AD NUMBER

ADB344197

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

Distribution: Further dissemination only as directed by US Army Corps of Engineers, Sacramento District, 1325 J Street, Room 1480, Sacramento, CA 95814, JUL 1979, or higher DoD authority.

AUTHORITY

COE/CA/SD ltr dtd 22 Oct 2008

JULY 1979

SACRAMENTO RIVER BANK PROTECTION PROJECT

CALIFORNIA

FIRST PHASE

SPECIAL REPORT

FISH AND WILDLIFE MITIGATION PLAN

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DEFENSE TECHNICAL INFORMATION CENTER

Information for the Defense Community

DTIC® has determined on Month: 11 Day: 03 Year: 2008 *that this Technical Document has the Distribution Statement checked below. The current distribution for this document can be found in the DTIC® Technical Report Database.*

☐ **DISTRIBUTION STATEMENT A.** Approved for public release; distribution is unlimited.

☐ **© COPYRIGHTED.** U.S. Government or Federal Rights License. All other rights and uses except those permitted by copyright law are reserved by the copyright owner.

☐ **DISTRIBUTION STATEMENT B.** Distribution authorized to U.S. Government agencies only. Other requests for this document shall be referred to controlling office.

☐ **DISTRIBUTION STATEMENT C.** Distribution authorized to U.S. Government Agencies and their contractors. Other requests for this document shall be referred to controlling office.

☐ **DISTRIBUTION STATEMENT D.** Distribution authorized to the Department of Defense and U.S. DoD contractors only. Other requests shall be referred to controlling office.

☐ **DISTRIBUTION STATEMENT E.** Distribution authorized to DoD Components only. Other requests shall be referred to controlling office.

☒ **DISTRIBUTION STATEMENT F.** Further dissemination only as directed by controlling office or higher DoD authority.

Distribution Statement F is also used when a document does not contain a distribution statement and no distribution statement can be determined.

☐ **DISTRIBUTION STATEMENT X.** Distribution authorized to U.S. Government Agencies and private individuals or enterprises eligible to obtain export-controlled technical data in accordance with DoDD 5230.25.

SPKED-W 20 July 1979

SUBJECT: Sacramento River Bank Protection Project, California, First Phase - Special Report on Fish and Wildlife Mitigation Plan

Division Engineer, South Pacific

1. Transmitted for your review are 30 copies of the subject Special Report prepared in accordance with the Fish and Wildlife Coordination Act and instructions contained in ER 1105-2-129. Your previous comments dated 7 February 1979 on the draft of this Special Report have been incorporated.

2. It is recommended that this Special Report be transmitted to OCE as a basis for seeking Congressional authorization of mitigation measures for the subject project.

HOLMBERG/jt

1 Incl (30 cys)
Rpt.,Jul 1979

DONALD M. O'SHEI
Colonel, CE
District Engineer

KINDEL

LUETHY

cc:
Engr Div
WRPB
Inv Sec A
Lev & Chan
C-O Div
Ofc of Counsel
Prog Dev
EPS(wd)

SCIANDRONE

PRATT

DENNEY

HELM

WEDDELL

O'SHEI

SPECIAL REPORT

FISH AND WILDLIFE MITIGATION PLAN

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA, FIRST PHASE

U.S. ARMY ENGINEER DISTRICT
SACRAMENTO, CALIFORNIA

July 1979

TABLE OF CONTENTS

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

This report contains an evaluation of the need for lands to be acquired for habitat restoration for fish and wildlife purposes to offset the impact of construction of the First Phase of the Sacramento River Bank Protection Project, California. It was prepared pursuant to Section 3(c) of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq) which requires that before properties are acquired for wildlife conservation and development purposes, the probable extent of such acquisition is to be set forth, along with other data necessary for project authorization, in a report submitted to the Congress by the construction agency.

Construction of the first phase of the project was authorized in 1960 and provides that costs will be shared 2/3 Federal and 1/3 non-Federal with operation and maintenance of the completed works a non-Federal responsibility. The Reclamation Board of the State of California is the non-Federal sponsor, providing the required local assurances for the project.

The District Engineer finds that the First Phase of the Sacramento River Bank Protection Project, authorized for construction by Public Law 86-645 (Flood Control Act of 1960), has adversely affected the fish and wildlife resources of the project area through removal of riparian habitat. Based on coordination with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and the California Resources Agency, and on a report by the U.S. Fish and Wildlife Service, acquisition of lands together with establishment and maintenance of riparian vegetation are proposed. These Federal and State agencies suggest acquisition and development of 668 acres of fish and wildlife habitat to replace all vegetation removed during construction of the First Phase. Three alternatives were examined for restoration of wildlife habitat: (1) a mitigation alternative of 260 acres, (2) a mitigation alternative of 668 acres, and (3) a combination mitigation and enhancement alternative of 668 acres. A comparative analysis of without-project and with-project conditions indicates that 260 acres of trees and associated habitat is needed to restore that removed from areas of the levee system where Federal and State regulations would have permitted it to remain. The additional 408 acres suggested would restore habitat for that removed from areas of the levee system where Federal and State regulations required that such vegetation be removed through normal maintenance of the levee system but which was actually removed by the bank protection construction. This analysis and coordination with the concerned agencies indicates that a Federal program would be justified for either a mitigation plan of 260 acres or a combination mitigation and enhancement plan of 668 acres. Mitigation measures for fish and wildlife resources affected by construction of the Second Phase of the

project have been authorized and are being implemented concurrently with construction. Acquisition of lands for mitigation in the Second Phase is usually by easement and is considered an adequate interest for establishment and maintenance of fish and wildlife habitat. Similarly, lands acquisition for mitigation of the First Phase would also be by easement, except where fee purchase is mutually desirable. Accordingly, the District Engineer recommends that the Sacramento River Bank Protection project be modified to include the acquisition of 260 acres of riverside berms within the limits of the levee system of the existing flood control project for the establishment and maintenance of riparian vegetation as mitigation for habitat removed during construction of the First Phase of the project, at an estimated cost to the United States of $529,000, subject to the same requirements of local participation as for the existing bank protection project. He further recommends additional modification of the Sacramento River Bank Protection Project to include the acquisition of 408 acres of riverside berms for establishment and maintenance of riparian vegetation for fish and wildlife enhancement at an estimated cost to the United States of $915,000 provided that, prior to acquisition of lands non-Federal interests agree to cost-share the enhancement measures in accordance with Public Law 89-72, as amended.

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

SPKED-W

July 1979

SUBJECT: First Phase - Sacramento River Bank Protection Project, California, Special Report on Fish and Wildlife Mitigation Plan

Division Engineer, South Pacific

AUTHORITY

This report was prepared pursuant to 16 USC 663(c), the Fish and Wildlife Coordination Act, which provides:

> "When consistent with the purposes of this Act and the reports and findings of the Secretary of the Interior prepared in accordance with Section 2, land, waters, and interests therein may be acquired by Federal construction agencies for the wildlife conservation and development purposes of this Act in connection with a project as reasonably needed to preserve and assure for the public benefit the wildlife potentials of the particular project area: Provided, That before properties are acquired for this purpose, the probable extent of such acquisition shall be set forth, along with other data necessary for project authorization, in a report submitted to the Congress, or in the case of a project previously authorized, no such properties shall be acquired unless specifically authorized by Congress, if specific authority for such acquisition is recommended by the construction agency."

This report describes the impact of construction of the First Phase of the Sacramento River Bank Protection Project on the fish and wildlife resources of the project area, assesses the need for measures to offset such impact, and recommends a solution which includes lands acquisition. The bank protection project was authorized by Public Laws 86-645 and 93-251, the Flood Control Act of 1960 and the River Basin Monetary Authorization Act of 1974 respectively, and includes a long-range program for construction of bank protection and levee setbacks to protect the existing levee system of the Sacramento River

Flood Control Project. Neither the authorizing Acts nor the project document for the First Phase -- Senate Document No. 103, 86th Congress, Second Session, "Sacramento River Flood Control Project, California" -- addressed fish and wildlife measures needed to prevent or offset losses or damage to this resource. Coordination with Federal and State fish and wildlife agencies during design and construction and during preparation of the environmental statement revealed a need for evaluation of impacts and consideration of offsetting measures. Evaluations by both the U.S. Fish and Wildlife Service and the Corps of Engineers indicated a need for mitigative measures including lands acquisition.

PURPOSE AND SCOPE

The Sacramento River Bank Protection Project is a phased modification of the existing Sacramento River Flood Control Project. The initial or First Phase, which included 430,000 lineal feet of bank protection and levee setbacks at critically eroding areas, was started in June 1963 and was completed in November 1974. The Second Phase, currently under construction, consists of an additional 405,000 lineal feet of bank protection and levee setbacks. Authorization for construction of the Second Phase includes provisions to prevent environmental losses or to mitigate unavoidable losses concurrently with project construction. Acquisition of lands for mitigation in the Second Phase is usually by easement and is considered an adequate interest for establishment and maintenance of fish and wildlife habitat. The wildlife mitigation evaluation and recommendations contained in this report pertain only to the First Phase of the bank protection project. Areas which are suitable for wildlife conservation and development measures and the nature of these measures are identified. The purpose of this report is to provide a basis for Congressional action regarding acquisition and development of lands for mitigation and enhancement purposes.

SACRAMENTO RIVER BASIN

The Sacramento River is the largest stream in California, draining 26,300 square miles in the northern Central Valley. It is an alluvial, meandering stream with an average annual runoff of about 18 million acre-feet which is equivalent to an average annual flow of about 25,000 cubic feet per second. In addition to furnishing water to adjacent landowners, the river serves as a conveyance facility to transfer water from upstream Federal and State reservoirs to the Sacramento-San Joaquin Delta for further transfer to the San Joaquin Valley and Southern California as part of the Federal Central Valley Project and the California State Water Project. The river provides irrigation and municipal and industrial water supplies, supports waterborne commerce, aids in maintaining the salinity gradient in the Sacramento-San Joaquin Delta estuary, and is used extensively for recreation and fish and wildlife purposes.

THE SACRAMENTO RIVER FLOOD CONTROL PROJECT

The Sacramento River Flood Control Project, authorized by Congress in 1917 was, with the exception of works along the Mississippi River, the first major flood control activity of the Corps of Engineers in the United States. The project was constructed to control widespread and frequent flooding of communities and agricultural land in the Sacramento River basin. The project consists of a comprehensive system of levees, overflow weirs, pumping plants, bypass channels, and channel enlargements. Approximately 980 miles of levee were constructed or improved to provide protection to communities and to 800,000 acres of highly productive agricultural lands. The 1978 population of the protected area was about 910,000.

THE SACRAMENTO RIVER BANK PROTECTION PROJECT

The Sacramento River Bank Protection Project was authorized in 1960 to provide protection for the existing levee system of the Sacramento River Flood Control Project. The bank protection project includes a program for construction of bank erosion control works and for setback of levees within the limits of the Sacramento River Flood Control Project, extending from near Collinsville to the vicinity of Chico. The initial phase of the project provided bank protection to about 6 percent of the total flood control project levees. Bank protection constructed during the First Phase of this project was at the most critical erosion sites where levees and their contiguous banks were progressively deteriorating and the possibility of major levee failure was jeopardizing the protection being provided by the flood control project. The general limits and location of units completed during the First Phase of the project are shown on Chart 1.

The bank protection was constructed by placing quarry stone or cobbles to a thickness of 12-15 inches on the bank or levee slope cleared of all vegetation. The prepared slope was 1 vertical on 2 horizontal for quarry stone and 1 vertical on 3 horizontal for cobbles. Where a stable channel without a shifting bed was encountered, the bank protection was extended below the streambed into an excavated toe trench to prevent undercutting. On the Sacramento River and its tributaries upstream from Sacramento, the bank protection was extended to the height of the berm or to the elevation of the project flood plane if no berm existed. On the Sacramento River and its distributaries downstream from Sacramento, the bank protection was extended either to the berm elevation or to an elevation which flood experience showed was sufficient to prevent appreciable erosion which varies between flood plane and about 3 feet below flood plane.

All lands, easements, rights-of-way, and utility changes for the bank protection project are provided by the State of California, and non-Federal cash contribution is required, if necessary, to make the

non-Federal share of costs equal to one-third of the total project costs. The non-Federal sponsor is the California Reclamation Board which has furnished assurances to provide the above items.

The Reclamation Board has overall responsibility for operation and maintenance of the levee system and the completed bank protection works. The maintenance is accomplished in accordance with Title 33 CFR 208.10(b)(1), the "Standard Operation and Maintenance Manual of the Sacramento River Flood Control Project", and the "Levee Encroachment Guide for Vegetation On Project Levees" initially adopted by the Reclamation Board of the State of California on 1 December 1967 and last revised on 10 December 1976. In general these regulations require trees, brush, and other wild growth to be removed from the levee slopes and crowns. The Board transfers responsibility for maintenance of the completed works to local reclamation or levee districts. Each of the local districts finances the cost of annual maintenance, which has ranged from $500 to $3,000 per mile of levee, by tax assessment of local landowners within the district. If a local district fails to adequately maintain the levees to standards established by the Corps of Engineers and the State of California, the State has authority to form a Maintenance Area and to accomplish the maintenance, with landowners in the district taxed for costs of such maintenance.

Normal maintenance accomplished by local reclamation or levee districts consists of removal of certain types of vegetation whose presence is recognized as detrimental to the structural integrity of the levee and which would interfere with effective flood fighting. The "Levee Encroachment Guide for Vegetation on Project Levees," stipulates where and what types of vegetation can be permitted. Charts 2 and 3 illustrate the types of vegetation that are permitted to grow on both standard project levees and on oversized levees at the time the First Phase was under construction. Although maintenance of the levee system had been transferred to local interests, their maintenance was generally limited to keeping the levees cleared of wild growth, protecting them against rodent damage, and repairs of surface erosion. Due to the major capital outlays required and the inability to finance such activity, bank protection in areas where new erosion developed after the levees had been transferred to non-Federal interests for maintenance was not considered as normal maintenance. If local interests, under their normal maintenance activity, had undertaken early preventive measures to halt incipient erosion of levees and their banks, localized areas of erosion would not have spread and enlarged to where bank protection was required. This presented a question as to whether the problem was one of "new work" or "maintenance" and whether the costs should be borne by the Federal Government or local interests. The answer to equitable cost-sharing was not computed but was based on definition and judgment and resulted in adoption of the 1/3 non-Federal 2/3 Federal cost-sharing ratio

authorized by Congress in 1960 (Senate Document No. 103, 86th Congress, 2d Session). This cost-sharing ratio is applied to all work accomplished as part of the bank protection project.

In addition to construction of rock bank protection, in an attempt to maintain the esthetic appearance and related values of the river bank, a vegetation planting program was conducted on a test basis to determine if there were suitable types of vegetation which could be established and permitted on project levees, and yet not impair the flood control function or safety of the levee structure. Revegetation of over 5 miles of river berm was accomplished during construction of the First Phase of the bank protection project. Experience has indicated that levee maintenance costs are more than doubled if vegetation is permitted, compared to levees that are maintained free of vegetation. Consequently, local maintenance districts refuse or are reluctant to accept the maintenance responsibility for levees with vegetation. The current practice is to provide and permit controlled vegetation only in those areas at bank protection sites where maintenance of such vegetation is assured and provided by non-Federal interests. A limited assistance program was authorized by the California Legislature in 1973 (Chapter 5 (commencing with Section 8450) of Part 2 of Division 5 of the Water Code of the State of California) and has provided some additional funds to local district in support of their maintenance programs involving vegetation retention on project levees.

As described in the project document, in the absence of the Sacramento River Bank Protection Project, erosion of the levees, berms, and riparian vegetation was occurring and would have continued until a levee failure appeared imminent, at which time emergency repairs would have been implemented. These repairs generally consisted of placing dredged material in the eroded areas and placing rock rubble or car bodies on the eroded areas to prevent failure of the levee. Under these conditions, berms, levees, and riparian vegetation were being destroyed by erosion. Without the extraordinary maintenance provided by the Sacramento River Bank Protection Project, the Sacramento River Flood Control Project levee system would fail causing widespread damages and loss of life. During the floodflows of January 1970, for example, it is estimated that the Sacramento River Flood Control Project averted over $100,000,000 in potential flood damage, including $300,000 specifically attributed to the bank protection project. To reduce the uncertainty of levee protection on an emergency basis, local interests, including the State of California, asked for Federal assistance to protect and preserve the existing levee system. The bank protection project was jointly developed, authorized and funded by the Federal Government and the State of California as the most appropriate solution to the problem.

ENVIRONMENTAL IMPACT OF CONSTRUCTION OF THE FIRST PHASE

Prior to Euro-American settlement of the Sacramento Valley, a large part of the valley was subject to periodic inundation by floodflows from the Sacramento River and its tributaries. The flood plain, varying in width from 2 to 30 miles, was about 250 miles long from the mouth of the river to the vicinity of Red Bluff. Much of the flood plain was covered with a dense growth of tules and other wetland vegetation. Between the river and the tule lands were areas of higher ground called rimlands, formed by floodflow sediment deposits along the channels. These rimlands formed low, discontinuous areas which were occupied by dense riparian forests. These lands were the locations of the first settlements and were the base upon which a system of private levees and eventually the Sacramento River Flood Control Project levees were built. In the reclamation of the flood plain for cities and agriculture, much of the tule wetland and riparian forest was eliminated. Remnant riparian forests remain in scattered locations along the upper reaches of the river, particularly upstream from Chico but are not within the limits of the project. Natural succession has also enabled thin bands of riparian vegetation to become established on berms and on some of the levee slopes. The riparian vegetation along the Sacramento River is significant because these remaining riparian areas provide habitat for a wide variety of wildlife species and because much of the land adjacent to the river is intensively farmed leaving little natural vegetation.

Because of its linear distribution and edge effect, riparian vegetation is particularly valuable to fish and wildlife. The numbers and kinds of animal species occupying the riparian vegetation and water interface is considerable larger than that occupying adjacent open water and agricultural habitats. Streambank vegetation provides shade which reduces daily water temperature fluctuations. Terrestrial insects that fall from overhanging branches contribute to the food source of the aquatic community. Riparian vegetation with low hanging branches are used by fish for escape cover from predators. Within the water, sunken logs and submerged root systems provide essential habitat components for fish and other aquatic organisms. They provide a stable surface for attachment of aquatic fish food organisms and shelter from strong light, predators, and swift currents. Massive root systems provide protective eddies during periods of high flows. More detail on the environmental aspects of the project area is contained in Appendix B.

An environmental impact statement for the bank protection project was filed with the Council on Environmental Quality on 15 June 1973. The statement indicated that the project would protect extensive areas in the Sacramento River flood plain from potential widespread damages and loss of life due to flooding. The statement also recognized that levee protection usually results in loss of riparian vegetation and associated fish and wildlife, recreation, and scenic values and that

most maintenance practices require removal of vegetation on a regular basis. During coordination of the draft statement, the possible need for mitigation for the First Phase of the project was identified by the California Department of Fish and Game and the U.S. Fish and Wildlife Service. The final environmental statement indicated that a study was being accomplished by the Corps pursuant to the Fish and Wildlife Coordination Act to determine if wildlife mitigation was needed and justified. A fish and wildlife management plan was requested from the U.S. Fish and Wildlife Service to establish the impact of construction of the First Phase on fish and wildlife and to develop the nature, type, and location of mitigation, if required. Their report, "Fish and Wildlife Management Plan for Sacramento River Bank Protection Project, California," was completed in May 1976 and is included as Appendix B to this report.

The U.S. Fish and Wildlife Service's report states that construction of the First Phase of the project had a significant adverse effect on the fish and wildlife of the Sacramento River and that substantial amounts of riparian habitat were either destroyed or degraded. Based on an analysis of aerial photographs and construction plans, their report described where vegetation was physically removed, and recommended that 668 acres of unvegetated riverside berms 30 feet wide or wider be acquired in fee or in easement and developed for riparian habitat as mitigation for habitat lost during construction of the bank protection project.

DETERMINATION OF MITIGATION NEEDS

Mitigation needs have been analyzed on two premises. One premise is that mitigation would be justified for those areas of the project in which vegetation was permitted by Federal regulations and State guidelines but was removed during construction. The second premise is that mitigation would be justified for any area in which vegetation was removed during construction, despite the fact that some of the vegetation was existing in violation of Federal regulations and State guidelines and should have been removed prior to construction as part of routine maintenance. Removal of such vegetation was recognized as deferred levee maintenance.

Based on the first premise, mitigation would be justified for 260 acres since construction of the First Phase resulted in the removal of that amount of riparian habitat, derived as follows:

a. Revetment was placed upstream and downstream of critical erosion sites (Area A on Charts 4 and 5) to insure the integrity of bank protection and to provide a transition area, in addition to correcting each erosion site. This amounted to 166 acres on standard levees and 10 acres on oversized levees.

b. Some riparian vegetation occurring outside of the construction area limits was removed to provide work areas for the contractor. On the berms this amounted to 58 acres (Area B minus Area C on Charts 4 and 5). On oversized levees this amounted to 26 acres (Area D minus Areas E and F on Chart 5).

Using the second premise, mitigation would be justified for 668 acres, as recommended by the U.S. Fish and Wildlife Service. This includes both the 260 acres due to actual First Phase construction plus an additional 408 acres for riparian habitat removed during construction as deferred levee maintenance. The 408 acres include Areas C and D shown on Chart 4 and Areas C, E, and F shown on Chart 5, and is vegetation that was not in conformance with the California Reclamation Board's levee maintenance criteria. These criteria, discussed previously and illustrated on Charts 2 and 3, were adopted by the Reclamation Board to provide guidance to local districts for the control of vegetation in their operation and maintenance programs. Clearing the levees of wild and nonconforming growth is an ongoing activity. Often this removal is delayed for a variety of reasons. When the nonconforming vegetation is removed during construction of bank protection, it is in reality deferred maintenance on the Sacramento River Flood Control Project levees, which is a non-Federal responsibility. Although this deferred levee maintenance work was performed during construction of the First Phase of bank protection on the Sacramento River Bank Protection Project, such maintenance was a non-Federal responsibility. The State of California, has overall responsibility for maintaining the Sacramento River Flood Control Project levees. The State is required to contribute to the bank protection project first costs in recognition that the bank protection work relieves the State of a portion of its maintenance obligation on the levee system where bank protection is placed. Annual reports are required from the State on operation and maintenance activities, and annual inspections are made by the Corps and the State to insure compliance with the regulations and to determine corrective actions, where needed.

ANALYSIS

The vegetation removed during construction because of deferred levee maintenance practices should be considered separately from the First Phase construction program because, in the absence of the bank protection project, only that vegetation permitted by the levee encroachment guide would have been allowed to remain. Ultimately, the State of California would have required local maintenance agencies to remove such vegetation or would have removed it with State personnel in order to comply with their legal assurances. Maintenance by State personnel is currently being done in 13 areas due to non-compliance by the local districts or at the request of the residents of such areas. In the absence of construction of the bank protection project, continuing erosion would have removed the vegetation or it would have

been necessary to remove the vegetation during flood fighting efforts or during construction of emergency bank protection measures previously described.

Adverse impacts on fish and wildlife resources caused by construction of the First Phase of the bank protection project can be mitigated by obtaining authority and funding to acquire riverside berms and by either permitting revegetation to occur or by establishing riparian habitat on these berms. The U.S. Fish and Wildlife Service has identified 681 acres of unvegetated riverside berms more than 30 feet wide that are or can be made suitable for habitat within the limits of the First Phase area (see Appendix B). Acquisition would be by "strong easement," except where fee purchase is mutually desirable similar to the program authorized for the Second Phase of the bank protection project. Public access and recreation on the lands to be acquired is not recommended. Easements will allow adequate establishment of fish and wildlife habitat and utilization by fish and wildlife. Intensive recreation development and use of the mitigation lands would be incompatible with their use for preservation and maintenance of wildlife habitat.

Three alternatives are available for implementation. The first alternative would provide 260 acres for mitigation, as described in the preceding portion of this report.

The second alternative was suggested by the Fish and Wildlife Service (Appendix B) and supported by the State of California: 668 acres of land would be acquired to mitigate for vegetation removed both during construction and because of deferred maintenance, and that cost-sharing for the entire 668 acres would be on the same basis as the project costs, i.e. 1/3 non-Federal and 2/3 Federal. The National Marine Fisheries Service also endorses this alternative. There is no apparent justification for this alternative, although the State suggests that all vegetation removed should be considered as a project responsibility and not deferred maintenance. Analysis indicates that this alternative is justified only if the vegetation removed during construction because of deferred maintenance is included. However, completed Federal projects that are transferred to local interests for maintenance must be maintained in accordance with Federal and State regulations and directives to maintain the integrity and permanence of such projects. Therefore, to implement this alternative, it would be necessary to adjust the cost-sharing to reflect the responsibility of non-Federal interests regarding the deferred maintenance.

A third alternative would provide wildlife habitat restoration to 668 acres under a combination of mitigation (260 acres) and enhancement (408 acres). Cost-sharing for the 260 acres to be acquired for mitigation would be the same as other project costs, i.e. 1/3 non-Federal, 2/3 Federal. Cost-sharing for lands to be acquired

and establishing habitat for enhancement would be pursuant to the formula established by the Federal Water Project Recreation Act (Public Law 89-72, as amended), i.e., 1/4 non-Federal, 3/4 Federal.

COST ESTIMATES

Cost estimates for lands, acquisition, revegetation, and operation and maintenance presented in Appendix B were prepared by the U.S. Fish and Wildlife Service and reviewed by the Corps of Engineers. Costs for revegetation and operation and maintenance are comparable to similar work accomplished by the Sacramento District. However, an analysis of recent land sales along the Sacramento River indicates that the land and acquisition costs presented in Appendix B were underestimated and that purchase of land in fee would cost between $800 and $1,200 per acre, depending on width. Using these prices, acquisition costs of $1,800 per parcel, and 30% contingencies, acquisition of 260 acres of land in fee would cost $468,000. Although purchase of lands in easement is contemplated in most cases and these costs would be about 65 percent of the fee value, the larger fee value estimate is used to avoid underestimating these costs. Employing a habitat restoration program identical to that proposed by the U.S. Fish and Wildlife Service (installation costs of $498 per acre, establishment costs for 2 years of $250 per acre per year, and overhead and administration allowance of 20% $\pm$), costs for habitat restoration would be $312,000. Using the same prices, acquisition of the 668 acres of land suggested by the U.S. Fish and Wildlife Service would cost $1,200,000 while the costs for habitat restoration would be $312,000. Total costs would average about $3,000 per acre.

The cost of the mitigation and enhancement features is to be shared with the non-Federal sponsor. The actual Federal and non-Federal share of the costs depends upon which alternative is selected for implementation.

Alternative 1. Acquire 260 acres for mitigation with costs for mitigation shared the same as for other project costs, i.e. 2/3 Federal and 1/3 non-Federal.

Alternative 2. - Acquire 668 acres for mitigation with costs shared 2/3 Federal and 1/3 non-Federal.

Alternative 3. - Acquire 668 acres for a combination of mitigation and enhancement: Acquire 260 acres for mitigation with costs for mitigation shared just as for other project costs or 2/3 Federal and 1/3 non-Federal. Acquire 408 acres for enhancement with costs for enhancement shared pursuant to the formula established in Public Law 89-72, as amended: 3/4 Federal and 1/4 non-Federal.

Operation and maintenance of enhancement measures would be the responsibility of a non-Federal agency. Operation and maintenance costs are estimated to be about $1,000 annually for 260 acres (or

about $2,600 for 668 acres). The Federal Government would provide a share of operation and maintenance cost in the same ratio as for capital costs of the adopted mitigation plan. A lump sum allowance would be included in the first cost of the mitigation measures to represent the annual capitalized operation and maintenance costs, and deducted from the required non-Federal contribution toward the first cost of the mitigation measures.

Costs for various alternative proposals are displayed in the table on page 12.

COORDINATION

This fish and wildlife mitigation plan was developed following extensive coordination with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the California Departments of Fish and Game and Water Resources, The California Reclamation Board, the Resources Agency of the State of California and other agencies, organizations, and individuals. Several meetings were held with interested agencies and correspondence exchanged to clarify the rationale used in determining the lands justified for mitigation for habitat lost due to construction of the First Phase of the bank protection project. Both the Department of Fish and Game and the U.S. Fish and Wildlife Service pointed out during formal and informal coordination that riparian habitat is a diminishing resource in the Sacramento Valley and is extremely important to fish and wildlife. The U.S. Fish and Wildlife Service indicated (see Appendix B) that the riparian vegetation associated with the Sacramento River is an essential habitat element for wildlife in the Sacramento Valley and recommended acquisition and development of 668 acres of barren riverside berms to restore habitat removed during construction. The Service also recommended that mitigative features be implemented concurrently with project construction and that interagency and multigovernmental working committees be established to guide habitat restoration and develop integrated land use plans for the floodway. The former recommendation is being implemented along with the Second Phase of the Bank Protection Project and the latter recommendation is being accomplished as part of the current Sacramento River (Bank Protection and Erosion Control) Investigation.

A preliminary draft of this report was circulated to the U.S. Fish and Wildlife Service, the National Marine Fishery Service, and the California Department of Fish and Game and a copies of letters furnishing their views are contained in Appendix A. The U.S. Fish and Wildlife Service indicated that 668 acres should be acquired and developed to compensate and/or mitigate for losses incurred during First Phase activities. The National Marine Fisheries Service supported the position of the U.S. Fish and Wildlife Service that 668 acres be acquired for compensation and/or mitigation. They urged replacement of riparian habitat wherever it was degraded or destroyed and indicated that the fact that levee maintenance regulations

FISH AND WILDLIFE COSTS

Item	Alternative 1 (excluding deferred maintenance)	Alternative 2 (including deferred maintenance with Federal participation)	Alternative 3		
			Mitigation	Enhancement	Total
Land Acquisition: (Acres)	260	668	260	408	668
Cost-Sharing Formula					
Federal	2/3	2/3	2/3	3/4	-
Non-Federal	1/3	1/3	1/3	1/4	-
Capital Costs:					
Lands	$468,000	$1,200,000	$468,000	$ 732,000	$1,200,000
Habitat Restoration	312,000	800,000	312,000	488,000	800,000
Total	$780,000	$2,000,000	$780,000	$1,220,000	$2,000,000
Shared Costs:					
Federal First Cost	$520,000	$1,333,000	$520,000	$ 915,000	$1,435,000
Non-Federal First Cost	260,000	667,000	260,000	305,000	565,000
Capitalized O & M	14,000 1/	36,000 2/	14,000 1/	0	14,000 1/
Cost-Sharing: 3/					
Federal	$529,000	$1,357,000	$529,000	$ 915,000	$1,444,000
Non-Federal	251,000	643,000	251,000	305,000	556,000
Totals	$780,000 3/	$2,000,000 3/	$780,000 3/	$1,220,000	$2,000,000 3/

1/ The capitalized present worth value of $1,000 @ 6-7/8%.
2/ The capitalized present worth value of $2,600 @ 6-7/8%.
3/ Two-thirds of the shared portion of capitalized O&M has been deducted from non-Federal first cost and added to Federal first cost.

prohibited retention of vegetation did not absolve an agency of its responsibility to compensate for its removal. The State of California stated that removal of vegetation from 408 acres of the 668 acres was not a simple act of deferred maintenance, was part of the First Phase construction, and suggested that cost sharing should be 2/3 Federal and 1/3 State, as for the remainder of the project. Public meetings to discuss the mitigation plan were held in Sacramento and Colusa, California, in May and June 1979.

Over 1,400 agencies, organizations, and individuals were notified of the availability of the April 1979 draft report and nearly 300 copies of the draft were distributed. The majority of respondents, in both correspondence and testimony at the two public meetings, expressed agreement with the U.S. Fish and Wildlife Service's report, full mitigation (compensation) for 668 acres, or both. Several comments indicated disagreement with the interpretation of deferred maintenance, while others expressed the need to modify bank protection and maintenance techniques to preserve habitat values. The Sacramento Valley Landowners Association was the only respondent specifically supporting the 260 acre mitigation alternative. Copies of all correspondence received in coordination of the draft report are included in Appendix A. Transcripts of the public meetings accompany this report but are bound separately.

All of the views of Federal, State, and local agencies, organizations, and individuals submitted either in testimony or by letter, (Appendix A) were considered in developing the conclusions and recommendations in this report.

ENVIRONMENTAL CONSIDERATIONS

In addition to the final Environmental Impact Statement filed with the Council on Environmental Quality in 1973, supplemental information was filed with the Council in 1975. It was concluded that no significant changes had surfaced concerning work to be accomplished in the Second Phase of the project that would require substantial change to statement on file. The environmental aspects of the wildlife mitigation work proposed in this report would benefit fish and wildlife resources of the Sacramento River as described by the U.S. Fish and Wildlife Service in Appendix B. The scope of the work proposed is limited, and review indicates that the changes are not of such significance that there is a need for a substantial change to the EIS on file.

CONCLUSIONS

On the basis of the foregoing information, it is concluded that wildlife habitat losses from construction of the First Phase of the Sacramento River Bank Protection Project have been adequately analyzed and documented. Construction of the First Phase of the project

provided rock bank protection for critically eroding levees and resulted in a loss of significant wildlife habitat. Acquisition of 260 acres of riverside berms and establishment of riparian habitat is considered to be adequate mitigation for the impacts of project construction. Acquisition and establishment of riparian habitat on additional lands could either be considered enhancement in which the Federal Government could participate in accordance with existing statutes, or could be considered mitigation for deferred maintenance which is the responsibility of non-Federal agencies. The U.S. Fish and Wildlife Service has identified 681 acres of berms, 30 feet or more in width, on which wildlife habitat could be established. The location of the 681 acres is shown generally on Chart 1 and is itemized in Table 4 of Appendix B. State and other Federal agencies suggest that the mitigation plan include acquisition and establishment of wildlife habitat on 668 acres of riverside berms. However, acquiring interest in lands and establishing vegetation on 260 of these acres would fully mitigate for habitat losses attributable to construction of the First Phase of the bank protection project. Normally, interests in lands would be easements to establish and maintain fish and wildlife habitat, except where fee purchase is mutually desirable. Establishing vegetation on the remaining 408 acres would represent compensation for deferred maintenance of levees constructed as a part of the Sacramento River Flood Control Project and any compensation or mitigation for this deferred maintenance is the responsibility of non-Federal agencies. No support has been expressed to date for restoring habitat on the 408 acres as an enhancement program.

RECOMMENDATIONS

The District Engineer recommends that the existing Sacramento River Bank Protection Project be modified to include the acquisition of 260 acres of riverside berms within the limits of the levee system of the existing flood control project for the establishment and maintenance of riparian vegetation as mitigation for habitat removed during construction of the First Phase of the project, at an estimated cost to the United States of $529,000, subject to the conditions that non-Federal interests meet the same requirements of local participation as for the Bank Protection Project. I further recommend additional modification of the Sacramento River Bank Protection Project to include acquisition of 408 acres of riverside berms for the establishment and maintenance of riparian vegetation for fish and wildlife enhancement at an estimated cost to the United States of $915,000 provided that: Prior to acquisition of lands, non-Federal interests agree to cost-share the enhancement measures in accordance with Public Law 89-72, as amended.

Donald M. O'Shei

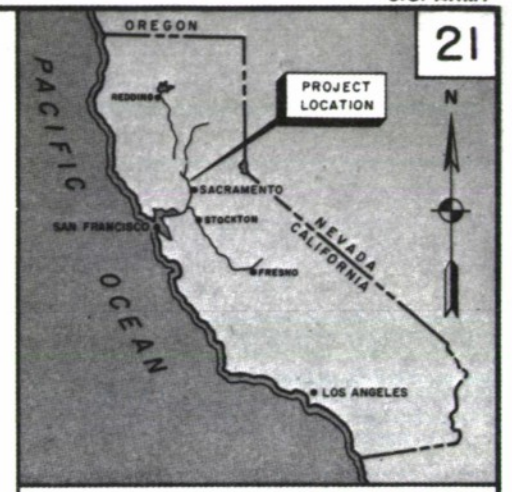
DONALD M. O'SHEI
Colonel, CE
District Engineer

21

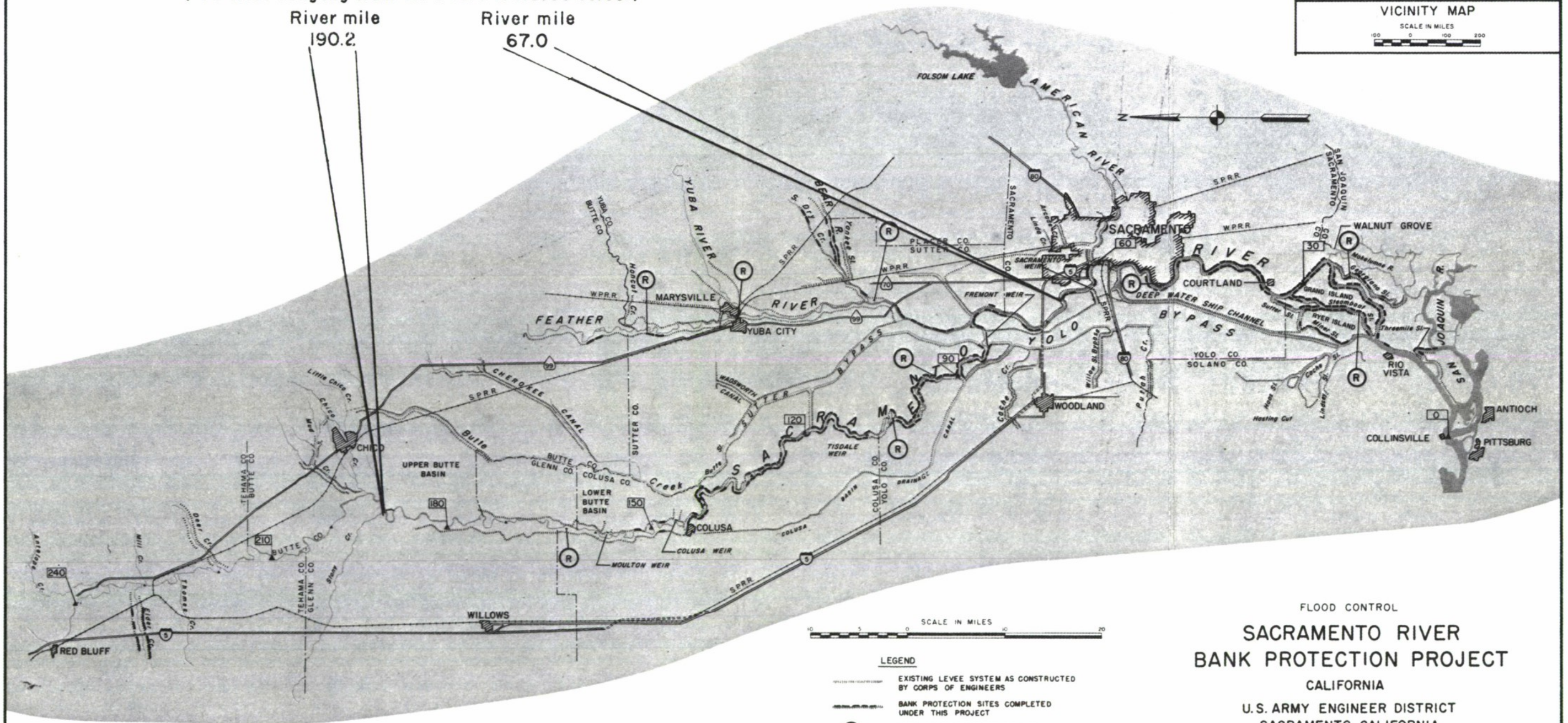
Reach of Sacramento River Identified for Land Acquisition and Riparian Habitat Plantings for Wildlife Mitigation and Enhancement connected with the First Phase.
(90 sites ranging from 0.34 acre to 113.63 acres.)

River mile 190.2

River mile 67.0



VICINITY MAP
SCALE IN MILES
100 0 100 200



SCALE IN MILES
10 5 0 10 20

LEGEND

- EXISTING LEVEE SYSTEM AS CONSTRUCTED BY CORPS OF ENGINEERS
- BANK PROTECTION SITES COMPLETED UNDER THIS PROJECT
- (R) COMPLETED RECREATION FACILITIES
- (R) FUTURE RECREATION SITES (CURRENTY PLANNED)

FLOOD CONTROL

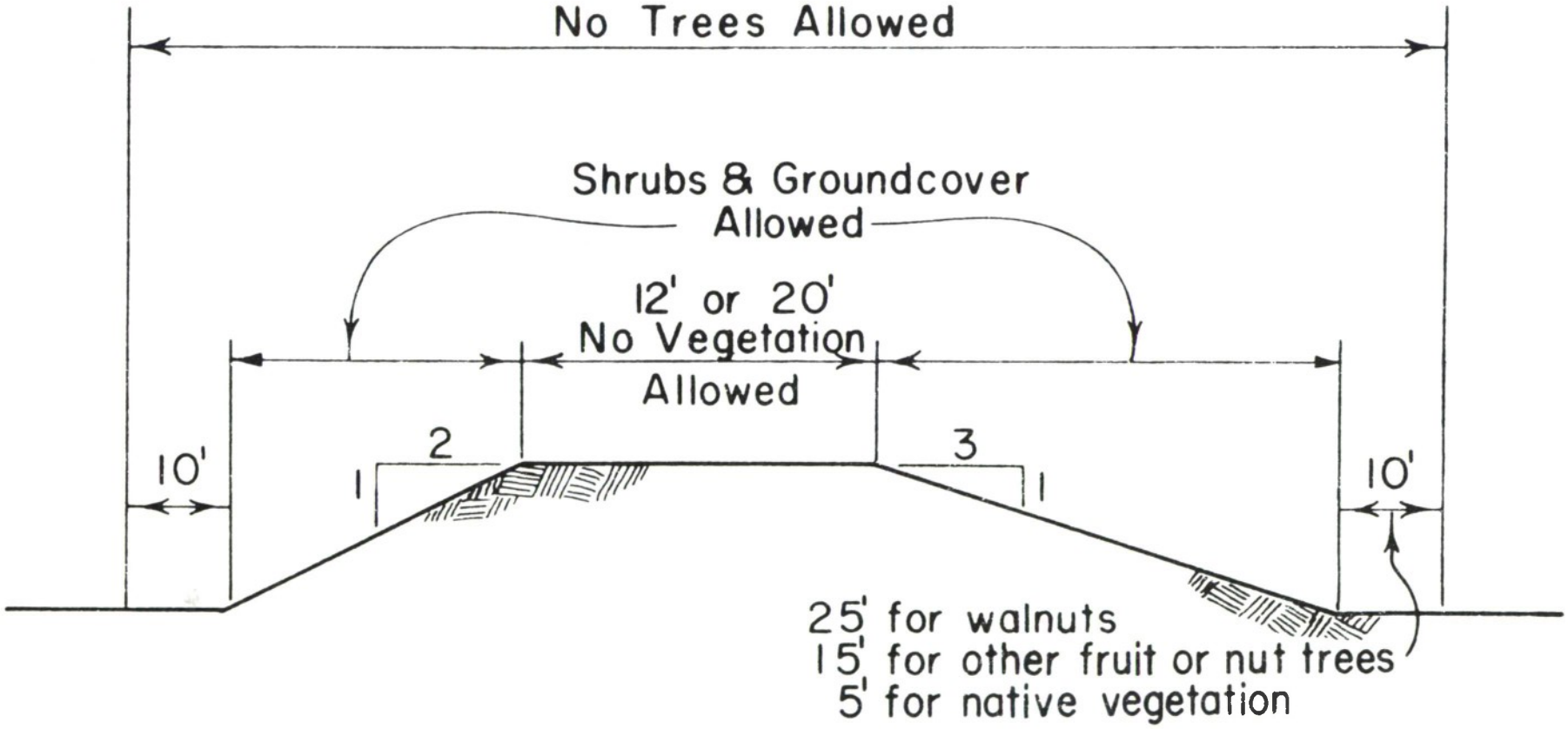
SACRAMENTO RIVER BANK PROTECTION PROJECT

CALIFORNIA

U.S. ARMY ENGINEER DISTRICT
SACRAMENTO, CALIFORNIA

Landside

Riverside

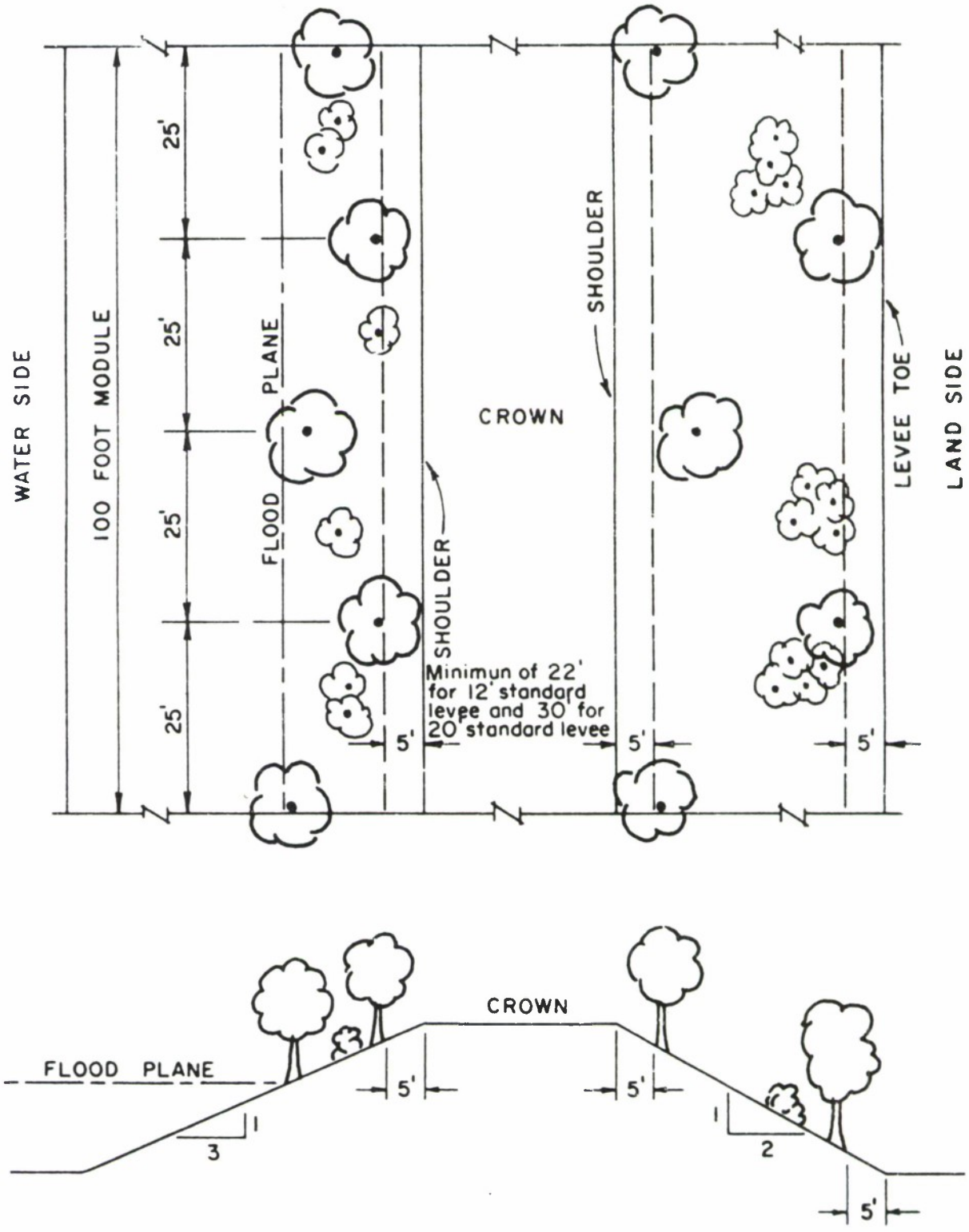


STANDARD PROJECT LEVEE

Note: Prior to 10 May 1974, native vegetation was excluded 10' horizontally from the riverside levee toe.

From: "Levee Encroachment Guide for Vegetation on Project Levees"
Revised Dec. 10, 1976

CHART 2

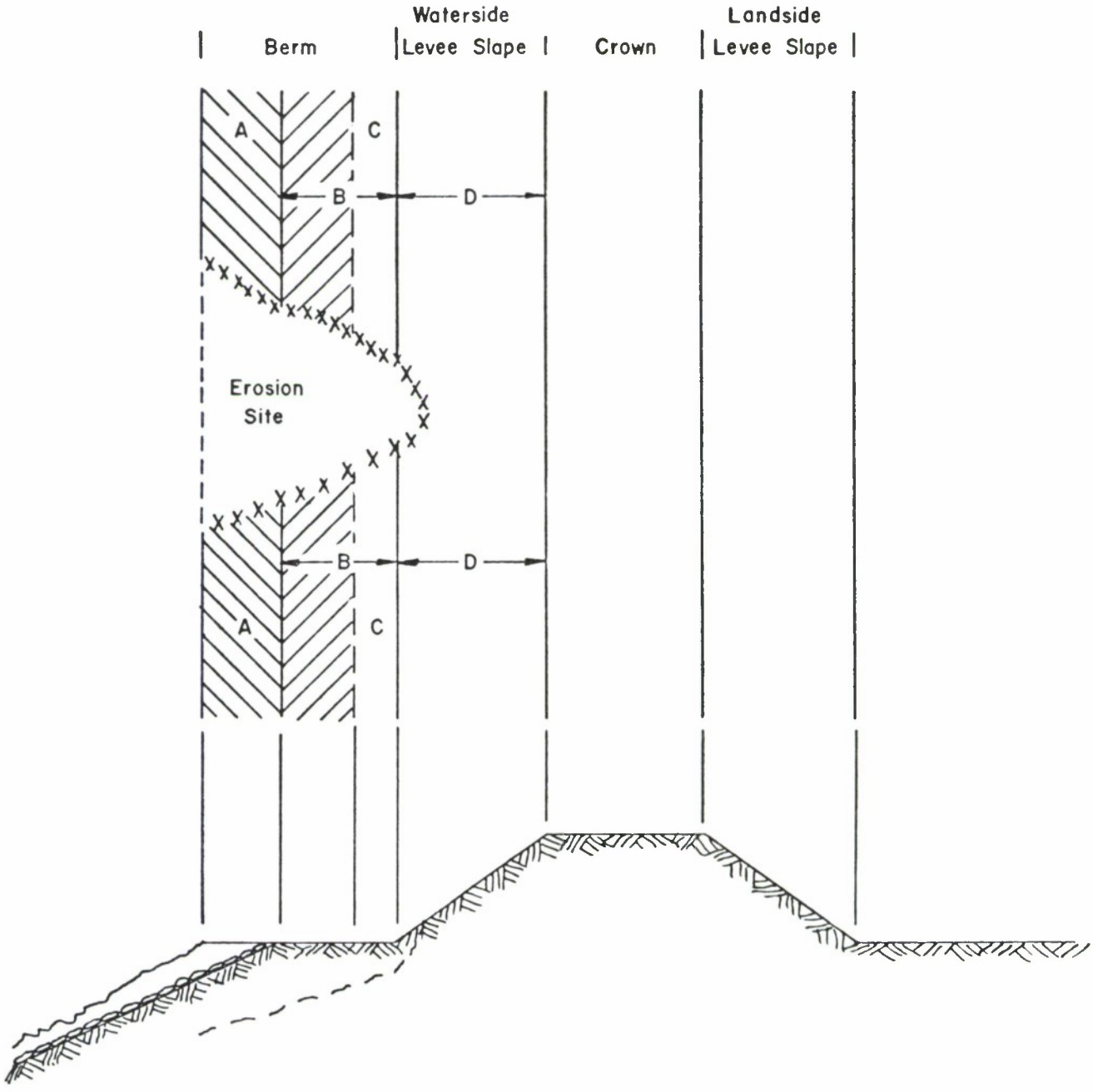


OVERSIZE LEVEE

SCALE : 1" = 20'

From: "Levee Encroachment Guide for Vegetation on Project Levees"
Revised Dec. 10, 1976

CHART 3



AREAS OF VEGETATION REMOVAL

A = Excavation & revetment

B = Remaining berm

C = 10' maintenance area *

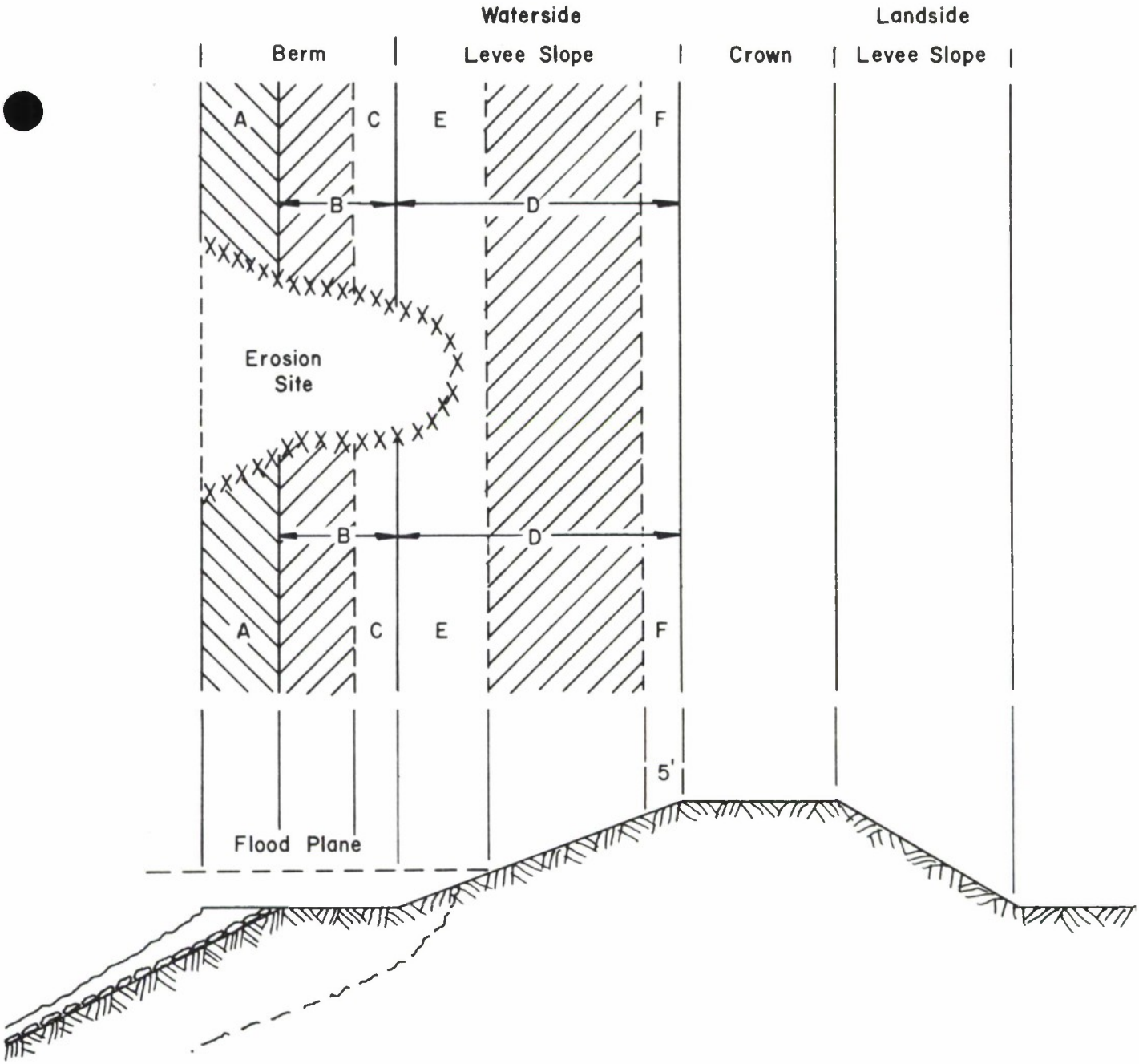
D = Levee slope *

\\\\/// Area from which riparian habitat was removed, the presence of which is permitted by encroachment guide

* Vegetation limited by "Levee Encroachment Guide for Vegetation on Project Levees"

STANDARD PROJECT LEVEE - SKETCH OF AREAS WHERE RIPARIAN VEGETATION WAS REMOVED DURING CONSTRUCTION

CHART 4



AREAS OF VEGETATION REMOVAL

A = Excavation & revetment

B = Remoining berm

C = 10' mointenance areo *

D = Levee slope

E = Levee slope below flood plane *

F = Levee slope, above 5' horizontol from levee crown *

\\\\\/// Area from which riporian habitat was removed, the presence of which is permitted by encroachment guide

* Vegetation limited by "Levee Encroochment Guide for Vegetation on Project Levees"

OVERSIZED LEVEE – SKETCH OF AREAS WHERE RIPARIAN VEGETATION WAS REMOVED DURING CONSTRUCTION

CHART 5

APPENDIX A

PERTINENT CORRESPONDENCE

PERTINENT CORRESPONDENCE

1. Pertinent Coordination Letters prior to draft report:

ORGANIZATION	DATE
National Marine Fisheries Service	3 April 1978
Fish and Wildlife Service	17 May 1978
Resources Agency of California	18 May 1978

2. Letters of Comment Received on Draft Report:

ORGANIZATION/INDIVIDUAL	DATE
Department of Water Resources-Northern District	4 May 1979
Northern California Council of Fly Fishing Clubs	7 May 1979
County of Sacramento-Community Development & Environmental Protection Agency	9 May 1979
State Water Resources Control Board	14 May 1979
Tehama Fly Fishers	15 May 1979
Resources Agency of California	16 May 1979
The Wildlife Society	16 May 1979
Anne Sands	18 May 1979
Fish and Wildlife Service	18 May 1979
Wintu Audubon Society	20 May 1979
State Lands Commission	22 May 1979
Sierra Club-Mother Lode Chapter	28 May 1979
Animal Protection Institute of America	30 May 1979
Resources Agency of California	1 June 1979
Department of Food and Agriculture	4 June 1979
Sacramento Audubon Society	4 June 1979
Dennis Coules	5 June 1979

Friends of Wildlife	7 June 1979
Chris Stromsness	7 June 1979
Elaine Stansfield	7 June 1979
Fred L. Rinne	7 June 1979
Warren Fetter	8 June 1979
Greenpeace	8 June 1979
California Wildlife Trust	9 June 1979
County of Yolo	11 June 1979
Legislative Telephone Tree	11 June 1979
Tim Murphy and Friends	11 June 1979
National Audubon Society	12 June 1979
Sacramento Valley Landowners Association	13 June 1979
Golden Gate Audubon Society	17 June 1979
Sierra Club-Davis Yolano Group	18 June 1979
Victor Sheffield	18 June 1979
Biff Ingles	19 June 1979
County of Sacramento-Department of Parks & Recreation	21 June 1979
Resources Agency of California	11 July 1979

3. Other comments received at public meetings held 16 May and 5 June 1979: Published separately in "Public Meetings Transcript," July 1979.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Region
300 South Ferry Street
Terminal Island, California 90731

April 3, 1978 FSW33/WSL

Mr. George C. Weddell
Chief, Engineering Division
Sacramento District Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Mr. Weddell:

We have reviewed the preliminary draft Fish and Wildlife Mitigation Plan for phase I of the Sacramento River Bank Protection Project, California. Inasmuch as we did not participate in the early planning stages of this project, we cannot provide specific comments on your recommendations for fish and wildlife mitigation.

As is recognized in the report, riparian vegetation plays a vital role in maintaining anadromous fish runs in the Sacramento River. Because bank protection necessarily alters or removes the riparian vegetation, it is detrimental to anadromous resources. Thus, we believe it would have been appropriate for you to have contacted us earlier in your planning for this project.

At this time we defer to the U.S. Fish and Wildlife Service for specific recommendations concerning mitigation requirements. We will provide only the following general comments. Wherever possible, riparian vegetation and riverbank configuration should be retained. Where riparian vegetation is destroyed or degraded it should be replaced. We do not agree with the rationale that riparian vegetation that has developed because of deferred maintenance need not be counted in the determination of how many acres are destroyed by the project. That regulations for levee maintenance prohibit growth of vegetation does not appear to absolve an agency of its responsibility to compensate for the elimination or degradation of riparian growth.

We would appreciate being kept advised of future developments in this and future phases of the Sacramento River Bank Protection Project.

Sincerely,

Gerald V. Howard
Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Area Office
2800 Cottage Way, Room E-2740
Sacramento, California 95825

MAY 1 [illegible]78

In reply refer to: ES-S

Mr. George C. Weddell
Chief, Engineering Division
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Mr. Weddell:

This responds to your April 18, 1978 letter and attached revised preliminary draft of your feasibility report on wildlife mitigation for the Sacramento River Bank Protection Project.

Your report is aimed solely at the Sacramento River Bank Protection Project. However, we believe that in order to develop resource compensation concepts for the Sacramento River, it is necessary to look at the entire river system and determine the inter-relationships among the different components of the entire river system, how they interact, and past Federal involvement in water development projects. It is only then that we will know why the extensive erosion is occurring and how we can control it and still protect or enhance the fish and wildlife resources and values of the Sacramento River and adjacent lands.

The Sacramento River and shoreland environments are and will continue to be impacted by several water resource use and development projects. Some of these projects were funded or cost shared in by the Federal Government. For example, Shasta Dam regulates flood flows by decreasing peak discharges while increasing the duration and frequency of lesser flood flows. This reregulation of the Sacramento River flows by Shasta Dam provides for greatly increased summer flows and decreased winter flows.

The impact of an additional 1,000,000 acre-feet imported from the Trinity River to the Sacramento River is not clearly understood. However, these flows added to the summer high flows of the Sacramento River must contribute to the negative aspects of already high summer flows and seepage problems at selected agricultural lands adjacent to the river. Dredging of the river periodically to maintain navigational depth also impacts the riverine ecosystems.

What has been the effect of this flow regulation on the sediment relations in the Sacramento River downstream of Shasta Dam? Has the reduction of sediment discharge or change in the particle size distribution of sediment, because of deposition in upstream reservoirs, i.e., Lake Shasta, caused the river to attack its banks and bed in an attempt to regain a water-sediment equilibrium? It is readily apparent to us that containing the Sacramento River in a narrow flood plain with its now high sustained summer flows and frequent high flood runoff, will result in an increased rate of streambank erosion which will require greater time, money, and effort to control.

A stream in equilibrium, one without major structures, will meander as erosion occurs on the outside of bends and point bar formation occurs on the inside of bends. Land that is lost through these processes will be replaced by the same processes. Growth of trees and shrubs would soon follow. Point bars and riparian vegetation are not being replaced by natural processes in the central and lower reaches of the Sacramento River. We believe that the bank protection project and the other water development projects have prevented the natural processes from occurring and therefore are responsible for the loss of riparian vegetation.

We agree that erosion of the streambank, bed and levees is occurring and will continue to occur along the Sacramento River. But are the resultant economic damages caused by erosion contributed to or accelerated by other water development or use projects in, on, or along the stream-rivers in the Basin? We believe the answer is yes. If all projects share in the benefits of flood control they must at the same time share the environmental and fish and wildlife resource compensation costs.

Your report states that, "The maintenance is accomplished in accordance with title 33 CFR 208.10(b)(1), the Standard Operation and Maintenance Manual of the Sacramento River Flood Control Project" and the Levee Encroachment Guide for Vegetation of Project Levees adopted by the State of California. It also recognizes that of the habitat lost due to construction activities, 260 acres, existed in compliance with these regulations and 408 acres existed in violation of these regulations. Your report indicates that 260 acres of land is recommended to be acquired and developed to help offset the losses attributed to the bank protection project and that the 408 acres to be acquired and developed is attributed to deferred maintenance and is a non-Federal responsibility.

The two alternatives proposed are formulated on the basis of whether or not the habitat destroyed by construction activities was allowable under the regulations. It is immaterial to those fish and wildlife species occupying this habitat if it exists legally or illegally. The

pertinent fact is that it exists. We concur in the proposal tc acquire and develop the 668 acres to riparian vegetation for wildlife resource compensation for losses incurred during Phase I activities. However, because of the many water development and use projects in the drainage area, cost shared in or funded by the Federal Government, that have had both individual and cumulative negative impact on the Sacramento River, its shorelands and associated ecosystems, we believe that all those projects must share the responsibility to protect the total riverine associated ecosystem and that the costs associated with resource compensation should be a project cost.

We recommend that the current regulations be modified in such a manner as to require retention of all riparian vegetation that is physically possible. Those unavoidable losses are a project responsibility and should be replaced at project expense.

The Service cannot condone future construction activities, nor enforcement of the maintenance regulations, until compensation for past habitat losses are achieved and that measures recommended to compensate for present and future losses are implemented as a condition of all actions.

The attachment "Fish and Wildlife Resources of the Sacramento River and Shorelands Ecosystem" is to be incorporated in the Environmental Impact of Construction of the First Phase portion of your April 1978 Preliminary Draft - Fish and Wildlife Mitigation Plan.

If you have any questions regarding this information, as well as that in the attachment, do not hesitate to contact me.

Sincerely yours,

Rene J Dorbes

Acting Area Manager

Attachment:
"Fish and Wildlife Resources of the Sacramento River and Shorelands Ecosystem"

cc: NMFS, SW Region, Terminal Island
Dir., CDF&G, Sacramento
Reg. Mgr., CDF&G, Reg. I, Redding
Reg. Mgr., CDF&G, Reg. II, Sacramento
Exec. Officer, Reclamation Bd., Sacramento
Bob Potter, DWR, Sacramento
Jim Burns, Resources Agency, Sacramento
Anne Sands, Rt. 1, Box 2230, Davis, CA 95616

FISH AND WILDLIFE RESOURCES OF THE SACRAMENTO RIVER AND SHORELANDS ECOSYSTEM

The vegetation of the shorelands ecosystem consists primarily of a remnant of a once vast riparian forest of valley oaks, sycamore, cottonwood, and willow. Many of the trees are draped with grapevine. Lesser numbers of blueberry, box elder, California black walnut, seep willow, white alder, and Oregon ash form a well-defined and nearly impenetrable woody understody. The California black walnut is listed as an endangered species in Tehama, Colusa, Butte, and Glenn Counties, California, by the California Native Plant Society and is presently a candidate for future listing on the Federal threatened and endangered species list. California blackberry, western raspberry, California mugwort, western ragweed, pigweed, yellow and white sweet clover, cocklebur, Johnson grass, and several thistles, grasses, and forbs form a dense nearly impenetrable ground cover. A complete checklist of the plant species found along the lands adjacent to the Sacramento River would probably reveal nearly every plant known to occur in cultivated and uncultivated fields of the Sacramento Valley.

Fish habitat is enhanced by the diversity of land forms and vegetation along the land-water interface. The importance of streambank vegetation and its associated snags and root systems at the land-water interface cannot be overemphasized. This vegetation provides shade which reduces daily water temperature fluctuations. Terrestrial organisms that fall

from overhanging branches contribute to the food source of the aquatic community. The important terrestrial food items are insects falling or flying down onto the water surface and those insects just emerging as adults from the water. Common examples of the first group are the poor flying insects such as cicadellids (leafhoppers), cercopids (froghoppers), aphids, and psyllids (jumping plantlice), all of which feed on vegetation in the immediate vicinity. Many of these terrestrial insects are poor fliers. Because of this fact, they are available as a food source for fish primarily due to the presence of riparian vegetation. This fact should be considered in any decision concerning Delta levee or bank alterations.

Riparian vegetation with low hanging branches are used by fish for escape cover from predators. Within the water, sunken logs and massive root systems provide essential habitat components for fish and other aquatic organisms. They provide a stable surface for attachment of aquatic fish food organisms and shelter from strong light, predators, and swift current. Massive root systems provide protective eddies during periods of high flows. Riparian vegetation is generally absent downstream from Sacramento where much of the river bank has been riprapped.

The anadromous fishes of the Sacramento River system include chinook salmon, steelhead trout, striped bass, American shad, and white sturgeon. It is estimated that an average of 326,000 chinook salmon and 39,000 steelhead trout enter the Sacramento River annually to spawn in the mainstem and its tributaries. Virtually all of California's white

sturgeon, American shad, and approximately two-thirds of the striped bass are believed to spawn in the Sacramento River system.

Chinook salmon contribute to the ocean commercial and sport fisheries with evidence that Central Valley salmon enter the commercial catch along the entire Pacific coast. It has been calculated that the Sacramento system contributes about one-half million chinook salmon annually to the commercial harvest of these fish in the Pacific Ocean. The ocean sport catch of chinook off California's coast in 1971 exceeded 188,000 fish, of which about 75 percent originated in the Sacramento system. Stream fishermen annually creel about 25,000 chinook salmon and 20,000 steelhead trout from the Sacramento River and its tributaries.

The striped bass population of the Sacramento River system has been estimated to be between 1.5 to 4 million adult fish with approximately 55 to 66 percent of this population spawning in the Sacramento River. An annual catch of 250,000 fish provides 1.5 million angler-days. The American shad population has grown tremendously in the last few years. The adult population is now estimated to be at the several million level. It was estimated that three years ago (1975) 83,000 shad were caught upstream from the city of Sacramento. They provided in excess of 36,800 angler-days. The striped bass and American shad are both directly dependent on the Sacramento River system and its estuary. They are numerically superior to salmon populations.

The adult population of white sturgeon is estimated to be between 72,000 to 212,000 fish with an average annual catch of approximately 42,000 fish that provide approximately 37,500 angler-days. The population size of green sturgeon is unknown, but it is believed to be smaller than that of the white sturgeon.

The Sacramento River system also supports a significant warmwater fishery consisting of smallmouth and largemouth bass, black and white crappie, white catfish, channel catfish, brown bullhead, and yellow bullhead, bluegill, green sunfish, and various nongame species.

Remnant populations of the Sacramento perch, California's only native sunfish, occur in the Sacramento system. Although the species is thought to be threatened with extinction in the Sacramento River, its present status is undetermined.

The plant communities found along the Sacramento River corridor are an integral part of the total valley ecosystem upon which wildlife resources depend. Although only about 1.4 percent of the historical riparian woodland habitat is currently existing, the Sacramento River and adjacent lands still support a variety and surprising abundance of wildlife. For example, about 230 species of birds are known to inhabit the riparian community as residents or seasonal visitors. Diverse vegetation bordering the river is critically important to raptors, woodpeckers, kingfishers, and a wide variety of passerine or perching birds. Egret and heron rookeries are also found at selected locations.

The value of the riparian vegetation to wildlife, because of its linear distribution and edge effect, far exceeds the value or an equivalent acreage of woody cover in a single large block. It is recognized by naturalists and wildlife managers that the numbers and kinds of wildlife species in a given habitat is oftentimes directly related to the amount

of interface between diverse habitat types. Data from our studies on the Sacramento River near Knights Landing, California, indicate that the riparian vegetation influences bird populations on adjacent agricultural lands to a minimum depth of at least 1/4 mile from the riparian vegetation and may extend a great deal further for some selected bird species.

Some comparative value of wooded riparian and riprap habitat and their adjacent agricultural lands for supporting avian species is illustrated in Table 1 and Figure 1.

Table 1. Comparative Value of Riparian Woodland, Cleared and Riprapped Berm and Banks, and Adjacent Agricultural Lands with Respect to Avian Use for the Period September 1, 1974, through August 1975

	Birds /ac/day	Species /ac/day	Bird Day use/ac/year
1. Riparian habitat (7.02 ac)	24.0	3.5	8,800
2. Riprap habitat (Grass and/or shrubs (6.63 ac)	1.7	0.5	620
3. Agricultural lands associated with riparian habitat (6.06 ac)	34.5	1.3	12,600
4. Agricultural lands associated with riprap (6.06 ac)	1.6	0.6	580

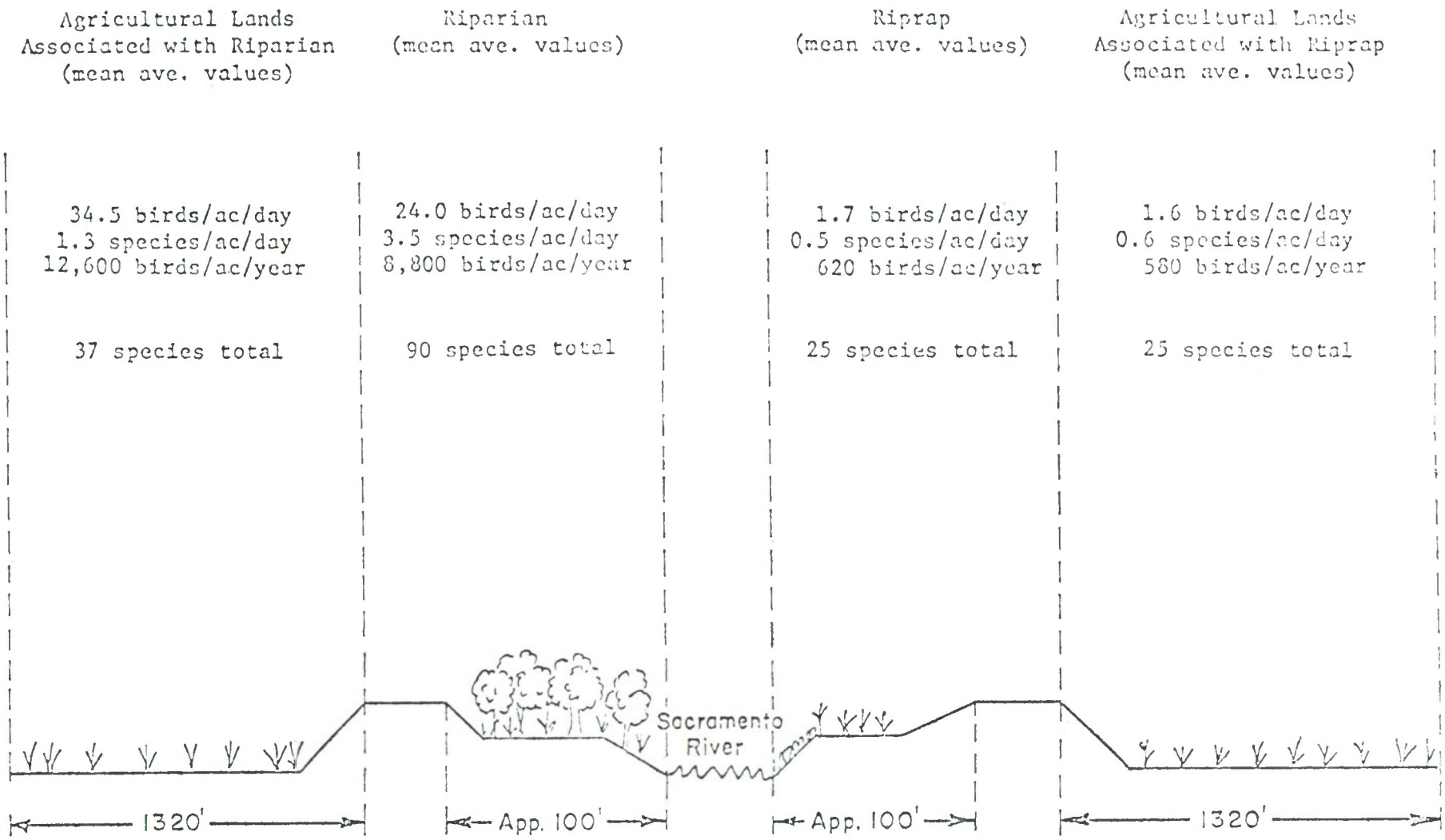


FIG. 1. A COMPARISON OF BIRD USE ON FOUR DIFFERENT HABITAT TYPES

(Summary of one year's data on eight different plots or transects. Sacramento River near Knights Landing, CA)

In summary, the impacts of Phase I on the fish and wildlife resources of the Sacramento River and shorelands ecosystem are:

a. A loss of 180 acres of land, 89 acres of which supported riparian woodland.

b. A loss of 192 acres of woody riparian vegetation cleared for project construction and being prevented from regrowing by maintenance practices.

c. The degradation of 264 acres of land resulting in lost annual regrowth potential because of maintenance practices.

d. The loss of 80 miles of naturally vegetated streambank, replaced by cobble-lined banks.

e. The loss of 80 miles of riverbank habitat for aquatic mammals such as bank beaver and muskrat. There also has been an adverse impact upon the river otter and mink.

f. The indirect reduction of bird use on 3,678 acres of adjacent agricultural lands where wildlife use has been reduced by the elimination of the riparian-agricultural interface.

g. There is an inestimable loss of resident and anadromous fish. Alteration of 80 miles of streambank destroyed 23 miles of woody riparian vegetation at the land-water interface and replaced it with a cobble-lined interface.

The general esthetic value of riparian vegetation to basin residents and travelers is inestimable. The attendant fish and wildlife populations are interwoven and inseparable components of the esthetic value. The number and diversity of wildlife species inhabiting the riverine area contributes significantly to its public recreational value.

In 1966 the California Department of Fish and Game estimated the total area in riparian habitat at 347,300 acres, which is equal to about 0.35 percent of the area of the State. No doubt that this area has been greatly reduced since that time. It is therefore no doubt that all agencies concerned with stream morphology, fish and wildlife resources and land and water project planning should go to extra lengths to protect and enhance riparian habitat, a most limited resource.

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Forestry
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

MAY 18 1979

Mr. George Weddell
Chief, Engineering Division
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Mr. Weddell:

Thank you for the opportunity to review and comment on the two alternative proposals for compensating wildlife habitat losses resulting from the Sacramento River Bank Protection Project, Phase I.

Basically, the two proposals presented in the Fish and Wildlife Mitigation Plan differ as to whether or not all existing fish and wildlife values that were destroyed through project construction should be termed mitigation needs and replaced through the mitigation process. The term "enhancement" has been used in one proposal for the compensation of the loss of 408 acres of habitat that would not have existed if levee maintenance guidelines were followed. We do not feel that "enhancement" is the proper term for this compensation. To take a position that does not recognize the existence of fish and wildlife values in these 408 acres would not be fulfilling the State's responsibilities to the public at large. Also, the vegetative guidelines are just that--guidelines. It may be that a review of actual local maintenance practices would reveal that some of the vegetation in question was not incompatible with good flood control maintenance practices. The history of flood control in the valley is replete with compromises in this area.

The removal of vegetation from the 408 acres was part of Phase I construction and as such, it was not a simple act of deferred maintenance. Therefore, the federal-state cost funding should be re-evaluated whereby the cost for compensating for the project's adverse impact upon fish and wildlife is borne as a project cost (2/3 federal, 1/3 state).

This dilemma is somewhat similar to the controversy which arose in a Bureau of Reclamation project to line the Coachella Canal with cement. The original Bureau canal was dirt lined and consequently water seeped from it. As a result of the seepage wetland habitat developed adjacent to the canal. When

the Bureau proposed to line the canal with cement, the issue arose over whether mitigation should be provided for the loss of wetland habitat that was there as a result of seepage. One position was that no mitigation should be provided while the opposing position was that the habitat was in fact present and its loss should be mitigated. The problem was resolved when the Bureau agreed to mitigate and otherwise compensate for the loss of the wetland habitat.

We suggest that the mitigation proposal for Phase I of the Sacramento River Bank Protection Project be resolved in the same manner, that is, all of the riparian habitat that was destroyed should be replaced. A good case can be built to justify this decision. Many jointly funded federal-state projects have impacted riparian habitat in the past with no provisions for compensating the losses. This is an opportunity to provide for some of that compensation. It is our understanding that this is the position being suggested by the Fish and Wildlife Service.

All parties involved in this issue recognize how difficult it is for you to resolve. We hope that you will choose the alternative that authorizes full compensation for wildlife habitat loss so that 668 acres of riparian lands can be restored to productive wildlife habitat.

Sincerely,

James W Burns

James W. Burns
Assistant to the Secretary

cc: Department of Fish and Game
U.S. Fish and Wildlife Service
Reclamation Board

STATE OF CALIFORNIA—RESOURCES AGENCY EDMUND G. BROWN JR., Governor

DEPARTMENT OF WATER RESOURCES

RTHERN DISTRICT
) MAIN STREET
O. BOX 607
RED BLUFF 96080
(916) 527-6530

May 4, 1979

Lt. Col. Carlos W. Hickman
Sacramento District
Corps of Engineers
U. S. Department of the Army
650 Capitol Mall
Sacramento, CA 95814

Attention: SPKED-W

Dear Colonel Hickman:

We have reviewed your draft report describing fish and wildlife mitigation plans for the first phase of the Sacramento River Bank Protection Project. We agree with the position of the California Resources Agency and the U. S. Fish and Wildlife Service that mitigation should be provided for the loss of 668 acres of riparian vegetation associated with the project. Whether riparian vegetation is lost directly due to construction activities or due to deferred levee maintenance activities is immaterial, it still represents a loss of riparian vegetation which should be mitigated.

Sincerely,

Wayne S. Gentry

Wayne S. Gentry, Acting Chief
Northern District

NORTHERN CALIFORNIA COUNCIL OF FLY FISHING CLUBS

Bob Baiocchi
Vice President
Conservation Chairman
1859 Salida Way
Paradise, CA 95969
(916) 872-9266
(916) 877-1565

Mr. George C. Weddell
Chief, Engineering Division
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

May 7, 1979

Dear Mr. Weddell;

This is in regards to our concerns for the Fish and Wildlife Plan for the First Phase of the Sacramento River Bank Protection Project, California.

This organization represents twenty-eight (28) member organizations in Northern California residing in twenty (20) counties. Many of our member organizations are situated near or adjacent to the Sacramento River, and our specific concern is the protection of the state's fishery resources relative to this project.

I have reviewed the Fish and Wildlife Mitigation Plan and alternatives, and the following are our comments;

We concur with the contents of the letter from the U.S. Fish and Wildlife Service dated May 17, 1978 regarding their concerns for the past federal water project impacts to the Sacramento River and support their recommendations. We also concur with the contents of the letter from the Resources Agency dated May 18, 1978 and their concerns for adequate mitigation measures. Therefore, we recommend and urge your agency to implement the second alternative which would provide 668 acres as mitigation and also provide cost-sharing for the entire 668 acres on the same basis as the project costs.

We also recommend that anadromous fisheries spawning area losses be documented through studies and mitigated for on the same basis as the project costs. There must be public assurance that fishery spawning area losses are mitigated for relative to the project.

Thank you for the opportunity to review the Plan and make comment,

Sincerely

Bob Baiocchi

cc: Jim Burns, RA
William Sweeney, USFW
E.C. Fullerton, DFG

COUNTY OF SACRAMENTO

COMMUNITY DEVELOPMENT AND ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL IMPACT SECTION

WILLIAM B. POND
AGENCY ADMINISTRATOR

ALCIDES FREITAS
ENVIRONMENTAL COORDINATOR

May 9, 1979

Carlos W. Hickman, Lt. Col, CE
Acting District Engineer
U.S. Corp of Engineers
650 Capitol Mall
Sacramento, CA 95814

Subject: Fish and Wildlife Mitigation Plan for the First Phase of the Sacramento River Protection Project, California

Dear Col. Hickman:

The Sacramento County Policy Planning Commission having reviewed the Draft Report for the Sacramento River Bank Protection Project - First Phase wishes to convey to you the following comments:

1) The Commission supports the alternative to acquire and develop the 668 acres of riparian wildlife habitat for wildlife resource compensation for losses incurred during construction of the First Phase rock bank protection along the Sacramento River. We regret that similar compensation planning approach was not used when the banks of the Sacramento River within Sacramento County were scraped of its vegetation in order to improve the quality of the levees system.

2) It is recommended that any future levee protection plans should include measures which would protect the area's environmental values, and that mitigating measures be incorporated as a part of the project proposal.

Thank you for the opportunity to comment.

Sincerely,

Alcides Freitas
Environmental Coordinator

AF:phg

827 SEVENTH STREET • ROOM 301C • SACRAMENTO, CALIFORNIA 95814 • (916) 440-7914

STATE OF CALIFORNIA—RESOURCES AGENCY EDMUND G. BROWN JR., *Governor*

STATE WATER RESOURCES CONTROL BOARD
P.O. BOX 100, SACRAMENTO, CALIFORNIA 95801
(916) 322-2868

In Reply Refer
to: 401:PML

MAY 14 1979

Lt. Col. Carlos W. Hickman
Acting District Engineer
Sacramento District
U. S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

DRAFT REPORT - FISH AND WILDLIFE MITIGATION PLAN FOR THE FIRST PHASE OF THE SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA

As problems associated with point source municipal and industrial waste discharges are being brought under control, the State Board is increasingly turning its attention to the more difficult problems associated with nonpoint (diffuse) sources of water quality degradation. Solutions to these problems will in the long term require comprehensive watershed management, a relatively new area of involvement for the Board. Maintenance of riparian habitat is an important component of any comprehensive watershed management program.

In this regard, having just reviewed the District's subject report, we would like to commend the Corps for recognizing the adverse impacts upon riverine fish and wildlife habitat that have occurred as a result of Phase I of the Sacramento River Bank Protection Project. We would like to supplement the information the U. S. Fish and Wildlife Service has submitted to you by noting the largely undocumented role played by riparian vegetation in the maintenance and enhancement of water quality. Beneficial effects of streamside vegetation include water temperature reduction, increased oxygen carrying capacity, and sediment/nutrient loading reduction. Healthy aquatic ecosystems (as discussed in the U. S. Fish and Wildlife Service report) also play an important role in maintaining good water quality.

The Board strongly supports acquisition of the full 668 acres for restoration of fish and wildlife habitat as mitigation for project induced losses of riparian vegetation. The proposed configuration of the acreages, which appear to maximize their linear dimensions, will enhance water quality benefits as well as the "edge effect" of fish and wildlife habitat.

In response to the Fish and Wildlife Service's recommendation that an interagency working committee be established, we would like to suggest that the Corps consider utilizing the Interagency Riparian Task Force that was recently established by the Department of Fish and Game. The Task Force was formed to assist the Department in developing a riparian study as defined and funded

by AB 3147 and also to identify the elements of a comprehensive program for the protection and management of the State's riparian resource. Each of the participating agencies will use the Task Force as a forum for discussion of their respective riparian plans and programs. Combination of multiple committees into one Task Force will ensure maximum utility and save much time by avoiding redundant effort.

A State Board staff representative is a member of the Riparian Committee. We will be happy to provide you with continued commentary either through that group or by personal communication if you desire.

for W. Don Maughan
Chairman

cc: Mr. Huey D. Johnson
Secretary for Resources
1416 Ninth Street, Room 1311
Sacramento, CA 95814

Mr. E. C. Fullerton
Director
Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

TEHAMA FLY FISHERS

P. O. Box 224
Red Bluff, California 96080

May 15, 1979

Mr. George Weddell
Chief, Engineering Division
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Sir,

The Tehama Fly Fishers concur with the plan to acquire and develop 668 acres to riparian vegetation for wildlife habitat to compensate for the loss of habitat during Phase 1 activities.

We also concur with the Northern California Salmon and Steelhead Association in favor of cutting a 5 to 1 slope and revegetating it with riparian habitat such as willows and blackberries in all future bank protection where possible, otherwise a barge should be used so stones can be put in place on the water side of the bank to save as much riparian habitat as possible.

The Fish and Wildlife Management Plan for Sacramento River Bank Protection Project California by the Fish and Wildlife Service, for what time I've had to dedicate to reviewing it, seems very well done as far as Phase 1 goes. Where does the riprap end? It seems to a lot of us that the ultimate goal for the Sacramento River is to be turned into a stone lined conduit to transport water to the Delta where it can be dispersed to water deficient areas.

With all the water projects planned for the Sacramento River, such as enlargement of Shasta Dam, Cottonwood Creek Project and Lake Mendocino, all meant for storing water to be transported by the Sacramento River. It would seem, to the average person, that not only the high flows that will cover the spawning riffles, that are not destroyed by the bank protection with too much water to be suitable for spawning,but fluctuating flows will also impact not only the salmon and steelhead but the shad and striped bass as well.

It is our conclusion that maybe the Corps of Engineers should build a canal to transport water instead of making one out of the Sacramento River.

Sincerely,
Lester B. Wolfe
VICE PRESIDENT

cc: R. Kahler Martinson, US Fish and Wildlife Service
Warren B. (Scott) Ferris, No. Calif. Salmon&Steelhead Assoc.
Bob Balocchi, Vice President NCCFFC

FFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

(916) 445-5656

epartment of Conservation
epartment of Fish and Game
epartment of Forestry
epartment of Navigation and
Ocean Development
epartment of Parks and Recreation
epartment of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and
Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and
Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

MAY 16 1979

Colonel Donald M. O'Shei
District Engineer
Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel O'Shei:

This is in response to your letter of April 13, 1979, requesting comments on the Corps' Fish and Wildlife Mitigation Plan for the Sacramento River Bank Protection Project, First Phase.

The Resources Agency believes that since the Fish and Wildlife Coordination Act authorizes the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (DFG) to evaluate project impacts on fish and wildlife, it is inappropriate for the Corps of Engineers to prepare a mitigation plan. In order to clear up an apparent misunderstanding, the State wishes to correct an unwarrented implication in the third sentence of paragraph two, page one of your letter. While the USFWS report of May 1976 was discussed with representatives of the Resources Agency, the decision for the Corps to prepare another mitigation plan was made exclusively by the Corps. The State did not concur in this decision, nor did it believe that the USFWS report was inadequate. Despite our objection to the Corps' preparation of its own mitigation plan, the State will comment via the Department of Fish and Game at the May 16 meeting.

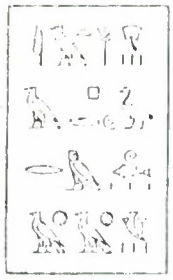
With regard to future units of the Sacramento River Bank Protection Project, the Resources Agency will not support additional funding until a satisfactory means of compensating for fish and wildlife losses is achieved. This has been the State's position since the initiation of Phase II. It appears that nearly seven years should have been adequate time to complete a compensation plan, especially since the USFWS report was ready three years ago. DFG considers that report to be adequate and has officially concurred with the recommended mitigation.

MAY 16 1979

The Sacramento River Bank Protection Project is of vital importance. We are, therefore, extremely concerned that the Corps is apparently willing to jeopardize the continuance of this project by refusing to compensate for fish and wildlife losses.

Sincerely,

L. FRANK GOODSON
Assistant Secretary for Resources



THE WILDLIFE SOCIETY

FOUNDED 1937

Western Section

SACRAMENTO CHAPTER

Lt. Col. Carlos W. Hickman
Acting, District Engineer
Sacramento District
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Hickman:

The Sacramento Chapter of the Wildlife Society appreciates the opportunity to review the Corps of Engineers' Draft Report describing fish and wildlife mitigation plans the Corps would like to consider as mitigation for the First Phase of the Sacramento River Bank Protection Project. The Wildlife Society permits and encourages individual chapters to provide input to public decision making on matters of professional interest within the geographical area of the local unit.

Our reading of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 USC 66 et seq.) Section 2(b) authorizes the Fish and Wildlife Service and the State Wildlife Resource Agency to determine damage to wildlife resources and make plans to prevent loss and damage as well as to develop and improve those resources. The Corps is given the responsibility to include the justifiable measures which obtain maximum overall project benefits.

The Wildlife Society, Sacramento Chapter considers the Corps to be operating outside its area of responsibility by preparing a clearly separate report, not integrated with the Department of Interior report (which is merely appended) and which proposes a different determination of the extent of wildlife damage and a different mechanism for the development and improvement of the resources.

The wildlife has certainly been affected and 668 acres of habitat damaged as a direct result of the execution of the project. Whether the habitat should have been there or not is immaterial to the issue of what project impacts were, and the Corps of Engineers is not charged with making such determinations.

The Corps is, however, to be commended for identifying a means by which wildlife habitat can be restored and protected at less cost to the State. The restoration and protection of wildlife habitat is undeniably the key to wildlife abundance and should be encouraged by whatever means possible.

In the future, the Wildlife Society recommends that for emergency works in which prompt action precludes advance study of potential project impacts or planning for construction which best preserves wildlife resources, all impacts to wildlife should be dealt with as mitigation measures.

Clearly the First Phase of the Sacramento River Bank Protection Project did not have the benefit of full coordination between Corps, Interior and State. Thus, its impacts should be mitigated as proposed by the responsible agencies under the Fish and Wildlife Coordination Act.

In future works, the Sacramento Chapter suggests that wildlife resource values be ascertained in advance where possible and mitigation, enhancement or development be proposed and considered for maximization of project benefits. Where consultation is precluded, as in an emergency, mitigation of impacts should be the rule.

We support the prompt completion of wildlife habitat mitigation measures on 668 acres as identified by the USFWS.

Sincerely,

Earle W. Cummings

Earle W. Cummings, President

cc: T.W.S. - National HQ
T.W.S. - Western Section
Reclamation Board
USDI, U[illegible] - Ecological Services, Cottage Way
Cal Fish and Game - Region 2
Resources Agency - Attn: Huey Johnson

/Presented to Public Meetir
Sacramento City College,
May 16, 1979 by Bill Cla
Vice-President, Sacrament
Chapter T.W.S.

May 18, 1979

Colonel Donald O'Shei
Department of the Army
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel O'Shei:

Thank you for the opportunity to review and comment on the draft fish and wildlife mitigation plan for Phase One of the Sacramento River Bank Protection Project. Riverlands Council and the Davis Audubon Society appreciate the Corps' recognition of the high wildlife values of riparian vegetation as discussed on pages 12 and 13 of the draft mitigation plan.

The organizations which I represent are deeply concerned over the drastic loss of riparian habitats due to bank protection and levee maintenance along the Sacramento River. We recognize the need for preventing levee failure and reducing bank erosion where lives are in danger, but we believe strongly that all wildlife habitats destroyed in these processes must be mitigated.

For this reason, we support the United States Fish and Wildlife Service Management Plan and the recommendations outlined therein as they apply to the 668 acres of Phase One of the Sacramento River Bank Protection Project. In addition, we feel that Phase Two, the Chico-Landing to Red Bluff Project, and all other Corps bank protection projects should be subject to full mitigation for fish and wildlife losses. The current practice of securing easements as mitigation for Phase Two must be examined to ensure that suitable wildlife habitats are acquired. We are aware that, more often than not, the "environmental easement" actually consists of gravel farm roads and cleared areas, rather than riparian vegetation. It appears that better coordination needs to occur

between the Corps and the fish and wildlife agencies, both state and federal, in this regard.

Revegetation of cleared areas is an essential part of any mitigation plan, but to be successful it must be done by people experienced in landscaping difficult terrains using native or well adapted species. We await the recommendations of the Corps' environmental advisory committee to the Sacramento River and Tributaries Bank Protection and Erosion Control Investigation with regard to revegetation. For a thorough review of suitable plant species for various conditions, we recommend the recent document prepared by the Fish and Wildlife Service in coordination with botanists from the University of California at Davis.

To best deal with current and future Sacramento River mitigation planning and implementation we suggest that the Sacramento Corps district would benefit from mitigation experiences documented by the Washington Corps district on the Lower Snake River. Among the important conclusions made in that study are the following three procedures which would be useful in planning for the Sacramento River mitigation efforts.

> First: During early planning, a pre-project wildlife data base should be collected. This would allow better estimates of mitigation needs. In addition, we recommend post-project surveys to document recovery efforts and their effectiveness.
>
> Second: Mitigation measures should be included in the water project authorization, and implementation should occur during project construction. This would prevent unnecessary losses from occurring during the planning period.
>
> Third: Land justified for mitigation should be purchased concurrently with and through the same procedure as land acquired for other project purposes.

One basic assumption must be remembered when designing any mitigation plan: that habitat losses occur only when "unavoidable". Evidently, riparian habitat losses have been and continue to be sustained in areas other than the specific bank or levee being protected. For example, trees which have been marked for retention were cut down or so severely damaged that they died. In

other cases, vegetation was cleared to provide for equipment storage. Riparian forests on berms are frequently burned "accidently" by fires set to clear levees. These kinds of losses are easily avoidable and, if stopped, would save subsequent rehabilitation costs. In these days of tight funding, it would seem wise to avoid such unnecessary corrective costs by modifying construction and maintenance techniques.

Revision of maintenance practices could also benefit the mitigation project by allowing vegetation to grow as long as it doesn't threaten levee integrity or bank stability. In many cases such vegetation would act to reduce the erosive effects of wave wash and accelerated flows, as was suggested in the Murray, Burns and Kienlen Report to the Reclamation Board.

In conclusion, we believe that it is in the best interests of the landowners, the wildlife, and the state to ensure adequate mitigation for fish and wildlife losses on all bank protection projects. Preservation and restoration of riparian vegetation can be beneficial to the riverland owner by providing visual and noise buffers, while at the same time creating wildlife habitat and aesthetically pleasing vistas for the general public.

We encourage the Sacramento District of the Corps of Engineers to accept the challenge of fish and wildlife mitigation on all projects along the Sacramento River. By working with the state and federal wildlife agencies and taking advantage of environmental expertise in the private sector, we believe the Corps can achieve the goal of mitigation for unavoidable fish and wildlife losses.

Sincerely,

Anne Sands

Anne Sands
Route One, Box 2230
Davis, California 95616

cc: Huey Johnson, Secretary for Resources
Jim McKevitt, U.S. Fish and Wildlife Service
E. Charles Fullerton, California Department of Fish and Game
Reclamation Board

United States Department of the Interior

FISH AND WILDLIFE SERVICE

DIVISION OF ECOLOGICAL SERVICES
2800 Cottage Way, Room E-2727
Sacramento, California 95825

May 18, 1979

District Engineer
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sir:

Attached are two copies of the Fish and Wildlife Service presentation made at the Public Meeting held May 16, 1979, for incorporation into the record.

Sincerely yours,

James J. McKevitt

James J. McKevitt
Field Supervisor

Attachments

United States Department of the Interior

FISH AND WILDLIFE SERVICE
DIVISION OF ECOLOGICAL SERVICES
2800 Cottage Way, Room E-2727
Sacramento, California 95825

U. S. FISH AND WILDLIFE SERVICE STATEMENT ON THE SACRAMENTO DISTRICT, CORPS OF ENGINEERS DRAFT REPORT "FISH AND WILDLIFE MITIGATION PLAN FOR THE FIRST PHASE OF THE SACRAMENTO RIVER PROTECTION PROJECT, CALIFORNIA"

My name is Jim McKevitt. I am the Supervisor of the U. S. Fish and Wildlife Service's Sacramento Field Office, Division of Ecological Services. It is the responsibility of my office to review and report on the ecological impacts of proposed and authorized water resource development projects and to make recommendations to protect, preserve and, wherever possible, to enhance the fish and wildlife resources of the project area. The Sacramento Office is responsible for all such projects in Northern California and Northern Nevada. In fulfilling this responsibility, we have reviewed and reported on the Sacramento River Bank Protection Project.

Our primary authority for providing this review of water resource development projects is the Fish and Wildlife Coordination Act. This statute provides that whenever any Federal agency proposes to alter, divert, or otherwise modify any stream or waterbody of the United States for any purpose, that agency shall first consult with

---

Presented at the public meeting held by the Sacramento District, Corps of Engineers May 16, 1979, Sacramento City College Auditorium, by James J. McKevitt, Field Supervisor, Division of Ecological Services, U.S. Fish and Wildlife Service, Sacramento, California

the U. S. Fish and Wildlife Service (Service) and with the concerned State wildlife agency. This required consultation is directed to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof. The Act also requires that the construction agency shall obtain the report and recommendations of the Service and the State wildlife agency for the purpose of determining the possible wildlife damages and for determining means and measures to prevent or mitigate such damages or losses. The recommendations in the Service's report are to be given consideration equal to other project features and the report of the Service shall be made an integral part of any construction agency's report to Congress.

In its evaluation of water resource development projects, the U.S. Fish and Wildlife Service also utilizes other authorities, statutes, executive orders, and procedures and reports on the adherence by the construction agency to environmental constraints. These constraints include the National Environmental Policy Act, the Endangered Species Act, the recently issued Executive Orders on Floodplain Management and Wetlands Protection, and the Water Resources Council Principles and Standards.

Of the authorities and constraints operating on Federal projects, two are particularly appropriate in this instance. First, the Fish and Wildlife Coordination Act provides that the Service and the State Fish and Game agency shall prepare the report for mitigation of

wildlife losses and that report shall be a part of the construction agency's submission to Washington. Second, President Carter in his Water Policy Message directed that all Federal agencies shall vigorously implement the Coordination Act and that such agencies shall request funds and provide for mitigation concurrently and proportionately with project construction.

The Fish and Wildlife Service, in its earliest correspondence on the Sacramento River Bank Protection Project, recognized the fish and wildlife losses inherent in the project and recommended that mitigation be provided. In 1971, three years before completion of Phase I of the project, joint efforts, initiated by the Service and the California Department of Fish and Game, were made to secure a mitigation agreement. A plan to develop the necessary data was agreed upon and studies were initiated by the Service and Fish and Game in 1973. The plan and the studies were agreed upon and encouraged by then District Engineer Donovan. A draft report was prepared in 1973 but later scrapped and more detailed studies undertaken. These studies culminated in the Service's Final Report entitled "Fish and Wildlife Management Plan for Sacramento River Bank Protection Project, California," dated May 1976. This report identified the following impacts:

1. Loss of 180 acres of land.
2. Loss of riparian vegetation on 192 additional acres.
3. Degradation of 264 acres of land resulting in lost regrowth potential.

4. Loss of 80 miles of naturally vegetated streambank, replaced by cobble-lined banks.

5. Reduction in wildlife value on 3,678 acres of adjacent agricultural lands due to loss of riparian edge community.

The report identified a need to acquire and develop 668 acres of lands for wildlife purposes to compensate for project induced losses. This report was prepared under the authority of and as provided for in the Fish and Wildlife Coordination Act previously mentioned.

The Sacramento District of the Corps of Engineers has now prepared and released a draft report entitled "Fish and Wildlife Mitigation Plan for the First Phase of the Sacramento River Protection Project, California." It identifies three alternatives for mitigation of project induced losses: 260 acres of mitigation; 668 acres of mitigation broken down as 260 acres mitigation for the bank protection and 408 acres identified as mitigation for deferred maintenance; and 260 acres mitigation for the project and 408 acres to be considered enhancement. The Fish and Wildlife Service disagrees emphatically with the Corps of Engineers' report and the conclusions contained therein. The Corps admits that construction of the First Phase of the Bank Protection Project resulted in the removal of 668 acres of wildlife habitat. Actually, the Service has calculated the loss at 636 acres; 668 acres is the area required to compensate for the loss. The Corps maintains, however, that 408 acres which were removed were removed as part of a "deferred maintenance" program for the flood control levees. This position is not defensible. The Corps own report to Congress on the

project when they recommended it for authorization did not separate the projects, but indicated that the bank protection project was merely a modification of the Flood Control Project. It was authorized as such. The Corps' request for authorization stated, and I quote, "It is impractical to separate bank protection work into the classifications of 'new work' which is normally a Federal responsibility and 'maintenance' which is normally a local responsibility." The project that was authorized in fact authorized what the Corps is now calling deferred maintenance.

If this were not enough, the Corps maintains that the 408 acres so removed had no legal right to exist since maintenance of the flood control project would not have permitted its existence. Standards for maintenance do exist and they permit certain species of vegetation to remain on and adjacent to project levees. The Corps removed 636 acres indiscriminately.

Finally, the vegetation was removed by the Corps, not by the local sponsor. The Corps of Engineers has no maintenance authority. If they removed the vegetation, it was either an unauthorized removal or it was authorized as part of this project and should be compensated as part of this project.

The Fish and Wildlife Service position is as follows: As provided for in the Fish and Wildlife Coordination Act, we have prepared and submitted a report on the wildlife mitigation requirements for Phase I of the Sacramento River Bank Protection Project. This report indicates

that 668 acres of land needs to be acquired and developed to offset losses induced by the Corps of Engineers as part of the authorized project. All work was authorized, performed, and is the responsibility of this project. There is no question of deferred maintenance and new work, and thus there is no question regarding enhancement. The 668 acres identified in our report is compensation; enhancement is not posssible until all losses are fully compensated. Alternative 2, described on pages 18 and 19, should be the recommended compensation measure but the attempt to separate new work from deferred maintenance should be removed from the text. Further, it is the position of the Service that the subject of mitigation has dragged on long enough. The Corps of Engineers has known for over 3 years the extent of compensation which would be required by the wildlife agencies to offset project induced losses. They should immediately forward their report recommending 668 acres mitigation. Failure to do so can only be construed as noncompliance with the Coordination Act and the provisions of the President's Water Policy Message. This agency would then be forced to identify this deficiency to higher levels and possibly jeopardize implementation of future needed bank protection measures.

Wintu Audubon Society

CHAPTER OF THE NATIONAL AUDUBON SOCIETY

P.O. Box 1318, Redding, California 96001

May 20, 1979

Mr. George C. Weddell
Chief, Engineering Division
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Sir:

The Wintu Chapter of the National Audubon Society supports the position of the U.S. Fish and Wildlife Service in regard to the wildlife mitigation for the Sacramento River Bank Protection Project. The group feels strongly that all 668 acres should be developed in riparian vegetation to compensate for losses during Phase I activities. Much wildlife habitat on private land along the river is being lost unavoidably due to agricultural and other activities. Land controlled by public agencies should not be handled in a manner to compound this problem of continual loss. Undeveloped flood plains which hold water during floods are a good way to control erosion due to high water, and they also afford living room for many forms of wildlife.

The Wintu Chapter urges you to keep these ideas in mind in the present project and in all future activities.

Yours truly,

Muriel Weissberg

Secretary, Wintu Chapter

...IA—STATE LANDS COMMISSION

LANDS COMMISSION
13TH STREET
CRAMENTO, CALIFORNIA 95814

(916) 322-7809

May 22, 1979

File Ref.: W 22145

Department of the Army
Sacramento District
Corps of Engineers
650 Capitol Mall
acramento, CA 95814

Attn: Mr. Patrick Frost

Gentlemen:

RE: Draft Report -- Fish and Wildlife Mitigation Plan for First Phase of the Sacramento River Bank Protection Project.

The staff of the State Lands Commission has made a preliminary review of the draft report dated April 1979, relative to your plans to acquire and develop wildlife habitats on the waterside of the levees of the Sacramento River.

Based upon this preliminary review, it appears the majority of the lands planned for acquisition may involve State-owned sovereign ands under the jurisdiction of the State Lands Commission.

Because of the large scope of the mitigation plan, the staff of this Commission would have to review each parcel in order to determine the extent of the State's ownership interests within each proposed acquisition site.

We would appreciate meeting with your assigned staff in order to discuss the proposed mitigation/acquisition plan, as it affects State-owned sovereign lands.

Please contact me at (916) 322-7809 to set up the meeting.

Thank you for the opportunity to review and comment on the proposed mitigation plan.

Very truly yours,

JAMES DE LA CRUZ
Land Agent

cc: U. S. Fish and Wildlife Service, 2800 Cottage Way, Sacramento, California
Attention: Ms. Gail Arnold

Sierra Club
Mother Lode Chapter

P.O. BOX 1335, SACRAMENTO, CALIFORNIA 95806

May 28, 1979

Carlos W. Hickman
Lieutenant Colonel
Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Colonel Hickman:

We have reviewed the Fish and Wildlife Mitigation Plan for the first phase of the Sacramento River Bank Protection Project and do not believe that it is adequate.

A mitigation plan for the Sacramento River Bank Protection Project is long overdue and should be promptly implemented. We believe that the Corps proposal to classify two-thirds of the proposed land acquisition and revegetation work as enhancement rather than mitigation will result in years of hagling between the Corps and other agencies and thus result in endless and unnecessary delays and further cost increases.

In order to get this project moving, we believe that the plan should be simplified by making the 668 acres of land acquisition and revegetation a full project responsibility. The money saved by prompt implementation will more than offset the reduction in non-federal cost participation.

Sincerely,

Gary L. Pichon, Chairman,
Chapter Conservation Committee

cc: Rep. Vic Fazio
Rep. Harold T. Johnson
Rep. Robert Matsui
State Resources Agency
State Dept. of Fish and Game
State Reclamation Board

ANIMAL
PROTECTION
INSTITUTE
OF AMERICA

5894 South Land Park Drive
P.O. Box 22505
Sacramento, CA 95822
(916) 422-1921

May 30, 1979

Colonel Donald O'Shei
Department of the Army
Sacramento District
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel O'Shei:

On behalf of the Animal Protection Institute of America; and our more than 100,000 members nationwide (25,000 in California), I would like to offer some additional comments on the draft fish and wildlife mitigation plan for Phase One of the Sacramento River Protection Project.

As I indicated during my oral testimony at the May 16th hearing, API is deeply distressed by the growing loss of riparian habitats in California. This loss has been especially appalling along the Sacramento River. According to the Fish and Wildlife Service, 98.6 percent of the riparian wetlands that existed in the 180 miles between Chico Landing and Collinsville have been destroyed since the turn of the century. Unfortunately, these losses continue due to Corps bank protection projects.

Of course, we recognize the importance of bank protection and levee maintenance work when it is genuinely necessary to protect lives and property. If such work involves truly unavoidable habitat losses, however, we believe that full mitigation should occur. In this regard, we feel that certain guidelines should be followed in connection with all such unavoidable losses. These guidelines, at a minimum, should include pre-project wildlife data collection (and post-project evaluations), full incorporation of mitigation measures in project authorization and implementation, and concurrent purchase of mitigation lands or easements with those necessary for project construction.

With this in mind, API strongly disagrees with much of what is said in the draft report and with the conclusions reached. Instead, we fully support the Fish and Wildlife Service's preferred Alternative 2 as described on pages 18 and 19--although we object to the language attempting to separate new work from deferred maintenance.

Continued . . . .

We support this recommendation for 668 acres of mitigation because it is consistent with Corps duties under the Fish and Wildlife Coordination Act, the President's Water Policy Message, the Wetlands Protection Executive Order, NEPA, and other relevant authorities. In addition, we are clearly not impressed with the Corps' excuse that the Phase One work was merely "deferred maintenance" and thereby not entitled to significant mitigation.

The Corps' request for authorization of this work stated, among other things, that "It is impractical to separate bank protection work into the classifications of 'new work' which is normally a Federal responsibility and 'maintenance' which is normally a local responsibility." It is also significant to note that the Corps removed and destroyed the habitat concerned, yet the Corps does not have "maintenance" authority.

Finally, we are dismayed by the Corps' attitude which appears to consist of a reluctance to recognize the importance of dwindling riparian habitats and a failure to pursue adequate mitigation measures in a timely and professional manner.

We again urge support for the Fish and Wildlife Service's preferred alternative and mitigation plan, and we trust this letter can be included--before the announced June 1st deadline--in the hearing record.

Thank you very much for considering our views.

Sincerely,

Richard Spotts

Richard Spotts
Field Services Director

cc: Huey Johnson, Secretary for Resources
Jim McKevitt, U.S. Fish and Wildlife Service
Charles Fullerton, Director of Fish and Game
State Reclamation Board

RS/bc

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Forestry
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

JUN 1 1979

Colonel Donald M.O'Shei
District Engineer
Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel O'Shei:

The State has reviewed the "Fish and Wildlife Mitigation Plan, Sacramento River Bank Protection Project, First Phase", which was submitted through the Office of Planning and Research in the Governor's Office. We have received the following comments from the Departments of Fish and Game and Water Resources and the State Lands Commission. In addition, the Resources Agency letters of May 16 and 18, 1979, and the presentation made at the May 16, 1979 public hearing by the Department of Fish and Game should all be considered a part of this response.

DEPARTMENT OF FISH AND GAME

The Department of Fish and Game (DFG) offered comments on two major items: the Corps' authority to develop a wildlife mitigation plan and wetlands.

Corps Authority

DFG believes that the Federal Fish and Wildlife Coordination Act specifically designates the U.S. Fish and Wildlife Service (USFWS) and DFG as the agencies responsible for evaluating a federal project's potential adverse impact on fish and wildlife resources, and developing the mitigation measures to prevent this loss or damage.

According to Section 2 b of the Act (48 Stat. 401, as amended; 16 U.S.G. 661 et seq.), the mitigation reports and recommendations of USFWS and DFG "shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction...." As such, DFG believes that the Corps of Engineers has exceeded its authority in preparing a separate mitigation report.

DFG participated with USFWS in developing the mitigation plan (completed in 1976 and submitted to the Corps) and concurs in its recommendations. DFG recommends that it be selected as the appropriate mitigation plan for the Sacramento River Bank Protection Project, First Phase.

Wetlands

The riparian vegetation along the Sacramento River are wetlands. The following are just a few of the documents that define riparian vegetation as wetlands:

1. The Corps of Engineers' April 1978 Technical Report Y-78-4, "Preliminary Guide to Wetlands of the West Coast States".

2. Dr. Herbert L. Mason's 1957 book, "A Flora of the Marshes of California".

3. The October 1, 1965 California Fish and Wildlife Plan.

Both the Corps and USFWS's mitigation plans identifies 668 acres of riparian habitat that were impacted by the Corps' Bank Protection Project. Conversely, the 668 acres of riparian vegetation that were lost were wetlands.

The President's Executive Order on the Protection of Wetlands (E.O. 11990) and the Executive Order on Flood Plain Management Guidelines (E.O. 11988) direct the Corps to provide leadership to minimize its projects adverse impact upon these areas, and to preserve and restore or enhance the flood plain values.

E.O. 11988 specifically directs the constructing agency (Corps) to go "beyond identifying the impacts of a specific proposal and include an ongoing analysis of the effects of agency policy and programs and the development of new improved policies and programs to carry out this order."

E.O. 11990, Section 1 (a) states:

> "Each agency shall provide leadership and shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities."

In order to comply with E.O.s 11988 and 11990, the Corps should assume the leadership role, adopt the mitigation plan prepared by the responsible agencies, and proceed to implement the said plan as soon as possible.

DEPARTMENT OF WATER RESOURCES

The Department of Water Resources (DWR) believes that the project fish and wildlife purposes can best be accomplished by acquiring 668 acres of land as mitigation.

The report identifies three alternatives -- the first of which (acquire only 260 acres) should receive no further consideration. Alternatives two and three both provide for the acquisition of 668 acres for fish and wildlife purposes. While DWR prefers alternative three, either alternative would accomplish the basic objective of acquiring 668 acres for fish and wildlife purposes.

DWR also has the following specific comments:

Page 7, Paragraph 3

This states:

> "The Reclamation Board has overall responsibility for operation and maintenance of the levee system and the completed bank protection works. The maintenance is accomplished in accordance with Title 33 CFS 208.10 (b) (1), the "Standard Operation and Maintenance Manual of the Sacramento River Flood Control Project", initially adopted by the Reclamation Board of the State of California on 1 December 1967 and last revised on 10 December 1976. In general these regulations require trees, brush, and other wild growth to be removed from the levee slopes and crowns." (emphasis added)

Corps of Engineers' operation and maintenance manuals are based on an interpretation of Federal Regulations of Title 33, Chapter II, Part 208, which have been applied nationwide. Of particular importance is Part 208.10 (b) (1) which states:

> "...Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levee." (emphasis added)

Title 33 does not include the specific term "trees". The inference that trees are wild growth has been made by a strict interpretation of Section IV, page 13, paragraph 4-05.b.1. of the "Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project", revised May 1955, which states:

> "The Superintendent shall provide for clearing of brush, trees, and other wild growth from the levee crown and slopes. Brush and small trees may be retained on the waterward slope where desirable for the prevention of erosion and wave wash." (emphasis added)

Given the above, DWR believes that Title 33 per se does not preclude retention of trees on levee slopes. DWR levee inspectors consider wild growth on levees to be the vegetation that inteferes with visual inspections and flood-fighting activities. These are the species which are characteristically thorny, of spreading habit, such as wild roses,berry vines, and bamboo.

Experience in California indicates that under the right conditions more growth can be tolerated on flood control project levees without significantly sacrificing the flood control function. There are circumstances where riparian growth can be beneficial to the flood control function. Under some conditions (e.g. berms and within revetments) even those species which DWR agrees should be classified as "wild growth" could be allowed.

Page 12, paragraph 2

This states that:

> "...Massive root systems provide protective eddies during periods of high flows."

Trees with exposed root systems are generally more subject to windfall, with attendant jeopardy to a levee, as compared to trees with roots completely contained within the levee material.

Page 17, Pagagraph 1

This states that:

> "...Maintenance by State personnel is currently being done in 13 areas due to non-compliance by the local districts."

There are 11 State Maintenance Areas, not 13. Most of these areas were created when the Corps completed the projects because the local (non-State) sponsoring agency requested maintenance by the State.

STATE LANDS COMMISSION

It appears that the majority of the lands planned for acquisition may involve State-owned sovereign lands under the jurisdiction of the State Lands Commission (SLC). Because of the large scope of the project's mitigation plan, the SLC staff would have to review each parcel in order to determine the extent of the State's ownership interests within each proposed acquisition site.

Because of these concerns, SLC staff would appreciate meeting with the appropriate Corps personnel to discuss the proposed mitigation/acquisition plan. To arrange a meeting, the Corps should contact James De La Cruz, land agent in SLC's Sacramento office.

REVIEW REQUIREMENTS

This review, which fulfills the requirements of Part II of Office of Management and Budget Circular A-95, was coordinated with the Departments of Conservation, Boating and Waterways, Fish and Game, Parks and Recreation, Water Resources, Food and Agriculture, Health Services, and Transportation; the Air Resources, Reclamation, Solid Waste Management, and State Water Resources Control Boards; and the Energy and State Lands Commissions.

We appreciate having been given an opportunity to review this report.

Sincerely,

L. FRANK GOODSON
Assistant Secretary for Resources

cc: Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH 78121204)

STATE OF CALIFORNIA — EDMUND G. BROWN JR., *Governor*

DEPARTMENT OF FOOD AND AGRICULTURE

1220 N Street
Sacramento
95814

June 4, 1979

Mr. Donald M. O'Shei
Colonel, C. E.
District Engineer
Department of the Army
Sacramento District Corps of
Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sir

We reviewed the draft report on the Fish and Wildlife Mitigation Plan for the first phase of the Sacramento River Bank Protection Project.

We have no opposition to the wildlife mitigation evaluation and recommendations contained in this report pertaining to the first phase of the bank protection project. We do; however, support the reinforcement of levee banks to prevent breaks and flooding of farmlands.

Sincerely

R. C. Roberson

Robert C. Roberson
Assistant Director for Plant Industry
(916) 445-5537

Sacramento Audubon Society
6274 Heathcliff Drive
Carmichael, CA. 95608

June 4, 1979

Carlos W. Hickman
Lieutenant Colonel,
Sacramento District
Corps of Engineers
650 Capitol Mall
Sacramento, CA. 95814

Dear Colonel Hickman:

Thank you for sending us a copy of the Draft Report - Fish and Wildlife Mitigation Plan for the first Phase of the Sacramento River Protection Project, California. I am sorry for not sending this sooner, but I was away on vacation.

Frankly, we were disappointed in the mitigation plan, particularly the Corps refusal to consider full mitigation for the 668 acres (80 miles) of habitat destroyed by the bank protection project.

We do not feel it is morally right for the Corps to claim that they are only responsible for 260 acres of mitigation and that compensation for the remaining 408 acres would only be considered as enhancement. This would require more nonfederal cost participation which would likely be difficult to obtain in light of Proposition 13.

We believe that the Corps' contention that 408 acres would have been lost anyway without the Corps' project as a result of routine district maintenance work is a smoke screen to confuse the issue. We doubt whether the vegetation losses associated with district maintenance work would be nearly as severe as the losses incurred by the Corps' project. We also doubt whether the artificial vegetation planned by the Corps on the 260 acres acquired for mitigation will be nearly as productive as the original riparian habitat destroyed by the Corps.

We therefore believe the Corps should accept mitigation responsibility for the entire 668 acres.

With respect to the second phase of the bank protection project, we urge that the river bank rock revetment be accomplished by barge so that most of the remaining natural vegetation can be preserved.

Sincerely,

Jon M. Langham

J. M. Langham, Ph.D.
President, Sacramento Audubon Society

cc. California State Reclamation Board
Huey Johnson, Resources Secretary
E. C. Fullerton, Director
Department of Fish and Game
Congressman Harold Johnson
Congressman Vic Fazio
Congressman Robert Matsui

Dennis Coules
522 Oeste Drive
Davis, CA 95616

June 4, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Army Corps:

This letter concerns the fish and wildlife mitigation plan for habitat losses caused by bank and levee work completed during phase one of the Sacramento River Bank Protection Project.

I strongly urge that the mitigation plan proposed by the U.S. Fish and Wildlife Service be carried out to compensate for the equivalent loss of 668 acres of riparian habitat destroyed during phase one. The importance of full mitigation cannot be overemphasized.

I am very perturbed that the Corps is attempting to avoid its responsibility for mitigation by claiming an invalid technical exemption on the basis of "deferred maintenance". The loss of riparian habitat cannot be tolerated without due compensation. The further loss of riparian habitat should be avoided altogether during the remainder of the project.

Riparian is among the most depleted and endangered of California's habitat types, and is an extremely important environment for many species of wildlife. In recent years the Army Corps has been responsible for much of the continued destruction of these areas during bank and levee work along the Sacramento River. I urge the Corps to be more careful!

Sincerely,

Dennis Coules

cc: Huey Johnson
Jim McEvitt

P.S. Wouldn't mind seeing an end to the inundation of the Stanislaus Canyon either!

FRIENDS OF WILDLIFE

814 West Markland Drive • Monterey Park, California 91754

June 5, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Sirs:

There is urgent need for a complete Fish and Wildlife Mitigation Plan as outlined by the US FISH & WILDLIFE SERVICE.

In fact, the proposal to compensate for only 668 acres of important riparian habitat is minimal in the extreme.

This phase one mitigation must be made before phase two is undertaken, and should be faithfully carried out, rather than averted by definition as "deferred maintenance" or similar device.

The US FISH & WILDLIFE SERVICE'S alternative for full mitigation for losses equivalent to 668 acres should be the bottom line for your positive and prompt consideration.

We appreciate your holding Hearings on the matter, and respectfully submit this letter as our testimony.

Please add it to the official Record of the Hearings.

Respectfully yours,

Beula Edmiston

Beula Edmiston
President

cc

Huey D. Johnson, Secretary for Resources, State of California
Jim McEvitt, US Fish & Wildlife Service
State Reclamation Board

HOWARD E. JONES
CHRIS STROMSNESS

PHONE 235-4881
P. O. B[redacted]87

JONES AND STROMSNESS
ATTORNEYS AT LAW
5832 DUNSMUIR AVENUE
DUNSMUIR, CALIFORNIA 96052

June 7, 1979

Corps of Engineers
650 Capital Mall
Sacramento, California
95814

Re: Sacramento Riverbank Protection Project

Last week I fished for shad below Tehama on the Sacramento. The long stretch of riprap bank obviously displaced a great deal of riparian habitat. It is essential that at least your 668 acre alternative for mitigation and enhancement of wildlife habitat be implemented. More acreage than that should be obtained.

Sincerely,

CHRIS STROMSNESS
Attorney at Law

CS/s

Elaine Stansfield
2098 1/2 Preuss Road
Los Angeles, CA 90034

June 7

I find it unconscionable that the very dept. the people have established to care for our fragile planet's environmental needs must be pleaded with to watch over those needs. I do not understand why we must beg for the wildlife and the fish of the Sacramento River. Surely full mitigation for fish and wildlife losses should be part of what I am talking about? Their habitat is being steadily eroded by man, and yet in the long run it is not just the surviv of defenceless animals, but of man himself, that is at stake. Please share my remarks with the rest of the committee, as well as Huey Johnson, Jim McEvitt and the State Recl.Board, and please keep my note as part of your records. Thank you.

Mrs. R. A. Stansfield

Colonel Donald O'Shei
Army Corps of Engineers
Sacramento CA

6-7-79

Dear Colonel O'Shei,

In accordance to the Public Response Period to the Sacramento River Bank Protection Project I adress you on this issue.

I have experianced the Sacramento River from Shasta County to Collinsville,and have seen first-hand the environmental impacts of Phase One of this project.

Having read both the Draft Environmental Statement and the Fish and Wildlife Mitigation Plan, I have my own recomendation to the Corps of Engineers concerning this project.

I recomend that the United States Fish and Wildlife Service's recommendations (P.42,Mitigation Plan) be followed to the letter. The Fish and Wildlife Service's plan for mitigation should be fully implimented for Phase One before any work is started on Phase Two of the project.

Furthermore, I recommend that no funds from the State of California be allotted toward Phase Two of the Sacramento River Bank Protection Project until Phase One has been fully mitigated to the satisfaction of the U.S. Fish and Wildlife Service.

Thank you for listening.I await your response on this matter.

Sincerely,

Fred L.Rinne
511 La Purissima Way
Sacramento Ca
95819

Copies furnished:
Secretary of Resour,
State of California,
State of California
Reclaimation Board

June 8, 1979

Dear Sir

I am writing in regard to the Draft Report of the Fish and Wildlife Services, "Fish and Wildlife Mitigation Plan For the Friist Phase of the Sacramento River Bank Protection Project, in California".

For the record I totaly support the Fish and Wildlife Services' "Mitigation Plan".

I feel that it is extremly important that at all cost that we save the remaining native riparian vegetation and Wildlife habitat.

I agree with the Fish and Wildlife Service following recommendations:

1. the Acquistion of the 668 acres for habitat restoration.

2. I agree also that all the projects that have had both Individual and Cumulative negative Impact on the Sacramento River, its shorelands and associated ecosystems, must share the responsibility to protect the total riverine associated ecosystem and that the Costs associated with Resource Compensation should be a project Cost.

3. There must be Compensation for past habitat losses and that measures be recommended to Compensate for present and future losses are Implemented as a Condition of all actions.

4. That Fish and Wildlife Resources of the Sacramento River and Shorelands Ecosystem as well

(over Please)

as (my own) Rare and Endangered Species is Incorporated in the Environmental Impact of Construction of the Frist Phase portion of the Preliminary Draft.

5. One way I feel would protect riparian habitat on Construction projects would be to use water side placement of stone revetments by barges rather than land-based equipment, I believe this should become standard procedure in order to save Riparian vegetation even if the Cost is greater.

6 That rare and endangered and threatened species will be taken into Consideration in regards to habitat loss, such as the California yellow-billed Cuckoo, the Peregrine Falcon, the Southern Bald Eagle, the beaver, River otter, Mink, Sacramento Perch and the Giant Garter snake, as well as others, there should be Interagency Cooperation on saveing these species.

7. Protecting the Spawning Areas, Channelization and riprapping will reduce the natural riffle-pool Complex where the pool is necessary for percolation of subsurface water and the riffle necessary for the Incubation of eggs and larvae and growth of aquatic organisms effecting such species as the Steelhead trout and Chinook Salmon.

(over Please)

8. Using only Native plants for restoration of riparian habitat such as the rare California Black Walnut, White Alder, Valley Oaks and Western Sycamores and others.

9. Establishing and Coordinating Programs for monitoring, maintaining, and enhancing the fish and Wildlife resources for the entire Sacramento River system.

10 and not last of which would be the designation of the upper Sacramento River down 20 or 30 miles past Chico as a National Wild and scenic River for the preservation of all these values.

I hope you will place this letter in the record, and Concur with the above.
Would you please place me on your mailing list.

Sincerely

Warren Fetter
816 Colusa Street
Chico, Ca 95926

GREENPEACE

THE GREENPEACE FOUNDATION OF AMERICA, 240 FORT MASON, SAN FRANCISCO, CALIFORNIA 94123
Telephone: (415) 474-6767 Telex: 340 275

June 8, 1979

Dear Director,

We urgently request that you support the U.S. Fish and Wildlife Services wildlife mitigation plan to compensate for the loss of 668 acres of superior habitat destroyed during phase one of the Sacramento River Bank Protection Project.

Ill planned water projects have destroyed much of our environment, sharply reduced many species, and ruined many rivers. Habitat mitigation not only prevents some of the destruction, it also forces us to realize the true, but often hidden, costs of these projects.

Therefore, we must insist on full mitigation for the damage wreaked upon our dwindling environment.

Looking forward to your reply.

Sincerely,

Tom Falvey

Tom Falvey
Director

TF/cb

cc: Huey Johnson, Resources Secretary
Jim McEuitt, U.S. Fish and Wildlife Service
The State Reclamation Board
Anne Sands, Animal Protection Institute
Governor Brown
Willie Brown, Assemblyman

CALIFORNIA WILDLIFE TRUST

3435 HERMOSA AVENUE • HERMOSA BEACH, CALIFORNIA 90254
TELEPHONE (213) 372-0285

EDWARD S. LOOSLI

June 9, 1979

U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, Ca. 95814

Dear Corps of Engineers,

Regarding the draft plans for Phase One of the Sacramento River Bank Protection Project, it is absolutely necessary that full mitigation measures be taken for any future unavoidable losses to the river bank and that mitigation be provided now for past losses.

The California Wildlife Trust urges you to agree to mitigate past losses in accordance to the suggestions of the U.S. Fish and Wildlife Service which calls for a full mitigation for losses equaling at least 668 acres.

This past work performed by the Corps was not "deferred maintenance" and, in fact, it is my understanding that the Corps does not perform "maintenance" work.

Your advisor under several federal laws is the U.S. Fish and Wildlife Service. We suggest that the Corps listen to that advise.

Sincerely

Edward S. Loosli

Edward S. Loosli
Director-Calif.Wildlife Trust

ESL/js

ccPresident Carter

BOARD OF SUPERVISORS
916-666-8407

COUNTY OF YOLO

Woodland, California
95695

June 11, 1979

Mr. Carlos W. Hickman
Acting District Engineer
Sacramento District Corps of
Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Mr. Hickman:

Thank you for the opportunity to respond to the Fish and Wildlife Mitigation Plan for the Sacramento River Bank Protection Project, First Phase. The Yolo County Board of Supervisors approves of the fact that the Corps of Engineers is attempting to mitigate past damage to riparian habitat along the Sacramento River. We support the U.S. Fish and Wildlife Service position that 668 acres should be acquired for mitigation. It is also suggested that this project serve as a basis for the review of all existing Federal and State level, maintenance regulations, as this will help insure the future effectiveness of the riparian environment along the Sacramento River.

Very truly yours,

Betsy Marchand

BETSY A. MARCHAND, Chairperson
Yolo County Board of Supervisors

BAM:DB:rm

Legislative Telephone Tree
P.O. Box 7434
Menlo Park, Ca. 94025

June 11, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, Ca. 95814

Dear Sirs:

As a group concerned with the welfare of California and Californians, we urge you to support the full and complete fish and wildlife mitigation plas as outlined by the U.S. Fish and Wildlife Service. This would help compensate for the loss of the nearly 700 acres of valuable habitat that were destroyed during the Phase One of the Sacramento River Bank Projection Project.

This is important and will benefit all of us in the long run.

Very truly yours,

G. Modrell
Corresponding Secretary

Timothy M. Murphy
11638 Kittridge
North Hollywood, CA 91606
June 11, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, CA. 95814

RE: Complete fish and Wildlife mitigation plan for Sacramento River Bank Protection Project.

ATTN: Huey Johnson Resources Secrataty, Jim McEvitt, The State Reclamation Board.

Dear Sirs:

We, the undersigned, strongly support a complete fish and wildlife mitigation plan as outlined by the U.S. Fish and Wildlife Service. We feel that this in the only way to compensate for the losses suffered during your bank protection work and levee maintenance. We agree with the estimated 668 acres destroyed plan. We feel it is important for all persons to know that many endangered species of wildlife are dependent on riparian lands along the Sacramento River. Among these animals are the American Peregrine falson, the Southern Bald Eagle, the giant garter Snake, and the yellow-billed cuckoo. Only full mitigation as suggested by the U.S. Fish and Wildlife Service will be able to insure the continued survival of these and other endangered species.

Sincerely yours,

Tim Murphy and Friends...

National Audubon Society
Western Regional Office
555 AUDUBON PLACE, SACRAMENTO, CALIFORNIA 95825 (916) 481-5332

12 June 1979

Colonel Donald O'Shei
Department of the Army
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel O'Shei:

We are pleased to be able to comment on the draft fish and wildlife mitigation plan for Phase I of the Sacramento River Bank Protection. The members of the National Audubon Society have long recognized the wildlife values of riparian vegetation in the arid West, and we appreciate the Corps' documentation of these values in this mitigation plan.

As a method for providing adequate mitigation for riparian habitat losses due to bank protection and levee maintenance along the Sacramento River, we support the U.S. Fish and Wildlife Service Management Plan and recommendations for mitigation of Phase I of the Sacramento River Bank Protection Project. Future Corps actions should be subject to full mitigation for fish and wildlife losses. Every attempt should be made to restore native riparian vegetation to areas which have been cleared.

The mitigation of fish and wildlife habitat losses along the Sacramento River is an integral part of the Corps' Bank Protection and Levee Maintenance Program. By systematically planning ahead for long-term wildlife habitat enhancement, the Army Corps can make a valuable contribution to the wildlife public trust values of the Sacramento River.

Sincerely,

RICHARD MARTYR
Representative

RM/sl

Sacramento Valley
Landowners
Association

June 13, 1979

Colonel Donald M. O'Shei
District Engineer
Sacramento District, Corps
of Engineers
650 Capitol Street
Sacramento, CA 95814

Dear Colonel O'Shei:

Thank you for the opportunity to review and comment on your Draft Report, Fish and Wildlife Mitigation Plan for The First Phase of the Sacramento River Bank Protection Project. We have reviewed the report and in general concur with the Corps findings.

Alternative I which would involve 260 acres for mitigation for those areas of the project on which vegetation would have been permitted by Federal Regulations and State Guidelines but was removed during construction seems to be fair and reasonable. The additional 408 acres which would have been required removed under Federal and State Regulations for normal maintenance purposes should not be considered as mitigation, since the removal of vegetation from those areas was necessary to maintain the integrity of the project.

We further agree that acquisition of lands by easement for the second Phase of the Project is adequate for the establishment and maintenance of fish and wildlife habitat.

The Sacramento Valley Landowners Association looks forward to working with the Corps in finding environmentally acceptable solutions to the problems involved in bank protection work.

Sincerely,

Thomas C. Mackey
Executive Director
SVLA

lm

1399 Montgomery Road
Red Bluff, CA 96080

Golden Gate Audubon Society

A Branch of the National Audubon Society

June 17, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sirs:

The Golden Gate Audubon Society, representing over 6,000 Bay Area members, is in strong support of a complete mitigation plan as outline by the U.S. Fish & Wildlife Service.

This mitigation would compensate fish and wildlife habitat losses equivilent to 668 acres destroyed by bank and levee work during Phase One of the Sacramento River Bank Protection Project.

Thank you for your consideration.

Sincerely,

Ingrid Lustig

Ingrid Lustig
Executive Director

June 18, 1979

Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

RE: SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA, FIRST PHASE (DRAFT REPORT)

Gentlemen:

The Davis Yolano Group of the Sierra Club (part of the Mother Lode Chapter) has recently become aware of wildlife habitat mitigation deliberations concerning the Sacramento River, and we wish to respond.

As might be expected, our sympathies are for as much protection of the natural system with its biological components as modern intervention can allow. In the case of the Sacramento River, it is obvious that the system has been so altered at this point as to permanently hinder anything approaching a return to its former state, and indeed, we are not advocating that such a return is possible or even necessarily desirable. Nonetheless, we are gratified that there now exists sufficient awareness of certain inflexible ecological laws as to allow consideration of such mitigation as is currently being proposed.

After carefully reading the Draft Report on this matter, we come to the firm conviction that the U.S. Fish and Wildlife Service alternative for full mitigation of 668 acres is the appropriate one. We feel this way since in our view the question of deferred vs. normal maintenance is in actual fact a technicality overriden in importance by the true issue at hand, namely, reparation for damage to innocent parties, i.e., the fish and wildlife inhabiting the streambed and banks of the Sacramento River, and in the long run, the general public, who enjoy and ultimately rely upon those resources. The fact is that whether in the name of levee maintenance or bank construction, an invaluable set of elements of the larger river system is being methodically destroyed. We are thus pleased to see honest efforts now being made to attempt to redeem some of the losses. This redemptive work speaks to the realization that the intricate web of species is interrelated in ways known and yet unknown, and that assaults on one portion of the chain often have ramifications far beyond those expected.

Again, we wholeheartedly support the full mitigative measures proposed by the Fish and Wildlife Service. We also feel that restorative work concurrent with ongoing Corps bank protection is

a not impractical goal and should be pursued. We favor modified approaches which allow wildlife and vegetative populations to happily remain where they belong through less than traditional rip rap procedures and through less than devastating disking, spraying and burning operations. And perhaps most important of all, we favor establishment of increased cooperative interagency and multigovernmental working committees, as outlined by Fish and Wildlife Service in that portion of its report devoted to a management concept for a Sacramento River corridor.

Thank you for this opportunity to express our views.

Sincerely,

Marilyn Glad

Marilyn Glad, Chairperson
Davis Yolano Group
(Sierra Club)
[illegible] Madrone Lane
Davis CA 95616

MG

CC: Huey Johnson, Resources Secretary
Jim McEvitt, U.S. Fish and Wildlife Service
The State Reclamation Board

Dear Staff 6/18/79

Before more funding of bank work for Phase Two of the Sacramento River Bank Prot. Project is agreed upon - Compensation or full mitigation for Phase I if destroyed valuable Riparian habitat should be completed.

Yours Truly.

Victor Sheffield

Department of the Army
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

June 19, 1979

Dear Sirs:

I would like to comment on the Fish and Wildlife Mitigation Plan for the First Phase of the Sacramento River Bank Protection Project, California.

Overall, I was not totally impressed with the Corp's attempt to mitigate wildlife and fish losses due to bank protection work under Phase I. It is my impression, based on the text of this document, that the Corps has not sufficiently documented the cumulative adverse effects upon species and related habitat due to Phase I construction. In my opinion, 260 acres of mitigation justification is far too low of a figure to offset losses. It is not enough to only document the acreage the Corps thinks will mitigate losses, but it is also extremely important for all of us to better understand the overall effects that bank protection has on fish and wildlife species. This includes, but is not limited to, low and high terrace riparian conversion, stream displacement, turbidity, spawning bed destruction, effects of rip-rap on downstream river velocity and the disturbance to fish cycles due to immediate construction. This goes far beyond the acquisition of 260 acres.

The bulk of the booklet, as you know, is actually a re-hash of studies previously completed by the Corps and by the Fish and Wildlife Service. The first 25 pages of the document is what I consider to be the proposed plan of action for the mitigation to fish and wildlife. This being the case, I can see a general lack of direction for mitigation and instead perceive an in-fighting among agencies as to the amount of acreage to be set aside. I feel the Corps is using the land acquisition proposal as an appeasement measure, rather than professionally discussing the seriousness of the problem and what can be done in the future to prevent such losses. Again, I believe the 260 acre figure that the Corps proposes is far too low for 430,000 lineal feet of work done. I would recommend a mitigation figure closer to 2000 acres.

I would like to comment on a few specific statements in the booklet:

pg. 8, line 12 - How does vegetation interfere with effective "flood fighting"? Riparian lands adjacent to the river will reduce velocity during flood stage by catching much of the volume.
line 10 - what "certain types" of vegetation is considered to be detrimental to flood control? I believe a rock-lined channel is more detrimental to downstream flooding.

pg. 9, line 21 - Please show figures as to the costs of maintaining a vegetation free bank as compared to a bank where vegetation is allowed to grow. I cannot see where costs would be doubled.

pg. 10, line 16 - What are the figures on the loss of riparian habitat due to erosion as compared to the loss due to rip-rap?

pg. 12, line 12 - temperature fluctuations are already extremely altered by Shasta Dam. What effect does this have on fisheries?

pg. 12 - 13 - This dissertation gave some indication of the value and destruction of riparian habitat, but does not specifically mention the effects of Phase I on riparian habitat.

pg. 17, line 4 - Riparian habitat has been on the river for 3 million years before white settlers came and there is no reason to believe that erosion will remove any substantial portion of that vegetation (exception: Woodson Bridge). Nor

would it be necessary to remove very much vegetation during "flood fighting" efforts. Again, I believe the vegetation itself is in most cases effective flood control. Mitigation, in my opinion, should occur by protecting most of the remaining vegetation along the river.

The map on page 26 was not definitive as to where your recommended mitigation sites are to be located. I have tried to locate them on other maps, but I am quite unsure as to their location. Please include a more detailed map in the final report.

As a person who appreciates the beauty and values of wildlife on the Sacramento River, I would like to see the Corps take a more active role in enhancing these values as you find better ways to obtain effective flood control. I feel that there is a dire need to protect riparian vegetation for us and future generations to enjoy.

Please put me on your mailing list for anything pertaining to the Sacramento River.

Thank you for allowing me to comment.

Sincerely,

Biff Ingels
708 Cherry St.
Chico, CA 95926

COUNTY OF SACRAMENTO
DEPARTMENT OF PARKS AND RECREATION

3701 BRANCH CENTER ROAD, ROOM 106
SACRAMENTO, CALIFORNIA 95827
TELEPHONE: 366-2061

DON H. NANCE
Director

June 21, 1979

Colonel Donald M. O'shei, District Engineer
Sacramento District, Corps of Engineers
650 Capital Mall
Sacramento, CA. 95814

Subject: DRAFT REPORT, FISH AND WILDLIFE MITIGATION PLAN FOR THE FIRST PHASE OF THE SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA

Dear Colonel O'Shei:

The staff of this Department has reviewed your agency's document entitled "Draft Report, Fish and Wildlife Mitigation Plan for the First Phase of the Sacramento River Bank Protection Project, California." Our comments are as follows:

This Department concurs with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the California Resources Agency and the California Department of Fish and Game that riparian habitat is a diminishing resource in the Sacramento Valley and is extremely important to fish and wildlife. Riparian vegetation associated with the Sacramento River is an essential element for wildlife in the Sacramento Valley and plays a vital role in maintaining anadromous fish runs in the Sacramento River and its tributaries. Three rare or endangered species of wildlife depend in part upon Sacramento River riparian habitat for their survival. The critical significance of Sacramento River riparian vegetation is further magnified by the fact that a mere 1.4% of the riparian woodland acreage which existed in 1900 along the river between Chico landing and Collinsville remains today.

The report suggests (pg. 21) three land acquisition mitigation alternatives. While the Corps apparently prefers the first alternative (260 acres), alternative two (668 acres) is recommended by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), California Resources Agency (CRA) and California Department of Fish and Game (CDFG). We note (pg. 17) that "the U.S. Fish and Wildlife Service has identified 681 acres of unvegetated riverside berms more than 30 feet wide that are or can be made available for habitat within the limits of the First Phase Area." Ample justification for implementing alternative two (668 acres) is provided in the report via letters from the four agencies which have recommended it. Since the USFWS has identified 13 additional acres as suitable for mitigation, and since the Corps and other Federal and State agencies have previously removed several thousand acres of riparian habitat along the Sacramento River for which no mitigation has ever been provided, we urge that the full 681 acres be incorporated into the mitigation program.

We also support the USFWS recommendation (pg. 31 of their proposed fish and wildlife management plan) that "... it would be most suitable to acquire fee title to all tracts with lease-back provisions for special uses." The cost of fee title appears to be only slightly higher than the cost of easements (same pg.) and would enhance and clarify Federal management authority over the land, reduce the potential for incompatible uses to occur in this area and provide a higher level of protection and mitigation than would otherwise occur.

The report clearly demonstrates the urgent and compelling need for modifying levee protection and maintenance procedures to allow for establishment of increased riparian habitat. Among the pertinent factors relating to this issue are (1) the miniscule amount of riparian habitat remaining along the Sacramento River, (2) the critical significance of this habitat to numerous fish and wildlife including migratory birds, anadromous fish and several rare or endangered species and (3) the fact that re-establishment of mature riparian habitat along a previously cleared berm would take at least 30 years.

Finally, we want to acknowledge our strong support for a Sacramento River Parkway, as discussed on pgs. 42-43 of the USFWS's fish and wildlife management plan, and as described in the 12 February 1979 issue of the "Sacramento Union" (attached).

Thank you for the opportunity to review and comment on this document.

Sincerely,

Walt Ueda, Chief
Planning and Development Division

cc: USFWS
NMFS
CRA
CDFG
California Reclamation Board

Plan to protect the Sacramento

Union 2-12-79

Water resources secretary wants 316-mile linear river parkway

By MICHAEL OTTEN
Staff Writer

The Brown administration has begun taking a look at the possibility of converting a 316-mile stretch along the Sacramento River into a gigantic park and bikeway.

Imagine, if you will, an American River Parkway 10 times as long as it is now.

The land and real estate division in the state Department of Water Resources has just completed a rough study to determine how much it would cost to acquire a 300 foot strip of land along both sides of the Sacramento.

The survey extended from Keswick Dam just below mighty Shasta in the north, southward to Collinsville in the Suisun Marsh area. The survey came up with a $170 million estimate to acquire such a strip along 285 miles of the meandering river.

IT COVERED primarily rural, agricultural and wildlands, excluding urban areas, marinas and other highly developed areas.

State Resources Secretary Huey D. Johnson finds the idea fascinating, one of a dozen or so he hopes to be able to pull out of his coat pocket should the time be ripe and the money available.

"One of the real pleasures in my life is the use of the American River bike trail," Johnson said in an interview with The Sacramento Union.

"IN FACT, my mode of transportation year around is right there," he said getting up from his canvas and wood chair suspended from the ceiling and walking to a nearby closet. Inside was a bicycle.

"I come (to work) about eight miles on that and I happily go in the rain, (it was raining heavily at the time) tonight even if it is flooded."

This unusual state bureaucrat and Brown cabinet member repeatedly emphasized it is not a hot burning issue like Lake Tahoe, salmon enhancement, reforestation or swapping the federal government the state's redwood parks for the 200 square miles or so Camp Pendleton Marine base, north of San Diego.

JAMES W. BURNS, a biologist who is a top assistant to Johnson, said a similar study might be made along the California shore of Lake Tahoe, to help officials look at the possibility of swapping private land owners their land for some state land outside the Tahoe basin.

Maybe it is the impossible dream.

But Burns said, "By talking about it and bringing it out in the open, you get people focusing on alternatives rather than looking tunnel vision.

"The tunnel vision of the Sacramento River has been rock riprap."

Johnson said his dream of a linear park may get serious consideration as soon as next year or possibly wait until long after he has left.

"IT IS AN idea that ought to be evaluated," said Johnson, who plans to discuss it with federal officials.

Burns added, "You throw it out and say 'Gee, it would be nice to have a linear park along the Sacramento River' and everbody says 'it would be so expensive it couldn't be done. It would be millions and millions. It would be $500 million, a billion dollars.'

"We hear that at Lake Tahoe when we talk about national recreational areas."

Burns said the $170 million estimate of acquiring orchards and other lands along the river "gives you a starting point so you can talk about it intelligently."

Burns and Johnson agreed that in the long run it may be cheaper for California, giving additional flood protection while at the same time providing an unprecedented mammoth recreation and wildlife area in the state.

THEY FULLY realize their approach may annoy agricultural and other private interests along the large river.

"The thing is," said Burns, "no one has looked at the river as to its long term situation and what has to be done to contain it."

One study, using 1977 prices, noted that in 1955, 100,600 acres were flooded in the area from Colusa to Shasta Dam and $3.2 million in damages occurred.

In 1974, 114,500 acres were flooded and $17.6 million in damage occured, much of it to encroaching orchard and other agricultural pursuits along the Sacramento.

A 1975 REPORT showed that in the period between 1952 and 1972, 53 percent of the riparian vegetation was taken away.

Johnson estimated that in 1850 there were about 800,000 acres of riparian forests in the Sacramento Valley, whereas today the clearing for agriculture and other purposes has turned this vast forest into a tiny remnant.

"There are only about 4,000 acres of mature trees remaining along the main stem of the Sacramento River. Protection of this vegetation is vital from an environmental point of view.

"Riparian vegetation helps stabilize river channels, protects levees from wind-driven wave wash and reduces bank erosion," Johnson said last October in a speech on a "holistic approach" to flood management.

IN THE interview with The Union, he said, "Each year we have to cover the cost of more damage because we were rather arrogant in our planning approaches to thinking we could contain a river on a state basis."

He visualizes converting the Sacramento River area with dikes set back from the river, allowing the area in between to "grow back to nature similar to the American River flood plain which is so beautiful.

"It would help stabilize agriculture if we look at least at the same approach on the Upper Sacramento that we are taking on the American River. The taxpayers would be ahead of the game and the citizens 100 years from now would be far better off."

THE RIVER IN high water moves about, cutting into orchards and banks, causing millions of dollars in damage each year.

"The decline of the salmon, steelhead and shad runs are attributed somewhat to the problems of silt in the river," said Johnson. "At the same time, if you riprap the bank you've got a [illegible] further [illegible]. You have a canal. Water seeps under the dikes because they are next to it and the state gets sued by the neighboring agricultural interests, saying 'you are drowning our trees.'"

Burns suggested that perhaps it is better to acquire the land rather than possibly riprapping the whole river. He said "$2 million was spent just last year in doing eight bank protection sites (covering about two miles total) along the Sacramento River between Colusa and Red Bluff."

JOHNSON ADDED it is "important that people realize that wildlife is an indicator of the health of the land.

"One of the greatest thrills to me is to go down and watch the salmon spawning in the American River in the fall with houses on both sides and other developments and to think that we have evolved effectively as managers; that we can provide water supply and conditions; that unique lifeform where salmon can survive there and yet, we too, as human beings, can carry on our affairs . . . and live compatibly.

"That ultimately is what we will have to do there (on the Sacramento River)."

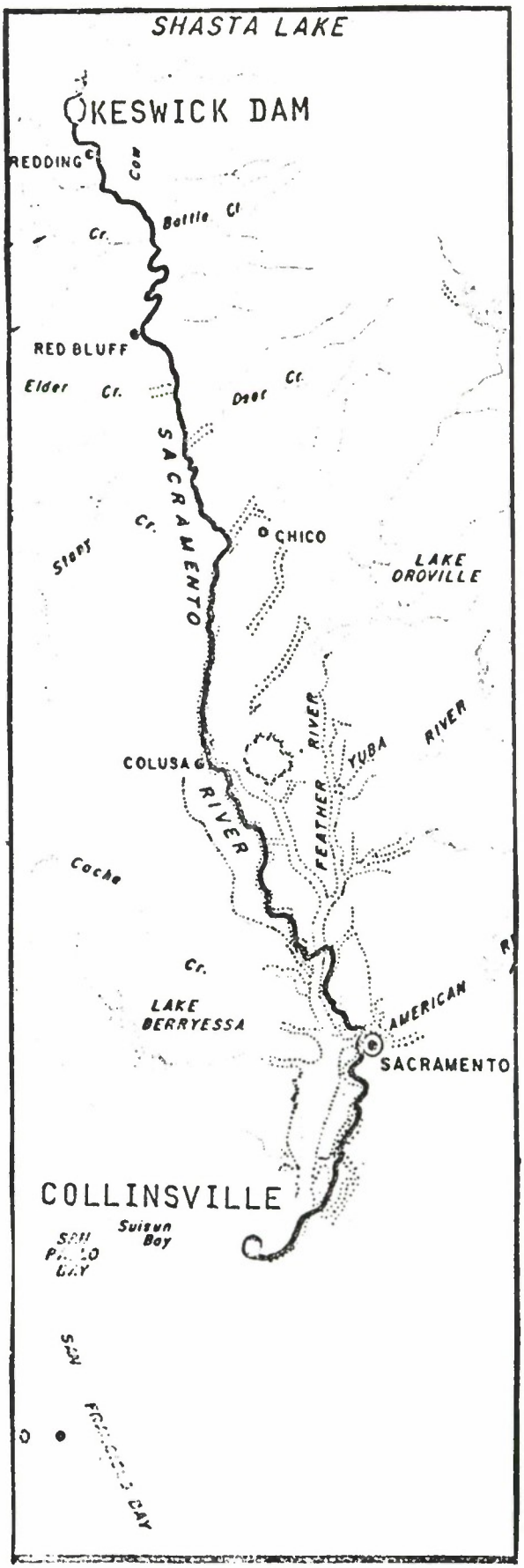
HE SAID A broad dike approach to the river instead of spending fortunes on riprapping with rock and concrete allows the native habitat to regrow and stabilize the bottom.

Instead of eroding away and filling the river with silt, "you have a canvas on the top of the soil (grasses, brush and trees) and that living blanket keeps it from being eroded at no cost to anybody," said Johnson.

Johnson, 46, founder and president of the Trust for Public Land when Gov. Brown named him to succeed Claire Dedrick in 1977, thinks the American River between the Sacramento River and Nimbus dam is a good model for the future of the Sacramento.

AT THIS POINT, the Sacramento River parkway and bikeway dream is sitting on Johnson's back burner, awaiting that day when perhaps the federal government decides it has some cash it wants to invest in a linear park.

Johnson figures he'll be ready.


SHASTA LAKE
KESWICK DAM
REDDING
Cow
Battle Cr.
RED BLUFF
Elder Cr.
Deer Cr.
SACRAMENTO
Stony Cr.
CHICO
LAKE OROVILLE
YUBA RIVER
FEATHER RIVER
COLUSA
RIVER
Cache Cr.
LAKE BERRYESSA
AMERICAN
SACRAMENTO
COLLINSVILLE
Suisun Bay
SAN FRANCISCO BAY

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Forestry
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

Colonel Paul F. Kavanaugh
District Engineer
Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

JUL 1 1 1979

Dear Colonel Kavanaugh:

It has come to my attention that a conflicting statement was included in the Resources Agency's letter of June 1, 1979, regarding the fish and wildlife mitigation plan for the Sacramento River Bank Protection Project. This letter is meant to clarify our earlier response.

In the June 1 letter the Department of Water Resources (DWR) stated a preference for Alternative Three, which would acquire 668 acres for fish and wildlife purposes. This alternative, however, consists of 260 acres of "mitigation" and 408 acres of "enhancement". The Resources Agency has consistently held that the entire 668 acres should be considered as mitigation. This is stated in our letter of May 18, 1978, copy attached, to Mr. George Weddell of the Sacramento District's engineering division.

Except for the false impression that the State had softened its stand regarding the "enhancement" issue, the June 1 letter accurately reflects the State's position on this matter. We continue to support the mitigation plan set forth by the U.S. Fish and Wildlife Service. If you have any questions, please contact me directly at the above address or at 445-9057.

Sincerely,

James W Burns

JAMES W. BURNS
Assistant Secretary for Resources

Attachment

cc: Director of Management Systems
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH 78121204)

GOVERNOR OF
CALIFORNIA

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

MAY 18 1973

Mr. George Weddell
Chief, Engineering Division
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Mr. Weddell:

Thank you for the opportunity to review and comment on the two alternative proposals for compensating wildlife habitat losses resulting from the Sacramento River Bank Protection Project, Phase I.

Basically, the two proposals presented in the Fish and Wildlife Mitigation Plan differ as to whether or not all existing fish and wildlife values that were destroyed through project construction should be termed mitigation needs and replaced through the mitigation process. The term "enhancement" has been used in one proposal for the compensation of the loss of 408 acres of habitat that would not have existed if levee maintenance guidelines were followed. We do not feel that "enhancement" is the proper term for this compensation. To take a position that does not recognize the existence of fish and wildlife values in these 408 acres would not be fulfilling the State's responsibilities to the public at large. Also, the vegetative guidelines are just that--guidelines. It may be that a review of actual local maintenance practices would reveal that some of the vegetation in question was not incompatible with good flood control maintenance practices. The history of flood control in the valley is replete with compromises in this area.

The removal of vegetation from the 408 acres was part of Phase I construction and as such, it was not a simple act of deferred maintenance. Therefore, the federal-state cost funding should be re-evaluated whereby the cost for compensating for the project's adverse impact upon fish and wildlife is borne as a project cost (2/3 federal, 1/3 state).

This dilemma is somewhat similar to the controversy which arose in a Bureau of Reclamation project to line the Coachella Canal with cement. The original Bureau canal was dirt lined and consequently water seeped from it. As a result of the seepage wetland habitat developed adjacent to the canal. When

the Bureau proposed to line the canal with cement, the issue arose over whether mitigation should be provided for the loss of wetland habitat that was there as a result of seepage. One position was that no mitigation should be provided while the opposing position was that the habitat was in fact present and its loss should be mitigated. The problem was resolved when the Bureau agreed to mitigate and otherwise compensate for the loss of the wetland habitat.

We suggest that the mitigation proposal for Phase I of the Sacramento River Bank Protection Project be resolved in the same manner, that is, all of the riparian habitat that was destroyed should be replaced. A good case can be built to justify this decision. Many jointly funded federal-state projects have impacted riparian habitat in the past with no provisions for compensating the losses. This is an opportunity to provide for some of that compensation. It is our understanding that this is the position being suggested by the Fish and Wildlife Service.

All parties involved in this issue recognize how difficult it is for you to resolve. We hope that you will choose the alternative that authorizes full compensation for wildlife habitat loss so that 663 acres of riparian lands can be restored to productive wildlife habitat.

Sincerely,

James W. Burns
Assistant to the Secretary

cc: Department of Fish and Game
U.S. Fish and Wildlife Service
Reclamation Board

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE MANAGEMENT PLAN FOR SACRAMENTO RIVER BANK PROTECTION PROJECT CALIFORNIA

PORTLAND, OREGON

MAY, 1976

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE MANAGEMENT PLAN

FOR

SACRAMENTO RIVER BANK PROTECTION PROJECT

CALIFORNIA

Portland, Oregon

May 1976

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1500 N.E. IRVING STREET
P.O. BOX 3737
PORTLAND, OREGON 97208

Reference: ES

MAY 3 1976

District Engineer
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sir:

This report is provided in response to a request from your agency that the U. S. Fish and Wildlife Service prepare a fish and wildlife management plan for the Sacramento River Bank Protection Project. Our plan is intended for your use in preparing a report seeking modification of project authorization so that wildlife losses, associated with Phase I bank protection work, may be mitigated or offset by appropriate measures. This report describes the importance of riparian vegetation to fish and wildlife, identifies the habitat losses attributable to the project, and presents a plan to reduce the project impact on fish and wildlife resources, and where possible, compensate for project-incurred fish and wildlife resource losses.

In addition to addressing the impacts of Phase I of the bank protection project and measures to reduce that impact, the recommendations for modifying planning and construction activities to protect fish and wildlife resources apply to all future phases of bank protection work including activities conducted under Emergency Flood Control Act P. L. 84-99.

This report has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Biological information received from the California Department of Fish and Game has been incorporated into the report. This report has been reviewed and concurred in by the California Department of Fish and Game as indicated by the attached copy of a letter dated January 28, 1976, from Director E. C. Fullerton.

We have proposed the development and implementation of a management plan for the Sacramento River floodway, its associated uses, and natural resources to assist present and future planning for the areas. This proposal and its support is described in the discussion of this report.

PROJECT DESCRIPTION

The Sacramento River Bank Protection Project was authorized by the Flood Control Act of 1960 to provide protection for the existing levee system of the Sacramento River Flood Control Project originally authorized by the Flood Control Act of 1917. It extends from Collinsville at river mile 0 to Chico at river mile 184 on the Sacramento River and also includes project levees on the American, Bear, and Feather Rivers and other tributaries (Plate I). The project includes a program to construct bank erosion control works on river banks and contiguous berms that lie between the river and its system of flanking levees.

The overall bank protection project is a long-range program of bank protection and levee setback to protect the existing levee system of the Sacramento River Flood Control Project. Such a program, according to the Corps of Engineers, is needed because the Sacramento River, a meandering stream, continously erodes its banks and bed. Therefore, it is necessary to stabilize the river in a fixed alignment to prevent its erosive attacks from destroying the integrity of the flood control system (12).

Bank protection is accomplished by mechanically sloping the river bank or berm and facing it with a stone revetment, either cobble or quarry stone (Figure 1). The desired slope is usually attained by excavating the river bank except where all or nearly all of the berm fronting the levee has been eroded. In such cases, the proper slope is attained by placing fill material against the bank or levee or by reconstructing the levee on a setback alignment.

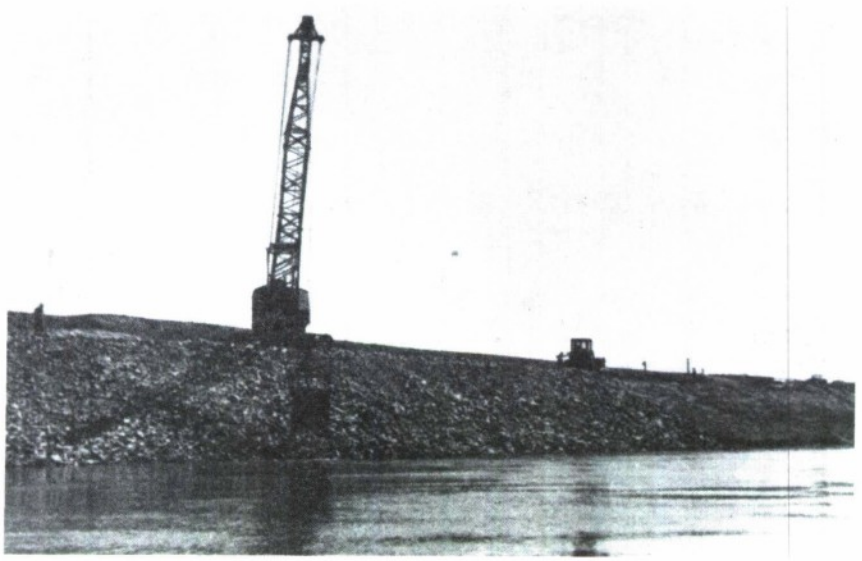
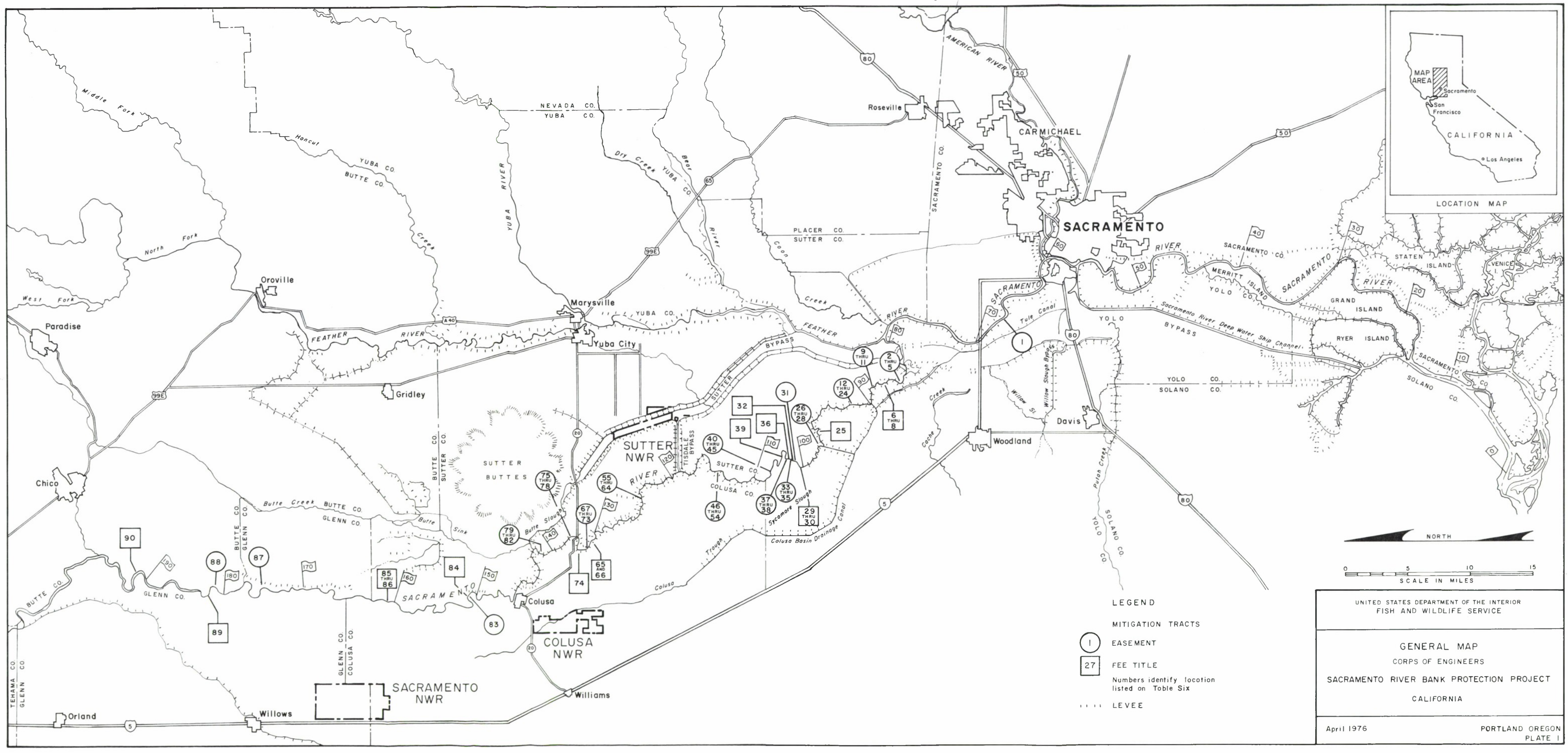


Figure 1. Landside placement of stone revetment.



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

GENERAL MAP

CORPS OF ENGINEERS

SACRAMENTO RIVER BANK PROTECTION PROJECT

CALIFORNIA

April 1976

PORTLAND OREGON
PLATE 1

Authorizing language for the Sacramento River Bank Protection Project provided for: (1) a long-range program of bank protection and levee setbacks, and for (2) construction of 430,000 lineal feet (80 miles) of bank protection at critical locations over an initial 10-year period. At the time of authorization (1960), appropriation of funds was approved only for implementation of item (2), referred to as Phase I of the project. Phase I construction was initiated in 1963 and completed in late 1974.

Congress later approved funding for an additional 405,000 lineal feet (77 miles) of bank protection. This additional work, referred to as Phase II, began in 1975 and will extend for 10 years. In general, the work to be accomplished under Phase II will be at erosion sites that are interspersed with the segments of bank protection constructed under Phase I.

The project authorization requires a non-Federal interest to make a cash contribution such that it, together with the cost of utility charges, equals one-third of the total project costs. The California Legislature adopted the bank protection project in 1961 and designated the State Reclamation Board as the State agency responsible for all matters pertaining to non-Federal cost-sharing. The California Department of Fish and Game may comment directly to the U. S. Army Corps of Engineers under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) when reviewing project plans.

The Reclamation Board is responsible for operation and maintenance of the completed project works in accordance with Federal instructions specified by the Secretary of the Army in Title 33, United States Code. Local governmental units (reclamation districts, levee districts, etc.) have accepted maintenance responsibilities from the Reclamation Board in most cases. The California Department of Water Resources cooperates with the Reclamation Board and provides maintenance under State law in those cases where maintenance is not performed by local entities.

ENVIRONMENTAL SETTING

The Sacramento River system is the largest watershed in California, draining 26,300 square miles of the Central Valley, the Coast and Cascade and the Sierra Nevada Ranges. A system of levees bounds much of the Sacramento River downstream from Chico. Flows are regulated by major dams and reservoirs, such as Shasta on the mainstem and Whiskeytown, Oroville, New Bullards Bar, Folsom, Black Butte, and Berryessa, on tributaries. In addition, water is transferred from Trinity Reservoir to the Sacramento River via Whiskeytown and Keswick Reservoirs. Auburn Dam and Reservoir, currently under construction on the North Fork of the American River, will also regulate flows in the Sacramento River. The Sacramento River, since the construction of these storage facilities, has become a conveyance system for transporting water

from north to south through the Sacramento-San Joaquin Delta to the State and Federal export pump facilities. The sustained high water level during the summer months, although controlled by upstream developments, contributes to some streambank erosion; however, winter flood flows are the major factor contributing to the erosion of the river's banks. Two-thousand square miles of fertile agricultural land and about 50 communities are located in the system's flood plain. Most of the agricultural land is irrigated.

Prior to human encroachment the Sacramento River, from Chico Landing to Collinsville, was flanked by natural levees or intermittent high banks covered with riparian forests of varied characteristics. These forests included trees of all sizes from shrub to valley oaks and sycamore 75 to 100 feet high, growing closely in irregular groves or belts on most of the natural levees. On the banks of the lower Sacramento River, in the vicinity of the mouths of the Feather and American Rivers the riparian forest achieved a width of about 5 miles. The groves were generally about 2 miles wide on the smaller streams but were narrower in the Delta.

At the turn of the century it is estimated that there were about 470,000 acres of riparian woodlands and associated plant communities along the 184 miles of the Sacramento River between Chico Landing and Collinsville. By 1972 this had been reduced to about 6,800 acres. This is about 1.4 percent of the estimated acreage in riparian woodland and associated communities existing at the turn of the century. Most of this loss has been and is due to agricultural encroachment.

Despite man's heavy intrusion into the Sacramento River Basin, some reaches of the river retain aspects of their pristine natural beauty and fish and wildlife resource base. Other areas are highly modified into trapezoidal channels bounded by rock and cobble banks. In recognition of its outstanding recreational, fish and wildlife, and esthetic values, the river, from its source to Clarksburg, has been designated Class I--Premium Scenic, Fishery, Wildlife, and Recreation Waterway by the State of California Environmental Goals and Policy Report (21). The river's exceptional natural values have also been recognized at the national level. Pursuant to the provisions of Section 5D of the Wild and Scenic Rivers Act (P. L. 90-542), the Sacramento River from Keswick Dam to the City of Sacramento has recently been studied by the Corps of Engineers to provide a basis against which to evaluate the effects of water resources projects on the river's wild, scenic, and recreational potential.

Fish Resources and the Aquatic Community

The anadromous fishes of the Sacramento River system include chinook salmon, steelhead trout, striped bass, American shad, and white sturgeon. It is estimated that an average of 326,000 chinook salmon and 39,200 steelhead trout enter the Sacramento River annually to spawn in the mainstem and its tributaries (22). Virtually all of California's white sturgeon, American shad, and approximately two-thirds of the striped bass are believed to spawn in the Sacramento River system (4).

There are three salmon and steelhead hatcheries in the Sacramento Basin: Nimbus Hatchery on the American River, Feather River Hatchery on the Feather River, and Coleman Hatchery on Battle Creek. The Nimbus and Feather River Hatcheries are operated by the California Department of Fish and Game; Coleman Hatchery is operated by the U. S. Fish and Wildlife Service. Another Service fish-rearing installation (Tehama-Colusa Fish Facility) is located near Red Bluff on the Bureau of Reclamation's Tehama-Colusa Canal. The Tehama-Colusa facility augments natural production of chinook salmon by means of artificial spawning channels. All four fish-rearing installations were constructed in conjunction with major State or Federal water development projects to protect, mitigate, replace, or enhance the salmon and steelhead resource.

Chinook salmon contribute to the ocean commercial and sport fisheries with evidence that Central Valley salmon enter the commercial catch along the entire Pacific coast. It has been calculated that the Sacramento system contributes about one-half million chinook salmon annually to the commercial harvest of these fish in the Pacific Ocean (6). The ocean sport catch of chinook off California's coast in 1971 exceeded 188,000 fish (9), of which about 75 percent originated in the Sacramento system. The Sacramento River's sport fishery is justifiably famous. Angling on the mainstem occurs throughout the year for both anadromous and warmwater species. Stream fishermen annually creel about 25,000 chinook salmon and 20,000 steelhead trout from the Sacramento River and its tributaries (8).

The striped bass population of the Sacramento River system has been estimated to be between 1.5 to 4 million adult fish with approximately 55 to 66 percent of this population spawning in the Sacramento River (8). An annual catch of 250,000 fish provides 1.5 million angler-days. The American shad population has grown tremendously in the last few years. The adult population is now estimated to be at the several million level. It was estimated that last year (1975) 83,000 shad were caught upstream from the city of Sacramento. They provided in excess of 36,800 angler-days. The striped bass and American shad are both directly dependent on the Sacramento River system and its estuary. They are numerically superior to salmon populations (8).

The adult population of white sturgeon is estimated to be between 72,000 to 212,000 fish with an average annual catch of approximately 42,000 fish that provide approximately 37,500 angler-days (8). The population size of green sturgeon is unknown, but it is believed to be smaller than that of the white sturgeon (8).

The Sacramento River system also supports a significant warmwater fishery consisting of smallmouth and largemouth bass, black and white crappie, white catfish, channel catfish, brown bullhead, and yellow bullhead, bluegill, green sunfish, and various nongame species.

Remnant populations of the Sacramento perch, California's only native sunfish, occur in the Sacramento system. Although the species is thought to be threatened with extinction in the Sacramento River, it is presently listed as status-undetermined pending collection of additional information because baseline resource information on this species is lacking (8).

Fish habitat is enhanced by the diversity of habitat at the land-water interface and adjacent berm (Figure 2). The importance of stream bank vegetation and its associated snags and root systems at the land-water interface cannot be overemphasized. This vegetation provides shade which reduces daily water temperature fluctuations. Terrestrial organisms that fall from overhanging branches contribute to the food source of the aquatic community. Low-hanging branches are used by fish for escape cover from predators. With the water, sunken logs and massive root systems provide essential habitat components for fish and other aquatic organisms. They provide a stable surface for attachment of aquatic fish food organisms and shelter from strong light, predators, and swift current. Massive root systems provide protective eddies during periods of high flows. Riverine vegetation is generally absent downstream from Sacramento where much of the river bank has been riprapped.

Figure 2. Riparian trees benefit fish as well as wildlife (Appendix I).

Wildlife Resources and the Riparian Community

The constant meandering, seasonal flooding, and sediment deposition by the Sacramento River created extensive natural levees or rim lands, numerous sloughs, islands, oxbow lakes, and marsh areas. The rim lands were clothed with extensive riparian forests with dense canopy and understory. This extensive riparian forest interspersed with lakes, sloughs, marshes, and flowing river provided diverse habitat to support numerous wildlife species at high population levels (20 and 23).

The riparian canopy consists primarily of valley oaks, sycamore, cottonwoods, and willow. Many of the trees are draped with grapevine. Lesser numbers of blueberry, box elder, California black walnut, seep willow, white alder, and Oregon ash form a well-defined and nearly impenetrable woody understory (20 and 23). The California black walnut is listed as an endangered species in Tehama, Colusa, Butte, and Glenn Counties, California, by the California Native Plant Society (11) and is presently a candidate for future listing on the Federal threatened and endangered species list. California blackberry, western raspberry, California mugwort, western ragweed, pigweed, yellow and white sweet clover, cocklebur, Johnson grass, and several thistles, grasses, and forbs form a dense nearly impenetrable ground cover. A complete checklist of the plant species found along the lands adjacent to the Sacramento River would probably reveal nearly every plant known to occur in cultivated and uncultivated fields of the Sacramento Valley. Those plant species considered rare and/or endangered by the California Native Plant Society in this general area are listed in Appendix IV.

Greater control of flooding through dam, channel modification, and levee construction has accelerated and expanded clearing of once-flood-prone land for agriculture. This significantly reduced the extent of riparian forests along the Sacramento River and caused subsequent reductions in wildlife populations. Urbanization also has been a factor.

The plant communities found along the Sacramento River corridor are an integral part of the total valley ecosystem upon which wildlife resources depend. Although only about 1.4 percent of the historical riparian woodland habitat is currently existing, the Sacramento River and adjacent lands still support a variety and surprising abundance of wildlife.

The blacktailed deer is the principal big game species. Upland game species include California quail, ring-necked pheasant, mourning dove, band-tailed pigeon, wild turkey, Audubon cottontail, brush rabbit, blacktailed hare, and gray squirrel. Fur animals are represented by coyote, red and gray foxes, bobcat, raccoon, opossum, mink, weasel, striped and spotted skunk, badger, muskrat, river otter, ringtail cat, and beaver. Waterfowl frequenting the river and contiguous bottomlands include whistling swan, seven species of geese, and 22 species of ducks. The wood duck, common merganser, and mallard are the most commonly seen ducks along the river throughout the year.

Wintering populations of waterfowl often number well over five million birds in the Sacramento Valley (5). About 230 species of birds are known to inhabit the riparian community as residents or seasonal visitors (Appendix II). Diverse vegetation bordering the river is critically important to raptors, woodpeckers, kingfishers, and a wide variety of passerine or perching birds. Egret and heron rookeries are also found at selected locations.

The value of the riparian vegetation to wildlife, because of its linear distribution and edge effect, far exceeds the value or an equivalent acreage of woody cover in a single large block. It is recognized by naturalists and wildlife managers that the numbers and kinds of wildlife species in a given habitat is oftentimes directly related to the amount of interface between diverse habitat types. Data from our ongoing (1974-present) studies on the Sacramento River near Knights Landing, California, indicate that the riparian vegetation and its support capacity influences bird populations of adjacent agricultural lands to a minimum depth of at least 1/4 mile and may extend a great deal further for some selected bird species.

Ongoing studies designed to identify the value of riparian vegetation to avian wildlife and the effect of the riparian vegetation upon the agricultural lands lying in association with it are presently being conducted by the Sacramento office of the U. S. Fish and Wildlife Service. These studies are designed and have been established with the cooperation of land owners adjacent to the Sacramento River near Knights Landing, California, in such a way that the only environmental parameter that is different is the fact that on one side of the river there is riparian vegetation without bank protection and on the other side of the river the riparian vegetation has been removed during the process of bank protection and the berm is now vegetated by grass and/or shrubs. All other parameters including identical agricultural vegetation on lands lying in association with the berms are the same.

Some comparative value of wooded riparian and riprap habitat and their adjacent agricultural lands for supporting avian species is illustrated in Table 1, Figure 3, and Bar Graphs 1 and 2.

Table 1. Comparative Value of Riparian Woodland, Cleared and Riprapped Berm and Banks, and Adjacent Agricultural Lands with Respect to Avian Use for the Period September 1, 1974, through August 1975

	Birds /ac/day	Species /ac/day	Bird Day use/ac/year
1. Riparian habitat (7.02 ac)	24.0	3.5	8,800
2. Riprap habitat (Grass and/or shrubs (6.63 ac)	1.7	0.5	620
3. Agricultural lands associated with riparian habitat (6.06 ac)	34.5	1.3	12,600
4. Agricultural lands associated with riprap (6.06 ac)	1.6	0.6	580

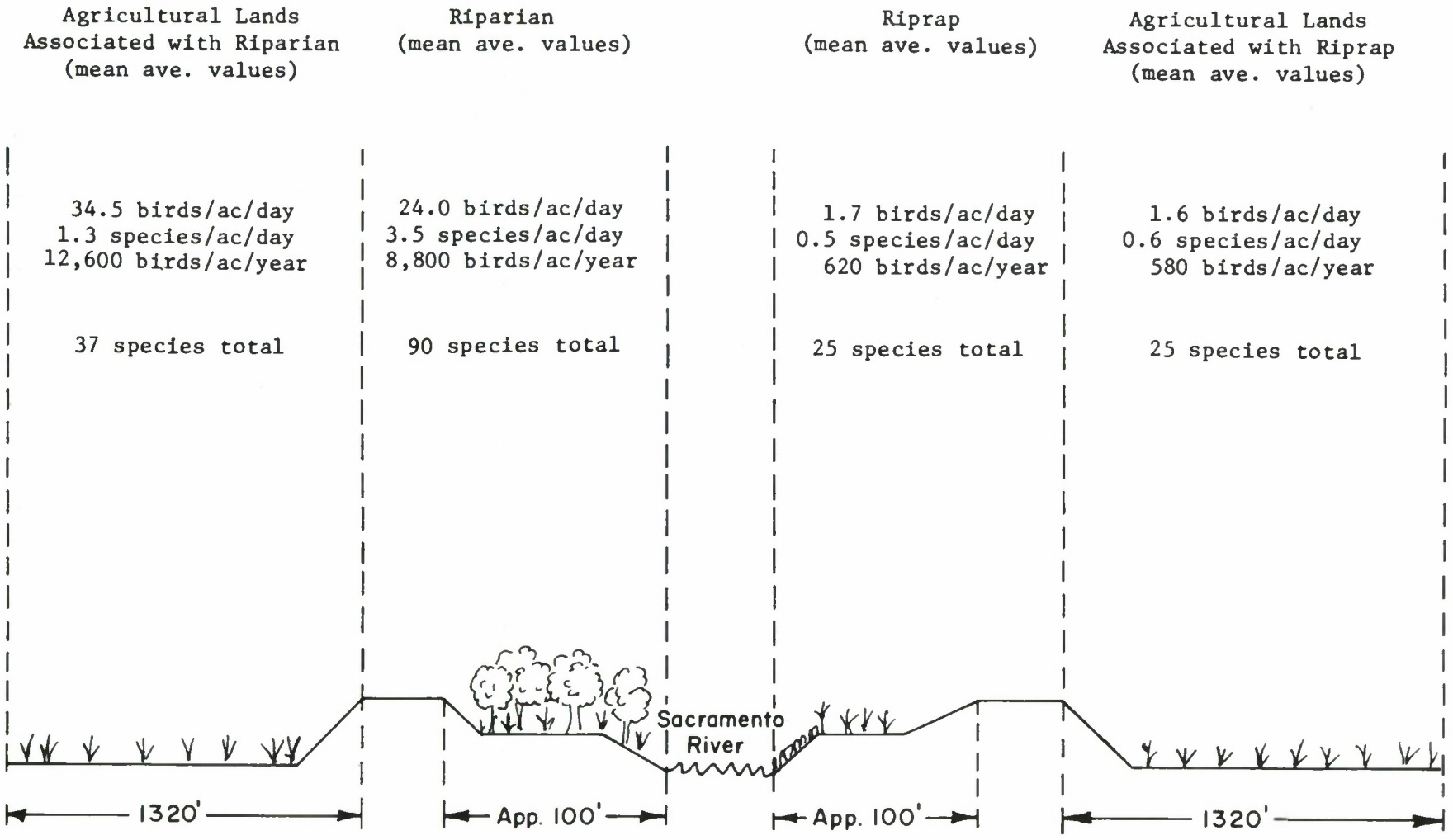
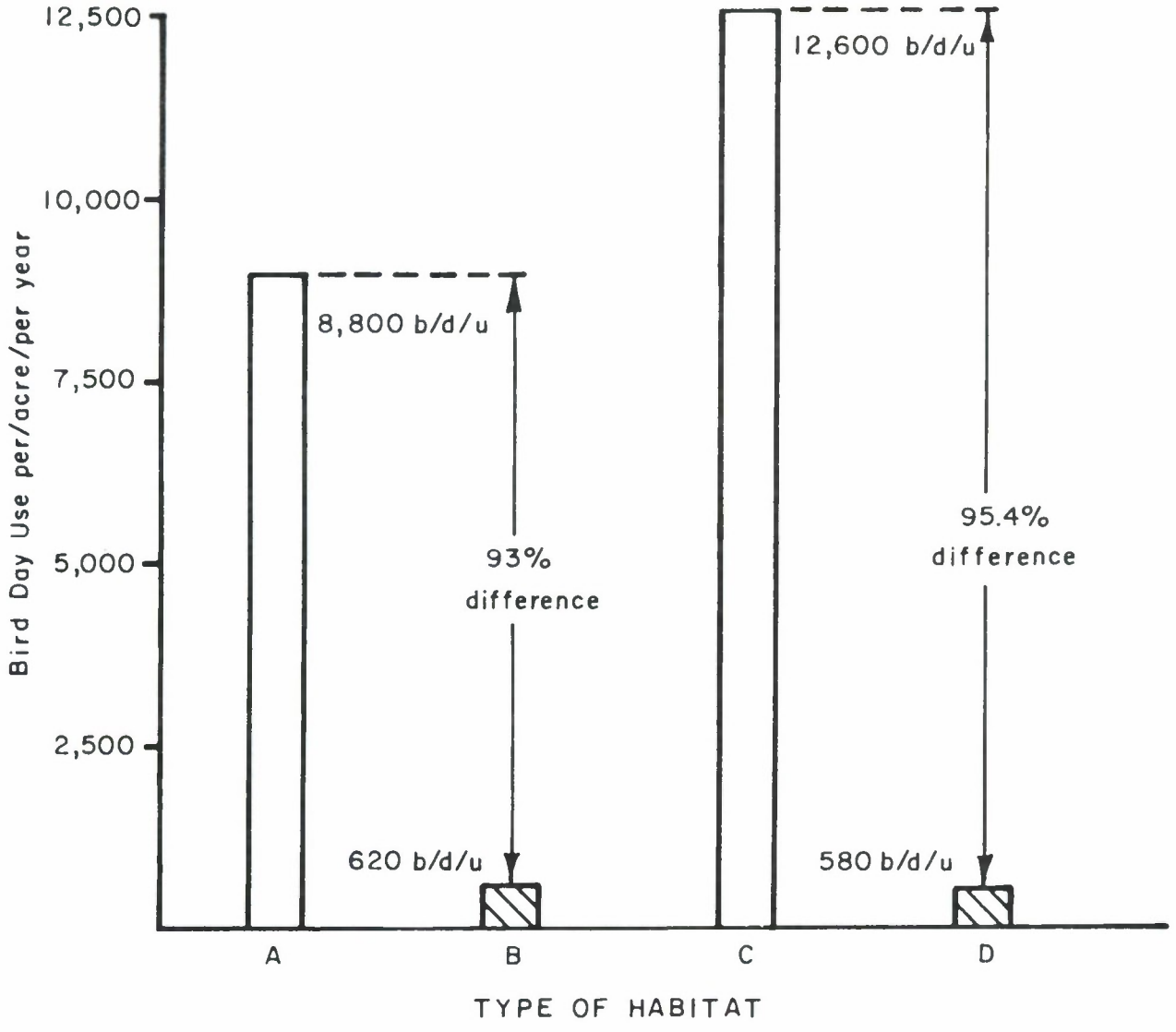


FIG. 3. A COMPARISON OF BIRD USE ON FOUR DIFFERENT HABITAT TYPES

(Summary of one year's data on eight different plots or transects.
Sacramento River near Knights Landing, CA)



A = Riparian

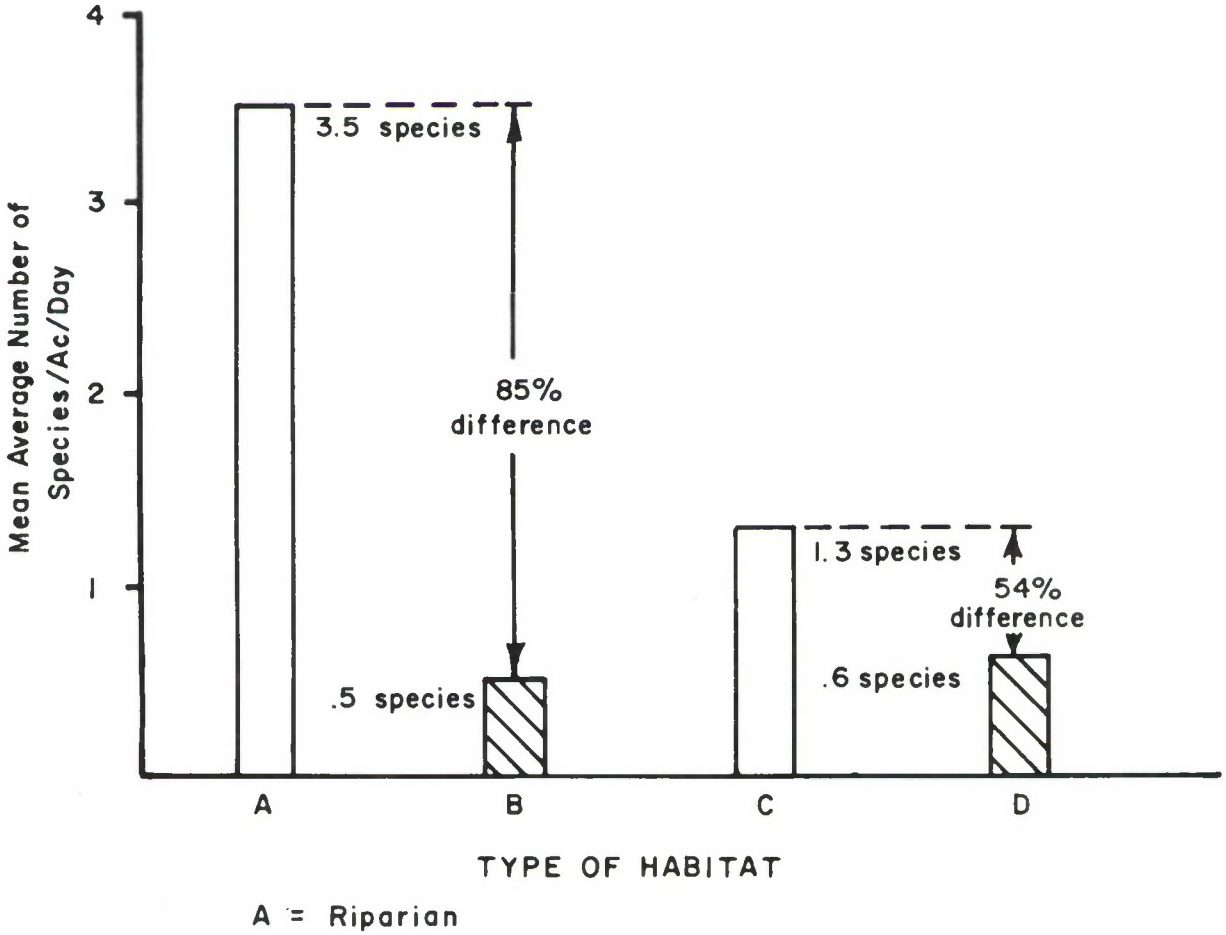
B = Riprap

C = Agricultural lands associated with riparian

D = Agricultural lands associated with riprap

b/d/u = bird day use

BAR GRAPH I. A COMPARISON OF AVIAN DENSITY ON FOUR DIFFERENT HABITAT TYPES. Summary of one year's data on eight plots. Sacramento River near Knights Landing, California.



BAR GRAPH 2. A COMPARISON OF AVIAN DIVERSITY ON FOUR DIFFERENT HABITAT TYPES. Summary of one year's data on eight plots. Sacramento River near Knights Landing, California.

A recent study by the California Department of Water Resources on the upper Sacramento River, between Keswick Dam and Colusa, also found a high avian use of riparian habitat as described in Table 2.

Table 2. Avian Population of the Upper Sacramento Riparian Lands

Nesting density	11.00 to 24.33 pairs/ac/year
Annual production of young	1.6 to 14 young/nest/year
Bird Use	68.05 birds/ac/day
Estimated bird day use	24,838/ac/year
Average nesting production	132.75 birds/ac/year

Four species of endangered or rare wildlife are associated with the Sacramento River. These are the American peregrine falcon and the southern bald eagle, each designated as endangered by the Department of the Interior (14) and the California Fish and Game Commission (7); and the California yellow-billed cuckoo and the giant garter snake, both designated rare by the California Department of Fish and Game (7) (Figures 4, 5, 6, and 7).

Figure 4. The endangered American peregrine falcon uses the riparian vegetation along the Sacramento River as a complete resting and hunting area.

Figure 5. The endangered southern bald eagle also uses the riparian vegetation along the Sacramento River as a complete resting and hunting area.

Figure 6. The yellow-billed cuckoo whose range and population has been adversely affected by the loss of vegetation along the Sacramento (7 and 16).

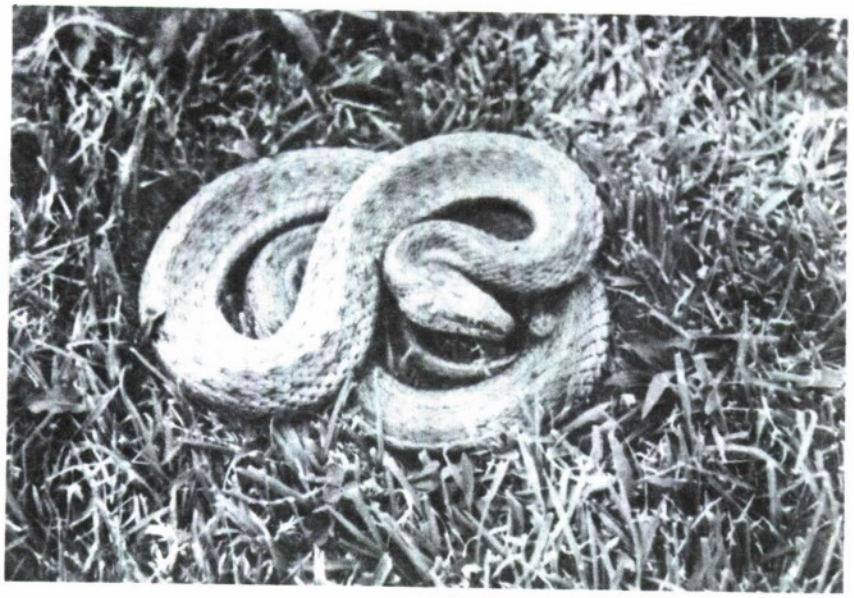


Figure 7. The giant garter snake whose range and population has been adversely affected by the loss of riparian vegetation along the Sacramento River (7).

The riverine vegetation associated with the Sacramento River is an absolutely essential habitat element for wildlife in the Sacramento Valley. The numbers and variety of wildlife would not be able to exist without this riparian corridor. Because most of the flood plain on the land side of levees is intensively farmed, riparian vegetation on the water side of leevees constitutes much of the remaining permanent cover (Figure 8). Prior to initiation of Phase I of the Bank Protection Project approximately 717 acres of land at the various project construction sites supported 362 acres of riparian woodland. All data is calculated from the actual project schematics at the time of individual site construction, obtained from the Corps of Engineers.

The general esthetic value of riparian vegetation to basin residents and travelers is inestimable. The attendant wildlife populations are interwoven and inseparable components of the esthetic value. The number and diversity of wildlife species inhabiting the riverine area contributes significantly to its public recreational value.

Figure 8. Riparian vegetation, critically important permanent cover, is in short supply along many reaches of the Sacramento River.

EFFECTS OF THE PROJECT

Fish and wildlife populations have been adversely affected and their habitat significantly degraded or eliminated by Phase I of the Sacramento River Bank Protection Project.

Fish Resources and The Aquatic Ecosystem

Placement of 430,000 feet (80 miles) of bank protection has resulted in fish habitat being degraded and eliminated. A review of available data revealed that of this total 121,387 feet (23 miles) supported woody riparian vegetation. Developing extensive areas of near-uniform condition by clearing, excavating, and riprapping decreases habitat diversity. Removing the shade canopy reduces the production of terrestrial and aquatic food organisms. Over-the-water and in-the-water branches, leaves, logs, roots, etc., provide valuable cover as well as sites for attachment of aquatic organisms. Riverine vegetation at the land-water interface is generally absent downstream from Sacramento where much of the bank has been riprapped.

A review of the literature on the effects of stream alteration (Appendix I) revealed an abundance of evidence citing the devastating effects of stream channelization on fish populations. Reductions in fish-carrying capacity of 60 to 80 percent have commonly occurred on streams both in the east and west. In North Carolina, significant recovery has been documented as taking well over 40 years (1). Similar results were noted in Idaho (18).

The Sacramento River Bank Protection Phase I has not caused such severe losses as those accompanying complete stream channelization. However, the factors of alterations at the land-water interface, riprapping, etc., and high sustained summer flows, and the varying needs of resident and anadromous fish must be taken into consideration. The amount of suitable cover and diversity of habitat is a major factor in determining the productivity and carrying capacity of the Sacramento River.

In our opinion, the fishery losses on the Sacramento River, associated with Phase I, have been significantly adverse. We will not attempt to quantify the fishery losses without further study. In order to determine or identify the exact losses in the Sacramento River we must first possess the base line data, which at this point in time, is unknown. We are presently conducting a study to identify the carrying capacity of the Sacramento River in a riparian area compared to a riprapped portion of the river. Limited information from this study may be available in the Fall of 1976. A major question which must be answered is: "What is the relationship of the stream bank zone to the affected resident and anadromous fisheries of the Sacramento River and downstream Delta areas?" A suitable answer to this question may never be available because of the difficulty of data collection and assessment.

Some Identifiable Adverse Impacts on Specific Species of Fish

Juvenile American shad have been found to move downstream past Hood as eggs, larvae, and fingerlings of various lengths up to 70 mm. Spawning occurs in the Sacramento River above Hood and in the tributaries. In a recent study of fish occurrence and distribution, juvenile shad taken by trawl were found almost entirely on the inside of river bends or on sandy bars. Hence, any riprapping that straightens the river results in the loss of normal juvenile American shad habitat.

The installation of riprap impacts chinook (king) salmon during three phases of their life cycle: nursery, migration, and spawning.

Nursery Area. Winter run salmon spawn principally in April, May, and June, and because of the prolonged period that the progeny spend in the river, the run is more severely impacted than others. Fry typically emerge from the gravel in July and August, about 75-90 days after spawning. These fry reach 45-55 mm by mid-October and remain in the river over winter, migrating as fully developed smolt in April and May at a mean size of 75-85 mm.

Habitat requirements during the juvenile residence period, based on USFWS beach seine studies, include back sloughs or finger sloughs along the river and shallow riffle and shoal areas 6" to 12" in depth. Both types of habitat have been adversely affected by riprapping.

Migration Passage and Feeding During Migration. Both fall and winter run fry and smolts depend on similar habitat during their movement downstream. The fall run in the Sacramento River spawns in October, November, and December, with the young emerging from the gravel in February and March. A large number of these young move or are displaced downstream during February and March as fry less than 45-50 mm in length. Others find suitable habitat along the banks and move slowly at about 1/2 to 1-1/2 miles per day until they reach a size of 75-80 mm, when they move to center stream and rapidly move out as smolts. Smolts migrate at about the rate of surface water flow, 20-30 miles per day. Smolts are not significantly impacted by riprapping, but more progeny of the fall run do not attain smolt size until early summer, around June 15. Cold stream temperatures reduce the growth rate of these fish so many may not even reach smolt size during the spring migration period.

Replacing the naturally diverse land-water interface with riprap may force these fish to move into the Delta too early because of competition for food and cover, or a general lack of rearing habitat. The problem is compounded as additional construction phases are implemented.

Spawning Area. Channelization and riprapping will reduce the natural riffle-pool complex where the pool is necessary for perculation of subsurface water and the riffle necessary for the incubation of eggs and larvae and growth of aquatic organisms.

Compaction of gravel will also occur more rapidly when channel changes and shifts are not permitted. This, coupled with reduced flood flows, and with total water management, will result in further degradation of the spawning gravels.

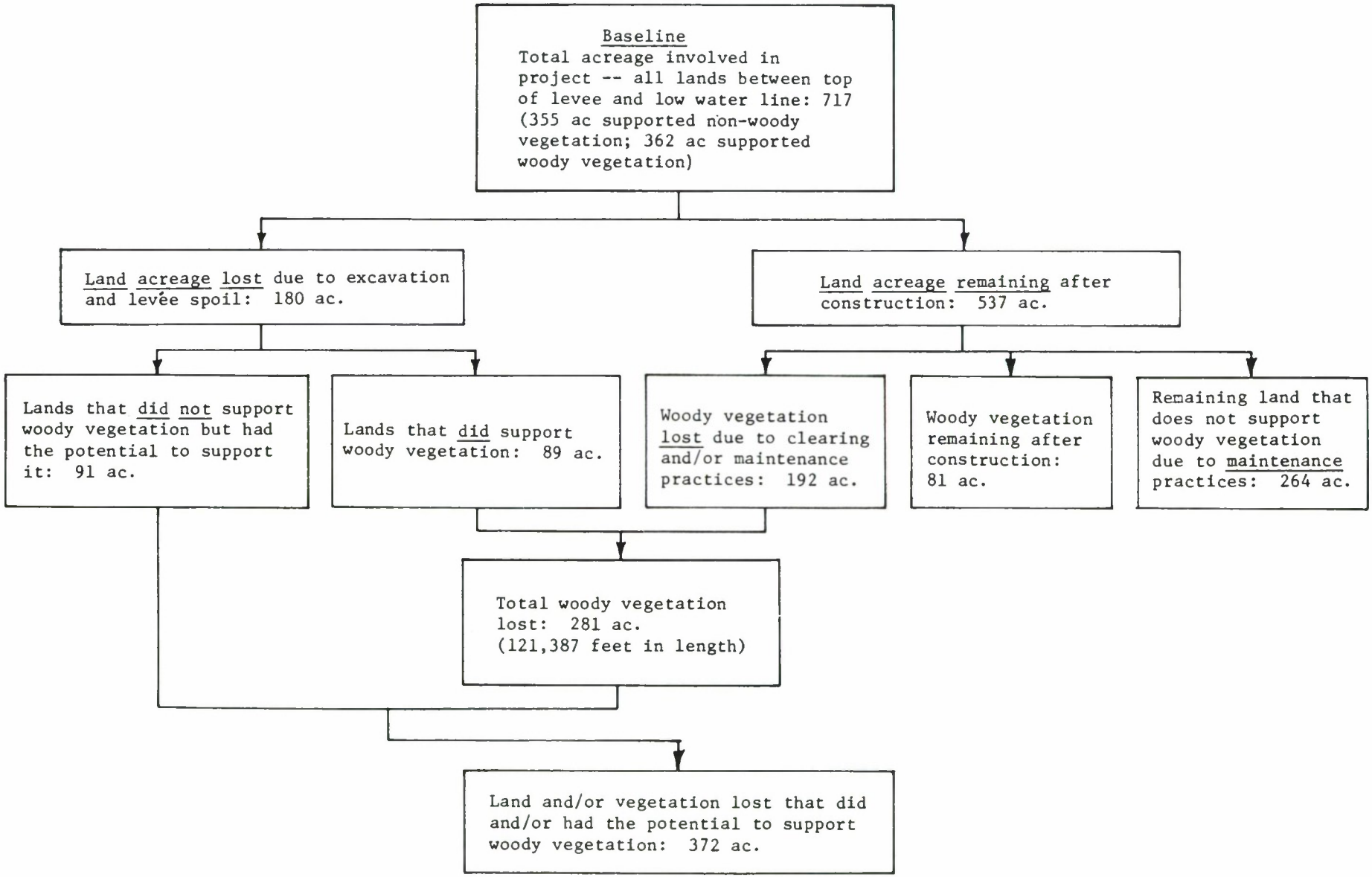
Wildlife Resources and the Riparian Community. It is impossible to accurately quantify the wildlife resources lost, habitat destroyed or seriously degraded during Phase I, because habitat conditions and wildlife use prior to project construction were not documented in detail. However, an analysis of aerial photographs and Phase I project plans does permit making an estimate of vegetative conditions and acreage within the floodway area before and after project construction.

A review of project plans indicates that there were a total of 717 acres of land between the low water line and the top of the levee at the various construction sites before protection was undertaken. About 180 acres of land were excavated and lost by construction activities, leaving 537 acres of land. A review of 1964 aerial photographs showed approximately 362 acres of riparian vegetation well-distributed throughout the area prior to project construction.

The remaining 355 acres vary from bare ground to subriparian vegetation, which understandably is the result of man's intrusion into the flood plain. Field inspection during 1974-1975 after Phase I of the project was completed revealed 81 acres of project lands remaining that supported riparian vegetation. A reduction of at least 281 acres of riparian vegetation occurred at the project sites--89 acres being lost to excavation and/or levee spoil and 192 acres being lost by the clearing process (Flow Chart 1). This is with the assumption that without the project, the land and vegetation lost to natural erosion would have been replaced by the natural meandering of the river and its resultant redepositing of sediment downstream, accompanied by the natural revegetation of the soil deposited. This assumption is valid because such conditions have been occurring for several thousand years and would continue to occur if the river and its floodway were left in a natural condition. Most project specifications required clearing the entire construction site, including the berm area not excavated. As a result, most project sites were stripped of riparian growth whenever it occurred, none of which have been allowed to revegetate to any significant degree.

In addition to the wildlife habitat destroyed by excavation-construction activities, riparian vegetation has been destroyed by maintenance practices. This destruction of vegetation has been observed by personnel of the U. S. Fish and Wildlife Service to occur annually on berms by the maintenance activities that involve disking, spraying, and burning. Generally, the maintenance practices eliminate established vegetation on berms as well as prevent the natural regrowth. On the project sites this has resulted in the inability of 264 acres (Flow Chart 1) to revegetate to riparian vegetation. It takes 30 to 40 years for riparian vegetation to mature. It is believed that if this acreage had been allowed to regrow during the period 1962 to 1975, it would have reached about 33 percent of its optimum growth and would have been supporting at least 1/3 of its biological potential. Consequently, we believe this potential for regrowth is being lost or suppressed annually and is directly attributable to maintenance practices associated with Phase I.

Bank protection involving extensive clearing of berms and banks has severely reduced bird-carrying capacity. Total bird-use of a cleared berm along the Sacramento River is about 4 percent of that of a berm supporting a riparian woodland community (Table 1, Figure 3, and Bar Graphs 1 and 2). In addition, the clearing of berms reduces the bird use of adjacent agricultural land by about 95 percent. This impact extends a minimum of 1/4-mile into the agricultural lands from the levee for most bird species. The effects on selected bird species (raptors) has been noted by FWS personnel to extend far beyond 1/4-mile. Additional studies may further define the impact. There also has been a loss of habitat for hole nesting species such as wood ducks, kestrels, and screech owls.



Flow Chart No. 1 Land & Woody Vegetation Lost as a Result of Phase I

Phase I impacts on bird populations have caused a direct annual loss in production of 37,300 birds and of 65,500,000 bird-use days. To date, the cumulative losses (1963-1975) have been 223,800 birds not produced and 393,000,000 bird-days use. The annual losses will accrue at the present rate for an indefinite period unless mitigation or compensation is implemented.

Removal of woody riparian vegetation, as commonly occurs with the bank protection project, results in a 93 percent reduction of bird-day use per acre. This also results in a 95 percent reduction of bird-day use per acre on adjacent agricultural lands (Bar Graph 1). The acreage of agricultural land affected averages over six times the acreage of riparian land affected. Ninety percent of the total project-induced bird-day use loss occurs on agricultural lands adjacent to the project site. Species diversity is roughly 2.5 times greater on wooded riparian lands than on agricultural lands in association with riparian vegetation and 3.5 times more than riprapped berms or agricultural lands lying in association with riprapped berms. If one were to not consider the most abundant bird species on agricultural land (Brewers black-bird) then the proportion of bird-day use per habitat type would change drastically. A careful study of Table 1 and Figure 3 illustrates the extreme importance of the presence and edge effect of woody riparian vegetation.

The total avian population can be used as an overall wildlife indicator. All wildlife species have been adversely affected by the project. Our ongoing avian study on the affected area along the Sacramento River has indicated that water-oriented avian species have suffered greater losses than upland type species. The overall wildlife loss is assumed to be roughly comparable to the 95 percent reduction in bird populations.

Rare and/or endangered wildlife species have also suffered losses of habitat and food sources.

In summary, the impacts of Phase I are:

1. Habitat resource

    a. A loss of 180 acres of land, 89 acres of which supported riparian woodland.

    b. A loss of 192 acres of woody riparian vegetation cleared for project construction and being prevented from regrowing by maintenance practices.

    c. The degradation of 264 acres of land resulting in lost annual regrowth potential due directly to maintenance practices.

d. The loss of 80 miles of naturally vegetated streambank, replaced by cobble-lined banks.

e. The loss of 80 miles of river bank habitat for aquatic mammals such as bank beaver and muskrats. There also has been an adverse impact upon the river otter and mink.

f. The indirect reduction of bird use on 3,678 acres of adjacent agricultural lands where wildlife use has been reduced by the elimination of the riparian "edge."

2. Fish and wildlife populations

a. There is an inestimable loss of resident and anadromous fish. Alteration of 80 miles of stream bank destroyed 23 miles of woody riparian vegetation at the land-water interface and replaced it with a cobble-lined interface.

b. A present net annual loss of:

(1) 37,300 birds not produced

(2) 65,500,000 bird-days use

c. A cumulative (1963-1975) net loss of:

(1) 223,800 birds not produced

(2) 393,000,000 bird-days use

d. The continual annual net losses described in 1c. and 2b. above.

e. Annual, cumulative, and continual losses of all associated wildlife populations in about the same proportion as birds (17); an approximate 95 percent reduction in bird-use on the remaining 537 acres of riparian lands; and the reduction in wildlife use associated with the 3,678 acres of adjacent agricultural lands.

3. Endangered or rare species

a. The American peregrine falcon: loss of habitat in which to hunt together with its prey species and annual production of prey species.

b. The Southern bald eagle: loss of habitat in which to hunt together with its prey species and annual production of prey species.

c. The yellow-billed cuckoo: reduction in population due to destruction and degradation of breeding and maintenance habitat.

d. The giant garter snake: reduction in population due to destruction and degradation of breeding and maintenance habitat.

DISCUSSION

The U. S. Fish and Wildlife Service recognizes the necessity for the Sacramento River Bank Protection Project. We also recognize that some adverse environmental effects cannot be avoided with project construction. We strongly believe that the Sacramento River and adjacent lands, supporting fish and wildlife, constitute an important component of the Sacramento River Basin's resources which, where possible, should be restored or protected against degradation.

Bank protection is essential under existing conditions to prevent erosion of levees and berms and associated riparian habitat. The Sacramento River, in the project area, is confined by a system of levees that prevents it from meandering freely across the valley. Prior to levee construction--and bank protection which necessarily followed--river banks and riparian habitat destroyed by erosion were continuously restored by aggradation and natural revegetation. Under today's conditions, eroded habitat is not restored by natural processes. River islands are gradually disappearing. Spawning gravel areas are also being lost. The day is fast-approaching when the Sacramento River, especially that reach downstream from Colusa, will be an esthetically sterile, rock-cobble-bound trapezoidal channel, devoid of most all wildlife values, and safely conveying water through the agricultural and urban areas and to the Sacramento-San Joaquin Delta for export to the southern San Joaquin Valley and southern California.

The District Engineer's report on Phase II of the Bank Protection Project indicates that alluvial meandering streams continuously erode their beds and banks and that erosive forces will continue at different locations as the streams shift and current directions change. Therefore, bank protection to protect the integrity of the flood control system will be a perpetual activity until the various rivers are stabilized on a fixed alignment.

We appreciate the concern that the integrity of the man-made levees and cobble-lined banks be protected, and this is as it should be. However, it is the integrity of the hydrological and ecological aspect of this system that has been violated and made a servant to our needs with little understanding of its total impact. We, in turn, now must be forever vigilant against nature's unexpected power and are now ensnared by the modified river system and to all primary and secondary costs associated with maintaining the new system. The long-range bank protection and levee setback program alone was estimated to cost $100,000,000 (1959 price levels). The completed Phase I is the first step of a yet unknown number of steps that will eventually denude and completely riprap or cobble the banks of the Sacramento River downstream from Chico Landing. Phase II is now authorized and right-of-way acquisition is proceeding.

Phase I of the Sacramento Bank Protection Project (protecting the river banks and levee faces with cobble and riprap) has destroyed or greatly modified approximately 80 miles of fish and wildlife habitat along the land-water

interface. It is conceivable that virtually all 368 miles of river bank within the project limits could be cobble-lined. Carried to the Sacramento-San Joaquin Delta, this activity could affect fish and wildlife habitat along an additional 1,600 miles of land-water interface.

The magnitude of habitat loss is not measurable in terms of acreage alone. The linear distribution of riparian habitat and edge effect along a valley floor largely devoid of permanent cover gives it an importance to wildlife populations which is out of proportion to its areal extent. From the standpoint of its impact on wildlife, it is more meaningful to think of the lost habitat in terms of a narrow bank of vegetation essential for sustaining the plethora of animal species associated with the Sacramento River Valley.

Degradation or destruction of the fish and wildlife habitat on the berms, shorelands, and land-water interface occurs when past construction methods of bank shaping and rock placement are employed. To some degree, improved construction methods have placed increased emphasis on preserving riparian vegetation during construction since barges rather than land-based equipment have been used to install stone revetment on banks and levees (Figure 9). However, unless these improved methods are continued, additional adverse impacts upon fish and wildlife resources will occur.

Figure 9. Waterside placement of stone revetment allows retention of riparian vegetation on levee berms.

Levees and berm areas can be designed for recreation and fish and wildlife and still provide for flood control and water conveyance. The present 2-foot horizontal, 1-foot vertical slope used for berm face construction is inadequate. Because of the numerous incidents of subsidence which have occurred with such slopes and to reduce maintenance costs while providing a greater land-water interface to permit the growth of selected vegetation on berm faces, experimental areas should be selected for study with berm facings of 4 to 1, 6 to 1, or 8 to 1 horizontal to vertical slope. Such slopes would be more stable, resistant to erosion and wave action, and permit the growth of selected vegetation into the land-water interface. Such construction could be instituted at selected locations, for example, on the inside of bends and along rather straight reaches.

The installation of bank protection rock cobble at the numerous erosion sites shifts the current and its attendant erosion forces to other areas of lesser resistance thereby necessitating corrective action elsewhere. Some reaches of the Sacramento River are now almost entirely riprapped. To minimize the problem, current-directing and velocity-reducing devices should be incorporated into project plans.

Modification of the maintenance program could achieve partial habitat protection and restoration by allowing riprap and cobble river banks to revegetate. A reach of river bank along the Sacramento River that was protected by stone about 20 years ago is shown in Figure 10. Trees have grown up through the stone revetment. The combination of stone and vegetation dampens the effects of fluctuating water levels and velocities thereby stabilizing the river bank and increasing its resistance to erosion. It is also esthetically pleasing, and provides both food and cover for wildlife and fish.

Figure 10. Maintenance practices can allow for some regrowth of natural vegetation along the rock-protected bank.

Protecting berms from erosion does not, in itself, assure preservation of wildlife habitat. Habitat preservation requires cooperation of project sponsors, construction interests, and those responsible for project maintenance. While construction of berm protection involves joint State and Federal funding, in most cases maintenance of levees and berms is conducted by special purpose districts. They are funded by the local landowners. The least expensive methods of inspection and vegetation control are used. This involves setting fire to vegetation, letting it consume all vegetation on levees and adjacent berms (Figure 11). In addition to the destruction of established vegetation, maintenance activities also prevent regrowth of vegetation on berms. Vegetation will grow on almost any portion of a streambed and its banks if the substrate is exposed long enough during early months of the growing season. This can be observed on many project sites. Thus, destroying potential for revegetation on remaining project berms through maintenance practices is as devastating to wildlife as removing the berm itself. That portion of the berm which remains with the project has the potential of supporting riparian vegetation and associated fish, wildlife, and esthetic values. If vegetation is to be preserved, modified maintenance procedures are absolutely essential. Assessed landowners and maintenance districts believe that increased cost of such maintenance should be shared with the public because benefits derived are widespread. Legislation recently enacted by the California Legislature which provides for a substantial level of cost-sharing by the State may resolve this difficult problem. Acceptance by landowners has not been successful to date.

Figure 11. Maintenance practices promoting annual burning of herbaceous vegetation precludes reestablishment of valuable wildlife habitat on berms and levees.

While cost-sharing by the State should help reduce the adverse impacts attributable to maintenance activities, the Corps of Engineers could accomplish substantial vegetation preservation by making appropriate modifications to the maintenance requirements for both the Sacramento River Flood Control Project and the Sacramento River Bank Protection Project, as well as stressing the implementation of innovative practices that protect riparian vegetation.

It appears that problems associated with stream bank erosion and the resulting losses of riverine vegetation are caused largely by high sustained and regulated river flows from upstream dams for flood control and irrigation purposes. Consequently, we believe that all costs associated with berm protection, with implementation of the wildlife habitat development plan and the maintenance thereof, should be shared among those agencies and beneficiaries deriving benefit from the upstream developments.

The works conducted under the Emergency Flood Control Act, P. L. 84-99, are also impacting aod contributing to the degradation of the scenic and wildlife values of the Sacramento River.

The loss of riparian habitat from emergency construction is as serious as losses occurring from other causes. Prime riparian areas have been destroyed.

The exact acreage or riparian habitat and land-water interface footage lost through emergency repair has not been determined. Attached is a copy of Corps' data listing 43 sites protected under P. L. 84-99 (Appendix III). However, this data is insufficient from which to estimate loss of riparian habitat.

In some instances large sums of money have been spent to protect small parcels of private land and structures. For example, at river mile 214.7, the Corps of Engineers spent approximately $426,700 between 1970 and 1975 to protect about 170 acres of aerable land cutoff by the river; that represents about $2,500 per acre.

In 1970 and 1971, a total of $113,000 dollars of public money was spent to rectify the problems of bank and levee restoration at river mile 212.7. In 1975, an additional $313,000 was spent to repair and restore the levee which was supposedly fixed in 1970 and 1971.

We suggest that if the Corps of Engineers had allowed the river to take its natural course, the $426,700 dollars spent in attempting to restore a levee which has continually washed out during periods of high flows could have been used in purchasing the 170 acres of farmland and an additional 363 acres of riparian (at $800 per acre) in the Sacramento River corridor. Also, in allowing the river to take its natural course within a system of setback levees, 75 acres of prime riparian vegetation would most likely remain intact, free from agricultural conversion.

We believe that, depending on the physical and ecological characteristics of each site, the acquisition of some of these lands (with lease-back provisions for special uses) would benefit the public and fish and wildlife resources, and would materially contribute to the Sacramento River corridor implementation.

Losses to Endangered and/or Threatened Species

The riparian habitat along the Sacramento River is an intricate part of the ecosystem upon which the Southern bald eagle, the American peregrine falcon, the yellow-billed cuckoo, and the giant garter snake depend for survival. The Endangered Species Act of 1973 states in Section 2(b), Purposes:

> The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.

Section 2(c), Policy:

> It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.

Section 3(2):

> The terms 'conserve,' 'conserving,' and 'conservation' mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved may include regulated taking.

Section 7, Interagency Cooperation:

> The Secretary shall review othe programs administered by him and utilize such programs in furtherance of the purposes of this Act. All other Federal departments and agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this Act and by taking

such action necessary to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with the affected States, to be critical.

It is our policy that whatever steps are necessary to protect and conserve endangered and/or threatened species or the ecosystems upon which such species depend for survival will be taken. Our policy is that no adverse impact upon an endangered and/or threatened species or the ecosystem upon which it relies shall be permitted or condoned. Endangered and/or threatened species shall be conserved.

FISH AND WILDLIFE HABITAT DEVELOPMENT PLAN

This plan is to compensate and/or mitigate fish and wildlife habitat and resource values lost or degraded as a result of the direct and indirect effect of Phase I of the Sacramento River Bank Protection Project. Loss of wildlife habitat can theoretically be compensated; fishery resource losses can realistically only be mitigated.

Fish and wildlife habitat losses summarized in the Effects of the Project section of this report are as follows:

1. Absolute loss of 180 acres of land

    a. 91 acres subclimax native vegetation

    b. 89 acres climax riparian vegetation

2. Alteration of 456 acres of riparian habitat

    a. 192 acres riparian vegetation cleared for construction and growth being suppressed by maintenance practices

    b. 264 acres of potential riparian vegetation not being allowed to attain its successional climax and optimum potential due directly to maintenance practices

3. A drastic loss of wildlife carrying capacity on 3,678 acres of agricultural land lying in association with the riparian habitat

4. A cumulative (1963-1975) net loss of:

    a. 223,800 birds not produced

    b. 393,000,000 bird-days use

5. Loss of 80 miles of streambank habitat for aquatic mammals

6. Fishery losses associated with the protection of 80 miles of bank by measures such as clearing, excavation, and riprapping

7. Adverse impact upon the following endangered and/or rare species:

   a. American peregrine falcon

   b. Southern bald eagle

   c. Giant garter snake

Several conferences involving personnel of the Service, California Department of Fish and Game, and your staff have been held to devise a mutually acceptable approach to fish and wildlife mitigation. We believe there is general agreement that the most effective means of compensation or mitigation is to (1) acquire fee title to selected lands adjacent to the river, (2) acquire easements to preserve, protect, and maintain riparian habitat, (3) establish desirable riparian vegetation on the unvegetated portion of these lands, and (4) administer, protect, and maintain the lands for fish, wildlife, and allied purposes. To this end we have quantified wildlife habitat losses using Ecological Planning and Evaluation Procedures (19), a method devised pursuant to the Water Resources Council's adoption of the Principles and Standards for Planning Water and Related Land Resources. Using the habitat unit value approach, we have arrived at a quantitative loss of 5,676 wildlife habitat units associated directly with bank protection and 10,134 wildlife habitat units (Table 3) associated with adjacent agricultural lands. A similar quantitative approach is not possible at this time with respect to fishery losses or rare or endangered species. Replacement of fishery habitat losses cannot realistically be accomplished at present, but some mitigation is expected to occur concomitant with wildlife compensation. Rare and/or endangered species will also benefit by wildlife habitat compensation measures. Indirect wildlife habitat losses associated with adjacent agricultural lands will generally be replaced in association with riparian habitat compensation efforts. These habitat values were based on interspersion value. The only fish and wildlife habitat compensation measure we can realistically and feasibly recommend is to provide for the regrowth of 668 acres (Table 3) of mature riparian vegetation on remaining project and nonproject lands not currently capable of attaining such values naturally. This will not compensate for or mitigate the fish and wildlife losses. For once they are lost, they are lost forever and can never really be replaced; but we believe this will realistically compensate for the habitat lost.

Table 3.

PROJECT-INDUCED WILDLIFE HABITAT LOSSES

Wildlife	PREPROJECT VALUE [1]	POTENTIAL VALUE [1]	RESIDUAL VALUE [1]	NET HABITAT UNITS LOST [2]
1. Absolute Loss				
A. 91 acres	5	10	0	910
B. 89 acres	10	10	0	890
2. Altered				
A. 192 acres	10	10	1½	1,632 [3]
B. 264 acres	5	10	1½	2,244 [3]
		SUBTOTAL (Direct Losses)		5,676 [5]
3. Associated Agriculture				
A. 3,678 acres [4]	5	5	2	11,034
		GRAND TOTAL		16,710

*

[1] Per acre values

[2] Cumulative values

[3] Net losses are difference of natural potential and post-project values.

[4] Assumed ¼ mile zone of influence

$$\frac{1{,}320 \times 121{,}387 \text{ lineal feet}}{43{,}560 \text{ sq. feet/acre}} = 3{,}678 \text{ acres}$$

[5] $\frac{5{,}676}{8.5} = 668$ acres needed to compensate planting clean berm (1½) to riparian (10).

* Habitat Values Used. (1 - 10 range)

Mature Riparian	10 Units
Maintained Berm	1½
Ag Land adjacent Riparian	5
Ag Land adjacent Maintained Berm	2

Values were arrived at using avian populations as a wildlife indicator species.

To provide the substitute 668 acres of mature riparian vegetation will require the necessary land acquisition, initial planting program, and followup maintenance until optimum growth is reached in 30 to 40 years. We understand that fee acquisition would require Congressional authorization insofar as the United States Government is concerned. The project authorization now requires that non-Federal interests pay one-third of the costs associated with lands, easements, and rights-of-way and that the Federal Government pay two-thirds of the difference between acquisition and easement costs for mitigation tracts.

Tracts of land suitable for acquisition and replanting to riparian vegetation are located on the water side of project and nonproject levees along the Sacramento River system. In order to develop a diverse biome, berms 30 feet in width and wider were selected for development. Of the lands available, we have been able to locate 681 acres of unvegetated berms which meet this criteria (Table 4) from which, hopefully, the selection of 668 acres of suitable berms can be accomplished.

Protection of vegetation on riprapped berms is necessary to assure that fish and wildlife habitat will not be destroyed through land use conversion or levee maintenance practices. To accomplish this purpose under Phase II, the Reclamation Board has agreed to acquire environmental protection easements on berms where significant habitat exists. Authorization of a mitigation program for Phase I would allow for berm acquisition and habitat development to restore losses attributable to that phase.

The estimated average cost of fee title acquisition to berms lands is $600 per acre, while the cost of an environmental easement would be $480 per acre. Thus, acquisition costs would range from $320,640 to $400,800. We believe that it would be most suitable to acquire fee title to all tracts with lease-back provisions for special uses. Acquiring all berms in fee title would increase overall public benefits and further offset some of the unavoidable losses attributable to the project.

Because of the limited availability of berm sites suitable for establishment of riparian vegetation, the restored habitat would have a more linear distribution than that which was lost. This would have adverse implications for certain riparian-dependent species of wildlife, but that would be offset to some degree by the improvement of conditions for wildlife on adjacent agricultural lands.

Because of favorable soil and moisture conditions, most berms and their water interface can support riparian vegetation. Several berms and levees now support diverse riparian vegetation. Since those riparian stands were not destroyed by maintenance activities, we are led to believe that riparian vegetation can be established on many of the berms and their water interface as well as at selected levee fronts.

TABLE 4

Berms 30 Feet or Wider That

Can Be Replanted To Riparian Vegetation

Fee Title and/or Easement Acquisition

Tract Number	Sacramento River Mile and Banks	Lineal Feet	Average Width	Approximate Acreage	
1	67.0 R	5,800x	35	4.66	
2	85.2 L	2,600xx	40	2.39	
3	85.5 L	2,300x	35	1.85	
4	85.9 L	1,500x	40	1.38	
5	86.8 L	500xx	30	.34	
6	86.8 L	1,400	200	6.42	
7	87.5 L	2,000	800	36.73	
8	87.9 L	1,300	250	7.46	
9	88.2 L	5,000x	35	4.01	
10	88.5 R	2,300x	35	1.85	
11	89.2 L	800x	30	.55	
12	90.0 L	3,400x	35	2.73	
13	90.5 L	10,000x	35	8.03	
14	92.5 R	1,300x	35	1.04	
15	93.0 L	3,400x	30	2.34	
16	93.0 R	1,500x	35	1.02	
17	93.3 L	2,900x	30	2.00	
18	93.8 R	1,000x	40	.92	
19	94.2 L	2,900x	35	2.33	
20	94.5 R	3,000x	50	3.44	
21	95.0 L	2,000xx	40	1.84	
22	95.2 R	1,600x	35	1.28	
23	95.5 L	2,000x	45	2.07	
24	96.2 L	2,600xx	40	2.39	
25	97.0 L	1,800	550	22.76	(Missouri Bend)
26	97.4 R	1,400x	45	1.45	
27	97.7 L	500x	35	.40	
28	97.9 L	5,300x	45	5.47	
29	99.2 L	1,600x	70	2.57	
30	100.0 L	2,300	450	23.76	
31	101.5 L	1,000xx	50	1.14	
32	101.5 L	3,000	350	24.10	(Across from Tyndall Landing)
33	101.8 R	3,000x	40	2.75	
34	102.2 L	1,000x	60	1.38	
35	102.5 L	2,900x	40	2.66	
36	102.5 R	2,100	500	24.10	

Table 4 Cont'd

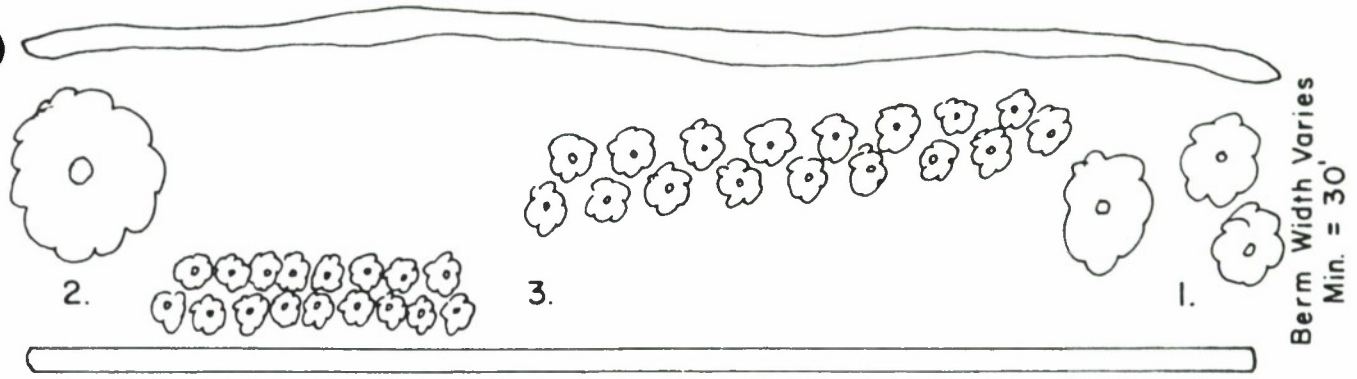
Tract Number	Sacramento River Mile and Banks	Lineal Feet	Average Width	Approximate Acreage	
37	103.3 R	1,000x	30	.69	
38	103.7 L	3,100x	50	3.56	
39	103.8 R	4,500	1,100	113.63	(China Bend)
40	104.3 L	2,000x	40	1.84	
41	104.7 L	4,700x	45	4.85	
42	105.3 R	2,900x	30	2.00	
43	106.2 L	26,900x	40	24.70	
44	107.5 R	7,900x	40	7.25	
45	109.2 R	1,500x	40	1.38	
46	111.2 L	1,300x	35	1.04	
47	111.7 L	12,100x	50	13.89	
48	114.3 L	9,500x	45	9.81	
49	116.2 R	1,800xx	40	1.65	
50	116.9 R	1,000x	35	.80	
51	117.0 L	1,300x	35	1.04	
52	117.8 L	1,600x	40	1.47	
53	118.5 R	1,000x	45	1.03	
54	119.8 L	1,300xx	45	1.34	
55	120.1 R	1,100x	40	2.85	
56	120.8 R	1,300x	50	1.49	
57	122.2 L	3,700xx	40	3.40	
58	122.2 R	500xx	50	.57	
59	123.0 R	1,000x	40	.92	
60	123.8 L	1,000x	35	.80	
61	125.3 L	1,600x	35	1.28	
62	126.3 R	1,300xx	35	1.04	
63	126.6 L	1,600x	50	1.84	
64	127.0 R	1,000x	30	.69	
65	130.0 R	1,300	800	23.87	(Ogden Bend)
66	130.9 R	1,800	250	10.33	
67	131.3 R	5,800x	65	8.65	
68	131.9 L	2,300xx	30	1.58	
69	132.8 L	10,000x	35	8.03	
70	135.0 R	1,300x	30	.89	
71	135.7 R	750xx	40	.69	
72	136.0 R	5,300x	45	5.47	
73	137.7 L	1,600x	30	1.10	
74	138.0 R	1,800	700	28.92	
75	138.3 L	1,300x	40	1.20	
76	138.5 L	1,300x	35	1.04	
77	139.0 R	1,800x	40	1.65	
78	139.3 L	4,200x	35	3.47	
79	140.3 L	3,100x	30	2.13	
80	141.6 R	1,000x	30	.68	
81	142.5 R	1,600xx	30	1.10	
82	142.8 R	500x	40	.46	

Table 4 Cont'd

Tract Number	Sacramento River Mile and Banks	Lineal Feet	Average Width	Approximate Acreage	
83	150.9 R	4,500x	35	3.61	
84	153.9 R	2,100x	75	3.61	
85	161.7 R	2,500	350	20.08	
86	162.0 R	1,500	350	12.05	
87	176.2 R	2,100	40	1.93	
88	181.8 R	2,600x	55	3.28	
89	182.5 L	2,600	1,000	59.60	
90	190.2 L	2,500	1,000	57.39	(Golden State Island)
		257,650 feet or 48.8 miles		681.27	

x = completely riprapped
xx = partially riprapped

Riverside Edge of Project Berm - Revetment



Riverside Toe of Project Levee - Berm Length Varies

Example of Planting Scheme on 1/6 Acre (30' Wide x 250' Long)

1. Group of 3 trees - 1 gallon container size
   White Alder or Honey Locust or Blackwood Acacia
   Planting distance varies 15'-25' apart

2. Single tree - 5 gallon container size
   Valley Oak or Western Sycamore or Black Walnut
   Planting distance varies from group of 3 trees 150'-200' apart

3. Shrubs - 1 gallon container size
   Holly - Leaf Cherry, Blue Elderberry, Toyon
   Quail Bush, Cotoneaster, Blue Blossom
   Two rows - 8 to 10 plants per row
   Length of rows vary 50'-80'
   Planting distance between plants vary with species

Planting scheme repeats every 1/6 acre

Vary plant species and planting distances between shrub groups and trees.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

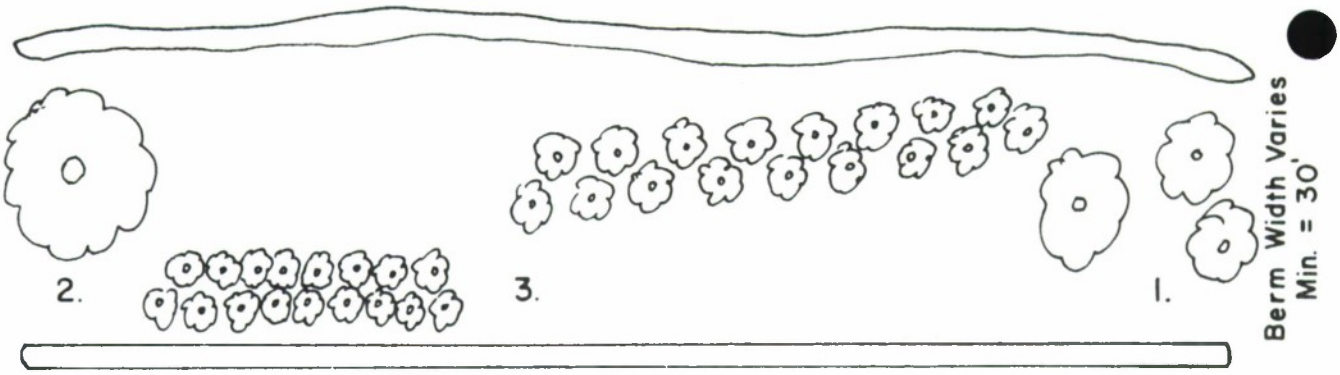
PLANTING SCHEME FOR
SACRAMENTO RIVER BANK PROTECTION

CALIFORNIA

APRIL 1976 PORTLAND, OREGON

PLATE II

Riverside Edge of Project Berm - Revetment



Riverside Toe of Project Levee - Berm Length Varies

Example of Planting Scheme on 1/6 Acre (30' Wide x 250' Long)

1. Group of 3 trees - 1 gallon container size
   White Alder or Honey Locust or Blackwood Acacia
   Planting distance varies 15'-25' apart

2. Single tree - 5 gallon container size
   Valley Oak or Western Sycamore or Black Walnut
   Planting distance varies from group of 3 trees 150'-200' apart

3. Shrubs - 1 gallon container size
   Holly - Leaf Cherry, Blue Elderberry, Toyon
   Quail Bush, Cotoneaster, Blue Blossom
   Two rows - 8 to 10 plants per row
   Length of rows vary 50'-80'
   Planting distance between plants vary with species

Planting scheme repeats every 1/6 acre

Vary plant species and planting distances between shrub groups and trees.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

PLANTING SCHEME FOR
SACRAMENTO RIVER BANK PROTECTION

CALIFORNIA

APRIL 1976 PORTLAND, OREGON

PLATE II

TABLE 5

Estimated Planting and Maintenance Costs

Installation Costs:

5-gallon size tree, "in place", 3 per acre @ $10 per plant = $30/acre

1-gallon size tree, "in place", 9 per acre @ $ 4 per plant = $36/acre

1-gallon size shrub, "in place", 108 per acre @ $ 4 per plant = $432/acre

Total cost of 120 plants per acre "in place" = $498

668 acres @ 120 plants per acre = 80,160 plants

668 acres @ $498 per acre SUBTOTAL = $ 332,664

Maintenance Cost:

120 plants per acre @ $2 per plant per year = $250/acre/year

668 acres @ $250 per acre per year = $167,000

$334,000 for first 2 years SUBTOTAL = $ 334,000

Overhead and Administration @ 20% $ 133,332

GRAND TOTAL $ 799,996

$ 800,000

Table 6

Plants Recommended for Habitat Restoration

Common Name	Botanical Name	Age in Years	Gallon Container Size
Trees			
White alder	Alnus rhombifolia	1	1
Valley oak	Quercus lobata	2-3	5
Black walnut	Juglans Hindsii	2-3	5
Shrubs			
Holly - leaf cherry	Prunus ilicifolia	1	1
Blue elderberry	Sambucus caerulea	1	1
Toyon	Heteromeles arbutifolia	1	1
Quail bush	Atriplex lentiformis	1	1 or direct seeding
Blue blossom	Ceanothus megacarpus	1	1

A MANAGEMENT CONCEPT--SACRAMENTO RIVER CORRIDOR

The Sacramento River has long been recognized as an irreplaceable natural resource of regional and State significance. The once-lush riparian vegetation that marked its course established it as a scenic resource of high esthetic value.

Demands on the Sacramento River system are increasing. Water for power, irrigation, M&I waste assimilation, have long been recognized. Recreational use is greatly increased especially in and near the urban centers. Besides fishing and hunting, other activities include boating, water skiing, hiking, camping, and bird watching. Users of the river desire attractive cruising reaches and mooring areas, as well as beaches, picnic grounds, and camping areas accessible from the water. A deterioration of the environmental setting and associated values has occurred along the Sacramento River and especially in selected areas in the Sacramento-San Joaquin Delta. Bank protection resulting in the conversion of a tree-lined waterway river into a rock-lined canal along with the construction of hundreds of private bulkheads, docks, piers, and other structures along the shoreline of the more populated and scenic reaches is affecting water-oriented recreation to a significant degree (Figures 12 and 13). Ecological Units important to many forms of fish and wildlife have been degraded. In addition, the serrated appearance of these waterways does not contribute to the esthetic value of a water body or to a quality outdoor experience. Homes and residences occupy lands waterward of existing levees.

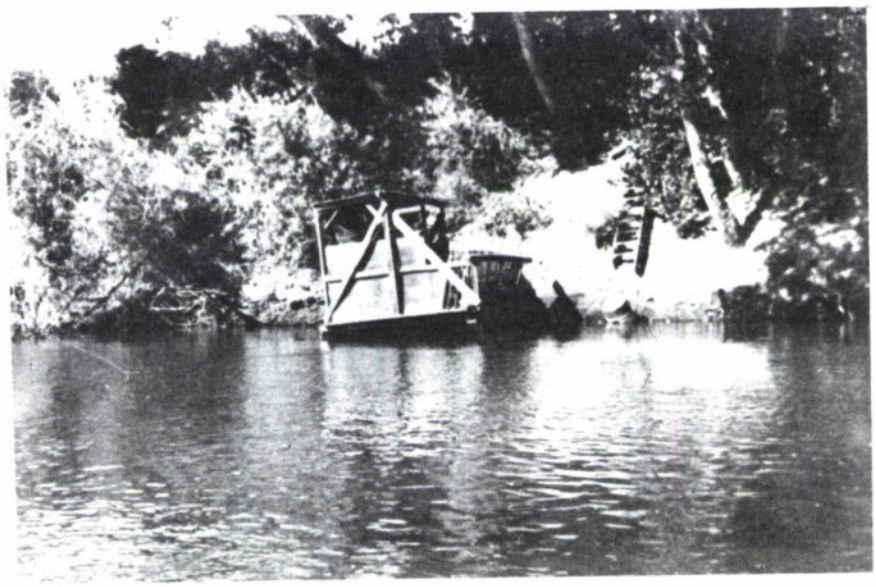


Figure 12. Piers and similar structures can degrade esthetics and fish and wildlife values.

Figure 13. Floating houses and boat docks not only intrude upon the river and seriously degrade the environmental integrity, but they preclude the use of the area by the public at large for fish and wildlife resources.

The State Reclamation Board and/or the Corps of Engineers issue permits for any encroachments upon the floodway or into the land-water interface of the Sacramento River and Delta and numerous tributary streams. Many of the encroachments do not require a waterfront location and are for private use.

The removal of riverine vegetation from along the Sacramento River has been viewed with great concern by the public. On January 5, 1961, the State Reclamation Board held a public hearing at Rio Vista, California, regarding the "removal of trees and other vegetation from the levees of the Delta." The hearing was held because boating, recreational, and sportsmen's interests had expressed concern regarding the continued enforcement of prescribed maintenance regulations in connection with the Sacramento River Flood Control Project levees, particularly those in the Delta where the removal of trees had affected the natural beauty of the area. The hearing was attended by five State assemblymen, four State senators, and a representative for a U. S. Senator. Letters from other State assemblymen were also presented. Others present included representatives from Federal, State, county, and city agencies, and recreational, landowner, and individual interest groups. Statements, both written and oral, voiced strong opposition to the methods of levee maintenance and stated that better methods should be employed so as not to destroy the esthetic beauty and wildlife habitat of the Delta waterways.

House Report No. 93-530, Stream Channelization: What Federally Financed Draglines and Bulldozers do to Our Nation's Streams, by the Committee on Government Operations, and hearing records describe how the Nation's rivers and streams are being modified. Apparently the Sacramento River is just another of the rivers being modified.

The previously expressed concerns demonstrate to us a clear need for a higher order to planning and evaluation before additional irreparable alterations to this river system occur. Although no governmental bodies, agencies, interests, or persons would deliberately set out to destroy the Sacramento River, adjacent lands, and natural resources, all too often there has been insufficient concern about the singular or cumulative effects of work accomplished by one agency or interest on the resources under the jurisdiction or responsibility of another or how such work affects the entire riverine ecosystem or the public interest.

The primary question is: Can the Sacramento and its adjacent lands and resources be protected, restored, or developed in the public interest for use by future generations?

This can be done; but it will require the formulation of a multigovernmental agency, department, and/or interest planning group whose general goal or objective will be to develop and implement a "green belt" or "corridor concept" for the entire Sacramento River system to see that further modifications or developments are accomplished without further deterioration of the existing resources and that efforts are undertaken to enhance these same resources in the public interest.

It is our opinion that this planning group should be coordinated with or have integrated into it both the Delta Master Recreation Plan task force and the Upper Sacramento River task force committee.

To evaluate the overall significance of the many uses, some of which are interrelated, planners need to assess the sensitivity of major land and water resources to various types of changes. Major land and water resources or uses that are sensitive can be classified as critical resources requiring special consideration.

In general, critical land resources could be described as (1) land that is primarily used for man's living, working, and recreational habitat, and (2) biologically productive land essential for the well-being of plant and animal life and for a pleasing environment for man's enjoyment. Critical water resources could be described as (1) those that supply man with water for drinking, hygienic, industrial, recreational, and agricultural purposes, and (2) those that support aquatic and wildlife habitats.

Preservation of scenic beauty and many other intangible values of the Sacramento River is a valid planning objective. A management and use plan for the Sacramento River smilar to the American River Parkway should be formulated and implemented to protect the river's remaining natural values. This should be a plan to protect the productivity and the fragility of the Sacramento River and adjacent lands. The plan should be based on the ecological, biological, and physical capabilities and limitations of the natural system. Preserving the river's environmental setting and resource values in conjunction with levee maintenance and the Sacramento River Bank Protection Project makes good sense to us. The adoption and implementation of flood plain zoning by involved counties as a requirement for bank protection in conjunction with the Chico to Red Bluff segment of the project would also contribute to the corridor concept. The study now finished by the Corps of Engineers in connection with the Wild and Scenic Rivers program should provide much of the information needed to support establishment of such a river corridor from Shasta Dam to Collinsville. During the formulation and implementation of the Sacramento River environmental corridor, all requests for encroachment across or upon this land-water interface within the floodway zone should be carefully controlled. Approval should only be granted for works necessary for health, safety, or welfare of the general public or be of such a nature that it would not have a long-term conflict with the natural resource scenic aspects of the area or the resultant management plan. All other works should be held in abeyance until the plan is developed and implemented.

RECOMMENDATIONS

The U. S. Fish and Wildlife Service, in the interest of protecting the fish and wildlife resources of the Sacramento River and adjacent lands, recommends that:

1. The Wildlife Habitat Development Plan described in this report be implemented as a mitigative feature of Phase I of the Sacramento River Bank Protection Project. This includes:

    a. Acquisition of 668 acres (Table 3) of project area berms currently being maintained devoid of woody vegetation in fee title and/or easement. The capital costs of acquisition are estimated between $320,640 and $400,800 plus overhead. Acquisition cost following our specific recommendation preferring fee title acquisition would be approximately $400,800. Substantial but underdetermined overhead costs would have to be added to the cost.

    b. Implementation of the habitat restoration program on the 668 acres at a total cost of approximately $800,000.

2. Planning for all future bank protection work include measures to protect the area's environmental values and that mitigative features be implemented concurrently with protective features as an integral part of the total bank protection activity.

3. An interagency working committee be established by the Corps of Engineers with one member each from the following agencies: California Department of Fish and Game, State Reclamation Board, Central Valley Flood Control, U. S. Bureau of Reclamation, Department of Water Resources, Wildlife Conservation Board, California State Department of Parks and Recreation, and the U. S. Fish and Wildlife Service. The purpose of this committee would be to:

a. Select lands to be used for mitigation in all future phases of the bank protection project.

b. Recommend changes and modifications in the maintenance program to insure the protection of riparian vegetation and wildlife resources.

c. Guide and evaluate the habitat restoration program.

d. Review and evaluate present construction methods with the aim of developing berm slopes more resistant to erosion and slumping and yet permit the growth of selected vegetation.

e. Implement a program for reviewing lands with chronic flood threat or erosion problems with the aim of acquiring such lands in fee title and incorporating same into a Sacramento River corridor or green belt for possible mitigation of future bank protection phases.

f. Implement an investigation to determine the effects of increased spring, summer, and fall flows on the integrity and stability of the Sacramento River system of berms and levees.

4. A multigovernmental working committee be established composed of one member each from all of the interested and/or involved agencies, departments, boards, elected governmental bodies, etc., to develop a coordinated and integrated long-term and in-depth land use management plan for the entire Sacramento River system corridor and floodway. It should incorporate and assimilate both the Delta Master Plan Recreation Task Force and the Upper Sacramento River Task Force Committee and their goals. The resultant plan developed should and would be adapted to the ecological and hydrological capabilities and limitations of the entire river system and its natural resources. The plan should accomplish the following:

a. Identify and classify land and water areas as to their scenic, open space, recreation, fishery, and wildlife values.

b. Identify and classify lands and water areas threatened by development or other land use changes.

c. Identify and classify land and water areas which have extraordinary or unique values.

d. Identify and classify land and water areas for possible multiple-use development consistent with a "Sacramento River Corridor" or "green belt" criteria.

e. Select and recommend the lands used for mitigation in any project involving the Sacramento River system and/or its corridor.

f. Develop and implement a habitat restoration program for the Sacramento River system and its corridor.

g. Develop, identify, and administer research projects to document and quantify the exact value of the Sacramento River system to fish and wildlife resources.

h. Establish and coordinate programs for monitoring, maintaining, and enhancing the fish and wildlife resources for the entire Sacramento River system.

The U. S. Fish and Wildlife Service would be very pleased to participate in such a program and stand ready to serve in any way possible for its establishment.

Please advise us of your proposed action regarding our recommendations.

Sincerely yours,

William H. Meyer

William H. Meyer
Acting Regional Director

STATE OF CALIFORNIA—RESOURCES AGENCY EDMUND G. BROWN JR., Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
SACRAMENTO, CALIFORNIA 95814
(916) 445-3531

January 28, 1976

Mr. R. Kahler Martinson
Regional Director
U. S. Fish and Wildlife Service
P. O. Box 3737
Portland, Oregon 97208

Dear Kahler:

We concur with the recommended mitigative actions listed in the final draft of your fish and wildlife management plan for the Sacramento River Bank Protection Project.

We would like to repeat our earlier recommendation that this report be finalized and transmitted to the Corps of Engineers with a view to early implementation of the recommended corrective measures.

We hope with the completion of this report long sought mitigation will finally be accomplished and will restore many of the significant natural values lost along the Sacramento River.

Sincerely,

Director

cc: USFWS, Sacramento

LITERATURE CITED

1. Bayless, Jack and William B. Smith. The effects of channelization upon the fish populations of lotic waters in eastern North Carolina, North Carolina Wildlife Resources Commission, 14 pp.

2. Bureau of Sport Fisheries and Wildlife March 1973 Threatened Wildlife of the United States Resource Publication 114.

3. California Department of Fish and Game January 1, 1966 California fish and wildlife plan, volume I.

4. California Department of Fish and Game 1966 Ecological studies of the Sacramento-San Joaquin Delta Fish Bulletin 136, Part II.

5. California Department of Fish and Game June 1967 Water requirements for the waterfowl of Butte Basin, California.

6. California Department of Fish and Game June 1968 Fish and wildlife resources of San Francisco Bay and Delta; description, environmental requirements, problems, opportunities and the future, Task VII (1b).

7. California Department of Fish and Game January 1972 At the cross-roads: a report on California's endangered and rare fish and wildlife.

8. California Department of Fish and Game June 1972 Ecological studies of the Sacramento-San Joaquin estuary (a decennial report 1961-1971).

9. California Department of Fish and Game 1973 California marine fish landings for 1971 Fish Bulletin 159.

10. California Department of Fish and Game 1973 Riparian habitats and avian densities along the Sacramento River.

11. California Native Plant Society 1974 Special Publication No. 1.

12. Department of the Army, Corps of Engineers, Sacramento District May 1972 Second phase - Sacramento River Bank Protection Project, California.

13. Department of the Army, Corps of Engineers, Sacramento District November 1972 Final Environmental statement: Sacramento River Bank Protection Project, California

14. Department of the Interior May 19, 1972 (Federal Register) United States list of endangered native fish and wildlife.

15. Department of Water Resources, California State 1967 "Pilot Levee Maintenance Study" Bulletin No. 167 June.

16. Gains, D. 1974 Distribution, Density and Habitat Requirements of the California Yellow-Billed Cuckoo in the Sacramento Valley, California Department of Fish and Game Wildlife Management Administrative Report W-54-R6.

17. Hines, Roy A. 1966 "Channelization of the Kings River and its Effect on Fish and Wildlife Resources" California Fish and Game Administrative Report 66-1 June 1966.

18. Irizarry, Richard A. 1969. "The Effects of Stream Alteration In Idaho". Project F 55-R-2. Idaho Fish and Game Department.

19. Joint Federal-State-Private Conservation Organization Committee (1974) "Ecological Planning and Evaluation Procedures". January Washington, D.C.

20. McGowan, J.A. 1961. History of the Sacramento Valley. Lewis Historical Publishing Company. New York and West Palm Beach: 403.

21. State of California Environmental Goals & Quality Report 1973. Ronald Reagan, Governor, State of California, June 1, 1973. Chap. 1534 Stat. 1970.

22. The Resources Agency February 1971 California Protected Waterways Plan (initial elements).

23. Thompson, K. 1961. Riparian Forests of the Sacramento Valley, California. Annals of the Association of American Geographers. 51 (3): 294-315.

APPENDIX I

A Partial Literature Review of the Adverse Effect of Stream and/or River Alterations on a Fishery

Alexander, Harold, Undated. "Stream Preservation, An Urgent Task." Arkansas Planning Commission, Game and Fish Building, Little Rock, Ark. 72201.

Allen, George W. Sept. 24-27, 1967. "The Corps of Engineers and the Fisheries Effort." Southeastern Association of Game and Fish Commissioners.

Allen, Ralph H. Jr. 1969. "Stream Alteration and Channelization as Viewed by a State Resource Agency." State Game Management Section, Game and Fish Division, Alabama Department of Conservation, 64 N. Union St., Montgomery, Ala. 36104.

Anon. July 1971. "Stream Restruction by Channelization." Sport Fishing Institute, 719 13th Street NW., Washington, D.C. 20015

Anon. Undated. "Idaho and the Vanishing Stream." Idaho Fish and Game Department, 600 S. Walnut, Box 25, Boise, Idaho 83707.

Apmann, Robert P. and Maurice B. Otis, July 1965. "Sedimentation and Stream Improvement." New York Fish and Game Journal, Vol. 12, No. 2, New York Department of Environmental Conservation, 50 Wolf Road, Albany, N.Y. 12201.

Bayless, Jack and William B. Smith. Undated. "The Effects of Channelization Project." Unpublished (Refer to Bayless and Smith, title below).

Bayless, Jack and William B. Smith. Undated. "The Effects of Channelization Upon the Fish Populations of Lotic Waters in Eastern North Carolina." Division of Inland Fisheries, North Carolina Wildlife Resources Commission, Box 2919, Raleigh, N.C. 27602.

Belusz, Lawrence C. Feb. 1, 1971. "Results of Recent Sampling of Binckwater River." Letter to Frederick Moleski, probably unpublished data. MIssouri Department of Conservation, P.O. Box 180, Jefferson City, Missouri 65101.

Burnside, Kermit Ray. August 1967. "The Effects of Channelization on Fish Populations in Boeuf River in Northeast Louisiana." Masters Thesis submitted to Northeast Louisiana State College.

Chapman, Charles. July 19-20, 1967. "Channelization and Spoiling in Gulf Coast and South Atlantic Estuaries." Proceedings of the Marsh and Estuary Management Symposium, Louisiana State University.

Congdon, James C. Undated. "Fish Populations of Straightened and Unstraightened Sections of the Charlton River, Mo." Missouri Department of Conservation. Probably unpublished.

Cottam, Clarence. July 19-20, 1967. "Research Needs in Estuarine Areas of the Gulf Coast." Proceedings of the Marsh and Estuary Management Symposium, Louisiana State University.

Cronin, L. Eugeue, Gordon Gunter, and Sewell H. Hopkins. Sept. 1969. "Effects of Engineering Activities on Coastal Ecology." Interim report to the Office of the Chief of Engineers, Corps of Engineers, U.S. Army.

Davidson, Gladney Gene. Undated (probably 1970). "Streams and Stream Preservation--Justification for a Scenic Rivers Program in Louisiana." Louisiana Wild Life and Fisheries Commission. Capitol Station, Baton Rouge, La.

Eichorn, Richard E. Apr. 21, 1971. The Environmental Effects of Drainage and Channelization Work in the Mississippi Delta Area." AWRBIAC (Arkansas-Red-White Basins Interagency Committee), 5401 Federal Office Building, Little Rock, Ar. 72201.

Gebhards, Stacy. March-April 1970. "The Vanishing Stream." Idaho Wildlife Review. Idaho Fish and Game Department, 600 S. Walnut, Box 25, Boise, Idaho 83707.

Greshman, Grits, July-August 1963. "Atchafalaya Basin Crisis." Louisiana Conservationist. Louisiana Wild Life and Fisheries Commission, 400 Royal Street, New Orleans, La. 70130.

Hansen, Douglas R. and Robert J. Muncy. June 1971. Effects of Stream Channelization on Fish and Bottom Fauna in the Little Sioux River, Iowa." Iowa State Water Resources Research Institute. Probably located at Iowa State University, Ames, Iowa.

Harrison, Harry et al. Apr. 8, 1971. "Stream Channelization." Ad hoc Committee on Stream Channelization, North Central Division, American Fisheries Society, 1040 Washington Building, 15th and New York Avenue NW., Washington, D.C. 20005.

Holder, Trusten H. 1970. "Disappearing Wetlands in Eastern Arkansas." Arkansas Planning Commission, Game and Fish Building, Little Rock, Ark. 72201.

_____ Oct. 19-22, 1969. "The Destruction of Our Most Valuable Wildlife Habitat." Proceedings 23rd Annual Conference, Southeastern Association of Game and Fish Commissioners.

Irizarry, Richard A. April 1969. "The Effects of Stream Alteration in Idaho." Federal Aid in Fish and Wildlife Restoration, Job Completion Report. Idaho Fish and Game Department, 600 S. Walnut, Box 25, Boise, Idaho 83707.

Kendle, Earl R. Nov. 9, 1970. "The Effects of Channelization in the Missouri River on Fish and Fish-Food Organisms." Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, Nebr. 68503.

Larimore, R. Weldon and Phillip W. Smith. March 1963. "The Fishes of Champaign County, Ill. as Affected by 60 Years of Stream Changes." State of Illinois, Department of Registration and Education, National History Survey Division, Urbana, Ill.

Morris, Larry A., Ralph N. Langemeier, Thomas R. Russell, Arthur Witt, Jr. October 1968. "Effects of Main Stem Impoundments and Channelization Upon the Limnology of the Missouri River, Nebraska." Transactions of the American Fisheries Society, AFS, 1040 Washington Bldg., 15th and New York Avenue NW., Washington, D.C. 20005.

Nelson, Perry H. and Cliff W. Hill. June 1, 1968. "Fishery History of Rock Creek." Montana Fish and Game Department, Billings, Mont.

Overton, Bob. 1969. "The Disaster of Channelization." Evenrude Writing Award--sponsored by Outdoor Writers Association of America, Outdoors Building, Columbia, Mo. 65201.

Peters, John C. and William Alvord, Mar. 9, 1964. "Manmade Channel Alterations in Thirteen Montana Streams and Rivers." Twenty-Ninth North American Wildlife Conference. Wildlife Management Institute, 709 Wire Building, Washington, D.C. 20005.

Platts,William S. March-April 1966. "Sand and Silt = Death!" Idaho Wildlife Review. Idaho Fish and Game Department, 600 South Walnut, Box 25, Boise, Idaho 83707.

Redmond, Lee. August 11, 1969. "Standing Crops of Fishes--SEMO Drainage Ditches." Missouri Department of Conservation, P.O. Box 180, Jefferson City, Mo. 65101. Memorandum, data probably unpublished.

Robinson, David W. October 19-22, 1969. "The Stream Disturbance Problem and Our Fishery Resources--Its Scope and a Method of Evaluation and Response." Proceedings 23rd Annual Conference, Southeastern Association of Game and Fish Commissioners.

Robinson, John W. April 1969. "Twilight for Two Rivers." Missouri Conservationist. Missouri Department of Conservation, P.O. Box 180, Jefferson City, Mo. 65101.

Smith, Phillip W. 1968. "An Assessment of Chances in the Fish Fauna of Two Illinois Rivers and Its Bearing on Their Future." Illinois State Academy of Science and Illinois Natural History Survey, Urbana, Ill.

Southwick, Hiram C. Undated. "Small Watershed Projects--Freind or Foe of Wildlife." Naturalist Magazine. Author's address: Minnesota Conservation Department, Slayton, Minn.

Summers, Max W. 1964 and 1965. Louisiana Wild Life and Fisheries Commission, 11th biennial report, river basin section. Louisiana Wild Life and Fisheries Commission, 400 Royal Street, New Orleand, La. 70130.

Tarplee, William H., Darrell E. Louder and Andrew J. Weber. October 1971. "Evaluation of the Effects of Channelization on Fish Populations in North Carolina's Coastal Plain Streams." North Carolina Wildlife Resources Commission, P.O. Box 2919, Raleigh, N.C. 27602.

Welker, Bill D. Undated. "Comparison of Channel Catfish Populations in Channeled and Unchanneled Sections of the Little Sioux River, Iowa." Missouri Department of Conservation (?).

Wharton, Charles H. May 1970. "The Southern River Swamp--A Multiple-Use Environment." Bureau of Business and Economic Research, School of Business Administration, Georgia State University, Atlanta, Ga.

Whitney, Arthur N. and Jack E. Bailey, 1959. "Detrimental Effects of Highway Construction on a Montana Stream." Transactions of the American Fisheries Society, 1040 Washington Building, 15th and New York Avenue NW., Wàshington, D.C. 20005.

William, Hollis R. April 21, 1971. "The Effects of Drainage and Channelization Work on the Environment in the Mississippi Delta Areas--AWR Basins. "Arkansas-Red-White Basins Interagency Committee, 5401 Federal Office Building, Little Rock, Ark. 72201.

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
LOONS						
Common loon	Gavia immer	U		U	U	
Arctic loon	Gavia arctica		R	R	R	
Red-throated loon	Gavia stellata			R		
GREBES						
Red-necked grebe	Podiceps grisegena				R	
Horned grebe	Podiceps auritus	U		U	U	
Eared grebe	Podiceps nigricollis	U	U	U	U	
Western grebe	Aechmophorus occidentalis	U	U	U	U	
Pied-billed grebe	Popilymbus podiceps	A	A	A	A	
PELICANS						
White pelican	Pelecanus erythrorhynchos	U	U	U	U	
CORMORANTS						
Double-crested cormorant	Phalacrocorax auritus	U	U	U	U	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
HERONS AND BITTERNS						
Great blue heron	Ardea herodias	A	A	A	A	1/
Green heron	Butorides virescens	U	U	U	U	2/
Great egret	Casmerodius albus	C	C	C	C	
Snowy egret	Egretta thula	U	U	U	U	
Black-crowned night heron	Nycticorax nycticorax	U	U	U	U	
Least bittern	Ixobrychus exilis	R	R			
American bittern	Botaurus lentiginosus	C	C	C	C	1/ 2/ 4/
Wood stork	Mycteria americana		R		R	
White-faced ibis	Plegadis chihi	O		O		
SWANS GEESE AND DUCKS						
Whistling swan	Olor columbianus	C		C	C	
Trumpeter swan	Olor buccinator				R	
Canada goose	Branta canadensis	A	A	A	A	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
SWANS, GEESE AND DUCKS, CONT'D						
Black brant	Branta nigricans				R	
Emperor goose	Philacte canagica				R	
White-fronted goose	Anser albifrons	A		A	A	
Snow goose	Chen caerulescens	A		A	A	2/
Ross goose	Chen rossii	C		C	C	
Fulvous tree duck	Dendrocygna bicolor				R	
Mallard	Anas platyrhynchos	A	C	A	A	1/ 2/ 3/ 4/
Gadwall	Anas strepera	U	U	U	U	
Pintail	Anas acuta	A	U	A	A	
Green-winged teal	Anas crecca	C	C	C	C	4/
Blue-winged teal	Anas discors	U	U			
Cinnamon teal	Anas cyanoptera	A	A	A	A	
American wigeon	Anas americana	A		A	A	4/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
SWANS, GEESE AND DUCKS, CONT'D						
Northern shoveler	Anas clypeata	A	A	A	A	1/
Wood duck	Aix sponsa	C	C	C	C	
Redhead	Aythya americana	U		U	U	
Ring-necked duck	Anthya collaris	U		U	U	
Canvasback	Aythya valisineria	U		U	U	
Greater scaup	Aythya marila	U			U	
Lesser scaup	Aytha affinis	C		C	C	1/
Common goldeneye	Bucephala clangula	C		C	C	
Barrow's goldeneye	Bucephala islandica				R	
Bufflehead	Bucephala albeola	C		C	C	
Harlequin duck	Histrionicus histrionicus			R		
Surf scoter	Melanitta perspicillata			R		
Ruddy duck	Oxyura jamaicensis	A	C	A	A	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
SWANS, GEESE AND DUCKS, CONT'D						
Hooded merganser	Lophodytes cucullatus			U	U	
Common merganser	Mergus merganser	C		C	C	
Red-breasted merganser	Mergus serrator				R	
VULTURES						
Turkey vulture	Cathartes aura	A	A	A	U	1/
Black vulture	Coragyps atratus	R				
KITE, HAWKS, HARRIERS AND OSPREY						
White-tailed kite	Elanus leucurus	A	A	A	A	1/
Goshawk	Accipiter gentilis	R		R		
Sharp-shinned hawk	Accipiter straitus	U		U	U	
Cooper's hawk	Accipiter cooperii	C	C	C	C	1/
Red-tailed hawk	Buteo Jamaicensis	A	A	A	A	1/ 2/
Red-shouldered hawk	Bureo lineatus	U	U	U	U	
Swainson's hawk	Buteo swainsoni	U	U	U		

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
KITE, HAWKS, HARRIERS AND OSPREY, CONT'D						
Rough-legged hawk	Buteo lagopus	C		C	C	1/ 2/ 4/
Ferruginous hawk	Buteo regalis			U	U	
Golden eagle	Aquila chrysaetos	U	U	U	U	
Bald eagle	Haliaeetus leucocephalus			U	U	1/
Marsh hawk	Circus cyaneus	A	A	A	A	2/ 3/
Osprey	Pandion haliaetus	U	U	U	U	
FALCONS						
Prairie falcon	Falco mexicanus	U	U	U	U	
Peregrine falcon	Falco peregrinus	U	U	U	U	1/
Merlin	Falco columbarius	U		U	U	2/
American kestrel	Falco sparuerius	A	A	A	A	1/ 2/ 4/
QUAILS AND PHEASANTS						
California quail	Lophortyx californicus	A	A	A	A	1/ 2/ 3/
Mountain quail	Oreortyx pictus	R				
Ring-necked pheasant	Phasianus colchicus	A	A	A	A	1/ 2/ 3/ 4/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
CRANE						
Sandhill crane	Grus canadensis			A	A	
RAILS, GALLINULE AND COOT						
Virginia rail	Rallus limicola	U	U	U	U	
Sora	Porzana carolina	U	U	U	U	
Common gallinule	Callinula chloropus	C	C	C	C	
American coot	Fulica americana	A	A	A	A	2/ 3/
PLOVERS AND TURNSTONE						
Semipalmated plover	Charadrius semipalmatus	U	U	U	U	
Snowy plover	Charadrius alexandrinus	R	R	R		
Killdeer	Charadrius vociferus	A	A	A	A	1/ 2/ 4/
Mountain plover	Charadrius montanus			U	U	
American golden plover	Pluvialis dominica			U	U	
Black-bellied plover	Pluvialis squatorola	C	U	C	C	
Ruddy turnstone	Arenaria interpres		R	R	R	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
SANDPIPERS						
Common snipe	Capella gallinago	C	C	C	C	
Long-billed curlew	Numenius americanus	C	C	C	C	
Whimbrel	Numenius phaeopus	U	U	U	U	
Spotted sandpiper	Actitis macularia	C	C	C	C	
Solitary sandpiper	Tringa solitaria	U	U			
Willet	Catoptrophorus semipalmatus	U	U		U	
Greater yellowlegs	Tringa melanoleuca	C	U	C	C	
Lesser yellowlegs	Tringa flavipes	U	U	U	U	
Red knot	Calidris canutus		R			
Sharp-tailed sandpiper	Calidris acuminata			R		
Pectoral sandpiper	Calidris melanotos			U		
White-rumped sandpiper	Calidris fuscicollis			R		
Baird's sandpiper	Calidris bairdii		U	U		

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
SANDPIPERS, CONT'D						
Least sandpiper	Calidris minutilla	A-C	U	C	C	
Dunlin	Calidris alpina	C	U	U-C	C	
Short-billed dowitcher	Limnodromus griseus	R	R			
Long-billed dowitcher	Limnodromus scolopaceus	A	U	A	A	
Stilt sandpiper	Micropalama himantopus			R		
Semipalmated sandpiper	Calidris pusillus		R	R		
Western sandpiper	Calidris mauri	C	U	C	C	
Marbled godwit	Limosa fedoa	U	U	U		
Sanderling	Calidris alba		R	R		
AVOCET AND STILT						
American avocet	Recurvirostra americana	A	A	A	U	
Black-necked stilt	Himantopus mexicanus	A	A	A		
PHALAROPES						
Red phalarope	Phalaropus fulicarius			R		
Wilson's phalarope	Steganopus tricolor	C	U	C		
Northern phalarope	Lobipes lobatus	U	U	U		

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
JAEGERS						
Pomarine jaeger	Stercorarius pomarinus				R	
Parasitic jaeger	Stercorarius parasiticus			R	R	
GULLS AND TERNS						
Glaucous-winged gull	Larus glaucescens	O		O	O	
Western gull	Larus occidentalis				R	
Herring gull	Larus argentatus	U		U	U	
California gull	Larus californicus	A	C	A	A	1/ 2/ 4/
Ring-billed gull	Larus delawarensis					
Mew gull	Larus canus			U	U	
Franklin's gull	Larus pipixcan	R			R	
Bonaparte's gull	Larus philadelphia	U	U	U	U	
Sabine's gull	Xema sabini			R		
Gull-billed tern	Gelochelidon nilotica	R				
Forster's tern	Sterna forsteri	U	U	U	U	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
Caspian tern	Hydroprogne caspia	U	U	U		
Black tern	Chlidonias niger	C	U	U		
PIGEON AND DOVES						
Band-tailed pigeon	Columba fasciata	U		U	U	
Rock dove	Columba livia	A	A	A	A	1/ 2/
Mourning dove	Zenaidura macroura	A	A	A	C	1/ 2/ 3/ 4/
Spotted dove	Streptopelia chinensis	R				
CUCKOO AND ROADRUNNER						
Yellow-billed cuckoo	Coccyzus americanus		O			
Roadrunner	Geococcyx californianus	O	O	O	O	
OWLS						
Barn owl	Tyto alba	A	A	A	A	1/
Screech owl	Otus asio	U	U	U	U	
Flammulated owl	Otus flammeolus			R		
Great horned owl	Bubo virginianus	U	U	U	U	1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
OWLS, CONT'D						
Snowy owl	Nyctea scandiaca				R	
Pygmy owl	Glaucidium gnoma				R	
Burrowing owl	Speotyto cunicularia	C	C	C	C	
Spotted owl	Strix occidentalis		R			
Long-eared owl	Asio otus	U	U	U	U	
Short-eared owl	Asio flammeus	U	U	U	U	1/
Saw-whet owl	Aegolius acadicus			U	U	
GOATSUCKERS						
Poor-will	Phalaenoptilus nuttallii	U	U	U		
Common nighthawk	Chordeiles minor		R			
Lesser nighthawk	Chordeiles acutipennis	U	U	U		
SWIFTS						
Black swift	Cypseloides niger	R	R			
Vaux's swift	Chaetura vauxi	U	U	U		
White-throated swift	Aeronautes saxatalis	U	U	U	U	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
HUMMINGBIRDS						
Black-chinned hummingbird	Archilochus alexandri	C	C			
Costa's hummingbird	Calypte costae	R				
Anna's hummingbird	Calypte anna	C	C	C	C	
Rufous hummingbird	Selasphorus rufus	U	U	U		
Allen's hummingbird	Selasphorus sasin	U	U	U	U	
Calliope hummingibrd	Stellula calliope	U		U		
KINGFISHER						
Belted kingfisher	Megaceryle alcyon	C	C	C	C	1/ 2/
WOODPECKERS						
Common flicker	Colaptes auratus	A	A	A	A	1/ 2/ 3/
Acorn woodpecker	Melanerpes formicivorus	A	A	A	A	1/
Lewis' woodpecker	Asyndesmus lewis	O		O	O	
Yellow-bellied sapsucker	Sphyrapicus varius	U		U	U	1/
Red-breasted sapsucker	Sphyrapicus varius	C		C	C	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
WOODPECKERS, CONT'D						
Hairy woodpecker	Dendrocopos villosus	U	U	U	U	
Downy woodpecker	Dendrocopos pubescens	C	C	C	C	1/
Nuttall's woodpecker	Dendrocopos nuttallii	A	A	A	A	1/
KINGBIRDS						
Eastern kingibrd	Tyrannus tyrannus	R	R			
Western kingbird	Tyrannus verticalis	A	A	A		1/
Cassin's kingbird	Tyrannus vociferans	R				
FLYCATCHERS						
Ash-throated flycatcher	Myiarchus cinerascens	C	C			1/
Black phoebe	Sayornis nigricans	A	A	A	A	1/
Say's phoebe	Sayornis saya	C		C	C	1/
Willow flycatcher (Traill's)	Empidonax traillii	U	U	U		1/
Gray flycatcher	Empidonax wrightii		R			
Western flycatcher	Empidonax difficilis	U	U	U		1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
FLYCATCHERS, CONT'D						
Western wood pewee	Contopus sordidulus	U	U	U		
Olive-sided flycatcher	Nuttallornis borealis	U		U		
Vermilion flycatcher	Pyrocephalus rubinus				R	
LARK						
Horned lark	Eremophila alpestris	A	A	A	A	
SWALLOWS						
Violet-green swallow	Tachycineta thalassina	C	C	C	U	
Tree swallow	Iridoprocne bicolor	C	C	C	U	1/ 2/ 3/ 4/
Bank swallow	Riparia riparia	C	C	C		1/
Rough-winged swallow	Stelgidopteryx ruficollis	C	C	C		
Barn swallow	Hirundo rustica	A	A	A		1/ 2/ 3/
Cliff swallow	Petrochelidon pyrrhonota	A	A	A		1/ 2/ 3/
Purple martin	Progne subis	U	U			

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
JAYS, MAGPIES AND CROWS						
Steller's jay	Cyanocitta stelleri	O		O	O	1/
Scrub jay	Aphelocoma coerulescens	A	A	A	A	1/ 2/
Black-billed magpie	Pica pica	R			R	
Yellow-billed magpie	Pica nuttalli	A	A	A	A	1/ 2/ 3/ 4/
Common raven	Corvus corax	R			R	
Common crow	Corvus brachyrhynchos	A	A	A	A	1/ 3/
Clark's nutcracker	Nucifraga columbiana			R		
CHICKADEE						
Black-capped chickadee	Parus atricapillus					1/
Mountain chickadee	Parus gambeli	R		R	R	
TITMOUSE AND BUSHTIT						
Plain titmouse	Parus inornatus	A	A	A	A	1/
Bushtit	Psaltriparus minimus	C	C	C	C	1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
NUTHATCHES						
White-breasted nuthatch	Sitta carolinensis	C	C	C	C	1/
Red-breasted nuthatch	Sitta canadensis	O	O	O	O	
Pygmy nuthatch	Sitta pygmaea		R			
CREEPER						
Brown creeper	Certhia familiaris	U	U	U	U	1/
WRENTIT						
Wrentit	Chamaea fasciata	C	C	C	C	1/
DIPPER						
Dipper	Cinclus mexicanus	U		U	U	
WRENS						
House wren	Troglodytes aedon	C	C	U	U	
Winter wren	Troglodytes troglodytes	O			O	
Bewick's wren	Thryomanes bewickii	A	A	A	A	1/ 3/
Long-billed marsh wren	Telmatodytes palustris	A	A	A	A	1/
Canyon wren	Catherpes mexicanus	U	U	U	U	
Rock wren	Salpinctes obsoletus	C	C	C	C	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
MOCKINGBIRD AND THRASHERS						
Mockingbird	Mimus polyglottos	A	A	A	A	1/
California thrasher	Toxostoma redivivum	U	U	U	U	
Sage thrasher	Oreoscoptes montanus	R		R	R	
THRUSHES, SOLITAIRE AND BLUEBIRDS						
American robin	Turdus migratorius	A	A	A	A	1/ 3/ 4/
Varied thrush	Ixoreus naevius	U		U	U	1/
Hermit thrush	Catharus guttata	C		C	C	1/
Veery	Catharus fuscescens	R				
Western bluebird	Sialia mexicana	C	C	C	C	1/
Mountain bluebird	Sialia currucoides	U			U	
Townsend's solitaire	Myadestes townsendi	O			O	
GNATCATCHERS AND KINGLETS						
Blue-gray gnatcatcher	Polioptila caerulea	U	U	U	U	
Golden-crowned kinglet	Regulus satrapa	U		U	U	1/
Ruby-crowned kinglet	Regulus calendula	A		A	A	1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
PIPIT						
Water pipit	Anthus spinoletta	A		A	A	
WAXWINGS						
Bohemian waxwing	Bombycilla garrula	O			O	
Cedar waxwing	Bombycilla cedrorum	A		A	A	
SILKY FLYCATCHERS						
Phainopepla	Phainopepla nitens	U	U	U	U	
SHRIKES						
Northern shrike	Lanius excubitor	R		R	R	
Loggerhead shrike	Lanius ludovicianus	A	A	A	A	1/
STARLING						
Starling	Sturnus vulgaris	A	A	A	A	1/ 2/ 3/ 4/
VIREOS						
Hutton's vireo	Vireo huttoni	U	U	U	U	
Solitary vireo	Vireo solitarius	U	U	U		
Yellow-green vireo	Vireo Flavoviridis			R		
Warbling vireo	Vireo gilvus	C	U	U		1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
WARBLERS						
Black-and-white warbler	Mniotilta varia	R		R	R	
Tennessee warbler	Vermivora peregrina	R		R		
Orange-crowned warbler	Vermivora celata	C	U	C	C	1/
Nashville Warbler	Vermivora ruficapilla	U	U	U		1/
Yellow warbler	Dendroica petechia	C	C	C		1/
Magnolia warbler	Dendroica magnolia			R		
Yellow-rumped warbler	Dendroica coronata	A		A	A	1/
Black-throated gray warbler	Dendroica nigrescens	C		C	U	1/
Townsend's warbler	Dendroica townsendi	U	U	U		1/
Black-throated blue warbler	Dendroica caerulescens	U	U	U		1/
Black-throated green warbler	Dendroica virens	R				
Hermit warbler	Dendroica occidentalis	U	U	U		1/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
WARBLERS, CONT'D						
Blackburnian warbler	Dendroica fusca			R		
Bay-breasted warbler	Dendroica castanea			R		
Blackpoll warbler	Dendroica striata	R				
MacGillivray's warbler	Oporornis tolmiei	U	U	U		1/
Common yellowthroat	Geothlypis trichas	U	U	U	U	
Yellow-breasted chat	Icteria virens	U	U			
Wilson's warbler	Wilsonia pusilla	A	A	A		1/
American redstart	Setophaga ruticilla			R		
WEAVER FINCH						
House sparrow	Passer domesticus	A	A	A	A	1/
BLACKBIRDS AND ORIOLES						
Western meadowlark	Sturnella neglecta	A	A	A	A	1/ 2/ 3/ 4/
Yellow-headed blackbird	Xanthocephalus xanthocephalus	C	C	U	U	
Red-winged blackbird	Agelaius phoeniceus	A	A	A	A	1/ 2/

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status and Relative Abundance				Observed in Transects
		Spring	Summer	Fall	Winter	
BLACKBIRDS AND ORIOLES, CONT'D						
Tricolored blackbird	Agelaius tricolor	C	C	C	C	
Red-winged blackbird	Agelaius phoenicius	C	C	C	C	1/ 2/ 3/ 4/
Hooded oriole	Icterus cucullatus	U	U	U		
Northern oriole	Icterus galbula	A	A	A		1/
Brewer's blackbird	Euphagus cyanocephalus	A	A	A	A	1/ 2/ 3/ 4/
Brown-headed cowbird	Molothrus ater	A	A	C	C	
TANAGER						
Western tanager	Piranga lucoviciana	C	C	C		1/
GROSBEAKS, BUNTINGS, FINCHES AND SPARROWS						
Rose-breasted grosbeak	Pheucticus ludovicianus	R			R	
Black-headed grosbeak	Pheucticus melanocephalus	A	A	A		
Blue grosbeak	Guiraca caerulea	U	U			
Indigo bunting	Passerina cyanea		R			
Lazuli bunting	Passerina amoena	C	C			
Evening grosbeak	Hesperiphona vespertina	O			O	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
GROSBEAKS, BUNTINGS, FINCHES AND SPARROWS, CONT'D						
Purple finch	Carpodacus purpureus	U		U	U	
Cassin's finch	Carpodacus cassinii			R	R	
House finch	Carpodacus mexicanus	A	A	A	A	1/ 2/ 3/ 4/
Common redpoll	Acanthis flammea	R		R		
Pine siskin	Spinus pinus	U		U	U	
American goldfinch	Spinus tristis	A	A	A	A	1/
Lesser goldfinch	Spinus psaltria	A	A	A	A	1/ 4/
Lawrence's goldfinch	Spinus lawrencei	U	U	U		
Red crossbill	Loxia curvirostra			R		
Green-tailed towhee	Chlorura chlorura	R		R	R	
Rufous-sided towhee	Pipilo erythrophthalmus	A	A	A	A	
Brown towhee	Pipilo fuscus	A	A	A	A	
Lark bunting	Calamospiza melanocorys	R		R		

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
GROSBEAKS, BUNTINGS, FINCHES AND SPARROWS, CONT'D						
Savannah sparrow	Passerculus sandwichensis	A		A	A	1/ 2/ 3/ 4/
Grasshopper sparrow	Ammodramus savannarum	R	R	R	R	
Vesper sparrow	Pooecetes gramineus	C		C	C	
Lark sparrow	Chondestes grammacus	A	A	A	A	
Rufous-crowned sparrow	Aimophila ruficeps	U	U	U	U	
Sage sparrow	Amphispiza belli	U	O	U	U	
Dark-eyed junco	Junco hyemalis	A		A	A	1/ 2/
Chipping sparrow	Spizella passerina	U	U	U	U	1/ 2/ 3/
Black-chinned sparrow	Spizella atrogularis					
Harris sparrow	Zonotrichia querula	R			R	
White-crowned sparrow	Zonotrichia leucophrys	A		A	A	1/ 2/ 3/ 4/
Golden-crowned sparrow	Zonotrichia atricapilla	A		A	A	1/ 2/ 3/
White-throated sparrow	Zonotrichia albicollis	O		O	O	

APPENDIX II

CHECKLIST OF BIRDS OCCURRING ALONG AND IN THE VICINITY OF THE SACRAMENTO RIVER CORRIDOR

Common Name	Scientific Name	Seasonal Status And Relative Abundance				Observed In Transects
		Spring	Summer	Fall	Winter	
GROSBEAKS, BUNTINGS, FINCHES AND SPARROWS, CONT'D						
Fox sparrow	Passerella iliaca	C		C	C	
Lincoln's sparrow	Melospiza lincolnii	C		C	C	2/ 4/
Swamp sparrow	Melospiza georgiana				R	
Song sparrow	Melospiza melodia	A	A	A	A	3/

A = Abundant, evidence of good populations seen on most visits

C = Common, evidence of established population frequently seen

U = Uncommon, evidence of some specimens residing in area

O = Occasional, evidence of sightings in irregular pattern of years

R = Rare, evidence of accidental sightings in area

1/ Birds observed in riparian areas

2/ " " " agricultural areas adjacent to riparian

3/ " " " riprap areas

4/ " " " agricultural areas adjacent to riprap

APPENDIX III Emergency Work P.L. 84-99
1963 to 1975
Collinsville to Chico Landing

	STREAM	BANK	YEAR	LOCATION	RIVER MILE	DRAWING NUMBER	LENGTH OF REPAIR LEVEE (ft)	LENGTH OF REPAIR RIPRAP (ft)	REMARKS
1.	Feather River	Left	1965	R. D. 784	Unknown	4-9-564	NA	NA	Repair landside boils
2.	Yolo Bypass	Left	1965	R. D. 537	NA	50-4-4079	4,300	NA	Intermitteot waterside erosion
3.	Yolo Bypass	Left	1965	R. D. 785	NA	50-4-4079	17,000	NA	Intermitteot waterside erosion
4.	Yolo Bypass	Left	1965	R. D. 827	NA	50-4-4079	2,700	NA	Intermittent waterside erosion
5.	Yolo Bypass	Right	1965	R. D. 536	NA	50-4-4081	1,000	NA	Intermittent waterside erosion
6.	Sacramento Rvr	Left	1969	Near Colusa		Eqp Rental	NA	Unknown	Repaired existiog bank protection
7.	Yuba River	Right	1969	At Marysville	0.6 & 0.8	8-4-799	NA	450	2 Sites
8.	Yolo Bypass	Right	1969	R. D. 787	NA	50-4-4478	50	NA	Landside levee slip
9.	Yolo Bypass	Left	1969	R. D. 900	NA	50-4-4478	600	NA	Landside levee slip
10.	Sacramento Rvr	Left	1969	Sacto to Rio Vista	12.4	50-4-4476	NA	700	Operation foresight
11.	Sacramento Rvr	Right	1969	Sacto to Rio Vista	19.9 & 20.1	50-4-4476	1,240	1,075	Operation foresight
12.	Sacramento Rvr	Left	1969	Sacto to Rio Vista	28.1	50-4-4476	NA	930	Operation foresight
13.	Sacramento Rvr	Left	1969	Sacto to Rio Vista	30.4	50-4-4476	NA	850	Operation foresight
14.	Sacramento Rvr	Right	1969	Sacto to Rio Vista	45.9	50-4-4476	450	450	Operation foresight
15.	Sacramento Rvr	Right	1969	Sacto to Rio Vista	53.3	50-4-4476	600	600	Operation foresight
16.	Yolo Bypass	Right	1969	R. D. 2068	NA	50-4-4478	600	NA	Landside levee slip
17.	Yolo Bypass	Left	1969	Near Sacto Bypass	NA	50-4-4489	500	NA	Landside levee slips (2)
18.	Elder Creek	Lt&Rt	1969	Near Gerber	NA	50-4-4490	1,200	1,200	4 Sites
19.	Elder Creek	Left	1970	Near Sacto River	NA	50-4-4541	110	NA	
20.	Sacramento Rvr	Right	1970	D.S. Woodson Br	214.7	50-4-4548	1,800	750	3 Sites
21.	Sacramento Rvr	Left	1970	Murphy Slough	190.3	50-4-4544	300	300	Rock on landside slope
22.	Sacramento Rvr	Left	1970	D.S. Ord Ferry	179-182.5	50-4-4576	1,050	NA	3 Sites - levee breaks
23.	Sacramento Rvr	Left	1970	U.S. Ord Ferry	195±	50-4-4593	1,600	NA	1400' landside erosion, 200' break
24.	Sutter Bypass	Right	1970	R. D. 1660	NA	50-4-4542	NA	NA	Construct landside seepage trench
25.	Feather River	Right	1970	Nelson Bend	7.2	4-4-588	800	2,330	Near weir constructed by State
26.	Sacramento Rvr	Left	1971	Murphy Slough	190.3	50-4-4695	1,400	NA	
27.	Miner Slough	Right	1972	Prospect Island	NA	NA	900	900	Change Order - Unit 25
28.	Three Mile Sl	Left	1973	R. D. 1601	NA	50-4-4899	400	NA	1/2 Mile downstream Seven Mile Slough
29.	Colusa Drain	Left	1973	R. D. 108 & 787	NA	50-4-4911	2,240	NA	4 Sites
30.	Miner Slough	Right	1973	Prospect Island	NA	NA	370	370	Chaoge Order - Unit 25
31.	Sacramento Rvr	Right	1973	Near Glenn	173.8	Eqp Rental	NA	300	Flood fight contract
32.	Sacramento Rvr	Right	1973	Near Glenn	174.3	50-4-4912	NA	950	
33.	Sacramento Rvr	Left	1974	Murphy Slough	190.3	50-4-5000	2,800	280	
34.	Yolo Bypass	Left	1974	R. D. 900	NA	NA	Unknown	NA	Equipment rental contract
35.	Yolo Bypass	Right	1974	R. D. 2068	NA	NA	Unknown	NA	Equipment rental contract
36.	Sacramento Rvr	Left	1974	D.S. Ord Ferry	179-182	50-4-5008	1,570	NA	3 Sites
37.	Sacramento Rvr	Right	1974	Grimes	124.5	50-4-4979	NA	475	
38.	Sacramento Rvr	Left	1974	Near Colusa	143.4	50-4-5001	NA	205	
39.	Sacramento Rvr	Left	1974	Near Colusa	154.8	50-4-5001	NA	550	
40.	Feather River	Right	1974	U.S. Yuba City	34.0	4-4-599	NA	625	
41.	Sacramento Rvr	Right	1974	Near Road 29	187.4	50-4-5008	520	NA	
42.	Elder Creek	Left	1974	Near Gerber	NA	50-4-4997	280	200	2 Sites
43.	Sacramento Rvr	Left	1974	D.S. Ord Ferry	183.3	50-4-5010	NA	600	Emergency bank protection - Section 14

ABBREVIATIONS:
NA - Not applicable
R.D. - Reclamation District
U.S. - Upstream
D.S. - Downstream

Appendix IV

Inventory of Rare and Endangered Vascular Plants of California
Associated with the Sacramento River Bank
Protection Project 1/

Scientific Name	Common Name	County Locale
Astragalus pauperculus Greene	Meager locoweed	Butte
Fritillaria phaeanthera Eastw.	Butte fritillaria	Butte
Fritillaria pluriflora Torr. in Benth.		Butte, Colusa, Glenn
Hibiscus californicus Kell.	California hibiscus	Butte, Glenn, Solano, Sutter
Juglans hindsii (Jeps.) Jeps.	Northern California black walnut	Butte, Contra Costa, Sacramento, Solano, Yolo
Lathyrus jepsonii Greene ssp. jepsonii	Delta tule pea	Contra Costa, Solano
Sidalcea robusta Heller ex Roush	Butte County sidalcea	Butte

1/ California Native Plant Society, Special Publication No. 1, 1974

TO: Defense Technical Information Center
ATTN: DTIC-O
8725 John J. Kingman Road, Suite 0944
Fort Belvoir VA 22060-6218

22 October 2008

FROM: US Army Corps of Engineers
Sacramento District Library
1325 J Street, Suite 820
Sacramento CA 95814-2292

SUBJECT: Submission of technical reports for inclusion in Technical Reports Database

The enclosed documents from USACE Sacramento District are hereby submitted for inclusion in DTIC's technical reports database. The following is a list of documents included in this shipment:

- ADB344304 Lemon Reservoir Florida River, Colorado. Report on reservoir regulation for flood control, July 1974
- ADB344333 Reconnaissance report Sacramento Metropolitan Area, California, February 1989
- ADB344346 New Hogan Dam and Lake, Calaveras River, California. Water Control Manual Appendix III to Master Water Control Manual San Joaquin River Basin, California, July 1983
- ADB344307 Special Flood Hazard Study Nephi, Utah, November 1998 (cataloged)
- ADB344344 Special Study on the Lower American River, California, Prepared for US Bureau of Reclamation – Mid Pacific Region and California Dept. of Water Resources..., March 1987
- ADB344313 Transcript of public meeting Caliente Creek stream group investigation, California, held by, the Kern County Water Agency in Lamont, California, 9 July 1979
- ADB344302 Initial appraisal Sacramento River Flood control project (Glenn-Colusa), California, 10 February 1989
- ADB344485 Report on November-December 1950 floods Sacramento-San Joaquin river basins, California and Truckee, Carson, and Walker rivers, California and Nevada, March 1951
- ADB344268 Reexamination Little Dell Lake, Utah, February 1984
- ADB344197 Special report fish and wildlife plan Sacramento River bank protection project, California, first phase, July 1979
- ADB344264 Programmatic environmental impact statement/environmental impact report Sacramento River flood control system evaluation, phases II-V, May 1992
- ADB344201 Hydrology office report Kern river, California, January 1979
- ADB344198 Kern River – California aqueduct intertie, Kern county, California, environmental statement, February 1974
- ADB344213 Sacramento river Chico Landing to Red Bluff, California, bank protection project, final environmental statement, January 1975
- ADB344265 Cottonwood Creek, California, Information brochure on selected project plan, June 1982
- ADB344261 Sacramento river flood control project Colusa Trough Drainage Canal, California, office report, March 1993
- ADB344343 Detailed project report on Kern River-California aqueduct intertie, Kern County, California. February 1974

[redacted]

- ADB344267 Sacramento River Flood Control Project, California, Right Bank Yolo Bypass and Left Bank Cache Slough near Junction Yolo Bypass and Cache Slough, Levee construction, General Design, Supplement No. 1 to Design Memorandum #13, May 1986
- ADB344246 Redbank and Fancher Creeks, California, General Design Memorandum #1, February 1986
- ADB344260 Cache Creek Basin, California, Feasibility report and environmental statement for water resources development Lake and Yolo counties, California, February 1979
- ADB344199 Sacramento River Deep Water Ship channel, California, Feasibility report and environmental impact statement for navigation and related purposes, July 1980
- ADB344263 Sacramento River flood control project, California, Mid-Valley area, phase III, Design Memorandum, Vol. I or II, June 1986
- ADB344262 Marysville Lake, Yuba River, California, General Design Memorandum Phase I, Plan Formulation, Preliminary Report, Appendixes A-N, Design Memorandum #3, March 1977

The **distribution statement is A** approved for public release; distribution is unlimited.

The Sacramento District source code is **410637**. Please return any materials that aren't appropriate for the technical reports database.

Please acknowledge receipt of shipment by sending email message to Frances.J.Sweeney@usace.army.mil.

Thank you,

Frances J. Sweeney
Library Manager
USACE, Sacramento District Library
916-557-6660