approximately 13 to 18 C (55 to 65 F). Available data from the past decade indicates that these temperatures commonly occur in the Yolo Bypass by the third week of October and commonly last into the third week of April (April 23), sometimes as late as May 12. Shallow water temperatures are more affected by sunlight and air temperature and sunlight, and hence commonly exhibit greater extremes than temperatures in deeper areas. Temperature is an important factor to monitor in managing fish species.