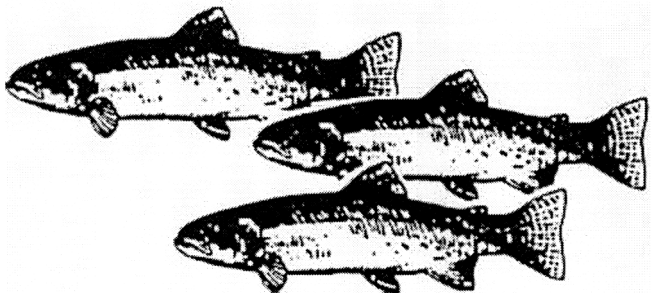
UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

CONCLUDING REPORT

EVALUATION OF PALISADE BANK STABILIZATION WOODSON BRIDGE, SACRAMENTO RIVER CALIFORNIA



REGION ONE

CONCLUDING REPORT

EVALUATION OF PALISADE BANK STABILIZATION

WOODSON BRIDGE, SACRAMENTO RIVER, CALIFORNIA

Prepared by

Frank Michny

Division of Ecological Services
U.S. Fish and Wildlife Service
Sacramento, California

Prepared for

U.S. Army Corps of Engineers
Sacramento, California

November 1988

Physical Features

As was done prior to construction, depth and velocity measurements were made at 10 representative locations along the palisade site. The measurements were taken June 24, 1987 in approximately the same locations and flow as in 1986. The data is provided as general information only on changes in nearshore aquatic habitat. A more definitive study on physical changes to the channel is being conducted by the California Department of Water Resources. Due to a low water year in 1987-88, there were no apparent changes to nearshore habitat; therefore, depths and velocities were not remeasured.

In general, following construction, the beach areas of the palisades have increased somewhat, while average depths at the measurement points remained about the same. Depth measurements were taken relative to the shoreline, and deposition between the palisades has moved the shoreline outward. Nearshore substrates prior to the palisades were a combination of gravels, sand/silt, and soil. However, following construction (the present study period), all of the nearshore substrate now consists of sand/silt and soil. No gravel was observed on the shoreline bottom.

Velocities have changed significantly as a result of palisade construction. Prior to construction, velocities measured three and ten feet from the bank were averaging 1.0 and 2.4 foot per second (f/s), respectively. Following construction, they were reduced to 0.1 and 0.2 f/s, respectively. The average depths and velocities for 1986 and 1987 are presented in Table 7. As indicated earlier, a number of velocity measurements were made behind the waterward palisade net. Velocities in this area ranged from 0.2 to 1.3 f/s with an average of 0.8 f/s. Immediately waterward of the last palisade, net velocities ranged from 3.0 to 6.0 f/s with an average of 4.8 f/s.

SUMMARY

Data in this report represent the second and concluding year of biological monitoring of the palisade-type bank protection project. Sites utilized in developing data were the palisade site at Woodson Bridge State Recreation Area, three natural banks utilized as controls, and one riprapped site. Fish abundance studies were conducted at each site; changes in nearshore aquatic habitat was noted; and a photographic record of wildlife habitat continued. Definitive information on engineering aspects, and depth and velocity changes relating to the palisades are being developed by the California Department of Water Resources in a separate report.

Juvenile salmon, the primary aquatic study species, were found to utilize all sites. The lowest occurrence of juvenile salmon was at the riprapped site. The relative abundance of juvenile salmon at the palisade site increased compared to pre-project conditions. The difference in salmon abundance between the palisade and the average of the three control sites was reduced from 56 percent prior to construction to 20 percent following construction. In the second year of the study, relative abundance of

Table 7. Average depth and velocity measurements at the palisade site in 1986 and 1987.

	Distance waterward from shoreline			
	3 feet		10 feet	
	Depth*	Velocity**	Depth	Velocity
	1.4	1.0	4.4	1.4
	1.6	0.1	4.0	0.2
% Change	+14	-90	-9	-92

* Depth in feet

Velocity in feet/second

juvenile salmonids at the palisade site exceeded that of the natural control sites. Based upon the two years of available post project data, it can be surmised that the palisade technique is comparable to natural banks in terms of juvenile salmonid rearing habitat values and clearly superior to rock revetment. The primary area used by salmon at the palisades was in the vicinity of the waterward panels. Data on abundance of other fish species encountered are provided.

Terrestrial and riparian wildlife habitat remained essentially unchanged following palisade construction. The year prior to construction, a bank swallow colony of about 3,400 burrows (one of the largest in California), was documented within the palisade site. During the following two years, the colony was reduced in extent and numbers. While the exact reason for reduction in colony size is unknown, it could be related to the presence of the palisades.

Following construction, salmon spawning did not occur adjacent to the palisades. This was probably due to natural changes in channel configuration rather than related to palisade induced changes. Nearshore aquatic habitat significantly changed. In addition to the presence of the physical structure of the palisades, velocities along the bank within the area of the palisade were dramatically reduced and beach areas increased.

Based on the information developed in the course of this study, it appears that palisades is an environmentally superior form of bank stabilization compared to standard rock revetment. The basic reasons are: (1) existing terrestrial vegetation is essentially undisturbed during project construction, (2) fishery values are comparable to natural banks, and (3) deposition, accretion, and natural succession will ultimately allow for a biologically natural shoreline environment. The less than positive aspects of palisades are associated with any bank stabilization project. These are: (1) loss of eroding banks providing habitat for bank swallows and similar nesting species, (2) long-term changes in the natural successional process of riparian vegetation, (3) loss of gravel recruitment, and (4) site specific impacts on adjacent spawning areas.

In conclusion, we find the palisades to be an environmentally superior form of bank protection in comparison to standard rock revetment. It is not, however, a panacea for all of the controversies associated with bank stabilization work on the Sacramento River. Where bank protection has been found to be clearly necessary, and where palisades would prove to be engineeringly effective, we recommend its use as an alternative to standard rock revetment.