Appendix N

Special-Status Species Requests to California Department of Fish and Game, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Response from U.S. Fish and Wildlife Service

State Water Resources Control Board

Division of Water Rights
901 P Street • Sacramento, California 95814 • (916) 657-2208
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
FAX (916) 657-1485 • Web Site Address: http://www.waterrights.ca.gov

Winston H. Hickox
Secretary for Environmental Protection

Gray Davis
Governor

MAY 11 2000

Mr. Don Koch
Regional Manager
California Department of Fish and Game
601 Locust Street
Redding, CA 96001

REQUEST FOR A LIST OF STATE ENDANGERED, THREATENED, CANDIDATE AND SPECIAL STATUS SPECIES OF CONCERN IN THE BATTLE CREEK WATERSHED IN SHASTA AND TEHAMA COUNTIES

Dear Mr. Koch:

The U.S. Bureau of Reclamation (Reclamation) is proposing the Battle Creek Salmon and Steelhead Restoration Project within the Battle Creek Watershed. Reclamation and the State Water Resources Control Board (SWRCB) will be preparing an Environmental Impact Statement/ Environmental Impact Report for the proposed project. Reclamation has already submitted a species request letter to the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The SWRCB as state lead agency is requesting from the California Department of Fish and Game a list of State-endangered, threatened, candidate, and special-status species of concern within the Battle Creek Watershed (topographic quadrangles Tuscan Buttes, Shingle Town, Manton, Hagaman Gulch, Finley Butte, and Lyonsville in Shasta and Tehama Counties). I have enclosed Figures 1 and 2, from the SWRCB's Notice of Preparation which show the project location and project features.

Please submit the species list to me via facsimile: (916) 657-1485; or by mailing the list to the following address: P.O. Box 2000, Sacramento, California 95812-2000. If you have any questions, please contact me at (916) 657-2208 or e-mail: jcanaday@waterrights.swrcb.ca.gov. Thank you in advance for your assistance.

Sincerely,

Jim Canaday

Jim Canaday
Environmental Specialist

Enclosures

cc: See Distribution List next page.

Distribution List

Mr. Harry Rectenwald
California Department of Fish and Game
601 Locust Street
Redding, CA 96001

Mr. Steve Turek
California Department of Fish and Game
601 Locust Street
Redding, CA 96001

Mr. Bart Prose
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1898

Mr. Steve Edmondson
National Marine Fisheries Service
777 Sonoma Avenue
Santa Rosa, CA 95404

Mr. Dan Free
National Marine Fisheries Service
650 Capitol Mall Boulevard, No. 6070
Sacramento, CA 95814-4706

Ms. Mary Marshall
U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825-1898

Mr. T.J. LoVullo
Federal Energy Regulatory Commission
888 First Street, NE Mail Code 6B-02
Washington DC 20426

Ms. Angela Risdon
Pacific Gas and Electric Company
Box 770000, Mail Code NIIC
San Francisco, CA 94177

Mr. Don Wagenet
Navigant Consulting Incorporated
3100 Zinfandel Drive, Suite 600
Rancho Cordova, CA 95670-6026

Mr. Ted Beedy
Jones & Stokes
2600 V Street
Sacramento, CA 95818

Mr. Ken Bogdan
Jones & Stokes
2600 V Street
Sacramento, CA 95818

Ms. Sue Bushnell-Bergfalk
Jones & Stokes
2600 V Street
Sacramento, CA 95818

Mr. Steve Centerwall
Jones & Stokes
2600 V Street
Sacramento, CA 95818

Ms. Colleen Smith
Jones & Stokes
2600 V Street
Sacramento, CA 95818

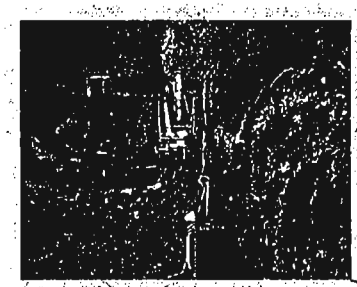
Mr. Michael B. Ward
Terraqua Environmental Consulting
P.O. Box 85
Wauconda, WA 98859

Proposed Battle Creek Salmon and Steelhead Restoration Project

Figure 2: Project Area Limits

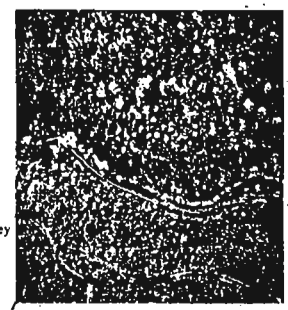
SYSTEM SCHEMATIC - Existing Conditions

NORTH BATTLE CREEK FEEDER

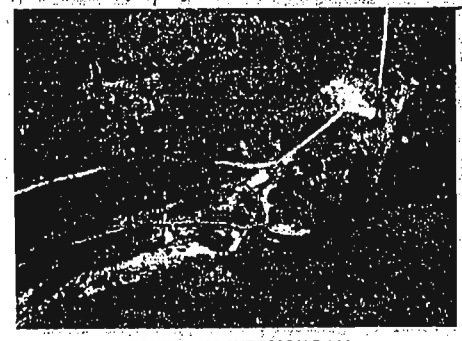


EAGLE CANYON DIVERSION DAM

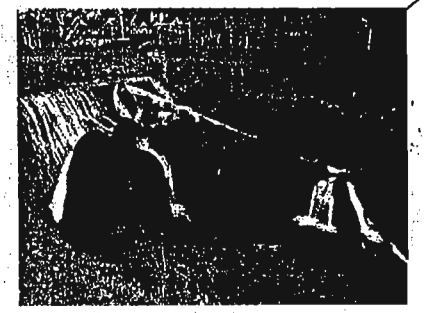
WILDCAT DIVERSION DAM



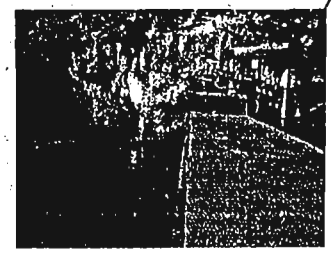
Soap Creek Diversion Dam and Feeder



COLEMAN DIVERSION DAM



INSKIP DIVERSION DAM



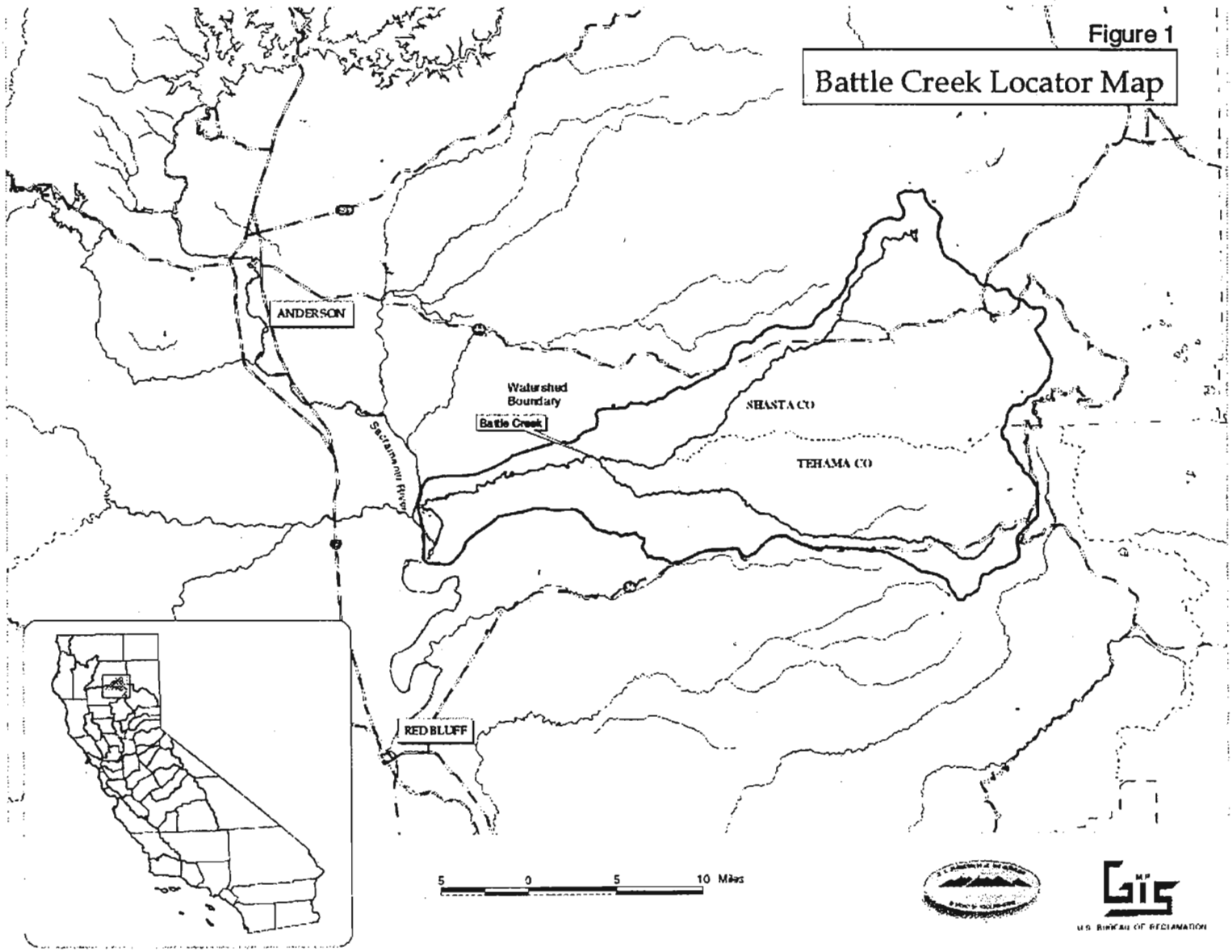
SOUTH DIVERSION DAM

Grace Lake
Lake Nora
North Battle Creek Reservoir
Macumber Reservoir
South Canal
Keswick Canal
Volta Powerhouse
Volta Powerhouse #2
North Battle Creek Feeder Diversion Dam
Al Smith Diversion Dam
Keswick Diversion Dam
Natural Fish Barrier
Upper Project Limit
North Battle Creek Feeder
Eagle Canyon Diversion Dam
BATTLE CREEK
Darrah Springs Hatchery
Baldwin Creek
Asbury Diversion Dam
Wildcat Diversion Dam
Eagle Canyon Canal
Cross Country Canal
Upper Ripley Creek Feeder
Upper Ripley Creek Diversion
Coleman Forebay
NORTH
Wildcat Canal
Ripley Creek
Lower Ripley Creek Feeder
Lower Ripley Creek Diversion
Inskip
Coleman National Fish Hatchery
Coleman Powerhouse
Soap Creek Feeder
Soap Creek
Soap Creek Diversion
South Union Canal
SACRAMENTO RIVER
BATTLE CREEK
SOUTH BATTLE CREEK
Inskip Powerhouse
Coleman Diversion Dam
South Powerhouse
Inskip Diversion Dam
South Diversion Dam
Natural Fish Barrier
Coleman National Fish Hatchery Weir
Lower Project Limit
Upper Project Limit

Project Limit

Figure 1

Battle Creek Locator Map



United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY
REFER TO:
MP-410
ENV-1.10

APR 18 2000

Mr. Jim Bybee
National Marine Fisheries Service
777 Sonoma Avenue, Suite 325
Santa Rosa CA 95404

Subject: Request for List of Federally-Endangered, Threatened, Proposed, and Candidate Species for the Battle Creek Watershed in Shasta and Tehama Counties, California

Dear Mr. Bybee:

Reclamation will be preparing an Environmental Impact Statement/Environmental Impact Report for the Battle Creek Salmon and Steelhead Restoration Project within the Battle Creek watershed. Reclamation and the State Water Resources Control Board are the Federal and State lead agencies for the proposed project. Reclamation is requesting a list of endangered, threatened, proposed, and candidate species for the Battle Creek Watershed (Tuscan Buttes, Shingle Town, Manton, Hagaman Gulch, Finley Butte, and Lyonsville topographic quadrangles in Shasta and Tehama Counties). Enclosed are Figures 1 and 2, which show the project location and project features.

Please submit the list to Ms. Mary Marshall; facsimile (916) 978-5290, mailing address: 2800 Cottage Way, Sacramento, California 95825-1898. If you have any questions, please contact Ms. Marshall at (916) 978-5248, e-mail: mmarshall@mp.usbr.gov. Thank you for your assistance.

Sincerely,

Rick Breitenbach
Acting Regional Resources Manager

Enclosures

cc: See next page

cc: Distribution list

Mr. Bart Prose
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento CA 95825-1898

Mr. T.J. LoVullo
FERC
888 First Street, N.E. Mail Code 6B-02
Washington DC 20426

Ms. Angela Risdon
Pacific Gas and Electric Company
Box 770000, Mail Code NIIC
San Francisco CA 94177

Mr. Jim Canaday
State Water Resources Control Board
PO Box 2000
Sacramento CA 95812-2000

Mr. Russ Kanz
State Water Resources Control Board
PO Box 2000
Sacramento CA 95812-2000

Mr. Steve Edmondson
National Marine Fisheries Service
777 Sonoma Avenue
Santa Rosa CA 95404

Mr. Dan Free
National Marine Fisheries Service
650 Capitol Mall Boulevard, No. 6070
Sacramento CA 95814-4706

Mr. Harry Rectenwald
California Department of Fish and Game
601 Locust Street
Redding CA 96001

Mr. Steve Turek
California Department of Fish and Game
601 Locust Street
Redding CA 96001

Navigant Consulting Incorporated
3100 Zinfandel Drive, Suite 600
Rancho Cordova CA 95670-6026

Mr. Ted Beedy
Jones & Stokes Associates Incorporated
2600 V Street
Sacramento CA 95818-1914

Ms. Colleen Smith
Jones & Stokes Associates Incorporated
2600 V Street
Sacramento CA 95818-191

Mr. Steve Centerwall
Jones & Stokes Associates Incorporated
2600 V Street
Sacramento CA 95818-191

Mr. Ken Bogdan
Jones & Stokes Associates Incorporated
2600 V Street
Sacramento CA 95818-191

Mr. Michael B. Ward
Terraqua Environmental Consulting
PO Box 85
Wauconda WA 98859

Figure 1

Battle Creek Locator Map

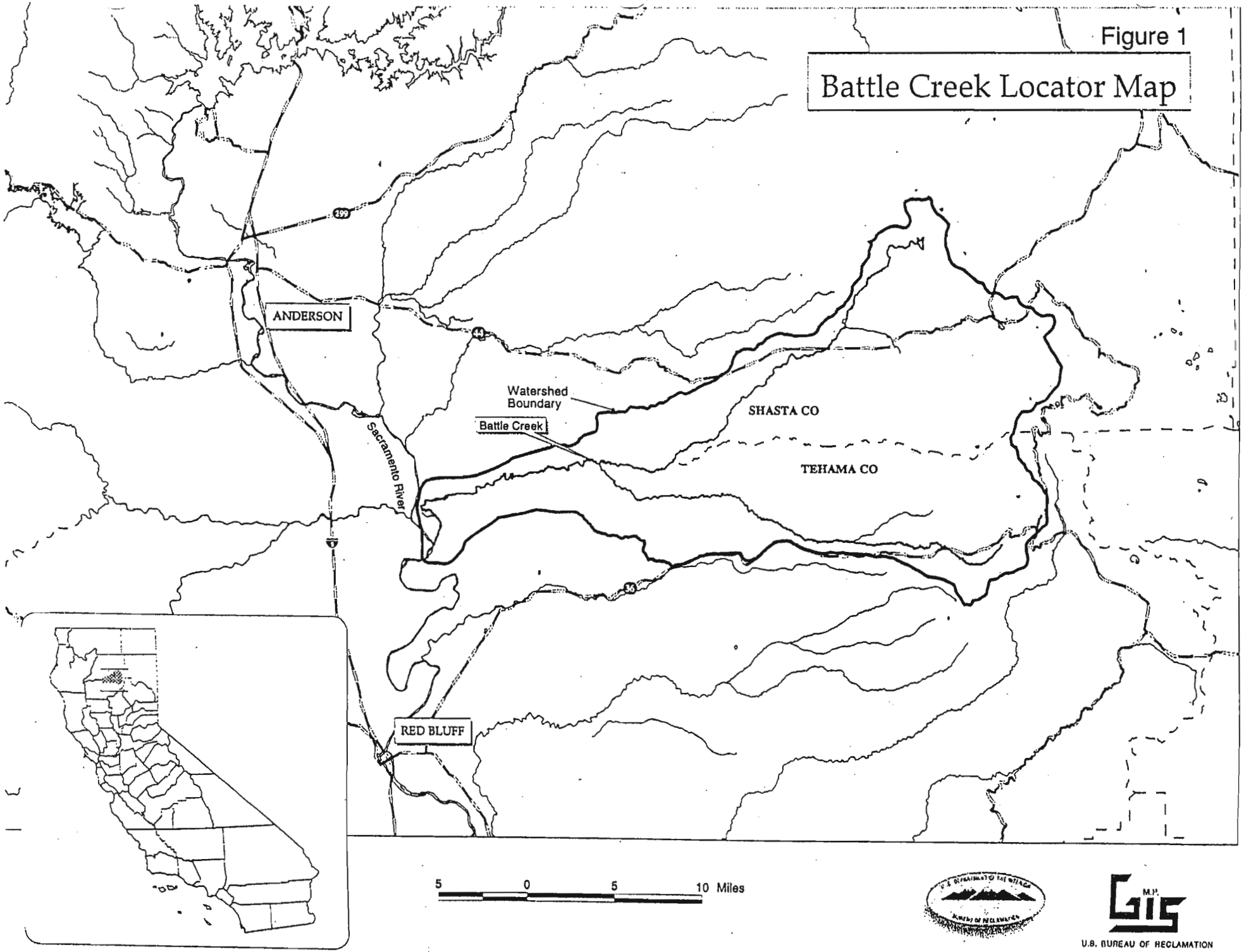
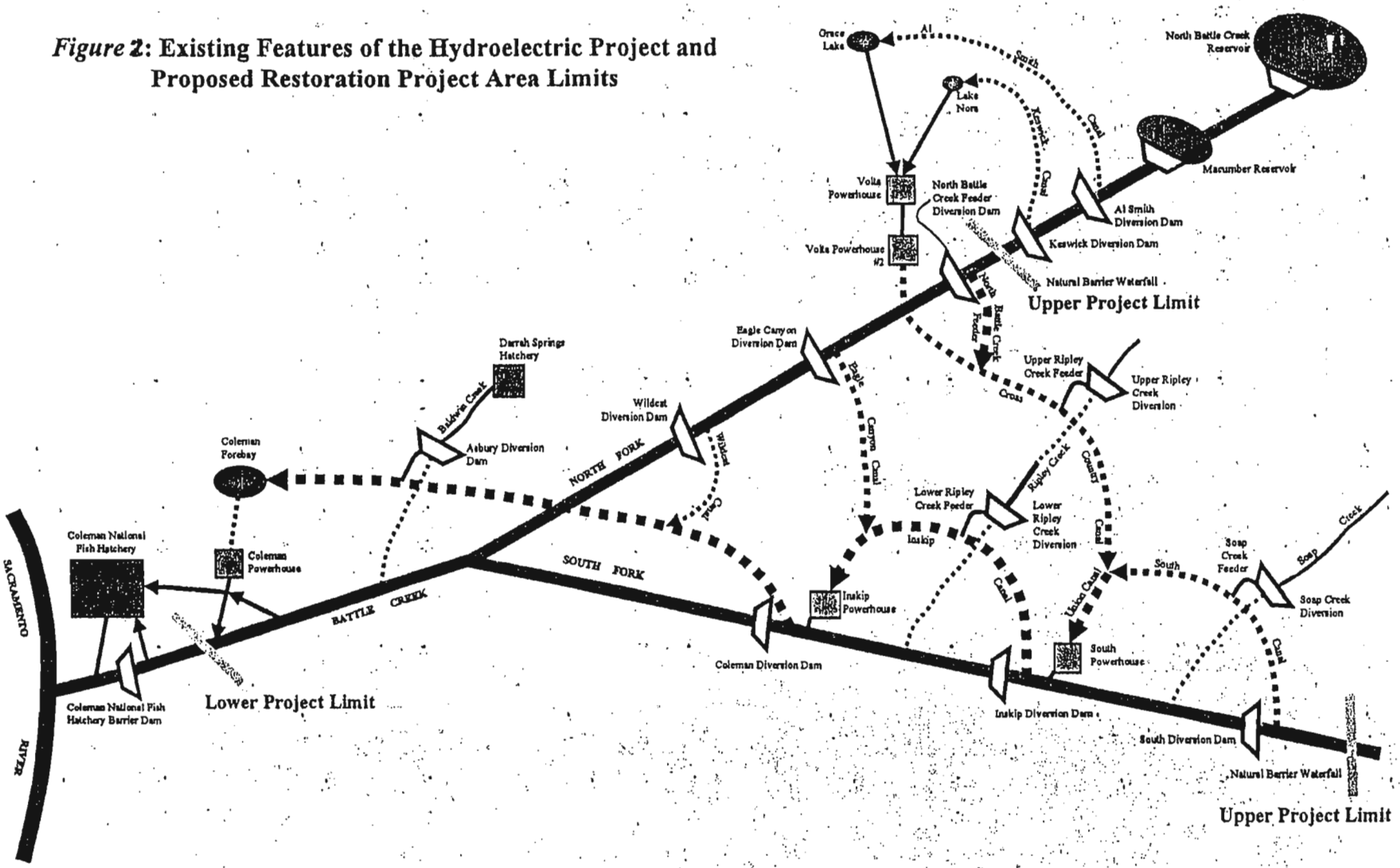


***Figure 2*: Existing Features of the Hydroelectric Project and Proposed Restoration Project Area Limits**



United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY
REFER TO:
MP-410
ENV-1.10

APR 1 8 2000

Mr. Harry Mossman
Sacramento Field Office
US Fish and Wildlife Service
2800 Cottage Way, W-2605
Sacramento CA 95825-1846

Subject: Request for List of Federally-Endangered, Threatened, Proposed, and Candidate Species for the Battle Creek Watershed in Shasta and Tehama Counties, California

Dear Mr. Mossman:

Reclamation will be preparing an Environmental Impact Statement/Environmental Impact Report for the Battle Creek Salmon and Steelhead Restoration Project within the Battle Creek watershed. Reclamation and the State Water Resources Control Board are the Federal and State lead agencies for the proposed project. Reclamation is requesting a list of endangered, threatened, proposed, and candidate species for the Battle Creek Watershed (Tuscan Buttes, Shingle Town, Manton, Hagaman Gulch, Finley Butte, and Lyonsville topographic quadrangles in Shasta and Tehama Counties). Enclosed are Figures 1 and 2, which show the project location and project features.

Please submit the list to Ms. Mary Marshall; facsimile number (916) 978-5290, or by mailing the list to address: 2800 Cottage Way, Sacramento, California 95825-1898. If you have any questions, please contact Ms. Marshall at (916) 978-5248 (TDD 978-5608), e-mail: mmarshall@mp.usbr.gov. Thank you for your assistance.

Sincerely,

Rick Breitenbach
Acting Regional Resources Manager

Enclosures

cc: See next page

cc: Distribution list

Mr. Bart Prose
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento CA 95825-1898

Mr. T.J. LoVullo
FERC
888 First Street, N.E. Mail Code 6B-02
Washington DC 20426

Ms. Angela Risdon
Pacific Gas and Electric Company
Box 770000, Mail Code NIIC
San Francisco CA 94177

Mr. Jim Canaday
State Water Resources Control Board
PO Box 2000
Sacramento CA 95812-2000

Mr. Russ Kanz
State Water Resources Control Board
PO Box 2000
Sacramento CA 95812-2000

Mr. Steve Edmondson
National Marine Fisheries Service
777 Sonoma Avenue
Santa Rosa CA 95404

Mr. Dan Free
National Marine Fisheries Service
650 Capitol Mall Boulevard, No. 6070
Sacramento CA 95814-4706

Mr. Harry Rectenwald
California Department of Fish and Game
601 Locust Street
Redding CA 96001

Mr. Steve Turek
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Mr. Ken Bogdan
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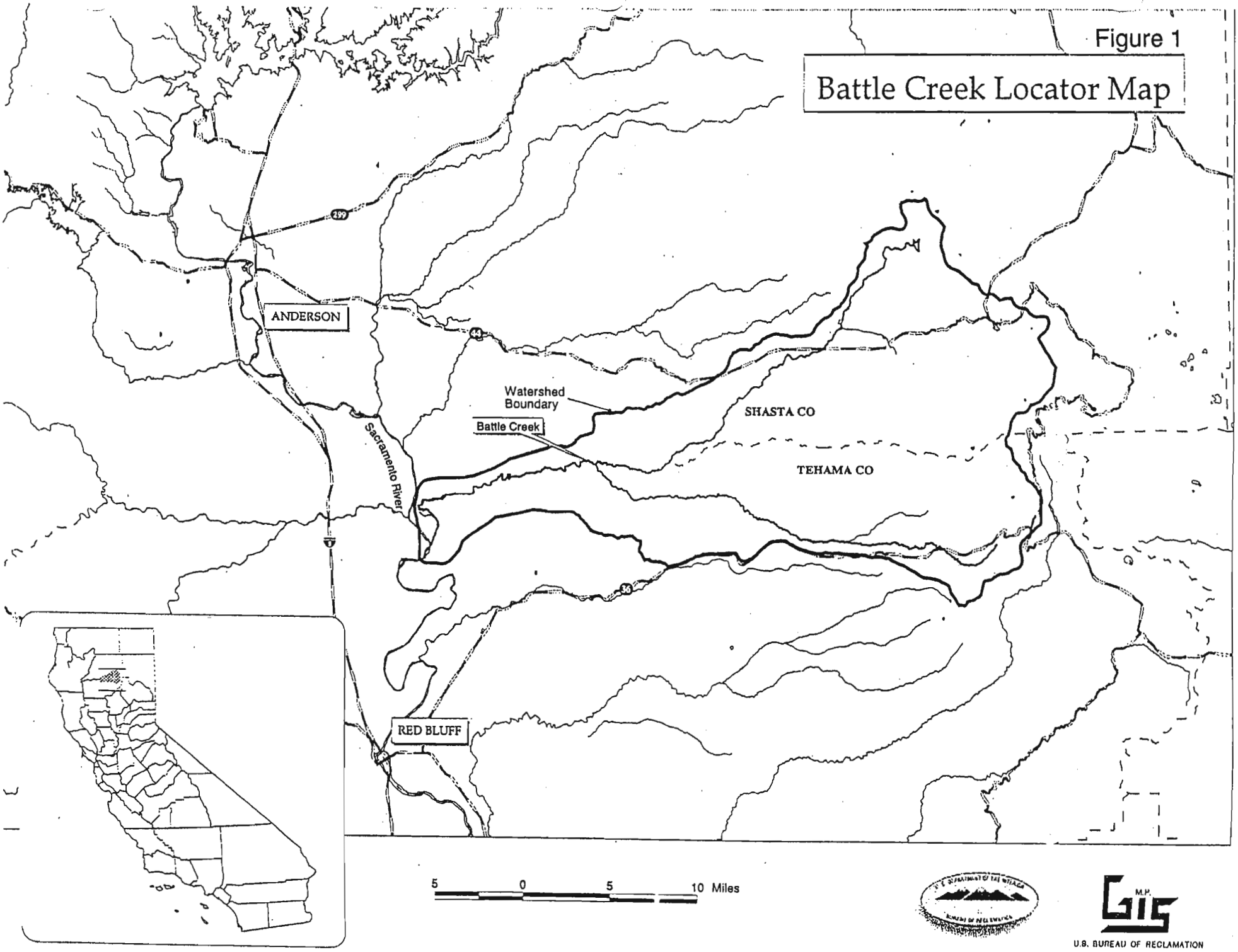
2600 V Street
Sacramento CA 95818-191

Mr. Michael B. Ward
Terraqua Environmental Consulting
PO Box 85
Wauconda WA 98859

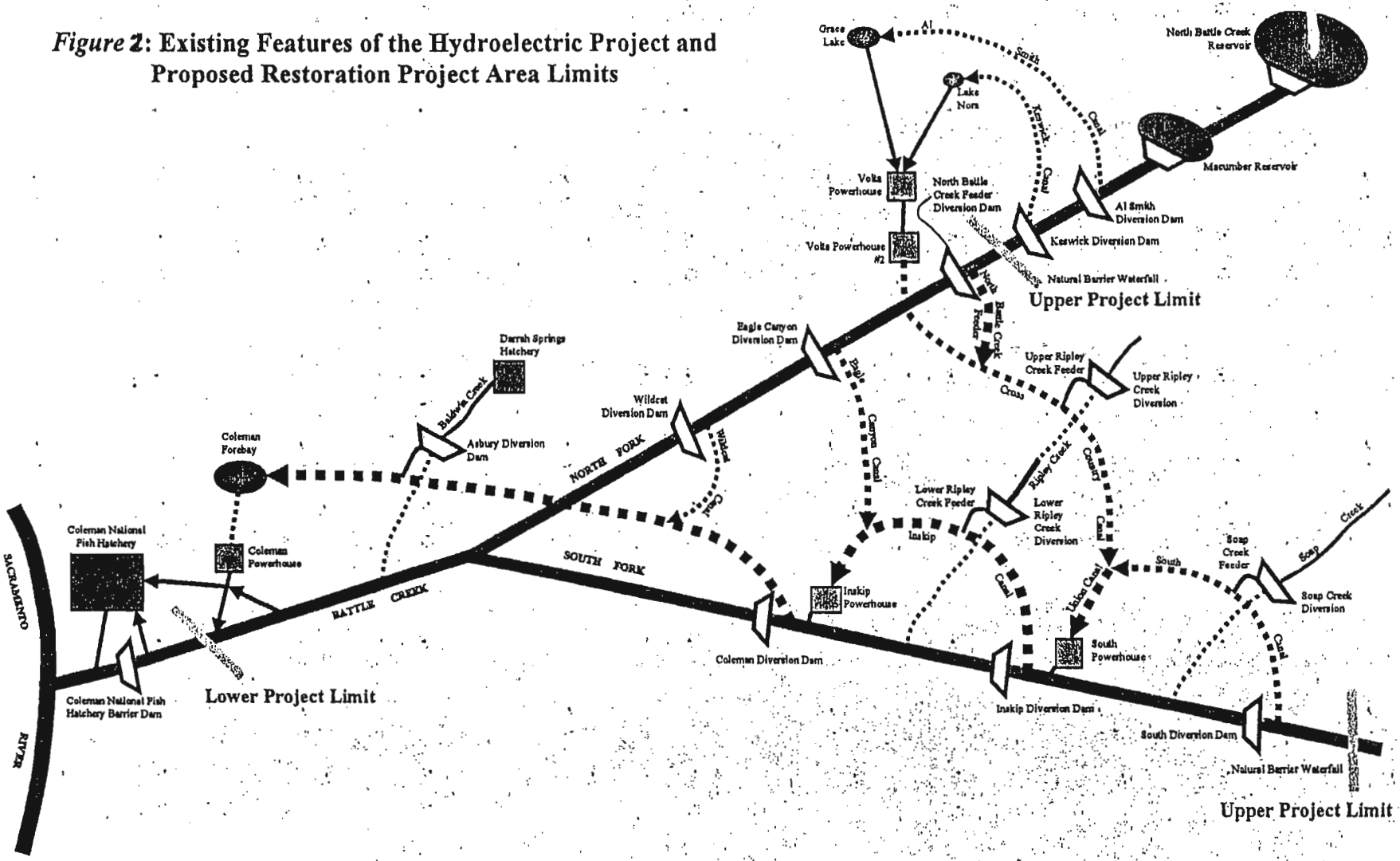
Figure 1

Battle Creek Locator Map



U.S. BUREAU OF RECLAMATION

Figure 2: Existing Features of the Hydroelectric Project and Proposed Restoration Project Area Limits



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W2605
Sacramento, California 95825

IN REPLY REFER TO:
1-1-00-SP-1576

RPL 5/3

April 27, 2000

Memorandum

To: Bureau of Reclamation, Mid-Pacific Regional Office, Sacramento, California
MP410 (Mary Marshall)

From: Chief, Endangered Species Division, Sacramento Fish and Wildlife Office, Fish and Wildlife Service, Sacramento, California

Subject: Species List for Battle Creek Watershed in Shasta and Tehama Counties, California

We are sending the enclosed list in response to your letter dated April 18, 2000, requesting information about endangered and threatened species (Enclosure A). These lists fulfill the requirement of the Fish and Wildlife Service (Service) to provide species lists under section 7(c) of the Endangered Species Act of 1973, as amended (Act).

The Service used the information in your letter to locate the proposed project on a U.S. Geological Survey (USGS) 7.5 minute quadrangle map. The animal species on the Enclosure A quad list are those species we believe may occur within, *or be affected by projects within*, the following USGS quads, where your project is planned: 626C, Lyonsville; 627A, Manton; 627B, Shingletown; 627D, Finley Butte; 628A, Tuscan Buttes NE; and 645D, Hagaman Gulch.

Any plants on the quad list are ones *that have actually been observed* in that quad. Plants may occur in a quad without having been observed there. Therefore we have included a species list for the whole county in which your project occurs. We recommend that you survey for any relevant plants shown on this list.

Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.

If a species has been listed as threatened or endangered by the State of California, but not by us nor by the National Marine Fisheries Service, it will appear on your list as a Species of Concern. *However you must contact the California Department of Fish and Game for official information about these species.* Call (916) 322-2493 or write Marketing Manager, California Department of Fish and Game, Natural Diversity Data Base, 1416 Ninth Street, Sacramento, California 95814.

Some of the species listed in Attachment A may not be affected by the proposed action. A trained biologist or botanist, familiar with the habitat requirements of the listed species, should determine whether these species or habitats suitable for them may be affected. For plants, we recommend using the enclosed Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Species (Enclosure C).

Some pertinent information concerning the distribution, life history, habitat requirements, and published references for the listed species is available upon request. This information may be helpful in preparing the biological assessment for this project, if one is required. Please see Attachment B for a discussion of the responsibilities Federal agencies have under section 7(c) of the Act and the conditions under which a biological assessment must be prepared by the lead Federal agency or its designated non-Federal representative.

Formal consultation, under 50 CFR § 402.14, should be initiated if you determine that a listed species may be affected by the proposed project. If you determine that a proposed species may be adversely affected, you should consider requesting a conference with our office under 50 CFR § 402.10. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office.

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as *critical habitat*. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal. Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, this will be noted on the species list. Maps and boundary descriptions of the critical habitat may be found in the *Federal Register*. The information is also reprinted in the *Code of Federal Regulations* (50 **CFR** 17.95).

Candidate species are being reviewed for possible listing. Contact our office if your biological assessment reveals any candidate species that might be adversely affected. Although they currently have no protection under the Endangered Species Act, one or more of them could be

proposed and listed before your project is completed. By considering them from the beginning, you could avoid problems later.

Your list may contain a section called *Species of Concern.* This term includes former *category 2 candidate species* and other plants and animals of concern to the Service and other Federal, State and private conservation agencies and organizations. Some of these species may become candidate species in the future.

If the proposed project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by the U.S. Army Corps of Engineers (Corps), a Corps permit will be required, under section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act. Impacts to wetland habitats require site specific mitigation and monitoring. You may request a copy of the Service's General Mitigation and Monitoring Guidelines or submit a detailed description of the proposed impacts for specific comments and recommendations. If you have any questions regarding wetlands, contact Mark Littlefield at (916) 414-6580.

We appreciate your concern for endangered species. Please contact Harry Mossman, Biological Technician, at (916) 414-6650, if you have any questions about the attached list or your responsibilities under the Endangered Species Act. For the fastest response to species list requests, address them to the attention of Mr. Mossman at this address. You may fax requests to him at 414-6712 or 6713.

Sincerely,

fn Karen J. Miller

Attachments

ATTACHMENT A

Endangered and Threatened Species that May Occur in
or be Affected by Projects in the Selected Quads Listed Below
Reference File No. 1-1-00-SP-1576

EIR/EIS for Battle Creek Restoration, Shasta and Tehama Counties, California

April 26, 2000

QUAD : 626C LYONSVILLE

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

California wolverine, *Gulo gulo luteus* (CA)

Sierra Nevada snowshoe hare, *Lepus americanus tahoensis* (SC)

Pacific fisher, *Martes pennanti pacifica* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

QUAD : 627A MANTON

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

white-faced ibis, *Plegadis chihi* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Plants

Butte fritillary, *Fritillaria eastwoodiae* (SC)

Ahart's whitlow-wort, *Paronychia ahartii* (SC)

QUAD : 627B SHINGLETOWN

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

ferruginous hawk, *Buteo regalis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

white-faced ibis, *Plegadis chihi* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

Butte fritillary, *Fritillaria eastwoodiae* (SC)

QUAD : 627D FINLEY BUTTE

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

white-faced ibis, *Plegadis chihi* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

QUAD : 628A TUSCAN BUTTES NE

Listed Species

Birds

Aleutian Canada goose, *Branta canadensis leucopareia* (T)

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

slender Orcutt grass, *Orcuttia tenuis* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Birds

ferruginous hawk, *Buteo regalis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

white-faced ibis, *Plegadis chihi* (SC)

bank swallow, *Riparia riparia* (CA)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

river lamprey, *Lampetra ayresi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)

Sacramento anthicid beetle, *Anthicus sacramento* (SC)

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

valley sagittaria, *Sagittaria sanfordii* (SC)

QUAD : 645D HAGAMAN GULCH

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

spotted bat, *Euderma maculatum* (SC)

California wolverine, *Gulo gulo luteus* (CA)

Pacific fisher, *Martes pennanti pacifica* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

Birds

ferruginous hawk, *Buteo regalis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

white-faced ibis, *Plegadis chihi* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

silky cryptantha, *Cryptantha crinita* (SC)

Butte fritillary, *Fritillaria eastwoodiae* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	May be endangered or threatened. Not enough biological information has been gathered to support listing at this time.
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
(*)	*Extirpated*	Possibly extirpated from this quad.
(**)	*Extinct*	Possibly extinct.
	Critical Habitat	Area essential to the conservation of a species.

Attachment B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a) Consultation/Conference

Requires: (1) federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species; (2) Consultation with FWS when a federal action may affect a listed endangered or threatened species to insure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the federal agency after determining the action may affect a listed species; and (3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7(c) Biological Assessment-Major Construction Activity[1]

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action[2] on listed and proposed species. The process begins with a Federal agency requesting from FWS a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion in the BA: an on-site inspection of the area affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat is present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirement; interviews with experts, including those within FWS, State conservation departments, universities and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of indirect effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, and problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

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[1] A construction project (or other undertaking having similar physical impacts) which is a major federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332(2)C).

[2] "Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action.

Attachment C

GUIDELINES FOR CONDUCTING AND REPORTING BOTANICAL INVENTORIES FOR FEDERALLY LISTED, PROPOSED AND CANDIDATE PLANTS

(September 23, 1996)

These guidelines describe protocols for conducting botanical inventories for federally listed, proposed and candidate plants, and describe minimum standards for reporting results. The Service will use, in part, the information outlined below in determining whether the project under consideration may affect any listed, proposed or candidate plants, and in determining the direct, indirect, and cumulative effects.

Field inventories should be conducted in a manner that will locate listed, proposed, or candidate species (target species) that may be present. The entire project area requires a botanical inventory, except developed agricultural lands. The field investigator(s) should:

1. Conduct inventories at the appropriate times of year when target species are present and identifiable. Inventories will include all potential habitats. Multiple site visits during a field season may be necessary to make observations during the appropriate phenological stage of all target species.

2. If available, use a regional or local reference population to obtain a visual image of the target species and associated habitat(s). If access to reference populations(s) is not available, investigators should study specimens from local herbaria.

3. List every species observed and compile a comprehensive list of vascular plants for the entire project site. Vascular plants need to be identified to a taxonomic level which allows rarity to be determined.

4. Report results of botanical field inventories that include:

    a. a description of the biological setting, including plant community, topography, soils, potential habitat of target species, and an evaluation of environmental conditions, such as timing or quantity of rainfall, which may influence the performance and expression of target species

    b. a map of project location showing scale, orientation, project boundaries, parcel size, and map quadrangle name

    c. survey dates and survey methodology(ies)

    d. if a reference population is available, provide a written narrative describing the target species reference population(s) used, and date(s) when observations were made

    e. a comprehensive list of all vascular plants occurring on the project site for each habitat type

    f. current and historic land uses of the habitat(s) and degree of site alteration

g. presence of target species off-site on adjacent parcels, if known.

h. an assessment of the biological significance or ecological quality of the project site in a local and regional context

5. If target species is(are) found, report results that additionally include:

a. a map showing federally listed, proposed and candidate species distribution as they relate to the proposed project

b. if target species is (are) associated with wetlands, a description of the direction and integrity of flow of surface hydrology. If target species is (are) affected by adjacent off-site hydrological influences, describe these factors.

c. the target species phenology and microhabitat, an estimate of the number of individuals of each target species per unit area; identify areas of high, medium and low density of target species over the project site, and provide acres of occupied habitat of target species. Investigators could provide color slides, photos or color copies of photos of target species or representative habitats to support information or descriptions contained in reports.

d. the degree of impact(s), if any, of the proposed project as it relates to the potential unoccupied habitat of target habitat.

6. Document findings of target species by completing California Native Species Field Survey Form(s) and submit form(s) to the Natural Diversity Data Base. Documentation of determinations and/or voucher specimens may be useful in cases of taxonomic ambiguities, habitat or range extensions.

7. Report as an addendum to the original survey, any change in abundance and distribution of target plants in subsequent years. Project sites with inventories older than 3 years from the current date of project proposal submission will likely need additional survey. Investigators need to assess whether an additional survey(s) is (are) needed.

8. Adverse conditions may prevent investigator(s) from determining presence or identifying some target species in potential habitat(s) of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any year. An additional botanical inventory(ies) in a subsequent year(s) may be required if adverse conditions occur in a potential habitat(s). Investigator(s) may need to discuss such conditions.

9. Guidance from California Department of Fish and Game (CDFG) regarding plant and plant community surveys can be found in Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities, 1984. Please contact the CDFG Regional Office for questions regarding the CDFG guidelines and for assistance in determining any applicable State regulatory requirements.

Endangered and Threatened Species that May Occur in or be Affected by
Projects in the Area of the Following California Counties
Reference File No. 1-1-00-sp-1576
April 26, 2000

SHASTA COUNTY

Listed Species

Birds

Aleutian Canada goose, *Branta canadensis leucopareia* (T)
bald eagle, *Haliaeetus leucocephalus* (T)
Critical habitat, northern spotted owl, *Strix occidentalis caurina* (T)
northern spotted owl, *Strix occidentalis caurina* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)
winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)
delta smelt, *Hypomesus transpacificus* (T)
Central Valley steelhead, *Oncorhynchus mykiss* (T)
Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)
Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool tadpole shrimp, *Lepidurus packardi* (E)
Shasta crayfish, *Pacifastacus fortis* (E)
vernal pool fairy shrimp, *Branchinecta lynchi* (T)
valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants

Greene's tuctoria, *Tuctoria greenei* (E)
slender Orcutt grass, *Orcuttia tenuis* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

McCloud River redband trout, *Oncorhynchus (=Salmo) mykiss ssp.* (C)
Klamath Mts. Province steelhead, *Oncorhynchus mykiss* (C)
Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

California wolverine, *Gulo gulo luteus* (CA)

pygmy rabbit, *Brachylagus idahoensis* (SC)
pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)
Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)
spotted bat, *Euderma maculatum* (SC)
Sierra Nevada snowshoe hare, *Lepus americanus tahoensis* (SC)
American (=pine) marten, *Martes americana* (SC)
Pacific fisher, *Martes pennanti pacifica* (SC)
small-footed myotis bat, *Myotis ciliolabrum* (SC)
long-eared myotis bat, *Myotis evotis* (SC)
fringed myotis bat, *Myotis thysanodes* (SC)
long-legged myotis bat, *Myotis volans* (SC)
Yuma myotis bat, *Myotis yumanensis* (SC)
San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

little willow flycatcher, *Empidonax traillii brewsteri* (CA)
greater sandhill crane, *Grus canadensis tabida* (CA)
bank swallow, *Riparia riparia* (CA)
American peregrine falcon, *Falco peregrinus anatum* (D)
northern goshawk, *Accipiter gentilis* (SC)
tricolored blackbird, *Agelaius tricolor* (SC)
grasshopper sparrow, *Ammodramus savannarum* (SC)
Bell's sage sparrow, *Amphispiza belli belli* (SC)
short-eared owl, *Asio flammeus* (SC)
western burrowing owl, *Athene cunicularia hypugea* (SC)
American bittern, *Botaurus lentiginosus* (SC)
ferruginous hawk, *Buteo regalis* (SC)
Lawrence's goldfinch, *Carduelis lawrencei* (SC)
Vaux's swift, *Chaetura vauxi* (SC)
black tern, *Chlidonias niger* (SC)
lark sparrow, *Chondestes grammacus* (SC)
olive-sided flycatcher, *Contopus cooperi* (SC)
black swift, *Cypseloides niger* (SC)
hermit warbler, *Dendroica occidentalis* (SC)
common loon, *Gavia immer* (SC)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
white-faced ibis, *Plegadis chihi* (SC)
rufous hummingbird, *Selasphorus rufus* (SC)
red-breasted sapsucker, *Sphyrapicus ruber* (SC)

Brewer's sparrow, *Spizella breweri* (SC)
California spotted owl, *Strix occidentalis occidentalis* (SC)
Bewick's wren, *Thryomanes bewickii* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

Shasta salamander, *Hydromantes shastae* (CA)
tailed frog, *Ascaphus truei* (SC)
foothill yellow-legged frog, *Rana boylii* (SC)
Cascades frog, *Rana cascadae* (SC)
western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

rough sculpin, *Cottus asperrimus* (CA)
green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Pit roach, *Lavinia symmetricus mitrulus* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Trinity (=California) bristlesnail, *Monadenia setosa* (CA)
Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
Sacramento anthicid beetle, *Anthicus sacramento* (SC)
confusion caddisfly, *Cryptochia shasta* (SC)
King's Creek ecclisomyian caddisfly, *Ecclisomyia bilera* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)
Shasta sideband snail, *Monadenia troglodytes* (SC)
Siskiyou ground beetle, *Nebria gebleri siskiyouensis* (SC)
Trinity Alps ground beetle, *Nebria sahlbergii triad* (SC)
King's Creek parapsyche caddisfly, *Parapsyche extensa* (SC)
Castle Crags rhyacophilan caddisfly, *Rhyacophila lineata* (SC)
bilobed rhyacophilan caddisfly, *Rhyacophila mosana* (SC)

Plants

Klamath manzanita, *Arctostaphylos klamathensis* (SC)
Suksdorf's milk-vetch, *Astragalus pulsiferae var. suksdorfii* (SC)
long-haired star-tulip, *Calochortus longebarbatus var. longebarbatus* (SC)
Wilkins' harebell, *Campanula wilkinsiana* (SC)
arid northern clarkia, *Clarkia borealis ssp. arida* (SC)
silky cryptantha, *Cryptantha crinita* (SC)
clustered lady's-slipper, *Cypripedium fasciculatum* (SC)

Oregon fireweed, *Epilobium oreganum* (SC)
Butte fritillary, *Fritillaria eastwoodiae* (SC)
Howell's lewisia, *Lewisia cotyledon var. howellii* (SC)
Bellinger's meadowfoam, *Limnanthes floccosa ssp. bellingeriana* (SC)
Stebbins' madia, *Madia stebbinsii* (SC)
The Lassics sandwort, *Minuartia decumbens* (SC)
Ahart's whitlow-wort, *Paronychia ahartii* (SC)
thread-leaved penstemon, *Penstemon filiformis* (SC)
Trinity (Scott Mountain) phacelia, *Phacelia dalesiana* (SC)
Devil's Garden pogogyne, *Pogogyne floribunda* (SC)
Howell's alkali grass, *Puccinellia howellii* (SC)
valley sagittaria, *Sagittaria sanfordii* (SC)
Canyon Creek stonecrop, *Sedum paradisum* (SC)
Butte County (western) catchfly, *Silene occidentalis ssp. longistipitata* (SC)
Mt. Lassen smelowskia, *Smelowskia ovalis ssp. congesta* (SC)
Pit River jewelflower, *Streptanthus sp. nov. /ined. (Shasta Co.)* (SC)

TEHAMA COUNTY

Listed Species

Birds

Aleutian Canada goose, *Branta canadensis leucopareia* (T)
bald eagle, *Haliaeetus leucocephalus* (T)
Critical habitat, northern spotted owl, *Strix occidentalis caurina* (T)
northern spotted owl, *Strix occidentalis caurina* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)
winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)
delta smelt, *Hypomesus transpacificus* (T)
Central Valley steelhead, *Oncorhynchus mykiss* (T)
Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)
Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

Conservancy fairy shrimp, *Branchinecta conservatio* (E)
vernal pool tadpole shrimp, *Lepidurus packardi* (E)
vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants

hairy Orcutt grass, *Orcuttia pilosa* (E)

Greene's tuctoria, *Tuctoria greenei* (E)

Hoover's spurge, *Chamaesyce hooveri* (T)

slender Orcutt grass, *Orcuttia tenuis* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (PX)

Candidate Species

Fish

Klamath Mts. Province steelhead, *Oncorhynchus mykiss* (C)

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Species of Concern

Mammals

California wolverine, *Gulo gulo luteus* (CA)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

spotted bat, *Euderma maculatum* (SC)

Sierra Nevada snowshoe hare, *Lepus americanus tahoensis* (SC)

Pacific fisher, *Martes pennanti pacifica* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

Swainson's hawk, *Buteo Swainsoni* (CA)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

greater sandhill crane, *Grus canadensis tabida* (CA)

bank swallow, *Riparia riparia* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

grasshopper sparrow, *Ammodramus savannarum* (SC)

Bell's sage sparrow, *Amphispiza belli belli* (SC)

short-eared owl, *Asio flammeus* (SC)

western burrowing owl, *Athene cunicularia hypugea* (SC)
American bittern, *Botaurus lentiginosus* (SC)
ferruginous hawk, *Buteo regalis* (SC)
Lawrence's goldfinch, *Carduelis lawrencei* (SC)
Vaux's swift, *Chaetura vauxi* (SC)
black tern, *Chlidonias niger* (SC)
lark sparrow, *Chondestes grammacus* (SC)
black swift, *Cypseloides niger* (SC)
hermit warbler, *Dendroica occidentalis* (SC)
white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
white-faced ibis, *Plegadis chihi* (SC)
rufous hummingbird, *Selasphorus rufus* (SC)
Brewer's sparrow, *Spizella breweri* (SC)
California spotted owl, *Strix occidentalis occidentalis* (SC)
Bewick's wren, *Thryomanes bewickii* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

tailed frog, *Ascaphus truei* (SC)
foothill yellow-legged frog, *Rana boylii* (SC)
mountain yellow-legged frog, *Rana muscosa* (SC)
western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
Sacramento anthicid beetle, *Anthicus sacramento* (SC)
Leech's skyline diving beetle, *Hydroporus leechi* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

Indian Valley brodiaea, *Brodiaea coronaria ssp. rosea* (CA)
upswept moonwort, *Botrychium ascendens* (SC)
scalloped moonwort, *Botrychium crenulatum* (SC)

Wilkins' harebell, *Campanula wilkinsiana* (SC)
silky cryptantha, *Cryptantha crinita* (SC)
clustered lady's-slipper, *Cypripedium fasciculatum* (SC)
Oregon fireweed, *Epilobium oreganum* (SC)
Brandegee's woolly-star, *Eriastrum brandegeae* (SC)
Butte fritillary, *Fritillaria eastwoodiae* (SC)
adobe lily, *Fritillaria pluriflora* (SC)
Tehama dwarf-flax, *Hesperolinon tehamense* (SC)
legenere, *Legenere limosa* (SC)
Mt. Tedoc linanthus, *Linanthus nuttallii ssp. howellii* (SC)
red-flowered lotus, *Lotus rubriflorus* (SC)
Anthony Peak lupine, *Lupinus antoninus* (SC)
Stebbins' madia, *Madia stebbinsii* (SC)
The Lassics sandwort, *Minuartia decumbens* (SC)
Ahart's whitlow-wort, *Paronychia ahartii* (SC)
valley sagittaria, *Sagittaria sanfordii* (SC)
Tracy's sanicle, *Sanicula tracyi* (SC)
Butte County (western) catchfly, *Silene occidentalis ssp. longistipitata* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	Other species of concern to the Service.
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
*	*Extirpated*	Possibly extirpated from the area.
**	*Extinct*	Possibly extinct
	Critical Habitat	Area essential to the conservation of a species.

Appendix O

Special-Status Species Accounts

Appendix O

Special-Status Species Accounts

This appendix describes the legal status, distribution, habitat association, and reasons for decline for the following special-status species that are evaluated in the Battle Creek Action Specific Implementation Plan (ASIP) and the Environmental Impact Statement/Environmental Impact Report (EIS/EIR): Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-run Chinook salmon, Central Valley steelhead, valley elderberry longhorn beetle (VELB), foothill yellow-legged frog, northwestern pond turtle, osprey, bald eagle, sharp-shinned hawk, Cooper's hawk, golden eagle, American peregrine falcon, California black rail, California spotted owl, Vaux's swift, willow flycatcher, special-status bat species, yellow breasted chat, and ringtail.

Sacramento River Winter-Run Chinook Salmon

Legal Status

The Sacramento River winter-run Chinook salmon is listed as endangered under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Battle Creek is also Essential Fish Habitat (Section 305[b][2]–[4] of the Magnuson-Stevens Act) for winter-run Chinook salmon.

Description

Spawning adults are olive brown to dark maroon without conspicuous streaking or blotches on the sides. Spawning males are darker than females and have hooked jaws and slightly humped backs. There are numerous small black spots on the back, dorsal fin, and both lobes of the tail in both sexes. They can be distinguished from other spawning salmon by color pattern, particularly spotting on the caudal fin and black gums of the lower jaw.

During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Newly emerged fry remain in shallow, lower-velocity edgewaters, particularly where debris congregates and makes the fish less visible to predators (California Department of Fish and Game

1998). Juveniles are distinguished by parr marks during freshwater residence (Moyle 2002). Prior to entering the ocean, juveniles loose their parr marks and become silvery.

Distribution

Historically, winter-run Chinook salmon spawned in the upper reaches of the Sacramento River and its major tributaries, the McCloud and Pit Rivers. Shasta and Keswick Dams block access to historical spawning and rearing areas and restrict spawning and rearing to the Sacramento River downstream of Keswick Dam. Based on counts at Red Bluff Diversion Dam (RBDD), habitat downstream of Keswick Dam apparently maintained relatively high abundance of winter-run Chinook salmon, with spawning populations averaging tens of thousands of adult salmon. Since 1970, winter-run adult abundance has declined to current levels of generally less than 1,000 and, in some years, less than 500. Impedance of migration by RBDD, deterioration of water temperature conditions below Keswick Dam, and other factors contributed to the decline.

Adult winter-run Chinook salmon enter the Battle Creek watershed between January and July, with the peak of the migration occurring at the Coleman National Fish Hatchery (CNFH) barrier dam in late April (USFWS 1996). The peak of the winter-run Chinook salmon spawning period is mid-June, when erratic winter flows stabilize and subsequent offspring can take advantage of the cooling effects of headwater springs. Most juvenile winter-run Chinook salmon leave the Sacramento River watershed by mid-March of the following year (USFWS 1993).

The winter-run Chinook salmon population presently exists in the Restoration Project area at remnant levels; few, if any, naturally spawned adult winter-run Chinook salmon have been documented in recent years (USFWS 2002).

Winter-run Chinook salmon are indigenous to Battle Creek (Kier Associates 1999b). However, no reliable records exist that document the size of the population prior to 1995. Historically, systematic counts of adult winter-run Chinook salmon had not been made because of unfavorable environmental conditions during the high-flow winter months when these fish migrate upstream.

The occurrence of successfully reproducing winter-run Chinook salmon in Battle Creek was first documented in 1898 and again in 1900, when the U.S. Fish Commission collected salmon fry in specially designed nets (Rutter 1902, 1903). Small, newly emerged salmon fry (of a size that could only have been winter-run Chinook salmon) were captured in Battle Creek in September and early October (Rutter 1902, 1903; USFWS 1992).

A spawning run of adult winter-run Chinook salmon in Battle Creek was documented during the late 1940s and early 1950s, when the CNFH began late fall–run Chinook salmon egg-taking operations (USFWS 1987). From the 1950s

to the early 1960s, the California Department of Fish and Game (DFG) (1965) reported the existence of winter-run Chinook salmon in Battle Creek during a statewide inventory of steelhead and salmon resources, but provided no estimate of the size of the population in Battle Creek. The CNFH trapped winter-run Chinook salmon in Battle Creek during the late 1950s, including 309 winter-run Chinook salmon in 1958 (USFWS 1963). Documentation of 24 adult winter-run Chinook salmon in South Fork Battle Creek in 1965 (DFG 1966) indicates that winter-run Chinook salmon populations persisted in Battle Creek during the mid-1960s. No records exist that document the size of winter-run Chinook salmon populations in Battle Creek from the mid-1960s to the mid-1990s.

Since 1995, as part of its brood stock collection efforts, the USFWS has counted winter-run Chinook salmon in Battle Creek at the CNFH during the September-through-February portion of the winter-run Chinook salmon migration period. Winter-run Chinook salmon are also counted from March through June at the CNFH barrier weir, using trapping and videography. Altogether, these monitoring techniques account for most of the December-to-August spawning and migration period of the winter-run Chinook salmon, but several sources of error associated with each of these counting methods suggest that recent counts may underestimate the number of winter-run Chinook salmon in Battle Creek.

Partial counts, derived from the methods used since 1995, have indicated that hatchery-origin winter-run Chinook salmon from past artificial propagation efforts at the CNFH (USFWS 1995, 1996; Smith pers. comm.) have returned to Battle Creek or that Battle Creek receives stray winter-run Chinook salmon from other artificial propagation efforts. The catch of nonhatchery-origin winter-run Chinook salmon in 1998 (USFWS 1998) and 2000 indicates that Battle Creek still supported a remnant population (fewer than 10 documented fish) of naturally produced winter-run Chinook salmon. Winter-run Chinook salmon may not currently occur in Battle Creek (USFWS 2002).

Habitat Association

Winter-run adults migrate through the Delta and into the Sacramento River in winter and early spring and spawn in the mainstem Sacramento River and Battle Creek during late spring and early summer (Moyle et al. 1995). Chinook salmon require cold, freshwater streams with suitable gravel for reproduction. Females deposit their eggs in nests in gravel-bottom areas of relatively swift water. For maximum survival of incubating eggs and larvae, water temperatures must be between 39°F and 54°F. After emerging, many Chinook salmon fry tend to seek shallow, nearshore habitat with slow water velocities and move to progressively deeper, faster water as they grow. Juvenile salmon rear in the Sacramento River in summer and fall, gradually moving downstream before entering the Delta from November to March. Some emerging fry are transported downstream into lower portions of the Sacramento River and lower tributaries, where they rear in shallow marsh and streamside habitats. Juveniles typically rear in fresh water for up to 5 months before migrating to sea when they reach a length of 4 to 6 inches.

They migrate out of the Delta to the Bay from February through April. Chinook salmon spend 2–4 years maturing in the ocean before returning to their natal streams to spawn. All adult salmon die after spawning (Moyle 2002, Allen and Hassler 1986).

Reasons for Decline

The winter-run Chinook salmon decline has been related to a variety of factors, including loss of spawning and rearing habitat and high summer water temperatures below Keswick Dam; blockage of adult migration at RBDD; predation on juveniles at RBDD; and loss of juveniles to entrainment into unscreened or poorly screened diversions, including Anderson-Cottonwood Irrigation District (ACID), Glenn-Colusa Irrigation District (GCID), and RBDD diversions, and south-Delta Central Valley Project (CVP) and State Water Project (SWP) pumping plants. Overharvest in sport and commercial fisheries may have contributed to depressed populations.

Within Battle Creek, the decline of salmon and steelhead in the Sacramento River and its tributaries is attributed to a number of factors that have acted upon the populations in a cumulative fashion over decades. These factors include reduced key habitat quantity, reduced migration habitat, warm water temperature, increased contaminants, entrainment in diversions, increased predation, reduced food, hatchery effects, and harvest.

Key Habitat Quantity

Battle Creek is a high-gradient, headwater stream with an elevation change in excess of 5,000 feet over 50 miles. The creek flows through remote, deep-shaded canyons and riparian corridors with little development near its banks. Battle Creek flow consists of rainfall and snowmelt from the western slope of the Cascade Mountain Range, complemented by the year-round flow of natural springs.

Substrate size ranges from sand to boulder with predominantly gravel and cobble throughout the system. The total estimated area of spawning gravel is 57,000 square feet in the mainstem above Coleman Powerhouse; 81,000 square feet in the North Fork Battle Creek up to the barrier waterfall; and 28,000 square feet in the South Fork Battle Creek up to Panther Creek (Thomas R. Payne and Associates 1994). Concentration and types of gravel deposits are directly correlated to stream gradient. Mobility studies imply that gravel in Battle Creek moves with enough frequency to keep it clean of fine sediment and loose enough to support spawning. The Battle Creek channel is characterized by alternating pools and riffles. The channel form, along with boulders, ledges, and turbulence, provides key elements of rearing habitat for fish species.

The primary factor affecting spawning and rearing habitat area in Battle Creek is streamflow. Habitat quality is also significantly affected by temperature as influenced by diversion of cold spring water accretions away from adjacent stream sections and reduced flows in the stream below dams. Diversions for power generation have substantially reduced streamflow in all the reaches of Battle Creek downstream of Keswick Diversion Dam and South Diversion Dam. Although minimum flows are maintained, reduced streamflow has substantially reduced spawning and rearing habitat area available to Chinook salmon, steelhead, and other fish species.

Limited information is available for flow-habitat relationships on Soap, Ripley, and Baldwin Creeks. However, the Federal Energy Regulatory Commission (FERC) license–required minimum flow of 0 cubic feet per second (cfs) would not provide sufficient water to sustain fish. Occurrence of fish in the reaches below the existing diversion dams is limited under the No Action Alternative.

Spawning habitat area may limit the production of juveniles and subsequent adult abundance of some species. Spawning habitat area for fall-/late fall–run Chinook salmon, which compose more than 90% of the Chinook salmon returning to the Central Valley streams, has been identified as limiting their population abundance. Spawning habitat area has not been identified as a limiting factor for the less-abundant winter-run and spring-run Chinook salmon (National Oceanic and Atmospheric Administration, National Marine Fisheries Service 1997; USFWS 1996), although habitat may be limiting in some streams (e.g., Battle Creek), especially during years of high adult abundance.

Spawning habitat area is defined by a number of factors, such as gravel size and quality and water depth and velocity. Although maximum usable gravel size depends on fish size, a number of studies have determined that Chinook salmon require gravel ranging from approximately 0.3 cm (0.1 inch) to 15 cm (5.9 inches) in diameter (Raleigh et al. 1986). Steelhead prefer substrate no larger than 10 cm (3.9 inches) (Reiser and Bjornn 1979). Salmonids spawn in water depths that range from a few inches to several feet. A minimum depth of 0.8 foot for Chinook salmon and steelhead spawning has been widely used in the literature and is within the range observed in some Central Valley rivers (DFG 1991). Velocity that supports spawning ranges from 0.8 foot per second to 3.8 feet per second (USFWS 1994).

Rearing habitat area may limit the production of juveniles and subsequent adult abundance of some species. Rearing habitat for salmonids is defined by environmental conditions such as water temperature, dissolved oxygen, turbidity, substrate, water velocity, water depth, and cover (Healey 1993; Jackson 1992; Reiser and Bjornn 1979).

Rearing area varies with flow. High flow increases the area available to juvenile Chinook salmon because they extensively use submerged terrestrial vegetation on the channel edge and the floodplain. Deeper inundation provides more overhead cover and protection from avian and terrestrial predators than shallow water (Everest and Chapman 1972). In broad, low-gradient rivers, change in

flow can greatly increase or decrease the lateral area available to juvenile Chinook salmon, particularly in riffles and shallow glides (Jackson 1992).

Water Temperature

Fish species have different responses to water temperature conditions depending on their physiological adaptations. Salmonids in general have evolved under conditions in which water temperatures are fairly cool. In addition to species-specific thresholds, different life stages have different water temperature requirements. Eggs and larval fish are the most sensitive to changes in water temperature.

Warm water temperature can limit the amount of habitat available and cause mortality of Chinook salmon, steelhead, and other fish species in the Battle Creek system. Primarily weather, channel form and dimension, shade, and flow determine water temperature. Diversion of flow, including spring-water accretions, from Battle Creek substantially warms water temperature, especially from March through October. Flow diversion and subsequent warming substantially reduce the habitat area that can support migration, holding, spawning, and rearing of Chinook salmon and steelhead in Battle Creek (Kier Associates 1999a). Transbasin water diversions from North Fork Battle Creek to the South Fork tend to warm North Fork Battle Creek and cool South Fork Battle Creek. Additional information on water temperature is provided in Section 4.4, Water Quality.

Unsuitable water temperatures for adult salmonids, such as Chinook salmon and steelhead, during upstream migration lead to delayed migration and potential lower reproduction. Elevated summer water temperature in holding areas of Battle Creek causes mortality of spring-run Chinook salmon (USFWS 1996). Warm water temperature and low dissolved oxygen also result in an increase of egg and fry mortality. USFWS (no date) cited elevated water temperatures as limiting factors for fall- and late fall–run Chinook salmon in Battle Creek.

Juvenile salmonid survival, growth, and vulnerability to disease are affected by water temperature. In addition, water temperature affects prey species abundance and predator occurrence and activity. Juvenile salmonids alter their behavior depending on water temperature, including movement to take advantage of local water temperature refugia (e.g., movement into stratified pools, shaded habitat, and subsurface flow) and to improve feeding efficiency (e.g., movement into riffles).

Water temperature in Central Valley rivers frequently exceeds the tolerance of Chinook salmon and steelhead life stages. Based on a literature review, conditions supporting adult Chinook salmon migration are reported to deteriorate as temperature warms between 54ºF and 70ºF (Hallock 1970 as cited in McCullough 1999). For Chinook salmon eggs and larvae, survival during incubation is assumed to decline with warming temperature between 54ºF and 63ºF (Myrick and Cech 2001; Seymour 1956). For juvenile Chinook salmon,

survival is assumed to decline as temperature warms from 64ºF to 75ºF (Myrick and Cech 2001; Rich 1997). Relative to rearing, Chinook salmon require cooler temperatures to complete the parr-smolt transformation and to maximize their saltwater survival. Successful smolt transformation is assumed to deteriorate at temperatures ranging from 63ºF to 73ºF (Baker et al. 1995; Marine 1997).

Winter-run Chinook salmon are the most vulnerable to temperature mortality of all the salmonids occurring in Battle Creek. Winter-run spawning occurs April through August with the peak activity in June. This spawn timing results in the most sensitive life stages (embryos and pre-emergent fry) being exposed to the highest water temperatures of the year during the month of July, thereby leaving them with a greater risk of mortality.

Migration Habitat Conditions

Migration habitat is the specific conditions that support migration of individuals to habitat required for activities essential to survival, growth, and reproduction. Migration habitat is supported by streamflows that provide suitable water velocities and depths.

Absolute barriers mark the terminus of the Restoration Project on North Fork and South Fork Battle Creek at all times. In the steep, high-elevation stream reaches there are natural features in the channel, such as boulders and logs, that can impede passage depending on vertical drop, flow depth, and flow velocity. Eight diversion dams in the project area currently block passage of Chinook salmon, steelhead, and other fish species; a fish barrier at CNFH blocks passage 6 months of the year.

Passage conditions that support migration of Chinook salmon, steelhead, and other fish species in Battle Creek also have been affected by the reduction in streamflow attributable to diversions for power production. Streamflow affects passage conditions, both flows within the range that can be controlled by the Hydroelectric Project, and the high, uncontrolled flows that spill. Natural events, such as floods, can alter physical characteristics of the channel, including depth of pools from which the fish jump, height that must be jumped, water velocity, slope of the streambed, and the length of the slope, all factors affecting passage. An on-site survey identified transitory barriers in 18 locations on North Fork Battle Creek and five locations on South Fork Battle Creek. Passage of all or some adult Chinook salmon and steelhead could be impaired under streamflow conditions in the range controlled by the hydroelectric diversions. Based on the conditions observed at the time of the survey, a general estimate was made of the streamflow allowing passage through the entire reach for all adult salmon and steelhead. On North Fork Battle Creek, obstacles required greater amounts of streamflow for unimpaired passage than on South Fork Battle Creek. In one extreme case on North Fork Battle Creek (river mile 5.14), an especially steep transitory barrier was modified by DFG in 1997 (Warner pers. comm.) to provide numerous ascent routes at more gradual slopes (Kier Associates 1999a).

The North Battle Creek Feeder, Eagle Canyon, Wildcat, Coleman, Inskip, and South Diversion Dams on Battle Creek, as well as Lower Ripley Creek Feeder and Soap Creek Feeder Diversion Dams on its tributaries, potentially block approximately 42 miles of upstream habitat. The fish ladders at Eagle Canyon, Wildcat, and Coleman Diversion Dams are considered ineffective under most flow conditions (California Department of Water Resources 1997, 1998). The fish ladder effective flow range for each diversion dam is between 2 and 7 cfs. The ladder at the South Diversion Dam has an effective flow range between 3 and 35 cfs. The ladders proved impossible to maintain during high flows. During average or wet water years, fish ladders at North Battle Creek Feeder, Eagle Canyon, Wildcat, Inskip, and Coleman Diversion Dams could be ineffective for 3 to 8 months because flow exceeds the maximum effective capacity of the ladders by a factor of 10 or more. Fish ladders at Eagle Canyon and Coleman Diversion Dams were intentionally closed to fish passage under the 1998 Interim Agreement.

In addition to the barriers discussed above, CNFH operates a barrier weir along with a fish ladder 5.5 miles upstream of Battle Creek's confluence with the Sacramento River (USFWS 2001). When the fish ladder is closed, the barrier weir extends across the full width of Battle Creek and obstructs passage of adult steelhead and Chinook salmon to Battle Creek above the hatchery. The barrier is not completely effective and some adult Chinook salmon and steelhead pass the barrier, especially at flow in excess of 350 cfs. The number of adult Chinook salmon passing over the barrier weir has been substantial (several thousand fish). The barrier weir is being redesigned to improve the ability to block upstream migration under all flow conditions. A fish ladder at the barrier weir is operated to manage and monitor passage of adult Chinook salmon into Battle Creek upstream of the weir. The objectives of management currently are to:

- minimize the potential for hybridization between co-occurring, naturally-reproducing runs of Chinook salmon in Battle Creek upstream of the barrier weir;
- minimize the risk of infectious hematopoietic necrosis (IHN) virus being shed into CNFH water supply; and
- monitor passage of salmonids.

Contaminants

In the Sacramento River, industrial and municipal discharge and agricultural runoff introduce contaminants. Organophosphate insecticides, such as carbofuran, chlorpyrifos, and diazinon, are present throughout the Central Valley and are dispersed in agricultural and urban runoff. Contaminants enter rivers in winter runoff and enter the estuary in concentrations that can be toxic to invertebrates (CALFED Bay-Delta Program 2000). Because they accumulate in living organisms, they may become toxic to fish species, especially those life stages that remain in the system year-round and spend considerable time during the early stages of development, such as Chinook salmon and steelhead.

Water samples were collected at eight sites in the Battle Creek watershed and analyzed for metal, total suspended solids (TSS), and oil and grease. The results revealed that each of these parameters was within the U.S. Environmental Protection Agency's (EPA's) recommended levels for aquatic life. Contaminant levels in Battle Creek are relatively low and adverse effects are not currently documented.

Entrainment in Diversions

All fish species are entrained to varying degrees by diversions throughout the Sacramento River system. Fish entrainment and subsequent mortality are a function of the size of the diversion, the location of the diversion, the behavior of the fish, and other factors, such as fish screens, presence of predatory species, and water temperature. Low approach velocities and fish screens are assumed to minimize stress and protect fish from entrainment.

Given that most of the flow is diverted from Battle Creek for power production and that fish screens are absent from all of the diversions, most downstream migrant fish, including steelhead and Chinook salmon, would be entrained. Survival of passage through the power turbines would likely be minimal and entrained fish would be lost from the population.

Predation and Pathogens

Native and nonnative species may cause substantial predation mortality on salmonids and other species. Nonnative fish predators in Battle Creek include brown trout, smallmouth bass, green sunfish, and other species. Although the contribution to mortality is uncertain, predation mortality may reduce survival of juvenile Chinook salmon and steelhead and other species, especially where the stream or river channel has been altered from natural conditions (California Department of Water Resources 1995). The existing diversion dams in the Restoration Project area may create environmental conditions that increase the probability that predator species will capture juvenile Chinook salmon, steelhead, and other species during downstream movement. Water turbulence in the vicinity of the dams and other structures may disorient migrating juvenile Chinook salmon and steelhead, increasing their vulnerability to predators. In addition, changes in flow velocity and depth affect the quality of habitat and potentially increase vulnerability of fish species to predation by other fish species and by birds and mammals.

Steelhead and Chinook salmon that are present in Battle Creek carry pathogens, including IHN. Currently the potential for occurrence of fish pathogens associated with anadromous fishes is likely low because the abundance of Chinook salmon and steelhead is relatively low. Rainbow trout (i.e., the resident form of steelhead) are susceptible to pathogens carried by stocked trout, Chinook salmon, and steelhead. Rainbow trout are relatively abundant in the reaches of

Battle Creek upstream of the diversion dams and in the canals conveying flow diverted from Battle Creek. Existing flows and fish ladder design and operation, including the operation of the fish barrier at CNFH, control the migration and abundance of anadromous fish in Battle Creek and in reaches upstream of the diversion dams. Although data on the incidence of pathogens in wild populations of rainbow trout are not available, the low abundance of Chinook salmon and steelhead in upstream reaches may minimize the incidence of pathogens upstream of diversion dams and in the canals conveying diversions.

Food

Food availability and type affect survival of fish species. Flow affects stream surface area and production of food. A primary factor affecting food production in Battle Creek is streamflow. Diversion for power generation has substantially reduced streamflow in all the reaches of Battle Creek downstream of Keswick Diversion Dam and South Diversion Dam. Although minimum flows are maintained, reduced streamflow has substantially reduced stream area. In addition, diversions entrain food organisms, exporting nutrients from segments of Battle Creek.

The density of adult salmon carcasses has been shown to increase nutrient input to stream systems and contribute to increased growth rates of juvenile salmonids (Wipfli et al. 2002). The historical reduction of Chinook salmon populations also may have reduced food availability and productivity of Battle Creek.

Hatchery

The primary objective of the CNFH is to mitigate the habitat lost when the upper Sacramento River and its tributaries were blocked by the construction of Shasta Dam in the 1940s. CNFH propagates three salmonid stocks: fall-run Chinook salmon, late fall–run Chinook salmon, and steelhead trout (USFWS 2001). The fall- and late fall–run Chinook salmon and steelhead hatchery programs are considered to be integrated with naturally spawning fall Chinook salmon in the upper Sacramento River and Battle Creek (USFWS 2001). Risks that hatchery operations and augmentation may pose to natural populations of steelhead and Chinook salmon include: introduction, spread, or amplification of fish pathogens; deleterious genetic effects of hatchery fish on natural stocks; impedance of migrating fish at the hatchery barrier weir and water intake structures; and exceeding the carrying capacity of riverine, estuarine, and marine habitat.

Harvest

Sport and commercial fishing affects the abundance of adult Chinook salmon and steelhead (sport fishing only) returning to the Sacramento River system,

including Battle Creek. Ocean survival may be reduced by 35–85% (Pacific Fishery Management Council 2002). Ocean and river regulations have been implemented to minimize effects of sport and commercial fishing, especially on winter-run Chinook salmon and steelhead.

Designated Critical Habitat

The portion of the Sacramento River from Keswick Dam to Chipps Island, all waters westward from Chipps Island to the Carquinez Strait bridge, all waters of San Pablo Bay, and all waters of San Francisco Bay north of the San Francisco–Oakland Bay Bridge have been designated as critical habitat (58 Federal Register [FR] 33212, June 16, 1993). Battle Creek is not included within the designated critical habitat.

Central Valley Spring-Run Chinook Salmon

Legal Status

The Central Valley spring-run Chinook salmon is listed as threatened under the ESA and CESA. Battle Creek is also Essential Fish Habitat (Section 305[b][2]–[4] of the Magnuson-Stevens Act) for spring-run Chinook salmon.

Description

See the description for Sacramento River winter-run Chinook salmon above.

Distribution

Historically, the Central Valley spring-run Chinook salmon was one of the most abundant and widely distributed salmon races. Gold mining and agricultural diversions caused the first major declines in spring-run Chinook salmon populations (Moyle et al. 1995). Further extirpations followed construction of major water storage and flood control reservoirs on the Sacramento and San Joaquin Rivers and their major tributaries in the 1940s and 1950s (Moyle et al. 1995; 63 FR 11841, March 9, 1998). Spring-run Chinook salmon have been completely extirpated in the San Joaquin drainage. Wild spring-run Chinook salmon are consistently found in Deer, Mill, and Butte Creeks, which are tributaries to the Sacramento River (Campbell and Moyle 1991; 63 FR 11841, March 9, 1998).

Spring-run Chinook enter the watershed as adults from mid-march until July 1, at which time the ladder at CNFH is closed to prevent early arriving fall-run from entering upstream areas occupied by spring-run. The peak of the run has been observed at the CNFH weir during mid to late May (Brown and Alston 2003). In general, adult spring-run Chinook salmon inhabit cool pools until they spawn from late August to mid-October (DFG 1996c, 1998). Emigration of juvenile spring-run Chinook salmon is highly variable, with observations ranging between spring outmigration of juveniles and fall outmigration of either yearlings or fingerlings (DFG 1998).

The spring-run Chinook salmon population presently exists in the project area at low levels; probably between 50 and 100 adult spring-run Chinook salmon have used the Restoration Project area annually during the past several years, although these population estimates are not precise (USFWS 2002). Current populations of spring-run Chinook salmon appear to be severely depressed compared to populations that existed in the 1940s and 1950s.

Surveys conducted by the USFWS (1940) in the late 1930s and early 1940 reported a small population of spring-run Chinook salmon and a larger run of fall-run Chinook salmon. At the beginning of CNFH operations, from 1943 to 1946, respectively, the hatchery collected 227, 1,181, 468, and 2,450 spring-run Chinook salmon from Battle Creek, indicating that a relatively large population was present in the creek (USFWS 1949). From 1952 to 1956, annual estimates of adult spring-run Chinook salmon in Battle Creek ranged from 1,700 to 2,200 (DFG 1961).

Stream surveys in the early 1960s indicated that spring-run Chinook salmon used various areas of the project area, including Eagle Canyon and South Fork Battle Creek upstream of Panther Creek, but these studies did not provide population estimates (DFG 1966; Tehama County Community Development Group 1983). Spring-run Chinook salmon (40 to 50 adult fish) were again observed in Eagle Canyon in 1970, but no systematic population estimate was provided (DFG 1970; Warner 1998).

From 1995 to 1998, the USFWS estimated the number of spring-run Chinook salmon located in holding habitat upstream of the CNFH barrier dam. These population estimates ranged from about 50 to 100 spring-run Chinook salmon (DFG 1996a; USFWS 1996, 1997, 2001, 2002). From 1998 to 2001, the USFWS counted Chinook salmon in Battle Creek during part of the spring-run Chinook salmon migration period. Although these partial counts did not definitively identify the number of spring-run Chinook salmon that use Battle Creek, it is likely that some fish identified as “nonwinter-run” were indeed spring-run Chinook salmon. These partial counts indicated that perhaps as many as 71 to 100 spring-run Chinook salmon passed the CNFH barrier weir into the project area from 1998 to 2001, but the actual number could be much lower.

Habitat Association

Naturally spawning, spring-run Chinook salmon enter the watershed as adults from mid-March to mid-October, although no specific peak has been observed in the run at the CNFH barrier dam (USFWS 1996). In general, adult spring-run Chinook salmon hold through the summer in cool pools until they spawn from late August to mid-October (DFG 1996c, 1998). Emigration of juvenile spring-run Chinook salmon is highly variable, with observations ranging between spring outmigration of juveniles and fall outmigration of either yearlings or fingerlings (DFG 1998).

Reasons for Decline

Factors related to the decline of spring-run Chinook salmon include loss of habitat in river reaches blocked by dams, degradation of habitat conditions (e.g., water temperature), entrainment in water diversions, and overharvest. The human-caused factor that has had the greatest effect on the abundance of spring-run Chinook salmon runs is loss of habitat, primarily in the rivers upstream of the Delta. Major dams have blocked upstream access to most Chinook salmon habitat in Central Valley rivers and streams, and smaller dams contribute to migration delay. On most Central Valley streams, spring-run Chinook salmon are restricted to habitats with marginal water temperature conditions and limited deep holding areas. Water diversions and reservoir operations affect streamflow, which influences the quantity, quality, and distribution of Chinook salmon spawning and rearing habitat. Water diversions also reduce survival of emigrating juvenile salmonids through direct entrainment losses in unscreened or inadequately screened diversions. Predation on emigrating salmonids at diversion dams, such as RBDD, may also be an important survival factor (U.S. Department of the Interior, Bureau of Reclamation 1983).

For factors affecting decline in Battle Creek, see the description for Sacramento River winter-run Chinook salmon above.

Central Valley Fall-/Late Fall–Run Chinook Salmon

Legal Status

The Central Valley fall-/late fall–run Chinook salmon is a species of concern under the ESA. Battle Creek is Essential Fish Habitat (Section 305[b][2]–[4] of the Magnuson-Stevens Act) for fall-/late fall–run Chinook salmon.

Description

See the general description for Sacramento River winter-run Chinook salmon above.

Distribution

Fall-/late fall–run Chinook salmon are the most abundant and widely distributed of the extant runs of Chinook salmon in the Central Valley, occurring in all of the major tributaries of the Sacramento and San Joaquin Rivers and in may small tributaries (DFG 1994). The most abundant populations are in the mainstem of the Sacramento, Feather, Yuba, and American Rivers. Populations also occur in the Cosumnes, Mokelumne, Stanislaus, Tuolumne, and Merced Rivers.

Fall-run Chinook salmon compose the largest population of Chinook salmon in Battle Creek, but they have been intentionally restricted from entering the Restoration Project area since 1989. During the past 5 years of record, an average of about 95,000 adult fall-run Chinook salmon returned to Battle Creek, of which an average of nearly 34,000 were allowed to enter the CNFH. The remaining fish were excluded from the hatchery and were mostly confined downstream of the CNFH barrier weir and outside the Restoration Project area (Comprehensive Assessment Monitoring Program 2001, USFWS 2001). The abundance of fall-run Chinook salmon in the Battle Creek watershed has increased since about 1993. Fisheries managers have conventionally believed that most of these fall-run Chinook salmon are products of CNFH operations (Kier Associates 1999a). However, recent research suggests that as many as one-third of the fall-run Chinook salmon were the product of hatchery fish that spawn naturally in Battle Creek (USFWS 2001).

From 1985 to 1989, fall-run Chinook salmon were intentionally allowed to pass over the barrier dam. However, from 1986 to 1989, they were intentionally confined downstream of Wildcat and Coleman Diversion Dams by the closure of the fish ladders at these dams. In 1986, these fish were located in the Wildcat, Coleman, and Inskip reaches, in numbers decreasing with distance upstream (Hoopaugh pers. comm.).

Late fall–run Chinook salmon make up the second largest population of Chinook salmon in Battle Creek. During the past 5 years, an average of 3,276 adult late fall–run Chinook salmon returned to the CNFH. Only a small number of unmarked, possibly natural-origin, late fall–run Chinook salmon used Battle Creek, and all of these fish (18 in 1998, six in 1999, four in 2000) were intentionally restricted to waters downstream of the Restoration Project area (Comprehensive Assessment Monitoring Program 2001; USFWS 2001).

Late fall–run Chinook salmon are restricted from passing upstream of the CNFH barrier weir, similar to restrictions placed on fall-run Chinook salmon. An unknown, but small number of late fall–run Chinook salmon presumably have

been able to pass upstream at the CNFH barrier weir. The number of late fall–run Chinook salmon spawning naturally below the CNFH barrier weir is unknown, but is presumed to be small (USFWS 2001).

Habitat Association

The fall-/late fall–run Chinook salmon evolutionarily significant unit (ESU) comprises a fall run and a late fall run. Adult fall-run Chinook salmon of both hatchery and naturally spawned origin migrate into the Battle Creek watershed from July through December, with a peak in migration usually occurring at the CNFH barrier dam during October (Parker pers. comm.). Natural spawning peaks in early November (DFG 1996c), and most of the subsequent offspring leave Battle Creek by the end of June of the following year (DFG 1990; Vogel and Marine 1991). Naturally spawning late fall–run Chinook salmon enter Battle Creek as adults from mid-October to mid-April and spawn from January through April with a peak in February. The offspring of these fish leave the watershed by mid-December (DFG 1990, Vogel and Marine 1991).

Reasons for Decline

For factors affecting decline in Battle Creek, see the description of Sacramento River winter-run Chinook salmon above.

Central Valley Steelhead

Legal Status

The Central Valley steelhead is listed as threatened under the ESA.

Description

Adults can usually be recognized as silvery with numerous black spots on the tail, adipose fin, dorsal fin, and back, with an iridescent pink to red lateral band. The spots on the tail are typically in radiating lines. The cheeks are also pinkish, the back iridescent blue to nearly brown, and the sides and belly silver, white, or yellowish.

Steelhead are generally classified into two races, depending on whether they begin their upstream migration in winter or summer. Winter steelhead typically begin their spawning migration in fall and winter and spawn within a few weeks to a few months from the time they enter fresh water. Summer steelhead

typically enter fresh water in spring and early summer, hold over in deep pools until mature, and spawn in late fall and winter.

During spawning, the female deposits her eggs in a redd, where they are fertilized by the male. Egg incubation time in the gravel is determined by water temperature, varying from approximately 19 days at an average water temperature of 15.5°C to approximately 80 days at an average temperature of 4.5°C.

Steelhead fry usually emerge from the gravel 2 to 8 weeks after hatching (Barnhart 1986, Reynolds et al. 1993). Newly emerged steelhead fry move to shallow, protected areas along streambanks but move to faster, deeper areas of the river as they grow. Though most occupy riffles in their first year of life, some of the larger steelhead live in deeper, faster runs or pools. Juvenile steelhead feed on a variety of aquatic and terrestrial insects and other small invertebrates.

Juveniles emigrate downstream to the ocean in November through May (Schafter 1980); however, most Sacramento River steelhead emigrate in spring and early summer (Reynolds et al. 1993). Sacramento River steelhead generally migrate as 1-year-olds at a length of 6 to 8 inches (Barnhart 1986, Reynolds et al. 1993).

Distribution

Central Valley steelhead historically inhabited large and small streams throughout the Sacramento–San Joaquin watershed. Current distribution in the watershed is limited primarily by dams that block access to upstream reaches of main rivers and their tributary streams. Central Valley steelhead populations are found in the Sacramento River and its tributaries, including the Feather, Yuba, and American Rivers, and many small tributaries, such as Mill, Deer, Cottonwood, and Butte Creeks. The Cosumnes and Mokelumne Rivers also support steelhead. In the San Joaquin River basin, the best available information suggests that the current range of steelhead is limited to reaches below major dams on the Stanislaus, Tuolumne, and Merced Rivers and to the mainstem San Joaquin River downstream of its confluence with the Merced River.

The annual average population of adult steelhead in the Battle Creek watershed, including fish managed at the CNFH, is currently about 2,100 fish. About 880 adult steelhead, on average, have been documented migrating into the Project area each year; however in most years previous to 1996 steelhead were not allowed upstream of the CNFH barrier weir (USFWS 2001). Despite periods of relatively low abundance from the 1980s through the early 1990s, steelhead populations in Battle Creek, including CNFH, have fluctuated steadily around the level of about 2,000 adults since 1967.

Steelhead spawn in almost every tributary of the upper Sacramento River and appear to do so in numbers proportionate to a given tributary's runoff; that is, the

larger streams (Mill, Deer, and Battle Creeks) have the larger runs (Hallock 1989; Hallock et al. 1961). Actual numbers of naturally spawning steelhead in these streams are generally unknown. However, an average of 1,160 steelhead per year migrated into Mill Creek between 1954 and 1963 (DFG no date), suggesting that populations in Battle Creek may have had a similar level of abundance.

From 1967 to 1993, the estimated number of steelhead passing Red Bluff Diversion Dam ranged from a low of 470 to a high of 19,615 (DFG 1994, 1996b). While estimates vary, perhaps 10% of these fish spawned in Battle Creek and about 28% were believed to have spawned at the CNFH (USFWS 1984b).

Steelhead returning to Battle Creek and/or the CNFH in recent years have been directly counted at the hatchery, where all steelhead, except an unknown number of fish that can swim over the CNFH barrier weir at high flows, are captured from September through February (USFWS 2001). Since 1991, from zero to as many as 1,469 steelhead each year have been intentionally allowed to pass upstream of the CNFH (USFWS 2001). About 1,600 steelhead, including 1,382 marked as hatchery fish, were released above CNFH barrier weir in 2001 (USFWS 2002). An unknown number of fish swim over the CNFH barrier weir at high flows.

Habitat Association

Steelhead return to natal streams to spawn as 2- to 4-year-old adults. The fish migrate upstream from July through February and usually spawn between late December and March. Although many steelhead die after spawning, a small proportion return to the sea between April and June (Mills and Fisher 1993).

The typical spawning period for steelhead populations in the upper Sacramento River, including, presumably, the Battle Creek population, begins in December and continues through April (DFG 1990; Schafter 1980). Steelhead eggs hatch by late May.

Following emergence, fry live in small schools in shallow water along streambanks. As steelhead grow, they establish individual feeding territories; juveniles typically rear for 1–2 years in streams before emigration. In the Sacramento River, juvenile steelhead migrate to the ocean in spring and early summer, with peak migration through the Delta in March and April (Reynolds et al. 1993). The juveniles likely spend a year or more in Battle Creek before migrating to the Pacific Ocean. Steelhead may remain in the ocean from 1 to 4 years, growing rapidly as they feed in the highly productive currents along the continental shelf (Barnhart 1986).

Reasons for Decline

Factors related to the decline of Central Valley steelhead include loss of habitat in river reaches blocked by dams, degradation of habitat conditions (e.g., water temperature), and entrainment in water diversions. Loss of habitat has the greatest effect on steelhead abundance. Major dams are the primary barriers to steelhead access to Central Valley rivers and streams. Dams at low elevations on all major tributaries block access to an estimated 95% of historical spawning habitat in the Central Valley (Reynolds et al. 1993). Below dams, remnant steelhead populations are affected by varying flow conditions and high summer and fall water temperature. Unscreened agricultural, municipal, and industrial diversions in the Delta and rivers cause entrainment losses of emigrating juvenile steelhead.

More than 90% of the adult steelhead in the Central Valley are produced in hatcheries (Reynolds et al. 1990). Hatchery-produced fish may substantially affect the genetic integrity of wild populations. Adult and juvenile steelhead are harvested by sport anglers within the Central Valley watershed. There is no commercial or sport fishery for steelhead in the ocean and, for unknown reasons, steelhead are rarely taken by commercial or sport salmon trollers (Skinner 1962).

For steelhead, successful adult migration and holding are assumed to deteriorate as water temperature warms between 52ºF and 70ºF. Adult steelhead appear to be much more sensitive to thermal extremes than are juveniles (McCullough 1999). Conditions supporting steelhead spawning and incubation are assumed to deteriorate as temperature warms between 52ºF and 59ºF (Myrick and Cech 2001). Juvenile rearing success is assumed to deteriorate at water temperatures ranging from 63ºF to 77ºF (Myrick and Cech 2001; Raleigh et al. 1984). Relative to rearing, smolt transformation requires cooler temperatures, and successful transformation occurs at temperatures ranging from 42.8ºF to 50ºF. Juvenile steelhead have, however, been captured at Chipps Island in June and July at water temperatures exceeding 68ºF (Nobriega and Cadrett 2001). Juvenile Chinook salmon have also been observed to migrate at water temperatures warmer than expected based on laboratory experimental results (Baker et al. 1995).

Valley Elderberry Longhorn Beetle

Legal Status

The VELB is federally listed as threatened (45 FR 52803, August 8, 1980); it is not listed by the state. The U.S. Fish and Wildlife Service (USFWS) developed a recovery plan in 1984 (USFWS 1984a) with the interim objectives of protecting three known localities, surveying riparian areas in the Central Valley to detect other VELB populations, and protecting the riparian habitats within the VELB's historical distribution. As more information becomes available, USFWS will

determine the number of sites and populations of VELB required before it considers delisting the species (USFWS 1984a).

Description

The VELB is a medium-sized beetle (0.8 inch long) in the long-horned wood-boring family Cerambycidae. The Latin term *dimorphus* in the beetle's scientific name (*Desmocerus californicus dimorphus*) refers to differences in appearance by gender. The forewings of the female are dark metallic green with red margins, whereas those of the male are primarily red with dark green spots.

The VELB's life history characteristics are assumed to follow a sequence of events similar to those of related taxa (USFWS 1984a). Females deposit eggs in crevices in the bark of living blue elderberry shrubs, primarily in valley foothill riparian habitats. Presumably, the eggs hatch shortly after they are laid and larvae bore into the pith of the trunk or stem. When larvae are ready to pupate, they work their way through the pith of the shrub, open an emergence hole through the bark, and return to the pith for pupation. Adults exit through the emergence holes and can be found on elderberry foliage, flowers, or stems or on adjacent vegetation. The entire life cycle of the VELB is thought to take 2 years from the time eggs are laid and hatch until adults emerge and die (USFWS 1984a).

The presence of exit holes in blue elderberry stems is an indication of previous VELB use. The distinctive oval exit holes are approximately 0.25 inch in diameter and can be found from a few inches above the ground to about 10 feet up on stems ranging from 1 to 8 inches in diameter (Barr 1991).

Distribution

Information on the historical distribution and abundance of VELB is scarce. The VELB may have always been a rare species; however, the substantial reduction in Central Valley riparian vegetation in the past 100 years probably has further reduced the beetle's range and isolated the remaining populations (USFWS 1984a).

In 1984, the VELB was known to occur in only three Central Valley drainages: the Merced River, Putah Creek, and the American River (USFWS 1984a). However, additional field surveys in subsequent years detected new locations of VELB along the Yuba, American, Cosumnes, Sacramento, Mokelumne, Calaveras, San Joaquin, Tuolumne, Stanislaus, and Merced Rivers (Barr 1991).

The current range of the VELB extends from the northern end of the Central Valley at Redding to the Bakersfield area. In the foothills of the Sierra Nevada, adult beetles have been found in elevations up to 2,220 feet and exit holes in elevations up to 2,940 feet. Along the Coast Ranges, adult beetles have been

found up to 500 feet elevation, and exit holes have been detected up to 730 feet elevation (Barr 1991).

Habitat Association

The beetle's entire life cycle is associated with blue elderberry shrubs in creeks and riparian areas connected to California's Central Valley and in the surrounding foothills up to 3,000 feet in elevation in the east and the entire watershed to the west (USFWS 1984a).

Reasons for Decline

Although its historical distribution is unknown, the extensive loss of riparian forests in the Central Valley during the past 100 years probably resulted in a decrease and fragmentation of the VELB's range (Barr 1991; USFWS 1984a). Insecticide from cultivated fields and orchards adjacent to blue elderberry shrubs could affect VELB populations if it drifts when adults are present on the shrubs (Barr 1991). Herbicide drift from agricultural fields and orchards could also negatively affect blue elderberry shrubs and reduce VELB habitat.

Occurrence in the Restoration Project Area

There are no known VELB occurrences in the Restoration Project area, and no VELB were observed during field surveys; however, numerous elderberry plants that provide habitat for the beetle were found during field surveys. Many had stems greater than 1-inch diameter, which could provide habitat for the larval stage. Wherever possible, stems were surveyed for exit holes. A few stems with possible VELB exit holes were found in two separate large clusters of elderberry bushes located on the South Powerhouse alternative access road. However, the holes were old, and it cannot be determined whether they were made by emerging VELB; other wood-boring insects and woodpeckers could make similar-sized holes. Information on each elderberry occurrence and the presence or absence of exit holes in stems is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Foothill Yellow-Legged Frog

Adult foothill yellow-legged frogs were found at the Lower Ripley Creek Feeder Dam and the Soap Creek Feeder. Juveniles were found at South Powerhouse, South Diversion Dam, and in the Soap Creek Feeder, and many tadpoles were found in the creek adjacent to the South Powerhouse. Information on each

foothill yellow-legged frog observation is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Legal Status

The foothill yellow-legged frog has been designated as a California species of special concern by the DFG and as a federal species of concern. The species currently receives no statutory protection under the CESA or the federal ESA.

Description

The foothill yellow-legged frog is easily distinguished from the rare, federally listed red-legged frog by the color of its legs. The foothill yellow-legged frog rarely gives its guttural croaking mating call so, unlike the common bullfrog and tree frogs, it is usually not found by its voice. This frog breeds after the winter river levels have dropped in mid-March to May. It can be distinguished from the mountain yellow-legged frog by its snout, which has a triangular buff-colored patch, and the absence of a dark mask.

Distribution

The foothill yellow-legged frog historically occurred in most Pacific drainages from the Oregon border to the San Gabriel River drainage in Los Angeles County (Jennings and Hayes 1994). Its current distribution is the Coast Ranges and the Transverse Mountains in Los Angeles County. This species is also found along the western side of the Sierra Nevada and in most of northern California west of the Cascade crest (Zeiner et al. 1988).

Habitat Association

Habitat requirements for the foothill yellow-legged frog include shallow, flowing streams with at least cobble-sized substrate. It is believed that this substrate provides necessary refuge for larval and juvenile stages (Jennings and Hayes 1994). In the warmer part of this species' range, individuals may remain active year-round; in colder areas, individuals may become inactive or hibernate (Zeiner et al. 1988).

Reasons for Decline

Introduced predatory aquatic species such as fish and bullfrogs, poorly timed water releases from reservoirs, and decreased water flows that have forced adults

to move into permanent pools where they are more susceptible to predation have contributed to the decline of this species throughout much of its range (Jennings and Hayes 1994).

Northwestern Pond Turtle

Legal Status

The northwestern pond turtle is designated as a species of concern by Region 1 of the USFWS and as a species of special concern by the DFG. The species currently receives no statutory protection under CESA (Fish and Game Code §§2050–2068) or the ESA (16 U.S. Code [USC] 1531–1544).]

Description

The northwestern pond turtle is an aquatic turtle of medium size (up to 7 inches long). It is the only native turtle in northern California and is unlikely to be misidentified. The carapace is olive brown to blackish, often with darker spots or lines radiating out from the centers of the shields on the plastron. The newly hatched young are 1 inch long, with the tail nearly as long as the shell. These turtles are dietary generalists that feed primarily on small aquatic invertebrates, such as crustaceans and insects, but they also will feed on carrion. Frogs, small fish, and ducklings have been reported prey items, but it is unknown whether they were captured while alive or taken as carrion (Holland 1994).

Distribution

The northwestern pond turtle is endemic to the Pacific Northwest. Two subspecies of western pond turtle are currently recognized, the northwestern and southwestern pond turtles. The former is found in northern California from the Oregon border south to the American River and the latter in the coastal areas south of San Francisco. The two subspecies intergrade in the Central and San Joaquin Valleys, but not within the Restoration Project area. It has been suggested that a third undescribed subspecies occurs near the Columbia River Gorge and that the three forms may actually represent different species (Holland 1994). Genetic studies are currently underway to resolve this question.

Movements of up to 3 miles across terrestrial habitats have been documented in all size classes of northwestern pond turtles. Reasons for such movements are generally unknown, but the movements may be responses to environmental stress such as drought, or regular movements among a series of ponds (Holland 1994). Male and female home ranges have been estimated at approximately 2.5 acres and 0.6 acre, respectively (Bury 1972).

Habitat Association

The northwestern pond turtle inhabits a wide range of freshwater or brackish rivers, streams, lakes, ponds, and permanent or ephemeral wetlands and is often seen basking on logs, rocks, and mud banks. The species typically occurs in slow-moving streams, pools, and ponds. In most cases, emergent basking sites, such as rocks, logs, or vegetation, are present. Although northwestern pond turtles are occasionally observed in reservoirs, abandoned gravel pits, stock ponds, and sewage treatment plants, most such sightings are of displaced individuals and do not represent viable populations (Holland 1994; Jennings and Hayes 1994).

The species typically nests on gentle slopes in compact soils with a large proportion of silt or clay. Vegetation is usually sparse and consists of grass or forbs. Nests can be from about 10 feet to more than 1,300 feet away from aquatic habitats (Holland 1994). Rathbun et al. (1992) recommended a 1,600-foot buffer zone around aquatic habitats to protect nesting habitat.

The characteristics of overwintering habitat and terrestrial habitats used at other times of the year are highly variable. The presence of a duff layer seems to be a general characteristic of such habitats. The species sometimes overwinters in aquatic environments, such as on mud bottoms, beneath undercut banks or logs, or in areas of emergent vegetation. Movement between overwintering sites does occur, and turtles have been observed swimming under ice in water with temperatures as low as 34ºF (Holland 1994).

Northwestern pond turtles may be either largely inactive during the winter or active throughout the year, depending on location and environmental conditions. In some areas, turtles overwinter communally in either aquatic or terrestrial sites. Terrestrial overwintering sites may be up to about 1,600 feet from aquatic habitats and usually consist of burrows in leaf litter or soil (Holland 1994; Jennings and Hayes 1994).

Reasons for Decline

Holland (1994) estimated a 96% to 98% decline in northwestern pond turtle populations in Oregon, but specific causes were not identified. Habitat destruction from agricultural activities, urbanization, and flood control and water diversion projects are considered primary causes of population decline (Jennings et al. 1992). Jennings and Hayes (1994) hypothesized that observed changes in age-class distribution suggest a lack of recruitment that may indicate that the destruction of nesting habitat is a significant factor in declines. They identified agricultural or livestock activity as probable causes. However, introduced exotic fish and bullfrogs that prey on young turtles may also be causing decreases in recruitment. In addition, disease and mortality from ingestion of baited hooks could be contributing factors. Although logging activities can affect the quality

of aquatic habitats, no evidence exists to suggest that timber harvesting has contributed to regional or statewide population declines.

Occurrence in the Restoration Project Area

One adult was found in Ripley Creek, just upstream of the Lower Ripley Creek Feeder Dam. The turtles are likely to occur elsewhere in both forks of Battle Creek, but no turtles were found during field surveys. Information on this single observation and its potential for occurrence elsewhere in the Restoration Project area is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Osprey

Legal Status

The osprey is a California species of special concern. This species is not considered to be a state species of special concern in the *Draft List of California Bird Species of Special Concern* (DFG and Point Reyes Bird Observatory 2001), which is currently under review by the DFG and the Point Reyes Bird Observatory Advisory Committee. The species currently receives no statutory protection under CESA or the ESA.

Description

The osprey is a very large raptor with bowed and angled wings in flight that give it a characteristic profile. Ospreys are largely white below and brown above. They often perch prominently close to water bodies. The osprey is not closely related to any other raptor and is placed in its own subfamily.

Distribution

In the western hemisphere, ospreys breed in the United States, Canada, and Mexico. While a portion of their population migrates to spend the winter in Mexico south to the Amazon Basin, some birds winter in California, especially along the coast. Often seen during migration soaring at great heights, ospreys are widely distributed throughout most of the world.

Historically, ospreys breed along the entire length of California, with population centers along the north interior, Channel Islands, and north, central, and south coasts (Grinnell 1915). Within this range, the distribution was spotty, as evidenced by the rarity of ospreys in the San Francisco Bay area (Grinnell and

Wythe 1927). By the 1940s, Grinnell and Miller (1944) reported declines and range contraction, particularly in the southern half of the state, including the Channel Islands and the central and south coasts, and along the Sacramento and San Joaquin Rivers.

Currently, the osprey breeds in northern California from the Cascade Range south to Lake Tahoe and along the north coast south to Marin County. Regular breeding sites include Shasta Lake, Eagle Lake, Lake Almanor, Lake Oroville, New Bullards Bar Reservoir, Camanche Reservoir, other inland lakes and reservoirs, and river systems (e.g., the Pit River, Sacramento River, Yuba River, and Cache Creek) (Zeiner et al. 1990). Ospreys winter in small numbers along the entire coast and large inland bodies of water, such as the Feather River, Putah and Cache Creeks, American River, Camanche Reservoir, Turlock Reservoir, New Melones Reservoir, and Lake San Antonio (Roberson 1985).

Habitat Association

The osprey is associated strictly with large, fish-bearing waters primarily in ponderosa pine and mixed conifer habitats. Nests are platforms of sticks constructed on the top of large snags, in dead-topped trees, on cliffs, or on human-made structures in open forest habitats. The location of nests requires tall, open-branched "pilot trees" nearby where the osprey can land before approaching the nest and where young osprey can practice flying. The osprey preys mainly on fish and, therefore, requires open waters for foraging (Zeiner et al. 1990).

Reasons for Decline

Factors leading to the decline of osprey populations include pesticide contamination, nest-tree removal, degradation of the environmental quality of rivers and lakes, boating and other human disturbances in nesting areas, and illegal shooting (Henny et al. 1978). Osprey populations declined through the 1960s, especially in the eastern United States, because of eggshell thinning caused by pesticide contamination (Henny and Ogden 1970), which led to reproductive failure (Garber 1972); however, reproductive success has increased since the early 1970s (Airola and Shubert 1981).

Occurrence in the Restoration Project Area

One active osprey nest was found in the 2000 breeding season in a large ponderosa pine on the south bank of the South Fork Battle Creek approximately 1.3 miles downstream of the South Diversion Dam and 0.7 mile north of the access road. This nest was not active in 2001, and no breeding ospreys were observed that year. One osprey was observed foraging along South Fork Battle

Creek. Information on both osprey observations is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Bald Eagle

Legal Status

The bald eagle is federally listed as threatened and state-listed as endangered and is protected under the federal Bald and Golden Eagle Protection Act (16 USC 668–668d).

Description

The sharp contrast between the adult bald eagle's distinctive white-feathered head and tail and its dark brown body and wings make this species clearly identifiable. The heads and tails of younger birds are mostly brown, and these birds are often mistaken for golden eagles. When fully grown, bald eagles measure 2.5 to 3.5 feet long, with a wingspan of more than 6.5 feet. Females typically are larger than males. Bald eagles tend to be more vocal than most raptors and emit a variety of high-pitched calls (Thelander 1994).

Distribution

Bald eagles winter throughout most of California at lakes, reservoirs, river systems, and some rangelands and coastal wetlands (Zeiner et al. 1990). Almost half of the state's population winters in the Klamath Basin, but this species is also an uncommon visitor to the Central Valley. The breeding range of bald eagles is primarily in mountainous habitats near reservoirs, lakes, and rivers in the northwest corner of the state (DFG 1989). Fish constitute most of the bald eagle's diet, but wintering birds frequent Central Valley wetlands in search of dead and dying waterfowl and other water birds.

Habitat Association

Bald eagle nesting territories are associated primarily with young or mature forests of varying canopy closure of ponderosa and mixed conifer types, but they can be found in all forest types from blue oak savanna to lodgepole pine types (Verner and Boss 1980). Bald eagles usually nest in overstory ponderosa or sugar pine with foliage shading the nests, within 0.5 mile of a large body of water and with low human disturbance (Verner and Boss 1980). Total canopy closure in stands that support bald eagle nests is usually less than 40% (Verner and Boss 1980).

Reasons for Decline

Historically, bald eagle populations have declined as a result of eggshell-thinning from the ingestion of dichlorodiphenyltrichloroethane (DDT), shooting, and disturbance of nest sites. However, because of their protection under the CESA, the federal ESA, and the Bald and Golden Eagle Protection Act, their populations have recovered across most of North America and soon they may be delisted from the federal list.]

Occurrence in the Restoration Project Area

Bald eagles hunt for fish within the Restoration Project area; however, no active or inactive nest sites were identified. Bald eagles likely nest outside the Restoration Project area. Adults were seen flying high over both forks of Battle Creek on several occasions during the spring field surveys. An adult bald eagle was observed flying over the Eagle Canyon Diversion Dam site in mid-June 2000, and in mid-April 2001, an adult was seen flying high about 1 mile east of Wildcat Diversion Dam. An immature bald eagle was observed at Coleman Diversion Dam in mid-June 2000. Information on the adult bald eagle observations is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Sharp-Shinned Hawk

Legal Status

The sharp-shinned hawk is designated as a species of special concern by DFG. This species is not considered to be a state species of special concern in the Draft List of California Bird Species of Special Concern (DFG and Point Reyes Bird Observatory 2001), which is currently under review by the DFG and the Point Reyes Bird Observatory Advisory Committee. The species currently receives no statutory protection under the CESA or the Federal ESA.

Description

The sharp-shinned hawk is the smallest North American member of the genus *Accipiter*, a group of forest-dwelling hawks with short, rounded wings and a long tail that enables them to maneuver in forested habitat. Of the three species of *Accipiter* in North America, the sharp-shinned hawk is the most specialized in hunting avian prey; birds commonly make up more than 90% of the sharp-shinned hawk's diet during the breeding season (Johnsgard 1990). They can be distinguished from the larger Cooper's hawk by their straight rather than rounded tail tips, their short undertail coverts, and their smaller heads and shorter necks.

Distribution

Found throughout North America, sharp-shinned hawks nest primarily in heavily forested locations with little human disturbance. In California, nest sites are found almost exclusively in forests in the northern Coast Ranges, the Sierra Nevada, and the Cascades. In California, they are rare breeders, primarily in the conifer forests of the Sierra Nevada, the coastal forests of northern California (Verner and Boss 1980), and, in small numbers, the mountain ranges of southern California (Garrett and Dunn 1981). During migration periods and in the winter, however, they are fairly common in most habitats (Grinnell and Miller 1944).

Habitat Association

Sharp-shinned hawks typically nest in montane settings with dense, relatively young, even-aged conifer stands or deciduous riparian habitats (Reynolds et al. 1982; Moore and Henny 1983; Johnsgard 1990). Nests are usually situated on moderately steep, north-facing slopes near water in stands with a high foliage density and often near forest openings or edges (Reynolds et al. 1982; Johnsgard 1990). Estimates of breeding season home ranges vary from 150 to 1,000 acres (Johnsgard 1990). Reynolds et al. (1982) recommended retaining 9-acre buffer zones around active nests, an area large enough to encompass nearby prey-plucking posts. During migration, sharp-shinned hawks can be found in all habitats, but during the winter, they are most frequently found in a variety of forest types, riparian woodlands, and suburban areas with an abundance of prey (small passerine birds).

Reasons for Decline

Sharp-shinned hawks may have never been abundant in California during the breeding season (Grinnell and Miller 1944; Remsen 1978). A possible decline noted in California during the DDT era (Remsen 1978) coincided with declines in eastern populations and probably was attributable to DDT and other pesticides (Bednarz et al. 1990). However, the population status in California is unknown. Timber harvesting has also been suggested as a potential threat to the species population (Remsen 1978).

Occurrence in the Restoration Project Area

Several individuals were seen during spring and fall migration (April and September) at various locations along access roads and Restoration Project sites. Their specific occurrence during migration is unpredictable but is often tied to local, ephemeral concentrations of prey (small passerine birds). No individuals were observed during the breeding season (June and July); therefore, they are not likely to nest in the Restoration Project area. Information on each sharp-shinned

hawk observation has not been presented in TableII-3 in Volume II of the Summary Report (Jones & Stokes 2001) because the individuals observed on access roads and Restoration Project sites were spring and fall migrants and were not nesting in the Restoration Project area.

Cooper's Hawk

Legal Status

The Cooper's hawk is designated as a state species of special concern by the DFG. This species is not considered to be a state species of special concern in the *Draft List of California Bird Species of Special Concern* (DFG and Point Reyes Bird Observatory 2001), which is currently under review by the DFG and the Point Reyes Bird Observatory Advisory Committee. The species currently receives no statutory protection under the CESA or the ESA.

Description

This medium-sized *Accipiter* is larger than the sharp-shinned hawk. Its rounded tail, longer undertail coverts, and larger head and neck help in its identification. Cooper's hawks are smaller than northern goshawks, and adults are easily identified by the reddish barring on their underparts and their lack of a white eye stripe. Immature Cooper's hawks are much more similar to northern goshawks, but often have straight, even white barring on the tail and are smaller and not as broad-winged. Cooper's hawks can be found in a variety of habitats and elevations; however, they are not as closely tied to montane coniferous forests as are sharp-shinned hawks or northern goshawks.

Distribution

The historical range of the Cooper's hawk is similar to its current range, although the species is less common in the Central Valley than it was historically. Cooper's hawks are found throughout most of the United States, southern Canada, and northern Mexico. Northern populations are said to be migratory and southern populations, resident; however, some southern populations apparently migrate as well (Rosenfield and Bielefeldt 1993). Cooper's hawks breed throughout most of California in a variety of woodland habitats (Garrett and Dunn 1981; Grinnell and Miller 1944). They are uncommon breeders in much of California; the highest densities probably occur in the foothill oak woodlands of the Sierra Nevada and Transverse Ranges (Asay 1987). Cooper's hawks are found in greater numbers during migration and winter, when they can be found in all habitats throughout California (Grinnell and Miller 1944).

Habitat Association

The Cooper's hawk nests in deciduous, conifer, and mixed woodlands (Garrett and Dunn 1981) but will also nest in urban areas and seems to tolerate human disturbance near the nest (Palmer 1988). The hawks nest and forage near open water or riparian vegetation. Prey comprises small birds, a variety of small mammals, reptiles, and amphibians (Zeiner et al. 1990). The species usually breeds after 2 years (Asay 1987; Henny et al. 1985; Rosenfield 1982), and pairs generally return to the same territory year after year and will often build a new nest in the vicinity of the existing one (Reynolds and Wight 1978).

Reasons for Decline

The decline of eastern United States populations of Cooper's hawk is attributed to pesticide contamination. Declines in the West are less documented, but in California, they have been attributed to destruction of habitat, particularly of lowland riparian areas (Remsen 1978). Pesticides may also play a role in declines in western populations.

Occurrence in the Restoration Project Area

An immature Cooper's hawk was seen during field surveys performed in July 2000 and was probably dispersing from its natal territory. An adult Cooper's hawk was seen in April 2001 on the road to South Diversion Dam and was probably a migrating bird not breeding locally. Information on these Cooper's hawk observations have not been presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001) because neither is considered to signify breeding within the Restoration Project area.

Golden Eagle

Legal Status

The golden eagle is designated as a species of special concern by DFG, is a fully protected species under the California Fish and Game Code, and is protected under the federal Bald and Golden Eagle Protection Act (16 USC 668-668d).

Description

One of the largest raptors in North America, the golden eagle is named for the golden crown and nape found on the adults. Immature golden eagles can be

distinguished from immature bald eagles by their smaller bill and the fact that they are white only on the bases of their primaries and tail feathers.

Distribution

Golden eagles are found throughout western North America, and a few migrate through and winter in parts of the eastern United States. The golden eagle is a permanent resident throughout California, except in the center of the Central Valley, although it winters in this area (Zeiner et al. 1990). Golden eagle populations have declined near human population centers, but overall its population appears stable (Remsen 1978).

Habitat Association

Golden eagles are closely tied to open range, including blue oak savanna. This species avoids dense coastal and montane coniferous forests (Small 1994). It breeds from late January through August, peaking from March though July. Nests are most frequently placed on cliff ledges, but may be placed on trees large enough to support their weight. Golden eagles often maintain alternative nest sites, and old nests are often reused (Zeiner et al. 1990). The golden eagle needs open areas for hunting. Its diet consists mostly of rabbits and rodents but also includes other mammals, reptiles, birds, and some carrion (Zeiner et al. 1990).

Reasons for Decline

Golden eagles have declined as a result of shooting, poisoning, and disturbance of nest sites (Remsen 1978).

Occurrence in the Restoration Project Area

Golden eagles were seen flying overhead at North Battle Creek Feeder Dam and the South Powerhouse. An immature bird was seen perched on a ledge in the headwaters of Soap Creek above the South Diversion Dam access road. Old, unoccupied nests were found at the headwaters of Soap Creek Feeder and at the South Powerhouse. The eagles sighted may have nested in the region, but because their home range is very large, observations of pairs of golden eagles at a site do not necessarily indicate local nesting. Information on each golden eagle observation is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001). In mid-April 2001, one adult golden eagle was seen circling very high over North Battle Creek, and two birds were observed in courtship display over crags at South Diversion Dam.

American Peregrine Falcon

Legal Status

The American peregrine falcon is state-listed as endangered under the CESA and is currently fully protected under the California Fish and Game Code. The peregrine falcon was formerly listed as federally endangered, but the population has recently recovered to the extent that it was delisted in August 1999 (64 FR 46541-46558, August 25, 1999).

Description

A large and powerful predator, the peregrine falcon is the fastest bird in North America, capable of reaching speeds up to 200 mph in a dive. The adult male is blue-gray on the back, with a streaked breast. The crown and nape are black, with a black wedge that extends below the eyes, forming a distinctive helmeted appearance.

Distribution

Historically, resident American peregrine falcons occurred throughout most of California (DFG 1980; USFWS 1982). The population increased during winter, when migrating birds arrived from the north. Peregrine falcons nested throughout the state, with breeding pairs concentrated along the coast and around the Channel Islands. Interior nesting locations included Tule Lake in Siskiyou County, Mono Lake in Mono County, and the inner Coast Ranges in Kern County (Grinnell and Miller 1944). The population of California peregrine falcons began to seriously decline in the 1950s. Based on a conservative historical estimate, there were 100 pairs breeding in California before 1947. By 1969, fewer than 10 nesting sites were believed to be active (Herman et al. 1970). In 1992, there were approximately 140 breeding pairs of American peregrine falcons in California, primarily in mountains of the central and northern Coast Ranges and the Cascade Range (DFG 1997).

Habitat Association

American peregrine falcons nest on protected ledges of high cliffs, primarily in woodland, forest, and coastal habitats (DFG 1980; USFWS 1982). They have been known to nest at elevations as high as 10,000 feet, but most occupied nest sites are below 4,000 feet (Shimamoto and Airola 1981). Falcons prefer to nest near marshes, lakes, and rivers that support an abundance of birds, but they may travel several miles from their nesting grounds to forage on pigeons, shorebirds, waterfowl, and songbirds (DFG 1980; Grinnell and Miller 1944). Coastal and

inland marsh habitats are especially important in fall and winter, when they attract large concentrations of water birds (DFG 1980).

Reasons for Decline

The widespread use of organochloride pesticides, especially DDT, was a primary cause of the decline in peregrine falcon populations (USFWS 1982). High levels of these pesticides and their metabolites (i.e., by-products of organic decompositions) have been found in the tissues of peregrine falcons, leading to thin eggshells, aberrant reproductive behavior, and reproductive failure. Other causes of decline include illegal shooting, illegal falconry activities, and habitat destruction (DFG 1980).

Occurrence in the Restoration Project Area

One adult peregrine falcon was observed circling high over the road at South Diversion Dam during raptor surveys on April 13, 2001.

California Black Rail

Legal Status

The California black rail is state-listed as threatened under the California Endangered Species Act (CESA) and is currently fully protected under the California Fish and Game Code.

Description

A small bird about the size of a sparrow, the black rail is extremely secretive in dense emergent marsh vegetation. The adult male is mostly black with spots, and the female has more gray and brown tones in its plumage.

Distribution

California black rail populations in California are limited to the San Francisco Bay Area, Bolinas Lagoon, Tomales Bay, Morro Bay, Suisun Bay, the Delta region, White Slough in San Joaquin County, the Salton Sea area, the Lower Colorado River Valley (Garrett and Dunn 1981; Eddleman et al. 1994; Evens et al. 1991; Manolis 1978), and the recently discovered (in 1994) population in the foothills of the western Sierra Nevada in Butte, Yuba, and Nevada Counties

(Tecklin 1999; Aigner et al. 1995). Black rail populations have been extirpated from Ventura County south to San Diego County (Garrett and Dunn 1981). The severe decline of 95% of marshes in the San Francisco Bay Area likely affected rail populations substantially (Evens et al. 1991). Populations along the lower Colorado River declined about 30% from 1973 to 1989 (Evens et al. 1991).

Habitat Association

Black rails in the Sierra Nevada foothills are found primarily in marshes dominated by *Scirpus acutus* and/or cattails (*Typha latifolia*) (Tecklin 1999; Aigner et al. 1995) and require water depths less than 3 cm (1.2 in) for breeding (Eddleman et al. 1994). Black rails forage on invertebrates, including snails, beetles, earwigs, grasshoppers, and ants, and seeds from bulrushes (*Scirpus* spp.) and cattails (*Typha* spp.) (Eddleman et al. 1994). There is no specific information on the diet of the Sierra Nevada foothill population. Black rails in California are mostly resident, although there is some local movement from San Pablo Bay south to the southern San Francisco Bay (Evens et al. 1991). It is likely that the Sierra Nevada foothill population is resident throughout the year.

Reasons for Decline

The primary population threat comes from destruction or degradation of marsh habitats, and, to a lesser extent, from potential increases in predation pressures from domestic cats, herons, egrets, and other predators, and from pollution carried by runoff into occupied marshes (Eddleman et al. 1994).

Occurrence in the Restoration Project Area

Three areas have been identified as supporting suitable habitat for black rail at the Willow Springs mitigation site. Each area consists of emergent wetland habitat dominated by cattails and bulrush. Two of the areas are portions of larger wetland complexes. The third area includes the edges along the Mount Lassen Trout Farm raceways used for raising trout. No known records of California black rail in Tehama and Shasta Counties exist, although breeding populations are currently known in nearby Butte County. Surveys for black rails have not been conducted in the foothills of Tehama and Shasta Counties, so there may be undiscovered populations in the emergent marshes in this region.

California Spotted Owl

Legal Status

The California spotted owl is a federal and state species of special concern. On October 12, 2000, the California spotted owl was proposed to be federally listed as a threatened species (65 FR 6060560607). However, until the USFWS makes the proposed listing final, the California spotted owl is still considered a federal species of concern and a state species of special concern. Because the California spotted owl is proposed as a federally listed threatened species, the USFWS requires that it be treated as a listed species by other federal agencies. The species currently receives no statutory protection under the CESA or the federal ESA.

Description

The spotted owl is a large nocturnal bird, overall brown in color, with irregular white spots on the back, head, and underparts. It is smaller than the great horned owl, lacks ear tufts, and has dark brown eyes. The closely related barred owl is slightly larger, with horizontal bars across the chest instead of spots. The California spotted owl is one of three subspecies of the spotted owl (American Ornithologists' Union 1957) and is paler in color with larger spots than the similar, federally threatened northern spotted owl, which also occurs in California. Females typically are larger than males. Spotted owls are vocal; both male and female frequently utter a distinctive four-note call during the breeding season.

Distribution

California spotted owls occur on the western side of the Sierra Nevada from the southern Cascade Range south to Kern County, in the southern part of the Coast Range, and in mountain ranges of southern California south to Baja California (Gutiérrez et al. 1995; Verner et al. 1992b).

Habitat Association

The California spotted owl occurs in coniferous, hardwood, and mixed forests and is strongly associated with forests that have complex, multilayered structure, large-diameter trees, and high canopy closure (Bias and Gutiérrez 1992; Gutiérrez et al. 1995). Nests are placed in tree cavities or abandoned nests of other animals within areas of dense old-growth forest with more than 75% canopy closure (Bias and Gutiérrez 1992). Roosting sites have similar characteristics. California spotted owls forage in a wider variety of forest types,

including more open forests with canopy cover as low as 40% (Verner et al. 1992b). In the Sierra Nevada, spotted owls prey largely on northern flying squirrels and dusky-footed woodrats, but a variety of other prey items are taken, including birds, mammals, insects, and reptiles.

Reasons for Decline

The status of the Sierra Nevada population of the California spotted owl is uncertain. Although short-term declines have been reported, data are lacking to demonstrate long-term population trends (Verner et al. 1992b). Key habitat requirements are declining as a result of logging, particularly the selective removal of large-diameter conifers (Verner et al. 1992a). In southern California, habitat for the spotted owls is decreasing because of urban expansion, rural development, and increasing water extraction, and owl populations are declining (LaHaye et al. 1992; Verner et al. 1992a).

Occurrence in the Restoration Project Area

Suitable nesting and roosting habitat occurs in dense forest with large trees on lower canyon slopes, and suitable foraging habitat occurs more widely throughout the Restoration Project area. The California spotted owl is not known to breed within the Restoration Project area, and to date, no California spotted owls have been observed within the Restoration Project area. Surveys in the 2001 breeding season are the first year of a 2-year survey following the USFWS–endorsed Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls (USFWS 1992). According to USFWS representatives, the survey protocol for the California spotted owl will be similar to the survey protocol for northern spotted owl.

Vaux's Swift

Legal Status

Vaux's swift is designated as a species of special concern by the DFG (Remsen 1978). The species currently receives no statutory protection under the CESA or the federal ESA.

Description

Vaux's swift is a migratory, insectivorous bird that nests and roosts in large hollow trees and snags. As with other swifts, this species forages in the air over forest canopy, grasslands, and water. Vaux's swift can be readily distinguished

from the larger white-throated swift by its lack of obvious white on the throat and flanks and from the larger black swift by its squared-off tail, pale brown throat and rump, and narrower wings. Vaux's swift can be readily distinguished from the many species of swallows by its overall dark brown plumage, cigar-shaped body, and twittering wing beats.

Distribution

In California, the species occurs during the breeding season primarily in the narrow redwood-forested coastal zone from the Oregon border south to Santa Cruz County. The species also occurs across the northern portion of the state and in the Sierra Nevada, although apparently at much lower densities (Bull and Collins 1993; Sterling and Paton 1996).

Habitat Association

In California, Vaux's swifts appear to prefer redwood and Douglas-fir forest types (Sterling and Paton 1996), constructing their nests in large hollow trees and snags and burned-out hollows (Bull and Cooper 1991; Bull and Collins 1993). Several investigators have reported an association between the presence of Vaux's swift and old-growth forests (Manuwal and Huff 1987; Lundquist and Mariani 1991; Bull and Hohmann 1993; Sterling and Paton 1996). However, age and structural characteristics of forest stands may not in themselves be as critical to swifts (Bull and Cooper 1991) as the need for suitable nest and roost trees. Nest and roost trees are more likely to occur in old-growth forests because of the large size and decay conditions of the trees (Bull and Hohmann 1993; Bull and Collins 1993).

Nest trees tend to be large, averaging 32 inches in diameter at breast height in one study (Bull and Hohmann 1993). However, Bull and Hohmann (1993) also reported limited use of residual snags in second-growth forests, and Dawson (1923) and others (cited in Sterling and Paton 1996) described nests in residual snags in old burns and clear-cuts. These findings suggest that retained hollowed trees and snags could continue to provide habitat in regeneration areas. Lundquist and Mariani (1991) recommend retention of snags greater than 30 inches in diameter at breast height. Vaux's swifts forage on insects and spiders, usually above the canopy, water, and grasslands, but may also take prey near branches inside the canopy (Bull and Collins 1993).

Reasons for Decline

Populations of Vaux's swift declined in Oregon and Washington during the 1980s (the percentages of annual change were 8% in Oregon and 11% in Washington) (Bull and Collins 1993). Corresponding data for California are

lacking (Sterling and Paton 1996). The removal of large snags and hollow trees generally associated with late seral-stage forests probably has contributed to population declines (Bull and Collins 1993).

Occurrence in the Restoration Project Area

An individual was sighted flying over blue oak savanna just outside the Restoration Project area on June 13, 2000, and a pair was observed at the Lower Ripley Creek Feeder on July 25, 2000. Although the nest location is unknown, these birds are probably nesting in a large snag somewhere in the canyon of either South Fork or North Fork Battle Creek at a higher elevation outside the Restoration Project area. Information on Vaux's swift has not been provided in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001) because it is not known to nest in the Restoration Project area or at the elevation and habitat in California where the swift was observed (Sterling and Paton 1996). Furthermore, the pair of Vaux's swifts observed at the Lower Ripley Creek Feeder in late July 2000 is best interpreted as birds dispersing from their breeding territory.

Willow Flycatcher

Legal Status

The willow flycatcher is state-listed as endangered. One subspecies occurring in California, the southwestern willow flycatcher (*Empidonax traillii extimus*) is federally listed as endangered.

Description

The willow flycatcher is in the genus *Empidonax*, a group of small, dull-plumaged flycatchers. It can be distinguished from other members of its genus by its loud song, "fitz-bew," and by its lack of a white eye ring. The species includes four or five subspecies, three of which breed in California: *extimus* (southwestern) in southern California, *brewsteri* (little) in the Sierra Nevada, and *adastus* east of the Sierra Nevada (Sedgwick 2000). The willow flycatchers seen in the Restoration Project area are likely to be *brewsteri*, based on range, although *adastus* could also occur in migration.

The willow flycatcher differs from the similar western wood-pewee in its song and "whit" call note; its habit of flicking its tail (shared by other *Empidonax* species); its lack of dark coloring or vested look on its breast; and its brighter yellow belly, longer tail, paler and greener head and back, and broader, more prominent white wing-bars.

Distribution

Historically, the little willow flycatcher was a common nesting species in the Sierra Nevada, Central Valley, and the central and northern Coast Ranges. Now it is found only in isolated populations in mountain meadow systems in the Sierra Nevada and the Cascade Range **(**DFG 1997; Harris et al. 1988).

Habitat Association

The little willow flycatcher breeds and forages almost exclusively in wet mountain meadow systems with standing water for at least part of the breeding season (May to July) and with ample numbers of willow and other associated trees and shrubs (Harris et al. 1988). It arrives on the breeding grounds in May and June and departs for South America in August (Harris et al. 1988; Zeiner et al. 1990)

Reasons for Decline

This species has declined for a variety of reasons, including nest parasitism by brown-headed cowbirds, loss and degradation of riparian and meadow habitats, and disturbance of nest sites by cattle (DFG 1997; Zeiner et al. 1990).

Occurrence in the Restoration Project Area

During 2000, willow flycatchers were seen at Eagle Canyon Diversion Dam and in the riparian habitat at the Lower Ripley Creek Feeder during their peak spring migration period. Although birds were observed singing in appropriate nesting habitat, they are presumed to have been migrants because follow-up searches of these sites in July did not detect nesting willow flycatchers. Information on both willow flycatcher occurrences is presented in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001).

Yellow-Breasted Chat

Legal Status

The yellow-breasted chat is designated as a species of special concern by DFG. The species currently receives no statutory protection under the CESA or the ESA.

Description

The yellow-breasted chat is the largest of the New World warblers. It has a very large head with bright white "spectacles," bright yellow breast, white belly, and undertail coverts. The head, back, and wings are medium gray. Throughout the year, the yellow-breasted chat feeds on insects and spiders, berries, and other fruits.

Distribution

The yellow-breasted chat was once common throughout riparian woodland and scrub habitats in California. It is now an uncommon breeder along the coast of California and in the foothills of the central and southern Sierra Nevada, and breeding populations have declined over much of its former range in southern California (Garrett and Dunn 1981). It is increasingly rare in the Sacramento Valley and rare in the San Joaquin Valley and Mojave Desert (Garrett and Dunn 1981; Small 1994). The mid-elevation western slope of the northern Sierra Nevada is one of the strongholds for this species in California. Yellow-breasted chats are fairly common throughout the riparian habitats in the Restoration Project vicinity.

The breeding season for the yellow-breasted chat is from early May to early August, peaking in June. A migratory species, the yellow-breasted chat leaves for wintering grounds in Mexico and Guatemala in September and returns in April (Dunn and Garrett 1997).

Habitat Association

Although generally associated with riparian habitats, chats in the foothills of the Sierra Nevada are very closely tied to blackberry brambles for cover and for foraging (fruit). Yellow-breasted chats build nests in dense riparian habitats, often consisting of willow thickets and tangles of California wild grape and blackberry brambles (Dunn and Garrett 1997; Grinnell and Miller 1944).

Reasons for Decline

The loss and fragmentation of riparian habitats are major causes of the decline of the yellow-breasted chat (Dunn and Garrett 1997; Garrett and Dunn 1981). Brood parasitism by the brown-headed cowbird has caused the decline of this species, even in areas with intact riparian habitat (Remsen 1978).

Occurrence in the Restoration Project Area

Yellow-breasted chats were found at four riparian sites that had blackberry brambles and riparian scrub: the Darrah Springs Feeder, Coleman Diversion Dam/Inskip Powerhouse, Lower Ripley Creek Feeder, and Inskip Diversion Dam/South Powerhouse. Information on the yellow-breasted chat occurrences at Darrah Springs and Coleman Diversion Dam/Inskip Powerhouse are in Table II-3 in Volume II of the Summary Report (Jones & Stokes 2001). The occurrences at the Lower Ripley Creek Feeder and Inskip Diversion Dam/South Powerhouse have not been provided in Volume II because the chats observed at these sites were migrants and do not nest in the area.

Ringtail

Legal Status

The ringtail is considered a Fully Protected species under the California Fish and Game Code (Section 86).

Description

The ringtail's slender body is 14–16" long, and its long, bushy tail is 14–15" long with alternating black and white rings. The body is drab brown, lighter below, and narrow black and white rings surround the eyes (Ingles 1965; Jameson and Peeters 1988).

Distribution

The ringtail's range encompasses southwestern Oregon, California, southern Nevada, the southern two-thirds of Utah, western Colorado, southern Kansas, Arizona, New Mexico, Oklahoma, and Texas (McMahon 1985). Ringtail is considered widely distributed in California (Burt et al. 1952; Zeiner et al. 1990) and is believed to be relatively common (Stephenson and Calcarone 1999).

Grinnell et al. (1937) described distribution of this species in California as including all portions of the state except portions of the Sacramento and San Joaquin Valleys, Modoc Plateau, eastern Sierra Nevada, and Mojave Desert. In a study conducted by the California Carnivore Study Group (Belluomini 1980), ringtail occurrences were reported in 49 counties throughout California. Belluomini (1980) reported an extension of the range into Imperial, eastern Riverside, and southwestern San Bernardino Counties. According to this study, ringtail abundance was greatest along riparian corridors in northern California and in the Sierra Nevada foothills (Belluomini 1980).

Habitat Association

Ringtails are generally known to occupy rocky habitats with scattered shrubs and woodlands areas along watercourses in foothill and lower montane canyons (Jameson and Peeters 1988). The species occurs at elevations from sea level (Grinnell et al. 1937) to 8,800 feet (2,682 meters) (Schempf and White 1977). Its principal habitat requirements seem to be den sites among boulders or in hollows of trees and sufficient food in the form of rodents and other small animals (Taylor 1954; Williams 1986). Ringtails are similar to raccoons in that they are often found within 0.6 mile (1 kilometer) of a permanent water source (Zeiner et al. 1990). Unlike raccoons, ringtails reportedly avoid urbanized areas (Jameson and Peeters 1988).

Reasons for Decline

Ringtail was harvested as a furbearer until 1967. Until that time, they were taken each trapping season; the highest take (4,368 animals) was in 1927–1928 and the lowest take (55 animals) was in 1964–1965. This decline is probably a result of low demand and low market value, which was typical for most furbearers in California during the 1950s and 1960s (Belluomini 1980). In 1967, ringtail was listed as Fully Protected by the California State Legislature and may no longer be hunted or trapped. Degradation of riparian areas (apparently the preferred habitat of ringtails) has been identified as a potential threat to the species (Stephenson and Calcarone 1999).

Occurrence in the Restoration Project Area

Ringtails are probably widespread and fairly common in suitable habitats throughout the Battle Creek study area. Because of their largely nocturnal habitats, however, only two occurrences of the ringtail were observed during biological surveys. One individual was observed at night near the North Battle Creek Feeder Diversion Dam site. The carcass of another individual was discovered near the Coleman Diversion Dam/Inskip Powerhouse site.

Special-Status Bats

Numerous bats were observed foraging over the Restoration Project area during the field surveys, and roosting bats were observed in abandoned tunnels near the South Powerhouse and at Inskip Diversion Dam. None was identified by species, but the following species have potential to occur in the Restoration Project area based on their habitats and geographic range:

- fringed myotis (*myotis thysanodes*)
- long-eared myotis (*myotis evotis*)

- small-footed myotis (*myotis leibii*)
- long-legged myotis (*myotis volans*)
- yuma myotis (*myotis yumanensis*)
- pallid bat (*antrozous pallidus*)
- Townsend's big-eared bat (*plecotus townsendii*)

All of these species are considered federal species of concern, and known roosting sites in abandoned tunnels should be protected with a steel mesh or bat door that permits access by bats but not by humans or predators.

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Appendix P

Common and Scientific Names for Plant and Wildlife Species Mentioned in the Battle Creek Salmon and Steelhead Restoration Project Environmental Impact Statement/Environmental Impact Report

Appendix P

Common and Scientific Names for Plant and Wildlife Species Mentioned in the Battle Creek Salmon and Steelhead Restoration Project Environmental Impact Statement/ Environmental Impact Report

Plants

Common Name	Scientific Name
Adobe-lily	*Fritillaria puriflora*
Ahart's paronychia	*Paronychia ahartii*
Annual agoseris	*Agoseris heterophylla*
Annual fescues	*Vulpia* sp.
Annual hairgrass	*Deschampsia danthoinoides*
Aster	*Aster* sp.
Bedstraws	*Galium* sp.
Bidwell's knotweed	*Polygonum bidwelliae*
Big manzanita	*Arctostaphylos manzanita*
Big-leaf maple	*Acer macrophyllum*
Big-scale balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*
Birch-leaved mountain-mahogany	*Cercocarpus betuloides*
Black oak	*Quercus kelloggii*
Blackberry	*Rubus* sp.
Blue dicks	*Dichelostemma* sp.
Blue elderberry	*Sambucus cerulea* var. *cerulea*
Blue oak	*Quercus douglasii*
Boggs Lake hedge-hyssop	*Gratiola heterosepala*
Bracken fern	*Pteridium aquilinum*
Brandegee's eriastrum	*Eriastrum brandegeae*
Brownbells	*Fritillaria micrantha*

Plants

Common Name	Scientific Name
Buckbrush	*Ceanothus cuneatus* var. *cuneatus*
Butte County fritillary	*Fritillaria eastwoodiae*
California bay laurel	*Umbellularia californica*
California buckeye	*Aesculus californica*
California melic grass	*Melica californica*
California wild grape	*Vitis californica*
California yerba-santa	*Eriodictyon californicum*
Canyon Creek stonecrop	*Sedum paradisum*
Canyon live oak	*Quercus chrysolepis*
Checkered fritillary	*Fritillaria affinis*
Chinese tree-of-heaven	*Ailanthus altissima*
Cocklebur	*Xanthium strumarium*
Coffeeberry	*Rhamnus tomentella*
Cowbag clover	*Trifolium depauperatum*
Coyote thistle	*Eryngium castrense*
Curly dock	*Rumex crispus*
Depauperate milk-vetch	*Astragalus pauperculus*
Dimorphic snapdragon	*Antirrhinum subcordatum*
Dogwood	*Cornus sessilis*
Douglas fir	*Pseudotsuga menziesii*
Downy navarretia	*Navarretia pubescens*
Dwarf downingia	*Downingia pusilla*
Dwarf stonecrop	*Parvisedum pumilum*
Eel-grass pondweed	*Potamogeton zosteriformis*
Elderberry	*Sambucus* spp.
Erect plantain	*Plantago erecta*
Fig	*Ficus carica*
Filago	*Filago* sp.
Filarees	*Erodium* sp.
Fitch's spikeweed	*Hemizonia fitchii*
Four-angled spikerush	*Eleocharis quadrangularis*
Fremont's goldfields	*Lasthenia fremontii*

Plants

Common Name	Scientific Name
Goldenroc	*Solidago* sp.
Goldfields	*Lasthenia* sp.
Grass nuts	*Triteleia* sp.
Gray pine	*Pinus sabiniana*
Green-leaved manzanita	*Arctostaphylos patula*
Hedgehog dogtail	*Cynosurus echinatus*
Henderson's bent grass	*Agrostis hendersonii*
Himalayan blackberry	*Rubus discolor*
Hot rock daisy	*Erigeron inornatus* var. *calidipetris*
Hyssop loosestrife	*Lythrum hyssopifolium*
Incense cedar	*Calocedrus decurrens*
Indian-pink	*Silene californica*
Interior live oak	*Quercus wislizenii* var. *wislizenii*
Italian rye-grass	*Lolium multiflorum*
Klamath weed	*Hypericum perforatum*
Legenere	*Legenere limosa*
Lemonadeberry	*Rhus trilobata*
Lesser quaking-grass	*Briza minor*
Liverworts	Hepaticopsida
Long-beaked hawkbit	*Leontodon taraxacoides*
Lowland shooting star	*Dodecatheon clevelandii*
Manroot	*Marah fabaceus*
Manzanitas	*Arctostaphylos* sp.
Marigold navarretia	*Navarretia tagetina*
Marsh claytonia	*Claytonia palustris*
Marsh skullcap	*Scutellaria galericulata*
Mediterranean barley	*Hordeum marinum* ssp. *gussoneanum*
Medusahead	*Taeniatherum caput-medusae*
Miner's lettuce	*Claytonia perfoliata*
Mistletoe	*Phoradendron* sp./*Viscum* sp.
Monkeyflower	*Mimulus guttatus*
Mountain brome	*Bromus marginatus*

Plants

Common Name	Scientific Name
Narrow-leaved cattail	*Typha angustifolia*
Needlegrass	*Achnatherum* sp.
Nitgrass	*Gastridium ventricosum*
Obtuse starwort	*Stellaria obtusa*
Orchard grass	*Dactylis glomerata*
Oregon ash	*Fraxinus latifolia*
Pacific sanicle	*Sanicula crassicaulis*
Pacific yew	*Taxus brevifolia*
Pale yellow stonecrop	*Sedum laxum* ssp. *flavidum*
Parish's spike-rush	*Eleocharis parishii*
Pipevine	*Aristolochia californica*
Poison oak	*Toxicodendron diversilobum*
Ponderosa pine	*Pinus ponderosa*
Popcorn-flowers	*Plagiobothrys* sp.
Prickly lettuce	*Lactuca serriola*
Puttyroots	*Plectritis* sp.
Q-tips	*Micropus californicus*
Red Bluff dwarf rush	*Juncus leiospermus* var. *leiospermus*
Red brome	*Bromus madritensis*
Red-flowered lotus	*Lotus rubriflorus*
Redberry	*Rhamnus crocea*
Redbud	*Cercis occidentalis*
Ripgut brome	*Bromus diandrus*
Rush	*Juncus effusus*
Sanborn's onion	*Allium sanbornii* var. *sanbornii*
Sanford's arrowhead	*Sagittaria sanfordii*
Sanicle	*Sanicula* sp.
Saxifrage	*Saxifraga californica*
Scotch broom	*Cytisus scoparius*
Scrub oak	*Quercus berberidifolia*
Sedge	*Carex* sp.
Shield-bracted monkeyflower	*Mimulus glaucescens*

Plants

Common Name	Scientific Name
Silky cryptantha	*Cryptantha crinita*
Silver hairgrass	*Aira caryophyllea*
Slender Orcutt grass	*Orcuttia tenuis*
Snub pea	*Lathyrus sulphureus*
Soaproots	*Chlorogalum* sp.
Soft chess	*Bromus hordaeaceus*
Star-thistle	*Centaurea* sp.
Sword ferns	*Polystichum* sp.
Tarweed	*Hemizonia* sp.
Tidy-tips	*Layia fremontii*
Toad rush	*Juncus bufonius* var. *bufonius*
Tomcat clover	*Trifolium willdenovii*
Toyon	*Heteromeles arbutifolia*
Valley oak	*Quercus lobata*
Vetch	*Vicia* sp.
Water bulrush	*Scripus subterminalis*
Water starwort	*Callitriche* sp.
Watercress	*Rorippa nasturtium-aquaticum*
Western buttercup	*Ranunculus occidentalis*
Western compion	*Silene occidentalis* ssp. *longistipitata*
Western spicebush	*Calycanthus occidentalis*
Western sycamore	*Platanus racemosa*
White alder	*Alnus rhombifolia*
White mulberry	*Morus alba*
White-leaved manzanita	*Arctostaphylos viscida*
White-stemmed pondweed	*Potamogeton praelongus*
White-tipped clover	*Trifolium variegatum*
Wild iris	*Iris* sp.
Wild oats	*Avena* sp.
Willows	*Salix exigua, S. laevigata, S. lasiolepis*
Woodland strawberry	*Fragaria vesca*
Woolly marbles	*Psilocarphus* sp.

Plants

Common Name	Scientific Name
Woolly meadowfoam	*Limnanthes flocossa* ssp. *flocossa*
Yellow star-thistle	*Centaurea solstitialis*
Yellowcarpet	*Blennosperma nanum*

Animals

Common Name	Scientific Name
Insect	
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
Amphibians	
California newt	*Taricha torosa*
California slender salamander	*Batrachoseps attenuatus*
California red-legged frog	*Rana aurora draytoni*
Cascades frog	*Rana cascadae*
Foothill yellow-legged frog	*Rana boylii*
Sierra Nevada salamander	*Ensatina eschscholtzi*
Southern torrent (seep) salamander	*Rhyacotriton variegates (olympicus)*
Tailed frog	*Ascaphus truei*
Reptiles	
Common kingsnake	*Lampropeltis getulus*
Garter snake	*Thamnophis* sp.
Gopher snake	*Pituophis melanoleucus*
Northern alligator lizard	*Gerrhonotus coeruleus*
Northwestern pond turtle	*Clemmys marmorata marmorata*
Ring-necked snake	*Diadophis punctatis*
Southwestern pond turtle	*Clemmys marmorata pallida*
Western fence lizard	*Sceloporus occidentalis*
Western rattlesnake	*Crotalus viridis*
Birds	
Acorn woodpecker	*Melanerpes formicivorus*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*

Animals

Common Name	Scientific Name
American dipper	*Cinclus mexicanus*
American kestrel	*Falco sparverius*
American peregrine falcon	*Falco peregrinus anatum*
American pipit	*Anthus rubescens*
American robin	*Turdus migratorius*
American wigeon	*Anas americana*
Anna's hummingbird	*Calypte anna*
Ash-throated flycatcher	*Myiarchis cinerascens*
Bald eagle	*Haliaeetus leucocephalus*
Band-tailed pigeon	*Columba fasciata*
Barn owl	*Tyto alba*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Ceryle alcyon*
Bewick's wren	*Thryomanes bewickii*
Black phoebe	*Sayornis nigricans*
Black swift	*Cypseloides niger*
Black-headed grosbeak	*Pheuticus melanocephalus*
Black-necked stilt	*Himantopus mexicanus*
Black-throated gray warbler	*Dendroica nigrescens*
Blue-gray gnatcatcher	*Polioptila caerulea*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown creeper	*Certhia americana*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
Bushtit	*Psaltriparus minimus*
California quail	*Callipepla californica*
California spotted owl	*Strix occidentalis occidentalis*
California thrasher	*Toxostoma redivivum*
California towhee	*Pipilo crissalis*
California yellow warbler	*Dendroica petechia brewsteri*
Cassin's vireo	*Vireo cassinii*
Chipping sparrow	*Spizella passerina*

Animals

Common Name	Scientific Name
Cinnamon teal	*Anas cyanoptera*
Common merganser	*Mergus merganser*
Common nighthawk	*Chordeiles minor*
Common poorwill	*Phalaenoptilus nuttallii*
Common raven	*Corvus corax*
Common snipe	*Gallinago gallinago*
Cooper's hawk	*Accipiter cooperi*
Dark-eyed junco	*Junco hyemalis*
Downy woodpecker	*Picoides pubescens*
Ferruginous hawk	*Buteo regalis*
Fox sparrow	*Passerella iliaca*
Gadwall	*Anas strepera*
Golden eagle	*Aquila chrysaetos*
Golden-crowned kinglet	*Regulus satrapa*
Golden-crowned sparrow	*Zonotrichia atricapilla*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Greater roadrunner	*Geococcyx californicus*
Greater yellowlegs	*Tringa melanoleuca*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Hairy woodpecker	*Picoides villosus*
Hermit thrush	*Catharus guttatus*
Hermit warbler	*Dendroica occidentalis*
Horned lark	*Eremophila alpestris*
House finch	*Carpodacus mexicanus*
House wren	*Troglodytes aedon*
Hutton's vireo	*Vireo huttoni*
Killdeer	*Charadrius vociferus*
Lark sparrow	*Chondestes grammacus*
Lazuli bunting	*Passerina amoena*

Animals

Common Name	Scientific Name
Lesser goldfinch	*Carduelis psaltria*
Little willow flycatcher	*Empidonax traillii brewsteri*
Loggerhead shrike	*Lanius ludovicianus*
Long-eared owl	*Asio otus*
Macgillivray's warbler	*Oporornis tolmiei*
Mallard	*Anas platyrhynchos*
Merlin	*Falco columbarius*
Mountain quail	*Oreortyx pictus*
Mourning dove	*Zenaida macroura*
Nashville warbler	*Vermivora ruficapilla*
Northern flicker	*Colaptes auratus*
Northern goshawk	*Accipiter gentilis*
Northern harrier	*Circus cyaneus*
Northern pygmy-owl	*Glaucidium gnoma*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Nuttall's woodpecker	*Picoides nuttallii*
Oak titmouse	*Baeolophus inornatus*
Olive-sided flycatcher	*Contopus cooperi*
Orange-crowned warbler	*Vermivora celata*
Osprey	*Pandion haliaetus*
Pacific-slope flycatcher	*Empidonax difficilis*
Phainopepla	*Phainopepla nitens*
Pied-billed grebe	*Podilymbus podiceps*
Pileated woodpecker	*Drycopus pileatus*
Pine siskin	*Carduelis pinus*
Prairie falcon	*Falco mexicanus*
Purple finch	*Carpodacus purpureus*
Purple martin	*Progne subis*
Red-breasted nuthatch	*Sitta canadensis*
Red-breasted sapsucker	*Sphyrapicus ruber*
Red-tailed hawk	*Buteo jamaicensis*
Ring-necked duck	*Aythya collaris*

Animals

Common Name	Scientific Name
Rough-legged hawk	*Buteo lagopus*
Rufous-crowned sparrow	*Aimophila ruficeps*
Savannah sparrow	*Passerculus sandwichensis*
Sharp-shinned hawk	*Accipiter striatus*
Song sparrow	*Melospiza melodia*
Spotted towhee	*Pipilo maculatus*
Steller's jay	*Cyanositta stelleri*
Swainson’s hawk	*Buteo swainsoni*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Vaux's swift	*Chaetura vauxi*
Vesper sparrow	*Pooecetes gramineus*
Violet-green swallow	*Tachycineta thalassina*
Warbling vireo	*Vireo gilvus*
Western bluebird	*Sialia mexicana*
Western burrowing owl	*Athene cunicularia hypugea*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Western screech owl	*Otus kennicottii*
Western scrub jay	*Aphelocoma californica*
Western tanager	*Piranga ludoviciana*
Western wood-pewee	*Contopus sordidulus*
White-breasted nuthatch	*Sitta carolinensis*
White-crowned sparrow	*Zonotrichia leucophrys*
White-tailed kite	*Elanus leucurus*
Willow flycatcher	*Empidonax traillii*
Wilson's warbler	*Wilsonia pusilla*
Winter wren	*Troglodytes troglodytes*
Wood duck	*Aix sponsa*
Wrentit	*Chamaea fasciata*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*

Animals

Common Name	Scientific Name
Mammals	
American badger	*Taxidae taxus*
Big brown bat	*Eptesicus fuscus*
Black-tailed deer	*Odocoileus hemionus*
Black-tailed hare	*Lepus californicus*
Bobcat	*Lynx rufus*
Brush rabbit	*Silvilagus bachmani*
California ground squirrel	*Spermophylla beecheyi*
Coyote	*Canis latrans*
Deer mouse	*Peromyscus maniculatus*
Dusky-footed woodrat	*Neotoma fuscipes*
Fringed myotis	*Myotis thysanodes*
Gray fox	*Urocyon cinereoargenteus*
Long-eared myotis	*Myotis evotis*
Long-legged myotis	*Myotis volans*
Northern flying squirrels	*Glaucomys sabrinus*
Pacific fisher	*Martes pennanti pacifica*
Pallid bat	*Antrozous pallidus*
Raccoon	*Procyon lotor*
Ringtail	*Bassariscus astutus*
Sierra Nevada Mountain beaver	*Aplodontia rufa*
Small-footed myotis	*Myotis ciliolabrum*
Spotted bat	*Euderma maculatum*
Striped skunk	*Mephitis mephitis*
Townsend's big-eared bat	*Plecotus townsendii*
Western gray squirrel	*Sciurus griseus*
Yuma myotis	*Myotis yumanensis*

Appendix Q

Final Fish and Wildlife Coordination Act Report

The Final Fish and Wildlife Coordination Act Report is also available on the Web site for the U.S. Fish and Wildlife Service's Sacramento Office, at http://sacramento.fws.gov/, under the section titled "Of Special Interest."

Fish and Wildlife Coordination Act Report

Battle Creek Salmon and Steelhead Restoration Project

Sacramento Fish and Wildlife Office
U.S. Fish and Wildlife Service
Sacramento, California

June 2005

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

Memorandum

To: Regional Director, Bureau of Reclamation, Mid-Pacific Region
Sacramento, California

From: Field Supervisor, Sacramento Fish and Wildlife Office
Sacramento, California

Subject: Fish and Wildlife Coordination Act Report for the Battle Creek Salmon and Steelhead Restoration Project

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in Section 2(b) of the Fish and Wildlife Coordination Act (48 stat. 401, as amended), for the Battle Creek Salmon and Steelhead Restoration Project (Restoration Project). The U.S. Bureau of Reclamation (Reclamation) is the lead Federal agency for Restoration Project implementation; the State Water Resources Control Board is the State lead agency.

The Restoration Project was designed to restore anadromous fish habitat in about 42 miles of the mainstem, North Fork, and South Fork Battle Creek and an additional 6 miles of Battle Creek's tributaries, while minimizing the loss of hydropower production. The Restoration Project is expected to considerably benefit anadromous fish and other aquatic species in Battle Creek downstream of each fork's naturally impassable waterfalls by increasing quantity and quality of instream habitat and improving fish passage. The Restoration Project also would provide benefits to terrestrial wildlife that use stream and riparian habitats, and potentially several bat species that might occupy decommissioned water conveyance tunnels. However, some restoration components would have incidental adverse impacts in the stream channel, and some upland, riparian, and wetland habitats within the construction footprints would be lost, including potential habitat for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*).

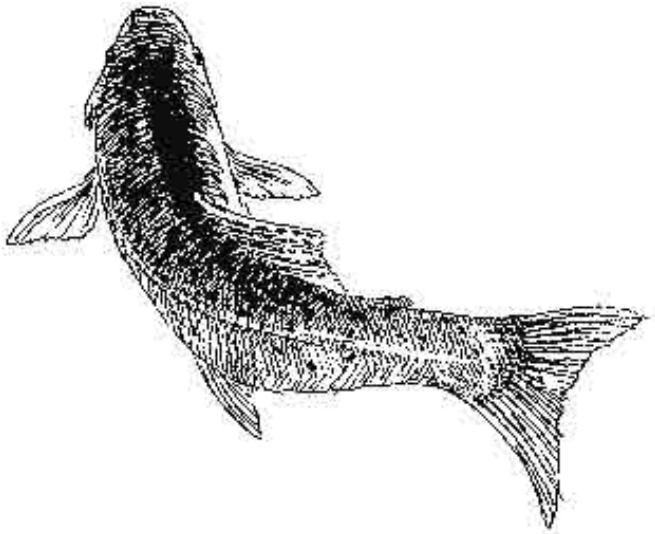
This report reviews the proposed action and alternatives, and summarizes potential beneficial and adverse effects on fish and wildlife resources. Recommendations are provided to help maximize project benefits and avoid, minimize, and compensate for incidental adverse effects in accordance with the Service's Mitigation Policy (Federal Register 46(15):7644-7663). Appropriate mitigation would help ensure that the Restoration Project provides the greatest possible benefits to overall ecosystem quality in the project area.

In accordance with the FWCA, the Service has coordinated biological issues with NOAA Fisheries and California Department of Fish and Game (CDFG). The draft FWCA report for the Restoration Project (July, 2003) and a review copy of the present final FWCA report were

provided to NOAA Fisheries and CDFG for their review and comment. The attached final FWCA Report should be included as an appendix to the Restoration Project's Final Environmental Impact Statement/Environmental Impact Report.

The Service appreciates the opportunity to comment and contribute to the Battle Creek Salmon and Steelhead Restoration Project planning process. If you have any questions regarding the FWCA report, please contact Bart Prose of my staff at (916) 414-6600.

cc:
U.S. Bureau of Reclamation, Sacramento, CA (Attn: Mary Marshall)
Federal Energy Regulatory Commission, Washington, DC (Attn: T. J. LoVullo)
NOAA Fisheries, Sacramento, CA (Attn: Mike Tucker)
U.S. Fish and Wildlife Service, Red Bluff, CA (Attn: Jim Smith)
California Department of Fish and Game, Redding, CA (Attn: Harry Rectenwald)
State Water Resources Control Board, Sacramento, CA (Attn: Jim Canaday)
Pacific Gas and Electric Company, San Francisco, CA (Attn: Angela Risdon)



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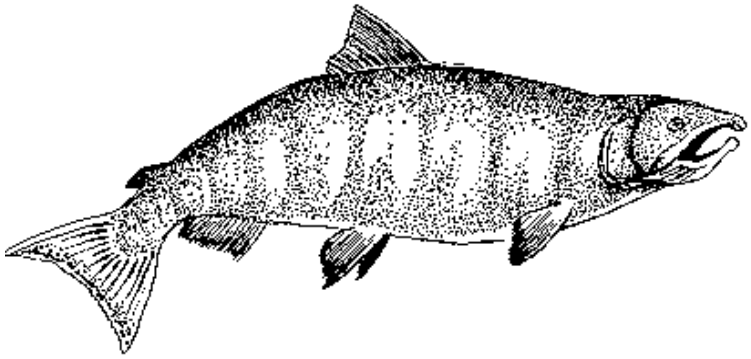

INTRODUCTION

The Battle Creek Salmon and Steelhead Restoration Project (Restoration Project) was designed to restore anadromous fish habitat in about 42 miles of the mainstem, North Fork, and South Fork Battle Creek downstream of each fork's naturally impassable waterfalls, and an additional 6 miles of Battle Creek's tributaries, while minimizing the loss of hydropower production. The Restoration Project is expected to considerably benefit anadromous fish and other aquatic species in Battle Creek by increasing quantity and quality of instream habitat and improving fish passage. However, some project components would have incidental adverse impacts in the stream channel and some upland, riparian, and wetland habitats within the construction footprints would be lost. Careful selection and implementation of a Restoration Project alternative, appropriate mitigation of adverse effects, and opportunistic enhancement of other affected habitat in the Restoration Project area would help ensure that the Restoration Project most fully meets its purpose and provides the greatest possible ecosystem benefits.

This Fish and Wildlife Coordination Act (FWCA) report provides environmental evaluations and recommendations of the U.S. Fish and Wildlife Service (Service) to the U.S. Bureau of Reclamation (Reclamation), pursuant to the FWCA. Reclamation is the lead Federal agency for Restoration Project construction and regulatory compliance. The FWCA is intended to help develop and improve fish and wildlife resources in association with Federal projects and projects carried out under Federal permits and licenses that affect bodies of water, and prevent the loss of, or damage to, fish and wildlife from such projects. A draft FWCA report (USFWS 2002a) prepared by the Service was included as Appendix Q in the Draft Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR) (USBR and SWRCB 2003b).

The FWCA report evaluates the proposed action and alternatives of the Restoration Project and summarizes potential beneficial and adverse effects on fish and wildlife resources. Recommendations are intended to help maximize project benefits and avoid, minimize, and compensate for incidental adverse effects in accordance with the Service's Mitigation Policy (Federal Register 46(15):7644-7663). Information sources include planning documents, field surveys and reports, construction designs and specifications, descriptions of restoration alternatives, and impact assessment data for the Restoration Project; meetings among the involved resource agencies, Pacific Gas and Electric Company (PG&E), and non-government organizations; a Memorandum of Understanding for the proposed restoration of Battle Creek (Restoration Project MOU) (MOU Parties 1999); and the Biological Assessment (BA) for operation of the Coleman National Fish Hatchery (CNFH) (USFWS 2001a).

In accordance with the FWCA, the Service has coordinated biological issues with NOAA Fisheries and California Department of Fish and Game (CDFG), and other members of the project's Environmental Team . The draft FWCA report (USFWS 2002a) and a draft of the present FWCA report were provided to NOAA Fisheries and CDFG for their review and input. This FWCA report will be included as an appendix to the Restoration Project's Final Environmental Impact Statement/Environmental Impact Report.

BACKGROUND

Declining Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) populations in the Sacramento River system (the mainstem river and its tributaries) have been attributed to several factors, including, water supply development, inadequate stream flow, rapid flow fluctuations, high summer and fall water temperatures in streams below diversions, dams that block access to upstream habitat, entrainment of juvenile fish into unscreened or poorly screened diversions, sedimentation, and over-harvest (USFWS 1995). These population declines have resulted in the need to implement habitat restoration actions throughout the Sacramento River system as one way to preserve and enhance populations.

Battle Creek is recognized as the most important Sacramento River tributary for restoration of Chinook salmon and steelhead (Kier Associates 1999). Before hydroelectric and other land development in the watershed, Battle Creek provided a contiguous stretch of prime habitat for anadromous Chinook salmon and steelhead from its confluence with the Sacramento River upstream to naturally impassable waterfalls. Hydroelectric power development and hatchery operations on Battle Creek have affected annual runs of naturally produced Chinook salmon and steelhead. Impaired fish passage and instream flows have been the primary factors. Restoration of anadromous fisheries in Battle Creek has been identified as a priority in several fishery restoration plans developed by State and Federal resource agencies (CRA 1989, CDFG 1990, CDFG 1993, CDFG 1996a, CDFG 1996b, CALFED 2000a, USFWS 2001b).

In early 1999, the Battle Creek Salmon and Steelhead Restoration Plan (Kier Associates 1999) was completed as a collaborative effort among Reclamation, NOAA Fisheries, the Service, CDFG, PG&E, and other Battle Creek Working Group (BCWG) stakeholders. The Plan provides biological criteria and information supporting restoration and identifies physical actions and monitoring measures that would be necessary. The following principles were considered essential by Reclamation, NOAA Fisheries, the Service, and CDFG for salmonid restoration and a necessary component of the negotiated Restoration Project:

- Biological Effectiveness - Restoration actions must incorporate the most biologically effective remedies that provide the highest certainty to successfully restore ecosystem functions and self-sustaining populations of native fish in a timely manner.

- Restoring Natural Processes - Restoration actions must incorporate measures that mimic the hydrologic conditions under which Battle Creek anadromous fish resources evolved by increasing baseflows and eliminating mixing of North Fork and South Fork waters.

- Biological Certainty - Restoration actions must provide maximum long-term effectiveness by minimizing long-term dependence on the integrity of man-made restoration actions and the cooperation of future project owners and operators.

In June 1999, the Restoration Project MOU, which defined the mutual intent to restore salmon and steelhead in Battle Creek in relation to PG&E's Hydroelectric Project (Hydroelectric Project)

facilities and included proposed restoration components and protocols for implementation, was signed by the MOU Parties (Reclamation, NOAA Fisheries, Service, CDFG, and PG&E). The MOU Parties expected to achieve the following benefits from the Restoration Project (MOU Parties 1999):

- Restoration of self-sustaining populations of Chinook salmon and steelhead and their habitat in the Battle Creek watershed through a voluntary partnership with State and Federal agencies, a third party donor(s), and PG&E.

- Up-front certainty regarding specific restoration components, including Resource Agency prescribed instream flow releases, selected decommissioning of dams at key locations in the watershed, dedication of water diversion rights for instream purposes at decommissioned sites, construction of tailrace connectors, and installation of fail-safe fish screens and fish ladders.

- Timely implementation and completion of restoration activities.

- Joint development and implementation of a long-term Adaptive Management Plan with dedicated funding sources to ensure the continued success of restoration efforts under this partnership.

In support of the completed Restoration Project MOU, the CALFED Bay-Delta Program (CALFED) provided funding for planning and implementation of resource agency portions of any approved actions of the Restoration Project. The Restoration Project is supported by several directives of CALFED, as recounted in CALFED's Ecological Restoration Program (ERP) (CALFED 2000a) and Multi-Species Conservation Strategy (MSCS) (CALFED 2000c). The goal of the Ecosystem Restoration Program is to:

> "... improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta system [including the Sacramento River Basin] to support sustainable populations of diverse and valuable plant and animal species through an adaptive management process." (CALFED 2000b).

The ERP (along with CALFED's water management strategy) is designed to achieve or contribute to the recovery of Bay-Delta species listed under the Federal and State Endangered Species Acts (ESA and CESA, respectively) and, thus, achieve the goals of the MSCS (CALFED 2000b). The ERP establishes adaptive management as the primary tool for achieving ERP objectives and making future decisions for large-scale ecosystem restoration (CALFED 2000a). Stage 1 actions and milestones for implementing the ERP and MSCS have been identified for Battle Creek in the Programmatic Biological Opinions for CALFED provided by NOAA Fisheries (NMFS 2000) and the Service (USFWS 2000). Stage 1 actions for Battle Creek are:

- Improve fish migration by removing diversion dams, upgrading fish passage facilities, and screening diversions.

- Improve instream flows in lower Battle Creek to provide adequate passage flows.

- Develop and implement a watershed management plan to reduce the amount of fine sediments introduced into the creek channel, to protect and restore riparian habitat, to improve base flows, and to reduce water temperatures.

Stage 1 milestones for Battle Creek are:

- Design and begin implementation of an ecologically based stream flow regulation plan for Battle Creek.

- Develop and implement a solution to improve passage of upstream migrant adult fish and downstream migrant juvenile fish in Battle Creek.

The Restoration Project also is consistent with the ERP's Watershed Program, which supports local and regional activities that improve the ability of watersheds to function as a contributor to the health of the entire Bay-Delta system (CALFED 2000d). The Watershed Program supports improvement of ecosystem quality through restoration projects, stating that "Watershed activities that improve riparian habitat, increase or improve fisheries habitat and passage, restore wetlands, or restore the natural stream morphology affecting downstream flows or species may benefit ecosystem quality."

Desired outcomes from the Watershed Program include improved ecosystem maintenance and enhancement for the watershed. CALFED may support projects or programs that address:

- "Streamflow Enhancements - Planning, management and project activities that maintain or restore appropriate stream flows in the tributary streams to the Bay-Delta system." "Particular emphasis will be on the restoration or maintenance of appropriate seasonal patterns that will sustain important ecological systems and successions." Examples include sediment balance, geomorphic stabilization, water quality enhancement, and improved spawning habitat (CALFED 2000d).

- "Biological Diversity Maintenance and Improvement - Programs, projects and other actions that maintain and conserve existing diversity will be supported. In addition, support will be provided for actions and programs that are intended to improve the diversity of appropriate local biological communities including riparian corridors, aquatic communities, wetlands, floodplains, forests and uplands" (CALFED 2000d).

The Restoration Project also is conceptually consistent with ecosystem-level restoration approaches specified by the Central Valley Project Improvement Act (CVPIA), which states that "The mitigation of fish and wildlife losses incurred as a result of construction, operation, or maintenance of the Central Valley Project shall be based on the replacement of ecologically

equivalent habitat ..." and "... give first priority to measures which protect and restore natural channel and riparian habitat values ..."

Further, the restoration plan for the CVPIA's Anadromous Fish Restoration Program (AFRP) (USFWS 2001b) states that "Protecting and restoring natural channel and riparian habitat values promotes natural processes that regulate geomorphic characteristics, nutrient dynamics, and production capabilities of streams, rivers and estuaries."

The restoration components and protocols proposed in the Restoration Project MOU comprise the Proposed Action of the Restoration Project. The Proposed Action and several alternatives are the focus of the Battle Creek Salmon and Steelhead Restoration Project. Restoration Project objectives (USBR and SWRCB 2005b) are:

- Restore self-sustaining populations of Chinook salmon and steelhead by restoring their habitat in the Battle Creek watershed and access to it through a voluntary partnership with State and Federal agencies, a third party donor(s), and PG&E.

- Establish instream flow releases that restore self-sustaining populations of Chinook salmon and steelhead.

- Remove selected dams at key locations in the watershed where the hydroelectric values were marginal due to increased instream flow.

- Dedicate water diversion rights for instream purposes at dam removal sites.

- Construct tailrace connectors and install fail-safe fish screens and fish ladders to provide increased certainty about restoration components.

- Restore stream function by structural improvements in the trans-basin diversion to provide a stable habitat and guard against false attraction of anadromous fish away from their migratory destinations.

- Avoid Restoration Project impacts on species of wildlife and native plants and their habitats to the extent practicable, minimize impacts that are unavoidable, and restore or compensate for impacts.

- Minimize loss of clean and renewable energy produced by the Battle Creek Hydroelectric Project.

- Implement restoration activities in a timely manner.

- Develop and implement a long-term adaptive management plan with dedicated funding sources to ensure the continued success of restoration efforts.

- Avoid impacts on other established water users/third parties.

Habitat restoration and enhancement is particularly important for spring-run Chinook salmon, which are listed as threatened under the Federal and State Endangered Species Acts; winter-run Chinook salmon, which are State and federally listed as endangered; and steelhead, which are federally listed as threatened within the Sacramento River and its tributaries. As a CALFED directed action, the Restoration Project conservation goals for fish in Battle Creek are the same as those identified in the CALFED MSCS for the CALFED Program (USBR 2005). The relative priorities among anadromous salmonids in Battle Creek are set by MSCS recovery objectives, which are described in the Restoration Project's Draft[1] Action Specific Implementation Plan (ASIP) (USBR and SWRCB 2004). First priority species are winter-run Chinook salmon, spring-run Chinook salmon, and steelhead. Second priority species are fall-run Chinook salmon and late fall-run Chinook salmon. During some periods of the year, needs of the different species, runs, and lifestages can conflict in a given reach of the creek and some balancing of needs might be required through short-term flow adjustment. However, overall priorities would be consistent with those described in the MSCS.

The Restoration Project has adopted the NOAA Fisheries concept of viable populations (McElhany et al. 2000) as the intermediate population goal (USBR and SWRCB 2005c: Appendix C). The ultimate goal is maximization of Chinook salmon and steelhead production and full utilization of project area carrying capacity. Quantitative goals and specific actions for the recovery of winter-run and spring-run Chinook salmon in the Central Valley are under development by the multi-agency Central Valley Technical Recovery Team under the direction of NOAA Fisheries. Recommendations for quantitative population goals and specific actions should be provided by the team by the time construction for the Restoration Project is completed (ca. 2008) (USBR 2005). In the interim, the Draft Restoration Project Adaptive Management Plan (AMP) (USBR and SWRCB 2005c: Appendix C) has identified a goal of 1,000 individual adults returning to spawn (spawners) for each of the four Chinook salmon runs and steelhead, based on several theories of genetic diversity for fish populations. These quantitative goals represent population increases one to three orders of magnitude greater than observed numbers of spring-run and winter-run spawners in Battle Creek, respectively (USBR 2005). There are no formal estimates of anadromous fish carrying capacity in Battle Creek for either pre-restoration or post-restoration conditions due to a lack of reliable methods (USBR and SWRCB 2005c: Appendix C), but coarse estimates suggest that 1,000 spawners represents about one-half the carrying capacity of moderately restored Battle Creek habitat for most anadromous fish runs/species (USBR 2005).

[1]The Draft ASIP was not formally made final, but was supplemented by an ASIP Addendum (USBR and SWRCB 2005e); the two documents taken together constitute final ASIP documentation.

FISH AND WILDLIFE SERVICE MITIGATION POLICY

The Service's views and recommendations contained in this report are guided by the Service's Mitigation Policy, which provides guidance to protect or conserve fish and wildlife resources. The intent of the Mitigation Policy is to protect and conserve the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources. The Mitigation Policy defines mitigation to include avoiding impacts, minimizing impacts, rectifying impacts, reducing or elimination impacts over time, and compensating for impacts. The Service considers the stated order of mitigation elements to represent the most desirable sequence of steps in the mitigation planning process.

Under the policy, fish and wildlife resources are divided into four Resource Categories to ensure that recommended mitigation is consistent with the fish and wildlife habitat values affected (Table 1). The four categories cover a range of habitat values from unique and irreplaceable to more common and of relatively less value to fish and wildlife. Corresponding mitigation goals are determined, accordingly, based on the habitat's scarcity or uniqueness and its perceived value to fish and wildlife species (the Mitigation Policy does not apply to species listed, or proposed for listing, under the ESA).

In addition to considerations and goals of its Mitigation Policy, the Service is further attentive to protection of wetland habitats. The Service has long recognized the importance of wetlands to waterfowl, other migratory birds, fish, and wildlife. Wetlands provide important fish and wildlife benefits as well as other significant functions (flood control, water quality maintenance, water supply, recreation, and scientific research) to the nation. Destruction of wetlands eliminates or reduces these values. It is the public's best interest to protect wetlands and maintain these values for this and future generations. The Service's Region 1 policy is to view wetland degradation or losses as unacceptable changes to an important national resource. It is the goal of the Service's Region 1 to ensure that no net loss (acreage or value, whichever is greater) of wetland habitats occurs. For the purposes of this policy, wetlands are defined according to Cowardin et al. (1979).

Lastly, Federal courts have recently affirmed that Federal agencies are subject to prohibitions in the Migratory Bird Treaty Act (MBTA), including restrictions on "take" of migratory birds. Executive Order 13186–*Responsibilities of Federal Agencies to Protect Migratory Birds* [Federal Register 66(11): 3853-3856]–requires that Federal agencies develop Memorandums of Agreement (MBTA Agreements) with the Service to ensure that migratory bird populations are safeguarded by avoiding or minimizing the impact of activities on migratory bird populations and incorporating migratory bird conservation measures into their agency activities. (U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Executive Order for the Conservation of Migratory Birds, Questions and Answers: http://migratorybirds.fws.gov/EO/QandA.html). Nothing in the Executive Order would constitute legal authorization to take migratory birds.

Table 1. Service Mitigation Policy for Resource Categories and mitigation planning goals.

Resource Category	Designation Criteria	Mitigation Planning Goal
1	High value for evaluation species and unique and irreplaceable	No loss of existing habitat value
2	High value for evaluation species and scarce or becoming scarce	No net loss of in-kind habitat value[1]
3	High to medium value for evaluation species and abundant	No net loss of habitat value while minimizing loss of in-kind habitat value
4	Medium to low value for evaluation species	Minimize loss of habitat value

[1]Unavoidable losses of habitat value would need to be replaced in-kind. In-kind replacement means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate to those lost.

Because Reclamation's MBTA Agreement with the Service is not yet completed, the Service's consultation with Reclamation on Restoration Project MBTA issues and associated recommendations provided to Reclamation were based on agency responsibilities outlined in section 3(e) of the Executive Order. These can be paraphrased as:

- Support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.
- Restore and enhance the habitat of migratory birds, as practicable.
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.
- Design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes, as practicable.
- Ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts, such as Partners-in-Flight.

- Ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

- Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors, and develop and use principles, standards, and practices that will lessen the amount of unintentional take in cooperation with the Service.

A summary of migratory bird directives, including programmatic-level guidance from the Service and California Partners in Flight Conservation Plans is provided in Attachment E.

PROJECT AREA

Battle Creek is a tributary of the upper Sacramento River in Shasta and Tehama counties, California. Battle Creek and its tributaries flow westward from the Sierra Nevada foothills, intersecting the Sacramento River between Red Bluff and Redding, and encompasses a watershed of 357 square miles (USBR and SWRCB 2003a) (Figure 1). Battle Creek flows through deep, shaded canyons and riparian corridors. The mountain stream is maintained by cold, spring-fed water. The overall gradient of Battle Creek is high, falling over 5,000 feet in less than 50 miles. Battle Creek has two main forks, North Fork Battle Creek and South Fork Battle Creek. The split of the two forks occurs about 12 miles east of Battle Creek's confluence with the Sacramento River. The Restoration Project area comprises about 42 miles of the mainstem and North and South Fork Battle Creek, downstream of each fork's natural fish barrier waterfalls to the confluence with the Coleman Powerhouse tailrace channel on the mainstem, and an additional 6 miles of Battle Creek tributaries.

The Hydroelectric Project facilities in the Restoration Project area are owned and operated by PG&E under FERC license number 1121 (USBR and SWRCB 2003a). The system includes a series of water diversions, several long canals, and low-volume/high-head power generators, including five powerhouses (Volta 1, Volta 2, South, Inskip and Coleman) with a combined nameplate capacity of 36.3 MW. FERC license instream flow requirements for the watershed are 3 cubic feet per second (cfs) instream flow below all North Fork Battle Creek diversions and 5 cfs instream flow below all South Fork Battle Creek diversions.

In 1995, PG&E began providing increased instream flows (up to 30 cfs) below Eagle Canyon and Coleman diversion dams to improve instream habitat below these dams in anticipation of the Restoration Project. The increased flows were provided under three successive interim agreements between PG&E and Reclamation; with concurrence of CDFG, NOAA Fisheries, and the Service; which provided partial financial compensation to PG&E for forgone power generation. The agreements also included temporary closure of fish ladders at Eagle Canyon and Coleman diversion dams, and suspended diversions at Wildcat Diversion Dam. The ladder

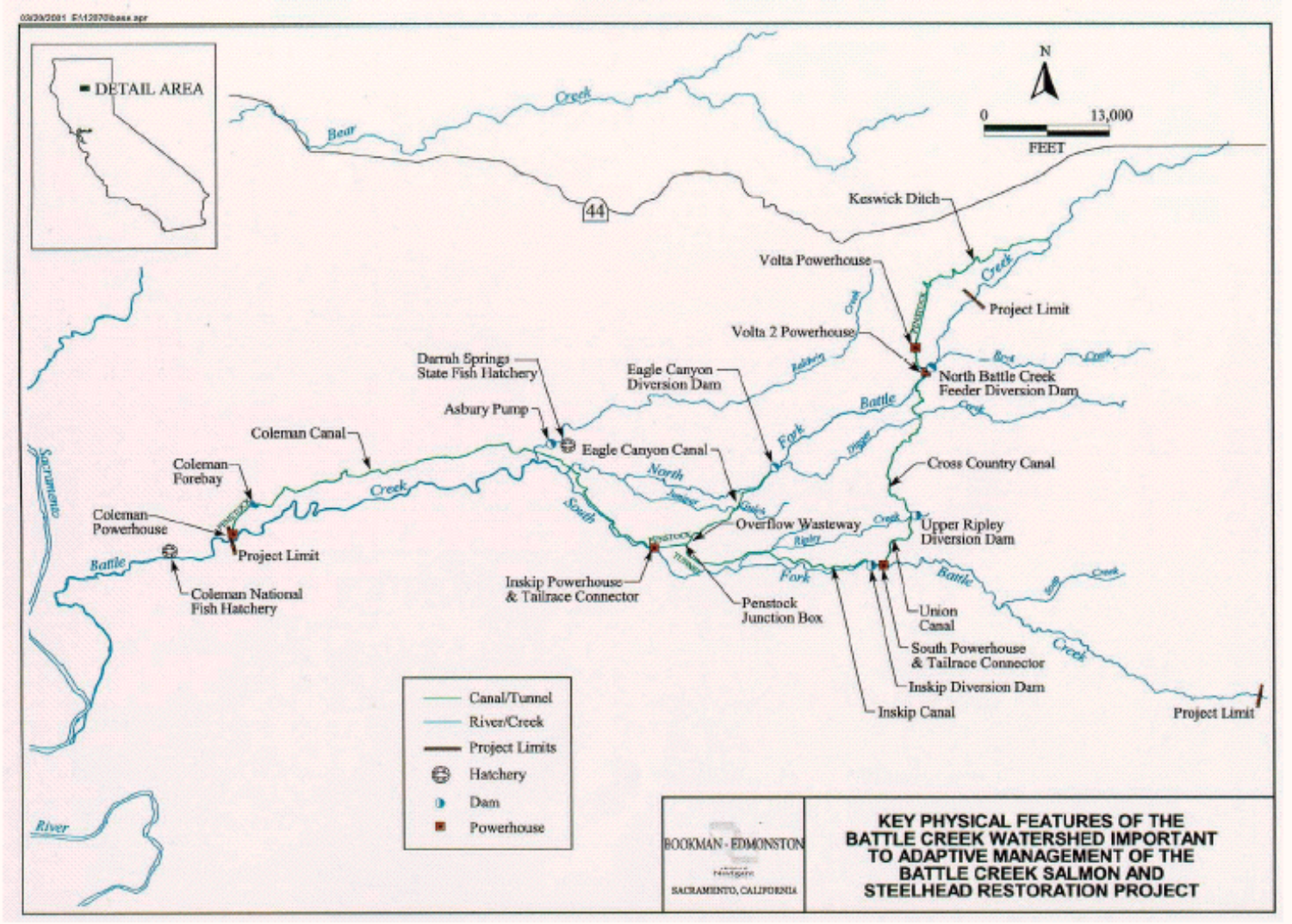

Figure 1. Battle Creek Salmon and Steelhead Restoration Project Area (USBR and SWRCB 2005c: Appendix C)

closures and suspended diversions are intended to confine anadromous fish to areas benefitting from interim flow enhancement, and protect juvenile anadromous fish from entrainment into unscreened diversions. The present agreement was begun in 2003 and will continue habitat provisions through the start of physical instream construction of the Restoration Project.

DEVELOPMENT OF RESTORATION COMPONENTS

Development of the Restoration Project has been consistent with CALFED and the CVPIA ecosystem restoration concepts, such as replacement of ecologically equivalent habitat; protection and restoration of natural channel and riparian habitat values; promotion of natural processes that regulate geomorphic characteristics, nutrient dynamics, and production capabilities; improvement of ecological functions to support sustainable populations of diverse plant and animal species; maintenance of appropriate seasonal patterns that will sustain important ecological systems; and ecosystem-based adaptive management (see *Background* above for more detail and citations). Restoration Project development also has been consistent with salmonid restoration principles developed by Spence et al. (1996), which include improvement of connectivity between isolated habitat patches and protection and restoration of areas surrounding critical refugia from further degradation, to allow for expansion of existing populations (Kier Associates 1999).

Instream Flow

Instream flow has been identified as the primary factor affecting spawning and rearing habitat of anadromous fish in Battle Creek, and the lack of spawning and rearing habitat has been identified as limiting the production of anadromous fish (USBR and SWRCB 2005b). Because Battle Creek contains a diversity of anadromous fish species and their life stages, substantial effort has been directed toward identifying which stream reaches and minimum instream flow schedules would be best suited to the recovery of the different species and life stages of anadromous fish throughout the year.

Estimates of increased minimum flows needed to help restore anadromous fisheries in Battle Creek were initially evaluated by the Service in coordination with State and Federal agencies, stakeholders, and interested parties pursuant to the AFRP (USFWS 1997), with the objective of providing adequate holding, spawning, and rearing habitat. AFRP flow prescriptions considered relationships between streamflow and physical habitat available to various life stages of anadromous fish for several reaches of Battle Creek (Thomas R. Payne and Associates 1991), based on the Instream Flow Incremental Methodology (IFIM) (Bovee 1996) and Physical Habitat Simulation System (PHABSIM) (Milhouse et al. 1984). The AFRP considered temperature and hydrology in prescribing its minimum instream flows, but a temperature model for Battle Creek was not available at the time. The AFRP flow prescriptions were offered as indicators of magnitude needed to optimize anadromous fish production, subject to revision on additional analysis (USFWS 1995), and were included in the Revised Draft Restoration Plan for the AFRP (USFWS 1997). In general, these flows were judged to be capable of developing 70-75% of the estimated life stage potentially limiting to the population (USBR and SWRCB 2005b).

In 1998, the BCWG biological technical team, composed of experts from resource agencies, PG&E, and stakeholders, considered additional analysis of IFIM data (Thomas R. Payne and Associates 1998a) and results of temperature modeling using the SNTEMP model (Thomas R. Payne and Associates 1998b,1998c; PG&E 2001). The analysis identified: 1) priority species and life stages of focus for each reach of Battle Creek, 2) flows to facilitate upstream access over obstacles in the stream channel, 3) rates of flow changes to avoid stranding and isolation of juveniles, and 4) water temperatures influenced both by increased flows and releases of cold spring-fed water to adjacent reaches of Battle Creek (USBR and SWRCB 2005c: Appendix C). The biological technical team assessed species' limiting life stages, generally spawning or rearing, to determine appropriate minimum flows (Kier Associates 1999). Flow prescriptions developed for the limiting life stages were designed to provide approximately 95% of the estimated potential habitat that could be created by flow management. As a result, the BCWG increased the minimum flows prescribed by the AFRP and incorporated them into the Restoration Project MOU as updated flow prescriptions.

A significant feature of the BCWG-derived flow prescriptions is the release of cold spring water into Battle Creek at Eagle Canyon on the North Fork, and Soap Creek and lower Ripley Creek tributaries to the South Fork. Instream flows provided below Asbury Dam on Baldwin Creek (a tributary to the mainstem Battle Creek) would contain spring water from Darrah Springs. Release of cold spring water into the natural stream channels provides cool water habitat for anadromous salmonids. Winter-run Chinook salmon originally were obligated to streams like Battle Creek having reaches with stable instream flow and temperature during summer, largely derived from cold-water springs (USFWS 1963). Battle Creek historically supported populations of winter-run Chinook salmon (USFWS 1987), but at present, the only measurable population occurs in the main stem Sacramento River below Shasta Dam, where cool water releases from the deepest portion of Shasta Lake provide suitable temperatures (Kier Associates 1999). However, the Sacramento River population is at risk of total reproductive failure due to lethal water temperatures at least 2 years out of 100, and partial reproductive failure 1 year out of 10 (USBR 1991). Spring water releases on Battle Creek could provide drought resistant refugia and spread the risk of reproductive failures of the Sacramento River winter-run population.

During some periods of the year, the needs of anadromous fish species and lifestages can conflict (Kier Associates 1999). Some accommodation is possible through short-term minimum flow adjustments that serve the needs of all species-life stages fairly well, but the adjustments might not be optimal for any particular species-life stage. Priorities were based on habitat availability in the watershed (less habitat means higher priority). The declining priority of species consideration used by the biological technical team was winter-run Chinook salmon, spring-run Chinook salmon, steelhead, late fall–run Chinook salmon, and fall-run Chinook salmon, based on the inability of scarce available habitat in this watershed, and elsewhere, to meet the needs for natural reproduction of the species and to effect their recovery (USBR and SWRCB 2005b). Whereas, the greatest divergence of seasonal flow needs occurs between steelhead and the various runs of Chinook salmon, steelhead have greater opportunities available to them for suitable habitat elsewhere in the upper Sacramento River basin; thus the biological technical team's decision to

provide a less-than optimal flow regime for steelhead ensures that habitat conditions for winter- and/or spring-run Chinook salmon are given priority.

Another important consideration for determining appropriate minimum flows in some stream reaches was passage over natural barriers (Kier Associates 1999), as discussed next under *Fish Passage*. In some cases, ensuring this passage required elevating flows to higher levels than optimal for other life stages. But typically, even with this passage accommodation, the minimum flows recommended by the biological technical team could achieve 95% or more of the estimated potential habitat for a limiting life stage.

Fish Passage

The cross-basin transfer of North Fork Battle Creek water to two powerhouses on the South Fork and then into the South Fork channel results in mixing of North Fork and South Fork water. Inter-basin mixing of water could adversely affect migration of adult salmon and steelhead to their natal streams–a phenomenon known as false attraction (Kier Associates 1999).

One aspect of false attraction is the confounding of olfactory cues that help guide migrating adults to their natal habitat for spawning. Olfactory cues are unique to each stream and inter-basin mixing of Battle Creek water could falsely attract fish to the wrong fork. For example, migrating winter- and spring-run Chinook salmon returning to North Fork Battle Creek may be drawn into the South Fork Battle Creek after sensing North Fork water mixed with South Fork water. During drought, South Fork Battle Creek is considered less desirable to winter- and spring-run Chinook salmon natal to the North Fork, because the South Fork would have limited capabilities to produce spring- and winter-run Chinook salmon, except in the higher elevation reaches. The North Fork, with its abundant cold water springs, has higher resistance to drought conditions.

Maintaining the fidelity of fish natal to the North Fork might help ensure survival of winter- and spring-run Chinook salmon populations during adverse stream conditions elsewhere in the Sacramento River basin. Guarding against false attraction might prevent the South Fork from becoming a drain on winter- and spring-run Chinook salmon populations produced in the North Fork, and the important North Fork drought refugia from being under-seeded during a drought. Should false attraction limit the rate and/or size of population growth in the North Fork, fewer returning adults would subsequently return to seed this refugia. Although lacking the North Fork's level of drought refugia, South Fork Battle Creek is still very desirable to restore for anadromous fish, as it has the largest capacity to produce Chinook salmon outside of drought years.

A second aspect of false attraction involves powerhouse discharges of relatively large amounts of cool water into the stream at their tailraces (Kier Associates 1999). Under natural conditions, water temperatures typically become cooler upstream. Adult fish migrating upstream key on declining temperature as they seek habitats with cooler water conducive to successful spawning and rearing. This natural temperature profile is interrupted where powerhouse discharges enter the South Fork Battle Creek. Localized zones of cooler water might cause adult fish to arrest upstream movement too early and spawn in those zones. Planned or unplanned powerhouse

outages or other disruptions of normal powerhouse discharges above those zones could then result in stream temperatures above the maximum threshold for salmonid eggs or fry. Although confined to South Fork Battle Creek, this situation is important because the natural cool water habitat needed to restore spring-run Chinook salmon and steelhead are located at distant upstream reaches of this fork (USBR and SWRCB 2005b). Interrupting the spawning migration to upstream habitat could compromise the recovery of naturally producing spring-run Chinook salmon and steelhead populations in South Fork Battle Creek.

The BCWG biological technical team determined that false attraction might be avoided by constructing conveyance facilities designed to avoid introducing North Fork Battle Creek water into the South Fork. The mixed North Fork and South Fork water within the Hydroelectric Project's water conveyance system would not enter Battle Creek until about 5 miles downstream of the forks' confluence, where the waters are already naturally mixed. Tailrace connectors at South and Inskip Powerhouses and a water bypass feature at Inskip Powerhouse would convey mixed water to Coleman Canal instead of discharging it into South Fork Battle Creek.

Another key consideration in restoring anadromous fish habitat is ensuring upstream and downstream passage beyond both natural barriers and artificial barriers such as dams. Natural barrier passage was addressed by the biological technical team's assessment of minimum instream flow requirements, primarily for adult fish migrating upstream to spawning and holding areas (Kier Associates 1999). Some natural barriers would need to be modified to improve passage conditions at prescribed flows and, because the stream is a dynamic environment and floods may create new natural barriers, monitoring for these occurrences should be performed regularly. Appropriate action would be needed to modify a new barrier or adjust instream flows to improve passage.

The Restoration Project addressed fish passage at Hydroelectric Project facilities with new fish ladders and screens. The MOU Parties determined that the fish screens and ladders would be "failsafe." Failsafe ladders must have "features inherent in the design of the ladder that ensure the structure will continue to operate to facilitate the safe passage of fish under the same performance criteria as designed under anticipated possible sources of failure" (MOU Parties 1999). Failsafe screens must be "designed to automatically shut off the water diversion whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again."

Ladders and screens were designed to be state-of-the-art installations (USBR and SWRCB 2005b). Ladders incorporated resource agency design recommendations (DWR 2000), with particular attention toward providing attraction flows throughout the range of instream flows needed by adult fish to move upstream. Ladder configurations known to provide reliable performance in the field would be used, and would allow for flow adjustment during abnormally low water conditions to ensure that effective passage conditions are maintained. Protective structures to minimize the potential for damage during floods would be included. The conservative design approach of ladders, coupled with the relatively low heights of dams, are expected to provide high passage reliability. Fish screen designs incorporated fish screen criteria from NOAA Fisheries (NMFS 1997a) and CDFG (CDFG 1997). These criteria would help

minimize the entrainment of out-migrating juvenile fish into Hydroelectric Project water conveyance facilities. In cases where diversion dams would no longer be needed by the Hydroelectric Project because of reduced diversions to increase instream flows, removal of dams at those sites would eliminate any concerns about fish passage.

Stream Function

The Hydroelectric Project's system of canals and/or powerhouses is subject to planned and unplanned outages, during which time water that cannot be conveyed through powerhouses or canals is released to the natural stream channel at any of the various spill outlets at the dams or along the canals (USBR and SWRCB 2005b). Although routine outages are scheduled during high flow periods, the amount of water released from the hydroelectric system during unplanned outages is up to five times the minimum amount released to the stream for fish. These flows of several hundred cubic feet per second added to the creek during minimum flow conditions, followed by their removal after the outage period, disrupts the stability of the stream. Rapid flow fluctuation in natural stream channels can adversely affect aquatic organisms through abnormal changes in water temperature, and fish that move into temporarily wetted habitat areas could be stranded when flows rapidly return to normal. Similarly, spawning redds that are established in transitory habitat are de-watered as instream flows recede (Kier Associates 1999). Effects on stream function are more widespread the farther upstream the spill of hydroelectric system waters occurs (although the spill is generally released as far downstream as possible to reduce the affects on the stream environment) (USBR and SWRCB 2005b).

Installation of tailrace facilities would address flow fluctuation issues, such as rapid temperature change and shifts is wetted habitat area. Flow fluctuations associated with hydroelectric system operations would be contained within the Hydroelectric Project's conveyance features, rather than causing disruptions in the natural stream channels. Minimizing flow fluctuations from both planned and unplanned hydroelectric system outages also was addressed by the Restoration Project through improved ramping rates, which would allow large flow changes to occur more gradually.

Monitoring and Adaptive Management

Because determining the effectiveness of Restoration Project actions would require monitoring population levels and habitat use, and unanticipated factors could affect fishery restoration results, adaptive management would be useful as a tool to monitor initial results and refine actions being taken. Adaptive management is defined by the Restoration Project as a formal, well-defined, science-based process to identify goals, parameters to be monitored, protocols for data assessment, trigger points to initiate action, and adaptive actions to be taken. The pattern would continually cycle with the goal of achieving restoration objectives (USBR and SWRCB 2005b). Initial restoration actions would be comprehensive and based on the best scientific information available. Adaptive management would continually refine initial actions, based on monitoring and acquisition of fishery response data and/or improved scientific information.

Restoration Timeliness
The Restoration Project enables timely restoration of the stream compared with waiting until 2026 for expiration of the existing FERC license of the Hydroelectric Project. Timely restoration of a drought resistant, spring-fed system like Battle Creek is especially important to recovery of species such as winter- and spring-run Chinook salmon and steelhead, which are dependant on cool-water stream habitats. The populations of these species/runs are presently at risk throughout the Central Valley, and no other Central Valley stream has the restoration potential for these species/runs as that of Battle Creek (Kier Associates 1999).

PROJECT DESCRIPTION

The Proposed Action and alternatives, as described in the EIS/EIR (USBR and SWRCB 2005b), were developed to restore the ecological processes that would allow recovery of Chinook salmon and steelhead populations in Battle Creek and minimize the loss of electrical power produced by the Hydroelectric Project. Restoration components focus on providing increased amounts and quality of spawning and rearing habitat (which are limiting salmon and steelhead production in Battle Creek), unimpeded passage past natural and Hydroelectric Project barriers to preferred habitats, appropriate water temperatures and temperature continuity, and unambiguous environmental cues used by salmon and steelhead to navigate (USBR and SWRCB 2005b). A summary of restoration options and their purposes are summarized in Table 2.

Variations and different combinations of restoration options (Table 2) were synthesized into four action alternatives (Table 3), which were named by the number of dams that would be removed: Five-Dam Removal (Proposed Action), No-Dam Removal, Six-Dam Removal, and Three-Dam Removal. Another alternative for removing all Hydroelectric Project facilities downstream of the natural fish passage barriers on Battle Creek (except the two Volta powerhouses) was considered, but eliminated because it was determined to not meet a primary Restoration Project purpose of minimizing lost power production from the Hydroelectric Project, and costs would preclude a viable Hydropower Project. An additional No Action Alternative was developed as a baseline for comparing of alternatives (Table 3).

All action alternatives include one of the two enhanced flow regimes (Table 4) for both forks of Battle Creek. Minimum flow releases below Hydroelectric Project diversion dams would vary by alternative, Hydroelectric Project facility, and month of year, depending on which enhanced flow regime applies. The first flow regime was originally proposed by the AFRP (USFWS 2001b) prior to origination of the Restoration Project. The second flow regime (Kier Associates 1999), developed by the BCWG biological technical team after additional analysis of instream flow data (Thomas R. Payne and Associates 1998a), increased the minimum flows prescribed by the AFRP and included cold-water releases from Eagle Canyon and Bluff springs.

Proposed Action
The Proposed Action (Five Dam Removal Alternative) was developed through a collaborative process involving resource agencies, PG&E, and Battle Creek stakeholders, and was originally

Table 2. Summary of restoration options and their purposes considered in developing alternatives for the Battle Creek Salmon and Steelhead Restoration Project.

Restoration Option	Restoration Purpose
Increase flow releases at diversion dams and release flows at natural springs	Increase quality and quantity of instream habitat, including improved water temperature conditions; facilitate fish passage at natural and Hydroelectric Project barriers
Construct fish screens	Facilitate juvenile fish passage past diversion intakes
Construct fish ladders	Facilitate adult fish passage past diversion dams
Construct tailrace connectors	Discontinue mixing of North Fork and South Fork water in South Fork; stabilize water flow and temperature in South Fork
Construct powerhouse bypass	Discontinue mixing of North Fork and South Fork water in South Fork; stabilize water flow and temperature in South Fork
Remove diversion dams and appurtenant facilities	Facilitate fish passage past diversion dams no longer needed for hydropower production under modified flow regimes
Re-operate Asbury dam	Increase quality and quantity of instream habitat, including improved water temperature conditions
Provide ramping rates for flow release changes at dams	Eliminate abnormally rapid flow fluctuations in the natural stream channels associated with Hydroelectric Project operation
Rededicate instream water rights to instream uses	Increase quality and quantity of instream habitat, including improved water temperature conditions
Establish and implement ecosystem-based Adaptive Management Plan (AMP)	Identify and implement changes to restoration strategies and actions needed to achieve long-term biological goals of Restoration Project based on monitoring and research
Establish adaptive management funds	Provide readily available funding for monitoring biological effects of restoration actions and financing potential future changes to restoration strategies and actions under the AMP
Establish water acquisition fund	Purchase future additional instream flows, as needed, through the AMP
Establish and implement Facility Monitoring and Maintenance Plan	Monitor effectiveness of new facilities and maintain to ensure proper function

Table 3. Summary of restoration components included in each alternative of the Battle Creek Salmon and Steelhead Restoration Project (adapted from USBR and SWRCB 2005b).

Restoration Project Component	Alternative[1, 2]				
	NA	5D	ND	6D	3D
Remove Eagle Canyon Diversion Dam & appurtenant facilities				✓	✓
Remove Wildcat Diversion Dam & appurtenant facilities		✓		✓	✓
Remove South Diversion Dam & appurtenant facilities		✓		✓	
Remove Coleman Diversion Dam & appurtenant facilities		✓		✓	✓
Remove Soap Creek Diversion Dam & appurtenant facilities		✓		✓	
Remove lower Ripley Creek Diversion Dam & appurtenant facilities		✓		✓	
Construct Inskip penstock bypass pipeline/chute		✓		✓	
Construct tailrace channel separator between South Powerhouse & Inskip Canal		✓		✓	✓
Construct tailrace connector between Inskip Powerhouse & Coleman Canal		✓		✓	✓
Construct North Battle Creek Feeder Diversion Dam fish screen and fish ladder		✓	✓	✓	✓
Construct Eagle Canyon Diversion Dam fish screen and fish ladder		✓	✓		
Construct Wildcat Diversion Dam fish screen and fish ladder			✓		
Construct South Diversion Dam fish screen and fish ladder			✓		✓
Construct Inskip Diversion Dam fish screen and fish ladder		✓	✓	✓	✓
Construct Coleman Diversion Dam fish screen and fish ladder			✓		
Increase releases at all Battle Creek dams not removed to levels per MOU		✓		✓	
Increase releases at all Battle Creek dams not removed to levels per AFRP			✓		✓
Release flows of cold natural springs into creeks		✓		✓	✓
Provide water below dam sites on Soap and lower Ripley Creeks		✓		✓	
Reoperate and gage Asbury Diversion Dam; provide water below dam		✓		✓	✓
Screen and ladder designs meet failsafe definition in MOU		✓	✓	✓	✓
Maintain and replace, as needed, all fish ladders on dams	✓	✓	✓	✓	✓
Provide improved ramping rates for flow release changes at dams (0.1 ft/hr)		✓	✓	✓	✓
Rededicate instream water rights to instream uses		✓			
Establish and implement ecosystem-based Adaptive Management Plan (AMP)		✓	✓	✓	✓
Establish adaptive management funds and water acquisition fund		✓			

[1] Small checkmark (✓) indicates design/plan is less environmentally beneficial than design with large checkmark (✓), as described under the *Future Conditions with the Project* and *Discussion* sections of this report.

[2] NA= No Action, 5D= Five-Dam Removal (Proposed Action), ND=No Dam Removal, 6D=Six-Dam Removal, 3D=Three-Dam Removal.

Table 4. Minimum instream flow releases[1] developed by the Anadromous Fish Restoration Program (AFRP) and Battle Creek Working Group (BCWG) for the Battle Creek Salmon and Steelhead Restoration Project (adapted from USBR and SWRCB 2005b).

Diversion Dam	Monthly Minimum Flow Release (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North Battle Creek Feeder												
AFRP	40	40	40	40	30	30	30	30	40	40	40	40
BCWG	88	88	88	67	47	47	47	47	47	47	47	88
Eagle Canyon												
AFRP	50	50	50	50	30	30	30	30	30	30	30	50
BCWG	46	46	46	46	35	35	35	35	35	35	35	46
Wildcat												
AFRP	50	50	50	50	30	30	30	30	30	30	30	50
BCWG	Facility Removed for all applicable alternatives; no instream flow requirement											
South												
AFRP	30	30	30	30	20	20	20	20	20	20	20	30
BCWG	Facility Removed for all applicable alternatives; no instream flow requirement											
Inskip												
AFRP	40	40	40	40	30	30	30	30	30	30	30	40
BCWG	86	86	86	61	40	40	40	40	40	40	40	86
Coleman												
AFRP	50	50	50	50	30	30	30	30	50	50	50	50
BCWG	Facility Removed for all applicable alternatives; no instream flow requirement											

[1]AFRP flows pertain to the No-Dam and Three-Dam Removal alternatives; BCWG flows pertain to the Five-Dam and Six-Dam Removal alternatives.

described in the Restoration Project MOU. Primary physical components, including fish screens and ladders, tailrace connectors, and powerhouse bypasses, are listed for each Hydroelectric Project facility (Table 3). The Proposed Action incorporates enhanced stream flows per the BCWG flow regime (Table 4) effectuated by increased releases at diversion dams and releases of all spring water at Eagle Canyon Diversion Dam, Bluff and Soap Creek basins, and Darrah/Baldwin Creek Basin. Release of spring water is intended to provide cold water refugia for fish, and is a component unique to the Proposed Action. Other unique components, stipulated per the Restoration Project MOU, include provision of flows below lower Ripley and Soap creek diversions, transfer of water rights associated with removed dams from PG&E to CDFG for instream uses, a funded AMP (USBR and SWRCB 2005c: Appendix C), and funding for additional water needs that may be identified in the future based on monitoring and adaptive management (USBR and SWRCB 2005b).

The Restoration Project AMP (USBR and SWRCB 2005c: Appendix C) was developed through a consensus process pursuant to the Restoration Project MOU by the Adaptive Management Policy Team, including management-level representation from each of the Restoration Project resource agencies and the Licensee, and the Adaptive Management Technical Team. Adaptive management was defined as a multi-agency team procedure that: "(1) uses monitoring and research to identify and define problems; (2) examines various alternative strategies and actions for meeting measurable biological goals and objectives; and (3) if necessary, makes timely adjustments to strategies and actions based upon best scientific and commercial information available" (MOU Parties 1999). The AMP would address project effects on fisheries habitat, fisheries populations, and riparian habitat.

The goal of the AMP is to implement specific actions to protect, restore, enhance, and monitor salmonid habitat, guard against false attraction of adult migrants, and ensure that Chinook salmon and steelhead are able to fully access and utilize available habitat in a manner that benefits all life stages and thereby maximizes natural production, fully utilizing ecosystem carrying capacity (MOU Parties 1999). Objectives of the AMP are summarized in Table 5. The AMP is aided by use of conceptual models that link restoration actions with goals and objectives. The models depict how different parts of the Battle Creek ecosystem are believed to work and how they might respond to restoration actions. Conceptual models were developed for Battle Creek limiting factors; development of the restoration process, including key passive management steps (e.g., review of available information, development of solutions, and solution screening); and project implementation actions. Uncertainties envisioned for restoration were identified for each conceptual model to help understand biological responses to restoration activities.

To help ensure sufficient instream flows, the Proposed Action includes a transfer of PG&E's water diversion rights associated with all dams removed under this alternative to CDFG (USBR and SWRCB 2005b) for instream uses. PG&E and CDFG would jointly file a petition with the SWRCB pursuant to section 1707 of the California Water Code to dedicate the water diversion rights to instream uses. Details on amounts and locations of water rights that would be deeded to CDFG are provided in USBR and SWRCB (2005b: Table 3-2).

Table 5. Objectives of the Battle Creek Salmon and Steelhead Restoration Project Adaptive Management Plan for the Proposed Action (USBR and SWRCB 2005c: Appendix C).

Population Objectives
Ensure successful salmon and steelhead spawning and juvenile production.
Restore and recover the assemblage of anadromous salmonids (i.e., winter-run, spring-run, steelhead) that inhabit the stream's cooler reaches during the dry season.
Restore and recover the assemblage of anadromous salmonids (i.e., fall-run, late fall-run) that enter the stream as adults in the wet season and spawn upon arrival.
Ensure salmon and steelhead fully utilize available habitat in a manner that benefits all life stages, thereby maximizing natural production and full utilization of the ecosystem carrying capacity.
Habitat Objectives
Maximize usable habitat quantity through changes in volume of instream flow.
Maximize usable habitat quantity by ensuring safe water temperatures.
Minimize false attraction and harmful fluctuation in thermal and flow regimes resulting from planned outages or detectable leaks from the hydroelectric project.
Minimize the stranding and isolation of salmon and steelhead resulting from variations in flow regimes caused by hydroelectric project operations.
Passage Objectives
Provide reliable upstream passage of adults at North Battle Creek Feeder, Eagle Canyon, and Inskip diversion dams.
Provide downstream passage of juveniles at North Battle Creek Feeder, Eagle Canyon, and Inskip diversion dams.
Provide upstream passage of adults to their appropriate habitat over natural obstacles while ensuring appropriate levels of spatial separation among fish runs.

Another feature of the Proposed Action to help ensure sufficient instream flows is a Water Acquisition Fund, which would establish a ready source of funds for future purchases of additional instream flow releases in Battle Creek, as needed. These releases could be recommended under the Adaptive Management Plan during the 10-year period following the initiation of prescribed instream flow releases. The Water Acquisition Fund would be supported with $3 million of California Bay-Delta Authority (CBDA)–approved Federal funds administered

by the resource agencies. Use of the Water Acquisition Fund would follow protocols developed by the adaptive management technical team.

To better understand biological effects of the Proposed Action, biological and environmental monitoring would be performed using funding from Central Valley fishery restoration program sources (USBR and SWRCB 2005b). These include, but are not limited to $1 million in Federal funds allocated for the Restoration Project by section 10.2 of the CBDA's Comprehensive Monitoring, Assessment, and Research Program, and the CVPIA's Comprehensive Assessment and Monitoring Program.

Per the Restoration Project MOU, the Service and/or DFG or their designated representatives would perform biological and environmental monitoring in the Battle Creek watershed and Restoration Project area to ascertain the overall status of anadromous fish populations and related ecosystem health. If sufficient funding is not available through the above sources, the MOU signatories would jointly pursue other funding sources.

Finally, to effectuate potential needed changes in the Restoration Project, as determined through adaptive management, the Proposed Action includes an Adaptive Management Fund, which would implement actions developed under the AMP (USBR and SWRCB 2005b). The fund would be used only for Restoration Project purposes directly associated with the Hydroelectric Project including compensation for prescribed instream flow release increases after the Water Acquisition Fund has been exhausted or terminated. The interest-bearing Adaptive Management Fund, in the amount of $3 million, would be made available to PG&E and the resource agencies by a third-party donor. In addition, PG&E has would provide up to $6 million for facility modifications or water acquisition (USBR and SWRCB 2005b:2-18).

No-Dam Removal Alternative

The No-Dam Removal Alternative reflects the view of resource agencies in the early 1990s that successful restoration of anadromous fish habitat on Battle Creek could be achieved by increasing flow releases at Hydroelectric Project diversion dams and installing new fish ladders and screens. This view was embodied in the Revised Draft Restoration Plan for the AFRP (USFWS 1997), which included the AFRP's enhanced flow prescriptions (Table 4). In the Restoration Project Draft EIS/EIR, the No-Dam Removal Alternative represents a lower-cost restoration approach that would not include removal of diversion dams, higher levels of lost hydroelectric power production, and other cost-invoking provisions and funding for additional environmental enhancements and water management (Table 3).

Six-Dam Removal Alternative

The Six-Dam Removal Alternative was developed in response to recommendations from the public to remove Eagle Canyon Dam in addition to removal of those identified in the Five-Dam Removal Alternative. Removal of Eagle Canyon Dam was proposed primarily as a benefit to anadromous fish migration. All other facility modifications of the Five-Dam Removal Alternative also would be included (Table 3). The instream flow regime would follow BCWG prescriptions (Table 4).

Three-Dam Removal Alternative
The Three-Dam Removal Alternative was developed in response to habitat needs of the endangered winter-run Chinook salmon. NOAA Fisheries' proposed recovery plan for Sacramento River winter-run Chinook salmon (NMFS 1997b) identified Battle Creek as a stream for potential recovery efforts through re-operation of the Hydroelectric Project, which could provide sufficient cold water flows during summer months for winter-run spawning and rearing, even during drought years. The three dams that would be removed are the first encountered by migrating salmon on the North Fork (Wildcat and Eagle Canyon diversion dams) and South Fork (Coleman Diversion Dam) Battle Creek (Table 3), and their removal was considered beneficial for winter-run to gain access to spawning and rearing habitat upstream (USBR and SWRCB 2001). The Three-Dam Removal Alternative would adopt the AFRP enhanced flow regime (Table 4) and a tailrace channel separator designed for normal creek flow conditions (50-year flood would overtop and allow South Fork and North Fork water to mix) would help stabilize instream conditions (Table 3). Removal of Soap and Lower Ripley diversion dams is not included, but water would be released from Asbury Dam on Baldwin Creek.

No Action Alternative
The No Action Alternative represents Hydroelectric Project facility operations consistent with the existing FERC license, which expires in 2026. The interim agreement and its provisions for habitat benefits would no longer be in effect. Minimum flow releases below diversion dams would be 3 cfs on the North Fork and 5 cfs on the South Fork. No fish passage and/or flow provisions would exist for Ripley, Soap, or Baldwin Creeks. Existing fish ladders would be maintained and operated in accordance with existing FERC license requirements for the Hydroelectric Project (USBR and SWRCB 2005b).

Alternatives Considered but Eliminated from Further Analysis
Following public review of the Draft EIS/EIR, the California Resources Agency and the California Bay-Delta Authority Selection Panel requested that the Restoration Project compare costs of the Proposed Action with three additional alternatives not considered in the Draft EIS/EIR: 1) decommissioning of the entire Hydroelectric Project, including PG&E's facilities upstream of the natural fish passage barriers on Battle Creek; 2) decommissioning of all eight diversion dams below the natural fish passage barriers on Battle Creek and its tributaries, but not the water conveyance facilities or powerhouses; and 3) decommissioning of all eight hydroelectric dams and appurtenant facilities below the natural fish passage barriers on Battle Creek, except the two Volta powerhouses (USBR and SWRCB 2005a). The last of these alternatives had been considered during development of the Draft EIS/EIR, but was eliminated, as described above.

In response, the Project Management Team organized an independent cost review of these alternatives. The final cost analyses concluded that the Proposed Action would be less costly than the second of the three alternatives (removing eight dams but not the water conveyance facilities or powerhouses), with costs of $113 million vs. $116 million, respectively (USBR and SWRCB 2005a). It was further estimated that the incremental habitat benefits of the second alternative would be only marginally greater than the Proposed Action, the cost of replacement energy for the second alternative would be excessive, and the Proposed Action would better achieve the

project co-purpose of minimizing loss of energy produced by the Hydroelectric Project. Lastly, and maybe most importantly, the second alternative lacks support of a willing participant (PG&E), as required by CALFED Program actions. The Project Management Team subsequently eliminated this alternative from further consideration. Because the first and third of the additional alternatives were significantly more costly than the Proposed Action, they also were eliminated from further consideration (USBR and SWRCB 2005a).

BIOLOGICAL RESOURCES

Fisheries and Aquatic Resources

Aquatic habitats and species

North Fork Battle Creek has runoff flows supplemented by large amounts of spring water that emerge along its banks (USBR and SWRCB 2005b). Both forks contain steadily flowing water through deep, often shaded, gorges and maintain relatively high, cold flows, even during dry seasons. Each fork usually contains about 50% of total creek flow. In winter, however, South Fork Battle Creek may have as much as 75% of total flow, while North Fork Battle Creek flows are more dominant in fall.

An important component of Battle Creek habitat is shaded riverine aquatic (SRA) cover, which is defined as the unique, near shore aquatic area occurring at the interface between the stream and adjacent woody riparian habitat (USFWS 1992). Key attributes of this aquatic area include the adjacent bank composed of natural, eroding substrates, and riparian vegetation that overhangs and/or protrudes into the water. The water contains variable amounts of woody debris, such as leaves, logs, branches, and roots, and often substantial detritus. Much of the instream cover often consists of dead woody debris that has fallen from overhanging riparian vegetation, but whole trees that periodically become dislodged from adjacent banks often contribute to SRA cover.

The anadromous salmonid fishery in Battle Creek comprises four runs (spring-, fall-, late fall-, and winter-run) of Chinook salmon and steelhead. Life history patterns and general timing of Chinook salmon and steelhead runs in Battle Creek result in at least one life stage of each Chinook salmon run and steelhead being present during each month of the year (Kier Associates 1999: Table 2). Both naturally produced and hatchery raised anadromous salmonids exist in Battle Creek. Naturally produced fish include steelhead and all four runs of Chinook, whereas, CNFH-produced fish include steelhead, fall-run Chinook salmon, and late fall-run Chinook salmon. The Pacific lamprey is the only other anadromous species known to occur in Battle Creek, but its abundance and distribution in Battle Creek are unknown. More-detailed descriptions anadromous fish are provided below under *Special Status Species*.

At least 12 species of resident (non-anadromous) fish occur in Battle Creek (Kier Associates 1999). Of the 12 species, 8 are native to the Sacramento River Basin, including rainbow trout (*Oncorhynchus mykiss*), pike minnow (*Ptychocheilus grandis*), Sacramento sucker (*Catostomus occidentalis*), California roach (*Hesperoleucus symmetricus*), riffle sculpin (*Cottus gulosus*), speckled dace (*Rhinichthys osculus*), hardhead (*Mylopharodon conocephalus*), three-spine

stickleback (*Gasterosteus aculeatus*), and tule perch (*Hysterocarpus traski*). Four of the species were introduced into the Sacramento River basin, including brown trout (*Salmo trutta*), smallmouth bass (*Micropterus dolomieui*), green sunfish (*Lepomis cyanellus*), and golden shiner (*Notemigonus crysoleucas*). Other important aquatic organisms include benthic macroinvertebrates and periphyton.

Existing conditions

Hydroelectric power development and hatchery operations on Battle Creek have affected annual runs of naturally produced Chinook salmon and steelhead (Kier Associates 1999). Inadequate instream flows and impaired fish passage are the primary factors. Inadequate instream flows can result in warming of water, which is harmful to fish populations when temperatures exceed biological tolerances. Inadequate instream flows also result in less wetted area in the stream channel and, thus, reduced quantity of habitat.

Fish passage is affected primarily by presence of Hydroelectric Project diversion dams with inadequate fish ladders, which can block or inhibit fish from passing upstream, and unscreened intakes, which can entrain rearing and downstream-migrating juvenile fish into Hydroelectric Project canals. Impaired passage over natural barriers in the stream channel can occur during periods of low instream flow resulting from Hydroelectric Project diversions.

Planned and unplanned outages of the Hydroelectric Project's conveyance facilities and powerhouses, generally due to changes in power generation at powerhouses, emergency powerhouse shutdowns, and powerhouse and canal maintenance, require that water from the conveyance system be released into Battle Creek (Kier Associates 1999). These releases and their subsequent termination produce unnaturally rapid fluctuations in instream flows, resulting in wetted area and water temperatures changes that can be detrimental to some lifestages of anadromous fish (USBR and SWRCB 2005b). Moreover, transfer of North Fork water to the South Fork for hydroelectric power generation results in abnormal mixing of North Fork and South Fork water. Mixing of waters from North Fork and South Fork Battle Creek is thought to confound olfactory cues and water temperature gradients, which lead migrating adult fish to improper spawning areas (i.e., false attraction). False attraction increases the risk of unsuccessful or less successful reproduction (USBR and SWRCB 2005b).

It is likely that resident fish species also have been affected by disrupted ecosystem processes within Battle Creek, such as reductions and fluctuations in instream flow (USBR 1998), changes in temperature regimes, entrainment of fish into the Hydroelectric Project canals, and disruption of fish movements caused by dams.

In consideration of the unique aquatic habitat conditions of Battle Creek and the creek's high ecological value for fall- and late fall-run Chinook salmon,[2] the Service has designated Battle Creek riverine habitat as Resource Category 2.

[2]The Mitigation Policy does not apply to species listed or proposed for listing under the ESA, including spring- and winter-run Chinook salmon and steelhead.

Upland Resources

Upland habitats and species

Upland habitats common to the project area comprise native and naturalized habitats including annual grassland, mixed chaparral, live oak woodland, blue oak woodland/savanna, gray pine/oak woodland, westside ponderosa pine (Table 6). The following descriptions of upland habitats and wildlife observed on the project area, or typically associated with these habitats in this part of the Sierra Nevada foothills, is derived primarily from field surveys conducted from 2000 to 2002 (JSA 2001a, 2001b, 2001c; JSA 2002a, 2002b). Data are provided for sites where restoration activities would occur, as well as sites where mitigation measures would be implemented.

Annual grassland. Annual grassland is the most common plant community on the project area and comprises mostly nonnative annual grass species, such as bromes (*Bromus* spp.), annual fescues (*Festuca* spp.), and Italian rye-grass (*Lolium multiflorum*). Nonnative forbs include filarees (Erodium sp.), yellow star-thistle (*Centaurea solstitialis*), and prickly lettuce (*Lactuca serriola*). Native forbs include (goldfields (Lasthenia spp), yellowcarpet (*Blennosperma nanum*), and popcorn-flower (*plagiobothrys* sp). Annual grassland provides habitat primarily for relatively common wildlife species, such as the gopher snake (*Pituophis melanoleucus*), western fence lizard (*Sceloporus occidentalis*), western king bird (*Tyranus verticalis*), horned lark (*Eremophilia alpestris*), red-tailed hawk (*Buteo jamaicensis*), California vole (*Microtus californicus*), and black-tailed deer (*Odocoileus hemionus*). Annual grassland is abundant on the project area and is associated with mostly common wildlife species, but also provides important habitat to native species using or requiring open space, such as raptors, horned lark, and California vole); therefore, the Service has designated annual grassland as Resource Category 3.

Mixed chaparral. Mixed chaparral also is common on the project area and comprises primarily broad-leaved, sclerophyll shrubs, such as buckbrush (*Ceanothus cuneatus*), manzanita (*Arctostaphylos* spp.), and coffeeberry (*Rhamnus tomentella*). Typical wildlife of mixed chaparral include the gopher snake, western fence lizard, California quail (*Callipepla californica*), spotted towhee (*Pipilo maculatus*), lesser goldfinch (*Carduelis psaltria*), black-tailed deer, and gray fox (*Urocyon cinereoargenteus*). Neotropical migrant birds include the western tanager (*Piranga ludoviciana*) and orange-crowned warbler (*Vermivora ruficapilla*), among others. Mixed chaparral is relatively abundant on the project area and is associated with many common wildlife species, but also provides habitat to important native species, such as neotropical migrant birds; therefore, the Service has designated mixed chaparral as Resource Category 3.

Live oak woodland. Live oak woodland is common on the project area, primarily in canyons and valley bottoms near streams. Predominant plant species are canyon and interior live oak *(Quercus chrysolepis* and *Q. wislizenii*) with other species, such as California bay (*Umbellularia californica*), buckeye (*Aesculus californica*), and black oak (*Q. kelloggii*), also usually present. Wildlife inhabiting live oak woodland include the western rattlesnake, northern alligator lizard (*Gerrhonotus coeruleus*), American kestrel (*Falco sparverius*), western screech owl (*Otus kennicottii*), California towhee (*P. crissalis*), ringtail (*Bassariscus astutus*), and bobcat (*Lynx rufus*). Neotropical migrant birds include Pacific-slope flycatcher (*Empidonax difficilis*),

Table 6. Plant communities and associated wildlife habitats observed at project restoration sites[1] (JSA 2001a) and mitigation sites[2] of the Battle Creek Salmon and Steelhead Restoration Project (USBR and SWRCB 2005a).

	Annual Grassland	Mixed Chaparral	Live Oak Woodland	Blue Oak Woodland/ Savanna	Grey Pine/Oak Woodland	Westside Ponderosa Pine Forest	Emergent Wetland	Seasonal Wetland	Emergent Scrub Wetland	Groundwater Seep	Riparian Forest/ Riparian Scrub
Restoration Sites											
North Battle Creek Feeder Diversion Dam	X	X	X								X
Eagle Canyon Diversion Dam	X	X	X							X	X
Wildcat Diversion Dam/ Wildcat Pipeline	X	X		X	X						X
Coleman Diversion Dam/ Inskip Powerhouse	X		X	X	X				X		X
Lower Ripley Creek Feeder											X
Inskip Diversion Dam/ South Powerhouse	X		X	X			X	X			X
Soap Creek Feeder	X		X								X
South Diversion Dam		X	X		X						X
South Battle Creek Canal	X		X	X	X						X

(continued on next page)

	Annual Grassland	Mixed Chaparral	Live Oak Woodland	Blue Oak Woodland/ Savanna	Grey Pine/Oak Woodland	Westside Ponderosa Pine Forest	Emergent Wetland	Seasonal Wetland	Emergent Scrub Wetland	Groundwater Seep	Riparian Forest/ Riparian Scrub
Mitigation Sites											
Jeffcoat East/West Units of Mount Lassen Trout Farms	X		X	X			X	X	X		X
Willow Springs Unit of Mount Lassen Trout Farms	X						X		X		
Asbury Diversion Dam at Darrah Spring State Fish Hatchery	X		X								X

[1] Sites on which construction would occur for purposes of salmon and steelhead restoration.

[2] Sites that would be affected by mitigative measures proposed to minimize potential for spread of fish pathogens and reduced water quality that could result from increased salmon and steelhead populations enabled by the Restoration Project.

blue-gray gnatcatcher (*Polioptila caerulea*), and lazuli bunting (*Passerina amoena*). Acorns produced by oaks are a major food source for many wildlife species, such as the California quail, wild turkey (*Meleagris gallopavo*), acorn woodpecker (*Melanerpes formicivorus*), and western gray squirrel (*Sciurus griseus*) (McDonald 1988). Because live oaks are slow growing and long lived, are often associated with ecologically valuable riparian woodland in canyon corridors, and acorns are an important food for many wildlife species, the Service has designated this habitat as Resource Category 2.

Blue oak woodland/savanna. Blue oak woodland/savanna occurs on the project area where soils are relatively thin and rocky. This type is composed predominantly of blue oaks (*Q. douglasii*). Shrubs are generally lacking except for occasional chaparral species. Representative wildlife species include the gopher snake, western fence lizard, barn owl (*Tyto alba*), greater roadrunner (*Geococcyx californicus*), white-breasted nuthatch (*Sitta carolinensis*), ringtail, and coyote (*Canis latrans*). Neotropical migrant birds include ash-throated flycatcher (*Myiarchis cinerascens*), blue-gray gnatcatcher, and orange-crowned warbler. As in live oak woodland, several wildlife species in blue oak woodland benefit from acorns as a food source (Schoenherr 1992:95), including the acorn woodpecker, wild turkey, western scrub jay (*Alphelocoma californica*), and western gray squirrel. Because blue oak is a slow growing, long lived species and is not regenerating in many parts of its range (Schoenherr 1992:95-96), and acorns are an important food for many wildlife species, the Service has designated this habitat as Resource Category 2.

Gray pine/oak woodland. Gray pine/oak woodland is common on the project area and comprises primarily a mixture of blue oak and gray pine (*Pinus sabiniani*) with inclusions of mixed chaparral as understory. Gray pine/oak woodland transitions into blue oak woodland at lower elevations and westside ponderosa pine forest at higher elevations and, consequently, wildlife species inhabiting gray pine/oak woodland resemble those found in the other two habitats. Because of the blue oak component of gray pine/oak woodland and the associated biological values of oaks, as described above for oak habitats, the Service has designated this habitat as Resource Category 2.

Westside ponderosa pine forest. Westside ponderosa pine forest occurs at higher elevations in the southern end of the project area. This habitat comprises primarily ponderosa pine with lesser amounts of incense cedar, black oak, and canyon live oak. Associated shrub species may include manzanita, live oak, and coffeeberry. Representative wildlife include the common kingsnake (*Lampropeltis getulus*), California slender salamander (*Batrachoseps attenuatus*), sharp-shinned hawk (*Accipiter striatus*), northern pygmy owl (*Glaucidium gnoma*), hairy woodpecker (*Picoides villosus*), deer mouse (*Peromyscus maniculatus*), racoon (*Procyon lotor*), and bobcat. Representative neotropical migrant birds include olive-sided flycatcher (*Contopus cooperi*), warbling vireo (*Vireo gilvus*), and western tanager (*Piranga ludoviciana*). Because westside ponderosa pine forest is common in the region, provides moderate biological values, and is not particularly difficult to regenerate or slow to mature compared to oak habitats, the Service has designated this habitat as Resource Category 3.

Existing conditions
Upland resources in the Restoration Project area appear to be in relatively good condition. Predominance of private land and steep terrain have helped minimize land development and existing land uses have had less impact in the Battle Creek watershed than in other watersheds (Kier Associates 1999). Hydroelectric power development has affected upland resources little since development of the hydroelectric facilities. Most effects on upland habitat probably are derived from land uses such as livestock grazing and timber cutting.

Wetland Resources
Wetland habitats and species
Wetlands on the Restoration Project area include emergent wetland, seasonal wetland, emergent scrub wetland, groundwater seep, and riparian forest/riparian scrub[3] (Table 6). The following descriptions of wetland habitats and wildlife observed on the project area, or typically associated with these habitats in this part of the Sierra Nevada foothills, are derived primarily from field surveys and reports contracted by Reclamation (JSA 2001a, 2001b, 2001c).

Emergent wetland. Emergent wetlands on the project area are characterized primarily by perennial, herbaceous hydrophytes, such as narrow-leaved cattail (*Typha angustifolia*), Pacific rush *(Juncus effusus*), tall cyperus (*Cyperus eragrostis*), and monkeyflower (*Mimulus guttatus*). Shrubs are less common, but may include sandbar willow (*Salix exigua*) and Himalayan blackberry (*Rubus discolor*). Emergent wetlands in the region are particularly important habitat for amphibians and water associated reptiles, such as California newt (*Taricha torosa*), Sierra Nevada salamander (*Ensatina eschscholtzi*), northwestern pond turtle (*Clemmys marmorata marmorata*), and garter snakes (*Thamnophis* spp.). Wetland associated birds include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), various ducks and geese (Anatidae), greater yellowlegs (*Tringa melanoleuca*), and common snipe (*Gallinago gallinago*). Many mammals use emergent wetlands for foraging and drinking water. Because emergent wetlands provide essential habitat for a large diversity of wildlife species, are relatively scarce on the project area, and are generally declining in abundance in California, the Service has designated this habitat as Resource Category 2.

Seasonal wetland. Seasonal wetlands on the project area result from short duration ponding sufficient to support hydrophytic plants, and generally occur at the margins of drainages, roads, and groundwater seeps. Associated plant species include Italian ryegrass (*Lolium multiflorum*), hyssop loosestrife (*Lythrum hyssopifolium*), and sedges (*Carex* spp.). The assemblage of wildlife species associated with seasonal wetlands is similar to that associated with emergent wetlands. Because seasonal wetlands provide essential habitat for a large diversity of wildlife species, are relatively scarce on the project area, and are generally declining in abundance in California, the Service has designated this habitat as Resource Category 2.

[3]The Service defines habitats as wetlands if they have one or more wetland characteristic (i.e., hydric soils, hydrophytic vegetation, or hydrologic conditions).

Emergent scrub wetland. Emergent scrub wetlands on the project area comprise plant species similar to those occurring in emergent wetlands, but with a large proportion of shrub species, such as willows (*Salix* spp.) and white alder (*Alnus rhombifolia*). Characteristic wildlife species are similar to those described for emergent and seasonal wetlands. Because emergent scrub wetlands provide essential habitat for a large diversity of wildlife species, are relatively scarce on the project area, and are generally declining in abundance in California, the Service has designated this habitat as Resource Category 2.

Groundwater seep. This wetland type is associated with steep canyons and slopes, and is characterized by saturated soils, especially early in the plant growing season. Predominant plants are annual and perennial hydrophytes, such as sedges, hyssop loosestrife, monkeyflower, watercress (*Rorripa nasturtium-aquatica*), Tinker's-penny (*Hypericum anagalloides*), and Bryophytes. Representative wildlife are similar to those described for the other wetland types. Because groundwater seeps provide essential habitat for a large diversity of wildlife species, and are relatively scarce on the project area, the Service has designated this habitat as Resource Category 2.

Riparian forest and scrub. Riparian forest and scrub habitats occur along edges of Battle Creek, Ripley Creek, Soap Creek, several unnamed drainages, and within some emergent wetlands. Plant overstory species comprised by riparian forest and scrub include California bay, white alder, big-leaf maple (*Acer macrophyllum*), white mulberry (*Morus alba*), Pacific yew (*Taxus brevifolia*), and Oregon ash (*Fraxinus latifolia*). Understory species include poison oak (*Toxicodendron diversilobum*), western spicebush (*Calycanthus occidentalis*), dogwood (*Cornus sessilis*), and willow. Riparian forest and scrub often forms a mosaic with live oak woodland, and on broader floodplains, valley oak (*Quercus lobata*) and sycamore (*Platanus racemosa*) trees tend to predominate.

Riparian forest and scrub are two of the most valuable habitats on the project area. Riparian areas provide food, water, and shade for resident species of wildlife as well as other species associated with adjacent habitats. The multiple layers of riparian vegetation in association with edges of adjacent plant communities create a diverse physical structure that provides cover for a diversity of amphibians, reptiles, birds, and mammals, including the Pacific chorus frog (*Hyla regilla*), foothill yellow-legged frog (*Rana boylei*), aquatic garter snake (*Thamnophis couchi*), northwestern pond turtle, downy woodpecker (*Picoides pubescens*), black phoebe (*Sayornis nigricans*), brush rabbit (*Silvilagus bachmani*), gray fox, and bobcat. Riparian forest and scrub provide important habitat for several species of neotropical migrant birds, such as the osprey (*Pandion haliaetus*), golden eagle (*Aquila chrysaetos*), sharp-shinned hawk, belted kingfisher (*Ceryle alcyon*), Wilson's warbler (*Wilsonia pusilla*), yellow-breasted chat (*Icteria virens*), and black-headed grosbeak (*Pheucticus melanocephalus*), and special status (Service Species of Concern) bats (Attachment C: Table 1). Riparian communities also function as dispersal and migration corridors for many wildlife species. Because riparian forest and scrub provide essential habitat for a large diversity of wildlife species, including neotropical migrant birds and special status bats, provide movement corridors for wildlife, and are generally declining in abundance in California, the Service has designated this habitat as Resource Category 2.

SRA cover, as described above for Fisheries and Aquatic Resources, is also important for amphibians and terrestrial wildlife that use riparian and stream edge habitat. This near shore aquatic area occurring at the stream-riparian habitat interface provides valuable resources, such as high quality food and cover (USFWS 1992). The amount of SRA cover present on Battle Creek is unknown, as it has not been inventoried. But because of the relatively small width of Battle Creek compared to the size of adjacent riparian vegetation, a high proportion of Battle Creek could probably be considered SRA cover.

Existing conditions

Wetland resources in the Restoration Project area appear to be in relatively good condition. Predominance of private land and steep terrain have helped minimize land development and existing land uses have had less impact in the Battle Creek watershed than in other watersheds (Kier Associates 1999). Hydroelectric power development has affected wetland resources adjacent to some portions of Battle Creek through reduced minimum instream flows and operation of hydroelectric power facilities; however, the extent to which wetland habitats and species and aquatic organisms, other than fish, may be affected is not well understood in the Restoration Project area.

Reducing instream flow results in warming of water, which is harmful to wetland and aquatic organisms, such as macroinvertebrates and amphibians, if temperatures exceed biological tolerances. Less wetted area in the stream channel also can reduce quantity of aquatic and adjacent wetland and near-shore habitat used by these organisms. Reduced instream flow can affect physical processes, such as routing of sediment that is important for re-establishment of riparian vegetation and maintenance of subsurface water levels that sustain riparian vegetation. Although fine sediment eventually is flushed downstream under existing conditions, diversion dams function as sediment traps and can affect rates and timing of sediment deposition. Maintenance of subsurface water levels are important for determining extent and growth rates of riparian vegetation. Higher levels of subsurface water can be expected to support riparian vegetation farther up-slope of the stream channel. In addition, rates of instream flow can correlate with growth of riparian vegetation (Stromberg and Patton 1990).

As described above for fisheries and aquatic resources, planned and unplanned outages of the Hydroelectric Project's conveyance facilities and powerhouses produce unnaturally rapid fluctuations in instream flows that can be detrimental to macroinvertebrates and amphibians. To some extent the natural hydrograph creates seasonally transitory habitat, but habitat use patterns by amphibians have evolved with the relatively predictable seasonal changes in hydrology, and the rate at which these types of flows change is generally slower than the ramping rate controlled by the dams. During an outage, rapid increases in flow can temporarily increase water turbidity and displace riparian organisms that cannot respond quickly to changes in water elevation (Kier Associates 1999). Transitory habitat created along edges of the stream channel during an outage may remain wet long enough to be colonized by macroinvertebrates and amphibians, but when outages end, recession of flow may de-water eggs of these organisms and may not be slow enough to allow early amphibian life stages (e.g., tadpoles) or sessile macroinvertebrates to follow

the receding water back to the normally wetted part of the stream. Fluctuation in water temperature also can be detrimental to early lifestages of macroinvertebrates and amphibians.

Special Status Species

Observed Species and their status

Four runs of Chinook salmon and the steelhead compose the anadromous salmonid fishery in Battle Creek. Because these fish are the target of the Restoration Project, basic life history information is provided below. More-detailed life history patterns and the general timing of Chinook salmon and steelhead runs in Battle Creek are described in the Restoration Project ASIP, which serves the purpose of a Biological Assessment for consultation under section 7 of the ESA.

Winter-run Chinook salmon. Abundance of winter-run Chinook salmon in the Sacramento River basin has declined markedly from historical numbers. Estimated escapement ranged from approximately 45,000 in the late 1960s to a few hundred in the early 1990s (USFWS 2001a). Since the mid-1990s, winter-run Chinook salmon populations have increased to around 3,000. Although occurrences of naturally produced winter-run Chinook salmon in Battle Creek have been reported (Rutter 1902, 1903; DFG 1965; USFWS 1987), present numbers in Battle Creek are unknown. Spawning and rearing currently occurs primarily in the Sacramento River.

The Sacramento River winter-run chinook salmon was state-listed as endangered on September 22, 1989, and federally listed as endangered on January 4, 1994. Designated critical habitat does not include Battle Creek, but Battle Creek is the only stream in which the winter-run chinook salmon recovery plan (NMFS 1997b) recommends efforts to establish a self-sustaining population.

Spring-run Chinook salmon. Spring-run Chinook salmon were once the predominant run in the Central Valley, but has declined dramatically from historical numbers (USFWS 2001a). Declines during 1950s are estimated at 90% compared to the period between 1916 and 1947. Estimated escapement in the Sacramento River basin ranged from 3,000 to more than 31,000 adults between 1987 and 1999, averaging 11,155. Sporadic counts of spring-run Chinook salmon, beginning in the 1940s, indicate that a relatively large population once was present in Battle Creek (DFG 1998). Estimates from recent years have ranged between 50 and 100 spring-run Chinook (USFWS 2002b). The Central Valley spring-run Chinook salmon was state-listed as threatened on February 5, 1999, and federally listed as threatened on September 16, 1999.

USFWS monitoring on the mainstem Battle Creek and North and South Forks of Battle Creek below the closed fish ladders (Eagle Canyon and Coleman diversion dams, respectively), during July through September, 2001, found 68% of holding Chinook salmon in the South Fork and 32% in the mainstem Battle Creek (USFWS 2002b). No Chinook salmon were found holding in the North Fork, but it was uncertain whether Chinook salmon observed in the South Fork were natal to the South Fork or were falsely attracted to the predominantly North Fork water, which had been re-directed into the South Fork for substantial periods to generate electrical power, leaving remaining North Fork flows low. During March through October, 2001, surveys found 75% of chinook redds were located in the North and South Forks (USFWS 2002b). Most redds in the

South Fork were close to Coleman Diversion Dam, whereas, redds in the North Fork were between Wildcat and Eagle Canyon diversion dams.

Steelhead. Abundance of steelhead in the Sacramento River basin has declined significantly since the 1950s. The estimated steelhead run was about 40,000 fish in the early 1960s (Hallock et al. 1961). Estimated escapement ranged from approximately 15,000 in the late 1960s to none recorded the early 1990s (USFWS 2001a). A reliable estimate for present-day numbers of steelhead in the Sacramento River is not available (USFWS 2001a), but a rough estimate in 1996 was less than 10,000 fish (McEwan and Jackson 1996). Steelhead are believed to have historically inhabited Battle Creek, but historical estimates of steelhead runs in Battle Creek do not exist (USFWS 2001a). The existing population of steelhead in Battle Creek comprises both hatchery- and natural-origin fish. Since 1996, large numbers of hatchery and (presumably) naturally spawned steelhead adults have passed above the Coleman barrier weir to spawn naturally. The Central Valley steelhead was federally listed as threatened on May 19, 1998 (63 FR 13347); the steelhead is not State-listed.

Fall- and late fall-run Chinook salmon. Abundance of fall-run chinook salmon in the Sacramento River watershed is high compared to other runs of Chinook salmon and steelhead (USFWS 2001a). Estimated numbers of fall-run Chinook salmon spawning in the Sacramento River upstream of Red Bluff have ranged from nearly 257,000 in 1959 to around 4,800 in 1998. During the 30 years between 1970 and 1999, estimated numbers generally remained well above 20,000, sometimes reaching more than 50,000 fish. Fall-run Chinook salmon in Battle Creek originate from both Coleman National Fish Hatchery and natural production occurring mainly downstream of the Coleman barrier weir (USFWS 2001a).

Since 1952, abundance of fall-run Chinook in Battle Creek fluctuated from less than 4,000 to more than 160,000 fish, and has increased dramatically since the late 1970s. Numbers of late fall–run chinook salmon adults in the Sacramento River has ranged from more than 38,000 in the late 1960s to as low as 48 fish in 1996, with increases to about 9,000 in 1998 and 1999 (Snider et al. 1998, 1999; USFWS 2001a). Late fall-run are generally considered to spawn in the mainstem Sacramento River, but information is scarce regarding the abundance of naturally spawning late fall-run in Battle Creek (USFWS 2001a). The number of late fall-run spawning downstream of the Coleman barrier weir is unknown, but is presumed to be small. Numbers of adult late fall-run returning to CNFH have increased from about 300 to over 7000 during the period between 1995 to 1999.

In 1999, NOAA Fisheries determined that listing the Central Valley fall-/late fall–run Chinook salmon under the ESA was not warranted. However, this Ecologically Significant Unit remains a candidate for listing because it is unclear whether natural populations are self-sustaining and various risk factors still exist.

Other special status species. The Service provided Reclamation with an initial list of Federal special status species that may occur in the project area dated April 26, 2000, pursuant to section 7(c) of the ESA. These species included mammals, birds, amphibians, reptiles, invertebrates, and

plants that are listed, or proposed to be listed, as endangered (E) or threatened (T) under the ESA, or designated as candidates or Species of Concern. A recent list is provided in Attachment A. Other special status species that may occur on the project area include those listed as endangered or threatened under CESA, designated as Species of Special Concern, listed by the California Native Plant Society, or identified as Fully Protected by the State.

Federally listed threatened and endangered species known to occur on the Restoration Project area (JSA 2001a, 2001b; USFWS 2001a; JSA 2002a, 2002b) include:

- bald eagle (*Haliaetus leucocephalus*) (T)
- Central Valley steelhead (*Oncorhynchus mykiss*) (T)
- winter-run Chinook salmon (*Oncorhynchus tshawytscha*) (E)
- spring-run Chinook salmon (*Oncorhynchus tshawytscha*) (T)

Federally listed threatened and endangered species that could exist on the Restoration Project area, as inferred by the Service (Attachment A), but not observed during surveys (JSA 2001a, 2001b, 2002a) include:

- California red-legged frog (*Rana aurora draytonii*) (T)
- slender Orcutt grass (*Orcuttia tenuis*) (T)
- valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)

Federally listed species that occur downstream within the Sacramento River and Sacramento-San Joaquin Delta that could be affected by altered hydrology in the Sacramento River include:

- delta smelt (*Hypomesus transpacificus*) (T)
- Sacramento splittail (Pogonichthys macrolepidotus) (T)

Federal candidates known to occur on the Restoration Project area are fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*) (USFWS 2001a). Other species that are Federal species of concern (SC), State endangered (SE), or State species of special concern (SSC) that were observed on the Restoration Project area during surveys (JSA 2001a, 2001b, USBR and SWRCB 2005e) were:

- foothill yellow-legged frog (*Rana boylii*) (SC, SSC)
- northwestern pond turtle (*Clemmys marmorata marmorata*) (SC, SSC)
- black rail (*Laterallus jamaicensis*) (SC,ST)
- golden eagle (*Aquila chrysaetos*) (SSC)
- osprey (*Pandion haliaetus*) (SSC)
- Cooper's hawk (*Accipiter cooperii*) (SSC)
- sharp-shinned hawk (*Accipiter striatus*) (SSC)
- American peregrine falcon (*Falco peregrinus anatum*) (SC, SE)
- Vaux's swift (*Chaetura vauxi*) (SSC)
- little willow flycatcher (*Empidonax traillii brewsteri*) (SC, SE)
- yellow-breasted chat (*Icteria virens*) (SSC)

Habitat for the federally threatened valley elderberry longhorn beetle, consisting of elderberry (*Sambucus* spp.) shrubs with stems at least 1 inch in diameter at ground level, is known to occur at several project sites. No exit holes from valley elderberry longhorn beetles have been confirmed on the Restoration Project area (USBR and SWRCB 2004, 2005e), but old exit holes have been found in elderberry shrubs 0.7 mile east of Paynes Creek, approximately 5 miles away from the Restoration Project area (CDFG 2003). A few stems with possible exit holes were found in two separate large clusters of elderberry shrubs located on the South Powerhouse alternative access road, but the holes were old, and it was uncertain whether they were made by emerging valley elderberry longhorn beetles, other wood-boring insects, or woodpeckers (USBR and SWRCB 2004, 2005e).

Many bats were observed on the Restoration Project area during general wildlife and botanical surveys (JSA 2001a, 2001b), but species could not be identified. Bat surveys were conducted at water diversion tunnels at Inskip and Eagle Canyon diversion dams and along the South Canal (JSA 2002b). The purpose was to ascertain the presence of hibernating bats and to assess the potential suitability of these tunnels for use by bats. The surveys identified an apparent big brown bat hibernating inside Inskip Tunnel 3, about 100 feet from the entrance portal. The following bat species may occur on the project area, as inferred by the Service (Attachment A):

- pale Townsend's big-eared bat (*Plecotus townsendii pallescens*) (SC, SSC)
- spotted bat (*Euderma maculatum*) (SC)
- fringed myotis bat (*Myotis thysanodes*) (SC)
- long-eared myotis bat (*Myotis evotis*) (SC)
- long-legged myotis bat (*Myotis volans*) (SC)
- small-footed myotis (*Myotis ciliolabrum*) (SC)
- Yuma myotis bat (*Myotis yumanensis*) (SC)
- pallid bat (*Antrozous pallidus*) (SSC)

The Coleman Diversion Dam/Inskip Powerhouse site was found to contain a population of Ahart's paronychia, a California Native Plant Society (CNPS) List 1B species (rare, threatened, or endangered in California or elsewhere) (Skinner and Pavlik 1994), during surveys in 2005 (USBR and SWRCB 2005b). Four species that are considered "plants of limited distribution," or List 4 plants, by the CNPS were located on Restoration Project sites during field surveys in 2000: woolly meadowfoam (*Limnanthes floccosa* ssp. *floccose*), shield-bracted monkeyflower (*Mimulus glaucescens*), depauperate milk-vetch (*Astragalus pauperculus*), and Bidwell's knotweed (*Polygonum bidwelliae*) (JSA 2001a, 2001b). Although considered plants of limited distribution by CNPS, they are locally common in the Restoration Project area.

Existing conditions

Special status species habitat in the Restoration Project area appear to be in relatively good condition, with the exception of fisheries, as described above under *Fisheries and Aquatic Resources*. Habitat conditions for other special status species are described above under *Upland and Wetland Resources*. Habitat for the elderberry longhorn beetle at Restoration Project sites is described in the Restoration Projects's ASIP and ASIP Addendum (USBR and SWRCB 2005e).

FUTURE CONDITIONS WITHOUT THE RESTORATION PROJECT

Fisheries and Aquatic Resources
Without the Restoration Project, fisheries and water quality conditions within the project area during the near term would likely remain similar to those existing in the recent past prior to the interim agreement for increased instream flows; i.e., interim agreement would no longer be in effect and minimum instream flows would continue per the current FERC license (3 cfs downstream of all North Fork Battle Creek diversions and 5 cfs downstream of all South Fork Battle Creek diversions). These extremely low flows would continue to impair fish passage and reduce habitat quality.

However, land use and habitat conversions resulting from subdivisions of land, increased public use, water pollution, and wildfire are potential risks for fisheries and aquatic resources in the future (Kier Associates 1999). The project area lies within the transition zone of the Central Valley, one of the fastest growing areas of the state. It is estimated that by the year 2040, an additional 1.6 million acres of agricultural land in this zone will be lost to outlying development and growth (American Farmland Trust 1995). Residential and commercial development in the Manton area has exponentially increased in the last five years, a trend that is expected to continue in the future. Recreational development in seasonal camping, hunting, and fishing resorts is expanding. Creek-side properties are particularly attractive for human uses.

Analyses for risk of development conducted by The Nature Conservancy concluded that Battle Creek watershed properties were vulnerable. However, habitat conservation opportunities in the watershed are being assessed by the Battle Creek Watershed Conservancy and The Nature Conservancy, which have a view for watershed conservation. It is possible that future conservation measures taken in the watershed would benefit fisheries and aquatic habitats, and help offset pressures for environmentally adverse land uses.

Upland and Wetland Resources
Without the Restoration Project, conditions within the project area in the near term are likely to remain similar to those presently existing. Eventually, though, land uses described above for *Fisheries and Aquatic Resources* could be detrimental to upland and wetland resources. Habitat fragmentation due to subdivisions or other development is a primary threat to this area. Because of the habitat conservation opportunities in the watershed being assessed by the Battle Creek Watershed Conservancy and The Nature Conservancy, it is possible that future conservation measures taken in the watershed would benefit wildlife and their habitats, and help offset pressures for environmentally adverse land uses.

Special Status Species
Future conditions without the project for special status species are likely to be similar to descriptions above for *Fisheries and Aquatic Resources* and *Upland and Wetland Resources*. Habitat areas with listed species present would have some protections under the ESA, but some degradation would be expected due to development pressures. It is possible that future conservation measures taken in the watershed by conservation organizations would benefit these

species. Precise future conditions without the Restoration Project for listed fish are difficult to estimate, as measures that might be taken toward recovery of listed Chinook salmon and steelhead are unknown at this time.

FUTURE CONDITIONS WITH THE RESTORATION PROJECT

Fisheries and Aquatic Resources

The following assessment assumes baseline instream flow conditions would be equivalent to those under the existing FERC license (i.e., without the interim agreement), which represents the NEPA baseline (future without the project). Because the purpose of the Restoration Project is to enhance and restore anadromous fish habitat, the effects on aquatic habitat and fisheries due to the Restoration Project would largely be beneficial. However, incidental temporary and permanent impacts[4] to the aquatic ecosystem also would occur during construction. The Restoration Project's Final EIS/EIR provides more-detailed descriptions of benefits to fisheries and aquatic resources that could result from implementing each of the four Restoration Project alternatives. The Restoration Project's, ASIP and ASIP Addendum provide further discussion on effects relative to the No Action Alternative and the Proposed Action.

Environmental benefits

A fundamental component of the Restoration Project is the provision of increased instream flows in Battle Creek and its Soap Creek, lower Ripley Creek, and Baldwin Creek tributaries. The instream flow component is provided through increased releases at Hydroelectric Project diversions (i.e., amount of instream flow diverted into the Hydroelectric Project water conveyance system is reduced, leaving more flows in natural creek channels) and releases of spring water that is normally collected and diverted into Hydroelectric Project canals. The amounts of flow released below dams would depend on flow prescriptions, availability of flows above the dams, and capacity of diversions. Figure 2 exemplifies effects of flow availability and diversion capacity on June flow releases at Inskip Diversion Dam. Increased instream flows should provide greater habitat area, improved water temperatures, more food production and, coupled with other structural measures of the Restoration Project, should facilitate fish passage for adult and juvenile anadromous fish. Implementation of the wide array of restoration actions and achievement of the broad range of environmental benefits would contribute toward ecosystem-level restoration.

Spawning and rearing habitat capacity. Based on IFIM and PHABSIM data for Chinook salmon and steelhead species-life stages (Thomas R. Payne and Associates 1998a), spawning and rearing habitat capacities (increased quantity and quality) for winter-, spring-, and late fall-run Chinook salmon and steelhead were modeled relative to minimum flow prescriptions of Restoration Project alternatives (USBR and SWRCB 2005c: Appendix H). Results generally indicate substantially improved habitat capacities for spring-, winter-, and late fall-run Chinook salmon runs and

[4]Temporary impacts include those which occur during construction, but would dissipate over time or be corrected after construction on the same site. Permanent impacts include those which occur within the footprint of permanent project features, such as fish ladders, and cannot be corrected on the same site or, otherwise, cannot be compensated due to lack of opportunity or effective methods.

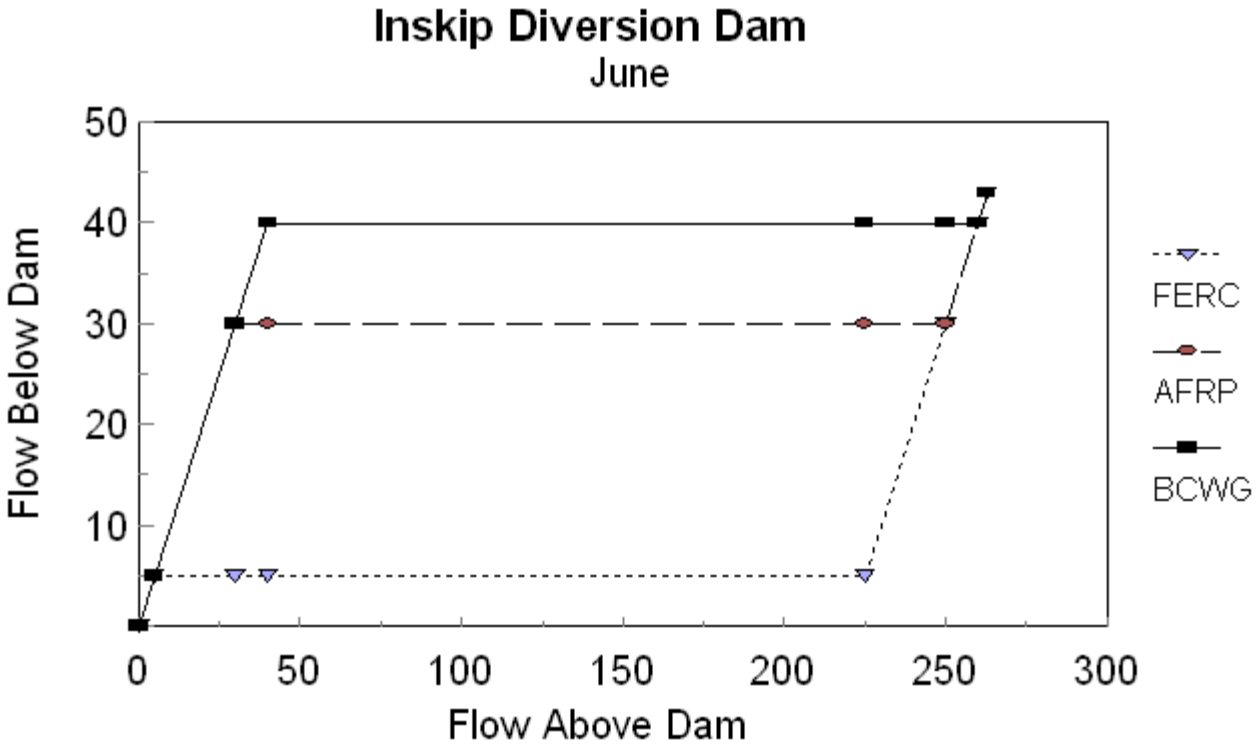

Figure 2. Flow releases below Inskip Diversion Dam (USBR and SWRCB 2005c: Appendix J) during June (90th percentile flow = 263 cfs) relative to flow availability (flow above dam) and diversion capacity (220 cfs) under three flow prescriptions (FERC = 5 cfs, AFRP = 30 cfs, BCWG = 40 cfs). The lower parallelogram represents instream flows gained under the AFRP prescription relative to FERC minimum requirements. The upper parallelogram represents additional flows gained under the BCWG prescription relative to AFRP flows.

steelhead under all action alternatives, compared to the No Action Alternative (USBR and SWRCB 2005c: Appendix H) (fall-run Chinook salmon were not modeled because current management objectives at CNFH include blocking fall-run at the hatchery's barrier weir). Increased spawning and rearing habitat capacities for salmon and steelhead would be expected to provide for greater production of fry and juveniles and, ultimately, greater populations of adults.

These comparisons were based on minimum flow releases prescribed by each alternative and did not consider contribution of natural runoff in the watershed to instream flow conditions. In this way, comparisons represented worst case (lowest) flows that would occur in the creek and conditions that are controllable by Hydroelectric Project facilities. During natural runoff events that are uncontrollable (canals are full and diversion dams are spilling), instream habitat conditions would be positively or negatively affected, depending on the flow rate, timing of the event, and species-life stage considered. These effects would be the same under all alternatives.

Because accuracy of the multiple layers of input data and assumed habitat relationships associated with the habitat modeling is uncertain, and unknown margins or error can be assumed exist,

modeling results should be considered approximate. Therefore, the small differences produced in many cases among action alternatives for spawning and rearing habitat capacity are probably not meaningfully different. The primary conclusions from modeling spawning and rearing habitat capacity should be that all restoration alternatives would provide considerable benefits compared to the No Action Alternative and, otherwise, only clear differences (in consideration of potential modeling error, a difference of 20% or more would be a conservative criterion) among action alternatives should be considered meaningful. This does not imply that no other differences exist among alternatives, but that the model does not precisely quantify them. Based on the 20% difference criterion, modeling results indicated a spawning capacity advantage (about 32% increased area) for steelhead under the Proposed Action and Six-Dam Removal Alternative (BCWG flow prescription), primarily in the South Fork, compared to the No-Dam Removal and Three-Dam Removal alternatives (AFRP flow prescription).

Flow-habitat relationships were not modeled for the Soap, Ripley, or Baldwin creek tributaries to Battle Creek, as IFIM data were not available. However, under the Proposed Action and Six-Dam Removal Alternative, flow releases in Soap, lower Ripley, and Baldwin creeks would substantially increase spawning and rearing habitat capacities (especially for steelhead and resident rainbow trout) in those creeks by providing at least 5-cfs releases in Baldwin Creek and all natural flows (dams removed) in Soap and lower Ripley creeks. Under the No Action and No-Dam Removal alternatives, no flow releases would be required on any of these tributaries. Under the Three-Dam Removal Alternative, Baldwin Creek would get a 10-cfs flow downstream of Asbury Dam, but no flows releases would be required on Soap or Ripley Creeks.

Fry and juvenile production. Production of fry and juveniles relative to differences in monthly temperature among Restoration Project alternatives was modeled for winter-, spring-, and late fall-run Chinook salmon and steelhead (USBR and SWRCB 2005b). Monthly temperature estimates from this "Warming Model" were based on upstream temperatures in each reach, assumed "equilibrium" temperatures, and the rate of flow in each reach (USBR and SWRCB 2005c: Appendix R). In general, water temperature differences among the alternatives depend on differences in Hydroelectric Project infrastructure and operations; such as minimum instream flows; where, when, and how much water is diverted; releases of cold spring water; presence or absence of powerhouse tailraces and their configurations; and degree of mixing of water from the North and South forks of Battle Creek. Cooler water temperatures are generally assumed to provide for greater fry and juvenile numbers and, ultimately, greater populations of adults. Results generally indicated substantially improved fry and juvenile production for all salmon runs and steelhead under all action alternatives, compared to the No Action Alternative (temperature effects were not modeled for fall-run Chinook salmon because current management objectives at CNFH include blocking fall-run at the hatchery's barrier weir) (USBR and SWRCB 2005b).

As discussed above for *Spawning and rearing habitat capacity*, modeling results for fry and juvenile production should be considered approximate, and perhaps only differences of 20% or more among action alternatives should be considered meaningful. Again, this does not imply that no other differences exist among alternatives, but that the model does not precisely quantify them. Based on this rationale, the primary conclusions from modeling fry and juvenile production should be that all of the restoration alternatives would provide considerable temperature benefits

compared to the No Action Alternative and, otherwise, modeling results indicated two other clear differences in temperature benefits: a fry production advantage (about 35% more fry) for steelhead under the Proposed Action and Six-Dam Removal Alternative, primarily in the South Fork, compared to the No-Dam Removal and Three-Dam Removal alternatives; and a juvenile production advantage (about 36% more juveniles) for steelhead under the No-Dam Removal and Three-Dam Removal alternatives, primarily in the South Fork, compared to the Proposed Action and Six-Dam Removal Alternative.

In two other instances, differences among alternatives for fry and juvenile production approached 20%: a spring-run fry production benefit (about 17% more fry) was predicted under the No-Dam Removal Alternative (primarily on the South Fork) compared to the Proposed Action and Six-Dam Removal Alternative; and a winter-run juvenile production benefit (about 17% more juveniles) was predicted under the No-Dam Removal Alternative (primarily due to exceptionally large numbers predicted on the Coleman reach) compared to the Proposed Action and Six-Dam Removal Alternatives.

However, the Warming Model used for fish production estimates does not account for inflows to the South Fork from Soap and lower Ripley creeks, which are fed by cold water springs, and should provide temperature benefits under the Proposed Action and Six-Dam Removal Alternative. Flows from Soap and lower Ripley creeks are not released under the No-Dam Removal and Three-Dam Removal alternatives. Moreover, the mechanism contributing cool water benefits to the South Fork under the No-Dam Removal Alternative–inflow of colder North Fork water at the South and Inskip powerhouse tailraces–also produces adverse effects for migrating adult salmon and steelhead due to mixing of North Fork and South Fork water (i.e., false attraction).

SNTEMP modeling. Distribution of water temperature affects quality of habitat used by all life stages of anadromous fish in Battle Creek and is influenced primarily by seasonal hydrology, meteorological conditions, flow releases below diversion dams, and the diversion or release of cold spring water where it enters the creek (USBR and SWRCB 2005c: Appendix K). Water temperatures in Battle Creek are sufficiently cool most of the year for steelhead and Chinook salmon, but warmer water temperatures may limit habitat quality during the summer months (June–September). Using the SNTEMP model, water temperature in the different reaches of Battle Creek were compared between the Proposed Action and the No Action Alternative relative to temperature tolerances of anadromous fish (USBR and SWRCB 2005c: Appendix K).

SNTEMP modeling indicated that increased flows released spring water under the Proposed Action generally provided cooler water temperatures during summer months than under the No Action Alternative, resulting in substantially increased spawning and rearing habitat for anadromous fish. This benefit was most apparent in the North Fork and in the South Fork upstream of Inskip Diversion Dam. Some stream locations (i.e., immediately downstream of the Inskip and Coleman diversion dams) would be warmer under the Proposed Action because cool North Fork water would no longer be discharged into the South Fork from the South and Inskip powerhouses, respectively, just upstream of the dams. However, these cooling effects under the No Action Alternative are dependent on the powerhouses being operable. Because the

powerhouses experience outages and restarts at unpredictable times, substantial fluctuations in water temperature occur that reduce habitat value for several miles downstream compared to stable conditions under the Proposed Action.

Cold water refugia. BCWG-derived flow prescriptions incorporated into the Proposed Action and Six-Dam Removal Alternative include the release of cold spring water into Battle Creek at Eagle Canyon on the North Fork, and Soap Creek and lower Ripley Creek tributaries to the South Fork. Instream flows provided downstream of Asbury Dam on Baldwin Creek (a tributary to the mainstem Battle Creek) would contain spring water from Darrah Springs. Release of cold spring water into the natural stream channels provides cool water habitat refugia for winter- and spring-run Chinook salmon holding in the creek during spring and summer. Elevated summer water temperature in holding areas of Battle Creek causes mortality of spring-run chinook salmon (USFWS 1996). The tributaries also should provide some spawning habitat, primarily for steelhead, but also for Chinook salmon (USBR and SWRCB 2005b).

Spring water releases to Battle Creek would be especially beneficial for winter-run Chinook salmon, as they originally were obligated to streams largely derived from cold-water springs (USFWS 1963). A restored winter-run population in Battle Creek would help spread the risk of population declines in the Sacramento River basin, as the only other population of winter-run occurs in the main stem Sacramento River downstream of Shasta Dam, where the risk of total reproductive failure due to lethal water temperatures is at least 2 years out of 100, and risk of partial reproductive failure is 1 year out of 10 (USBR 1991).

Spring water releases would also occur at Eagle Canyon and Baldwin Creek under the Three-Dam Removal Alternative, but benefits would be less than the Proposed Action and Six-Dam Removal Alternative, as Soap and lower Ripley creeks would not have instream flow releases. The No-Dam Removal Alternative would not provide any spring water releases or associated benefits.

Fish passage–false attraction. False attraction to South Fork Battle Creek due to the cross-basin transfer of North Fork water to the South and Inskip powerhouses and subsequent discharge into the South Fork channel would be addressed under the Proposed Action and Six- and Three-Dam Removal alternatives. Under the Proposed Action and Six-Dam Removal Alternative, a tailrace connector tunnel at the South Powerhouse and tailrace connector at the Inskip Powerhouse would direct powerhouse discharge into Inskip and Coleman canals, respectively, and largely keep mixed North Fork and South Fork water from entering the South Fork channel. Construction of the penstock bypass pipeline/chute at the Inskip Powerhouse would largely keep mixed North Fork and South Fork water from entering the South Fork channel during powerhouse outages. This would help prevent confounding of olfactory cues and water temperature gradients, which help guide migrating adults to their natal habitat for spawning.

Migrating winter- and spring-run Chinook salmon returning to North Fork Battle Creek would more likely be attracted into the South Fork after sensing North Fork water mixed with South Fork water. Maintaining the fidelity of fish natal to the North Fork should help ensure survival of winter- and spring run Chinook salmon populations during adverse stream conditions elsewhere in

the Sacramento River basin (USBR and SWRCB 2005b). Guarding against false attraction might prevent the South Fork from becoming a drain on winter- and spring-run Chinook salmon populations produced in the North Fork, and the important North Fork drought refugia from being under-seeded during a drought.

In addition, adult fish migrating upstream in the South Fork would less likely key on localized zones of cooler water below powerhouse tailraces, arrest upstream movement too early, and spawn in these zones where planned or unplanned powerhouse outages, or other disruptions of normal powerhouse discharges above these zones, could result in stream temperatures above the maximum threshold for salmonid eggs or fry. This potential miscue is important because the natural cool water habitat needed to restore spring-run Chinook salmon and steelhead are located at distant upstream reaches of the South Fork (USBR and SWRCB 2005b). Uninterrupted migration to the natural upstream spawning habitat facilitated by normal temperature gradients could benefit the recovery of naturally producing spring-run Chinook salmon and steelhead populations in South Fork Battle Creek.

Under the Three-Dam Removal Alternative, benefits to anadromous fish migration from reduced mixing of North Fork and South Fork water would be the same as under the Proposed Action and Six-Dam Removal Alternative for Inskip powerhouse discharge, as the same tailrace connector would be constructed to the Coleman Canal. However, because the penstock bypass at Inskip powerhouse would not be constructed under the Three-Dam Removal Alternative, greater potential for spill of North Fork water from the Inskip Canal through natural pathways into the South Fork would exist, particularly during unplanned outages of the Inskip Powerhouse. In addition, the Three-Dam Removal Alternative would construct a tailrace separator channel instead of a tailrace connector tunnel the South Powerhouse. Because the separator channel would be designed to function during normal flows, spillage of mixed North Fork and South Fork water could occur during abnormally high flows. The No-Dam Removal Alternative would not provide any benefits with regard to false attraction.

Fish passage–natural barriers. A key consideration used by the BCWG for establishing minimum instream flow prescriptions was facilitation of upstream passage of adult anadromous fish beyond natural barriers to preferred holding and spawning habitat (Kier Associates 1999). Any of the action alternatives should provide improved passage past natural barriers by adult salmon and steelhead, and would be expected to increase survival and spawning success, leading to higher production and population numbers, compared to the No Action Alternative. A comparison among Restoration Project alternatives (USBR and SWRCB 2005b: Table 4.1-7) indicated that the Proposed Action and Six-Dam Removal Alternative (BCWG minimum flow prescription) would provide better passage over natural barriers than the No-Dam Removal and Three-Dam Removal alternatives (AFRP Minimum flow prescription). The BCWG prescription provided passage for greater proportions of the migration season or greater lengths of stream reaches (Table 7). In the absence of temporary higher flows during storms, passage over natural barriers would be permitted at more locations, for more anadromous fish species/runs, and during more months under the Proposed Action and Six-Dam Removal Alternatives.

Table 7. Benefit indices for adult anadromous fish passage over natural barriers of North and South Fork Battle Creek compared between BCWG and AFRP minimum flow regimes.[1] Indices are the product of proportion (decimal fraction) of adult migration season[2] that passage is available and miles of adult migration habitat available[3] during minimum instream flow conditions.

	North Fork			South Fork			North/ South Fork Total Index
	Miles	Proportion of Season	Index	Miles	Proportion of Season	Index	
BCWG							Sum
Steelhead	9.9	1.00	**9.9**	18.9	1.00	**18.9**	**28.8**
Winter-Run Chinook	9.9	1.00	**9.9**	18.9	1.00	**18.9**	**28.8**
Spring-Run Chinook	9.9	1.00	**9.9**	18.9	1.00	**18.9**	**28.8**
AFRP							
Steelhead	9.9	0.88	**8.7**	3.6	1.00	**3.6**	**12.3**
Winter-Run Chinook	9.9	0.64	**6.3**	3.6	1.00	**3.6**	**9.9**
Spring-Run Chinook	9.9	0.43	**4.3**	3.6	1.00	**3.6**	**7.9**

[1]BCWG minimum flow regime applies to Five Dam (Proposed Action) and Six Dam Removal Alternatives; AFRP minimum flow regime applies to No Dam and Three Dam Removal Alternatives.
[2]USBR and SWRCB 2003b: Table 4.1-1.
[3]USBR and SWRCB 2003b: Table 4.1-7.

Fish passage–upstream migration at diversion dams. The Restoration Project addressed upstream fish passage at Hydroelectric Project diversion dams with new state-of-the-art fish ladders. In cases where diversion dams would no longer be needed by the Hydroelectric Project because of reduced diversions to increase instream flows, removal of dams would provide enhanced fish passage. Any of the action alternatives should provide much improved upstream passage past diversion dams compared to the No Action Alternative as a result of diversion dam removal and/or construction of new state-of-the-art fish ladders. Improved adult fish passage would be expected to permit better utilization of available spawning habitat, increased spawning success, and ultimately, higher population levels of anadromous salmonids.

The conservative design approach to fish ladder design, coupled with the relatively low height of dams, would be expected to provide high adult passage reliability. The effective flow range of new fish ladders would be at least 10 times that of existing ladders and, therefore, should provide

much more efficient passage in terms of reduced delay, energy expenditure, and injury. Although only a relatively small area of stream is affected, fish ladders create a passage bottleneck and concentrate migrating fish into small areas; therefore, efficiency of new fish ladders also might substantially reduce predation on migrating individuals compared to the No Action Alternative. Although fish ladders were conservatively designed to be state-of-the-art, fish ladder design, by definition, still is an art, and each ladder design is unique and untested. Some additional level of delay, energy expenditure, and potential for injury or predation would still exist compared to dam removal. Therefore, removal of dams should be considered more reliable for fish passage, as the obstacle would be removed altogether, eliminating any concern regarding ladder effectiveness.

Under the Proposed Action, removal of Wildcat, South, Soap Creek Feeder, Lower Ripley Creek Feeder, and Coleman diversion dams coupled with construction of new fish ladders at remaining diversion dams should permit significantly improved upstream passage of adults to preferred spawning habitat compared to the No Action Alternative. Like all alternatives incorporating fish ladders, deficiencies in effectiveness of any fish ladder design might be correctable through adaptive management; however, only the Proposed Action provides funding sources for adaptive management. Additional differences among the action alternatives probably would be related only to any relative passage efficiencies of removing or retaining diversion dams. In this respect the Six-Dam Removal Alternative would be the most efficient for adult passage, followed by the Five-Dam Removal Alternative, Three-Dam Removal Alternative, and No-Dam Removal Alternative.

Fish passage–downstream migration at diversion intakes. The Restoration Project addressed downstream fish passage at Hydroelectric Project diversion intakes with new state-of-the-art fish screens. In cases where diversions would no longer be needed by the Hydroelectric Project because of reduced diversions to increase instream flows, removal of diversion dams would eliminate diversion intakes. Any of the action alternatives should provide much improved downstream passage past diversion intakes compared to the No Action Alternative as a result of diversion removal and/or construction of new state-of-the-art fish screens. Improved juvenile fish passage would be expected to permit better utilization of available rearing habitat, increased survival of juvenile fish, and ultimately, higher population levels of anadromous salmonids.

The conservative design approach to fish screen design and conformance to fish screen design criteria established by NOAA Fisheries (NMFS 1997a) and CDFG (CDFG 1997) would be expected to minimize entrainment and impingement of juveniles at diversions, and increase reliability of safe passage. Fish screens designed to automatically shut off the diversion whenever the fish screen fails to meet design or performance criteria should further increase reliability of safe passage. Where dams and diversions are retained, construction of tailrace connectors would reduce the volume of diverted water at intakes, thereby reducing the potential for entrainment and impingement, while maintaining the same volume of flow within the Hydroelectric Project conveyance system.

Under the Proposed Action, removal of Wildcat, South, Soap Creek Feeder, Lower Ripley Creek Feeder, and Coleman diversions coupled with construction of new fish screens at remaining diversions should permit significantly improved downstream passage of juveniles compared to the No Action Alternative. Like all alternatives incorporating fish screens, deficiencies in

effectiveness of any fish screen design might be correctable through adaptive management; however, only the Proposed Action provides funding sources for monitoring and adaptive management.

Aquatic habitat stability. The Hydroelectric Project's system of canals and/or powerhouses is subject to planned and unplanned outages, during which time water that cannot be conveyed through powerhouses or canals is released to the natural stream channel at any of a number of spill outlets at the dams or along the canals (USBR and SWRCB 2005b). Fluctuations in transitory wetted habitat that is created during spills, then de-watered as conveyance returns to normal, can adversely affect anadromous fish and other aquatic organisms (effects on macroinvertebrates and other aquatic organisms are discussed below under *Upland and Wetland Resources*). For example, redds established in transitory habitat during wetted periods would become de-watered when instream flows recede, and juvenile and adult fish that occupy this habitat during wetted periods could become stranded if they are not able to follow receding water back to the normally wetted habitat area.

The reduced occurrence and rapidity of instream flow fluctuations that would occur under the Proposed Action compared to the No Action Alternative, would be expected to benefit anadromous fish and other fish species. The proposed tailrace connector tunnel at South Powerhouse and penstock bypass and tailrace connector at Inskip Powerhouse are designed to reduce the potential for spills from the Hydroelectric Project conveyance system into Battle Creek during planned and unplanned facility outages. Rather than spill into the South Fork during a powerhouse outage, the tailrace connector tunnel, penstock bypass, and tailrace connector would route water back into the canal system beyond the powerhouses reducing potential for flow fluctuations in reaches below spill outlets. Removal of South, Coleman, and Wildcat diversion dams, where hydroelectric values would be marginal after minimum instream flows are met, should further reduce instream flow fluctuations resulting from planned or unplanned outages of diversions or canals associated with the dams (particularly South and Wildcat diversion dams).

Under the Six-Dam Removal Alternative, benefits of the penstock bypass and tailrace connectors are the same as under the Proposed Action. The Six-Dam Removal Alternative also would provide the same benefits as the Proposed Action for reduced instream flow fluctuations due to fewer canal outages, but with an added incremental benefit from removing Eagle Canyon Dam. The Three-Dam Removal Alternative would provide similar tailrace benefits as the Proposed Action, except that the tailrace separator channel used in place of a tailrace connector tunnel at the South Powerhouse would be prone to mixing into the South Fork during higher than normal creek flows. This alternative also would provide benefits of fewer canal outages with respect to Wildcat, Eagle Canyon, and Coleman diversion dam removal, but would not provide reduced canal outage benefits from removal of Soap and Lower Ripley diversion dams. The No-Dam removal Alternative would not provide any benefits from tailrace connectors or dam removal.

Ramping rates prescribed by the Restoration Project for altering instream flows during Hydropower Project operations (0.1 ft/hr) would further benefit anadromous fish and other fish species. Under the No Action Alternative (present FERC license), there is no requirement for rate of flow changes below the dams. Juvenile and adult fish occupying transient habitat during

Hydroelectric Project outages might more easily follow receding waters back to the normally wetted stream channel following the outages if the waters recede more slowly (Kier Associates 1999). All action alternatives include the same prescribed ramping rates.

SRA cover. Another potential ecosystem-level benefit of the Restoration Project for fish and aquatic resources is enhancement of SRA cover along the edges of Battle Creek. The amount of SRA cover present on Battle Creek is unknown, as it has not been inventoried. Riparian vegetation that either overhangs or protrudes into the water; instream woody debris, such as leaves, logs, branches and roots; and often substantial amounts of detritus provide high quality food and cover for fish and other aquatic species (USFWS 1992). Improved flow regimes that are proposed under all action alternatives could enhance riparian vegetation, as described below under Upland and Wetland Resources, and help enhance the extent and perpetuation of associated SRA cover.

Relative enhancement of riparian habitat or SRA cover has not been evaluated among alternatives for the Restoration Project, but because riparian vegetation is especially sensitive to changes in minimum and maximum instream flows (Auble et al. 1994, cited in The Instream Flow Council 2002), it might be assumed that the higher minimum flows of the Proposed Action and Six-Dam removal alternatives, particularly during the drier summer months, would provide greater SRA cover benefits than the No-Dam Removal and Three-Dam Removal Alternatives in reaches of Battle Creek where AFRP and BCWG minimum flow regimes are most different, such as on the South Fork and between North Battle Creek Feeder and Eagle Canyon Dam on the North Fork (Table 4).

Adaptive management. Because determining the effectiveness of Restoration Project actions would require monitoring population levels and habitat use, and unanticipated factors could affect fishery restoration results, the Restoration Project would implement adaptive management as a tool to monitor initial results and refine actions being taken. The use of adaptive management should increase the probability that the Restoration Project would achieve its objectives. For example, effects of minimum flow prescriptions could be evaluated, and effectiveness of fish screens and ladders could be monitored and structures modified, as necessary, to achieve desired performance. Monitoring also would provide information on population changes over time to help ascertain success of restoration actions. The Restoration Project has incorporated adaptive management into all alternatives, but the Proposed Action has the unique advantage of having acquired funding sources for implementing the AMP and acquiring additional flows, as needed. This advantage should increase certainty of restoration success compared to the other alternatives.

The No-Dam, Six-Dam, and Three-Dam Removal alternatives also would include elements of adaptive management consistent with the overarching principles of adaptive management set forth by the CBDA Science Program. However, unlike the Proposed Action, these other alternatives would not include dedicated water rights, a water acquisition fund, or an adaptive management fund (USBR and SWRCB 2005b).

Adverse effects

All action alternatives are designed to benefit the stream ecosystem, including fisheries and aquatic resources. Appropriate mitigation measures incorporated into the actions would largely avoid incidental adverse effects. However, all of the action alternatives have a similar potential for temporary, incidental adverse effects on fisheries and aquatic resources, such as increased mortality or reduced reproductive success.

Temporary adverse effects may result from actions involving instream work, including streambank modification, fish screen and ladder installation, and tailrace modifications. Fish in all life stages and other aquatic organisms would be subject to impacts of instream construction activities, including cofferdam construction, form building and concrete pouring, stream channel alteration, heavy equipment movements in the streambed, accidental spill of petroleum products, de-watering and re-watering of work sites, blasting, and placement of dismantled dam debris into the stream channel have potential for impacts. Soils and sediment trapped behind dams would be disturbed and temporarily degrade water quality through turbidity and sedimentation, including potential siltation of salmonid spawning habitat downstream.

Construction of new roads and other earth moving activity adjacent to the creek also can induce sedimentation. Changes in stream hydrology due to removal or modification of diversion dams and tailraces also may adversely alter sediment transport and deposition. Eggs of fish and other aquatic organisms may be adversely affected by shockwaves from blasting within or near the stream channel. Instream habitat structure, such as pools, riffles, and spawning gravel also may be disturbed or altered in construction areas or from changes in stream hydrology caused by removal or modification of water control structures. Risks also exist for oil and grease discharges into the creek from heavy equipment within the streambed.

Impacts to riparian habitats could also affect fish species. In particular, SRA cover, which provides valuable cover for fish and shade that can moderate water temperatures, would be lost (the amount has not been estimated). Also, wetland habitat associated with the stream channel, which can provide similar wildlife benefits as SRA cover, also would be lost by a small amount. However, improved flow regimes that are proposed under all action alternatives should help restore lost riparian and wetland habitat, and enhance riparian and wetland habitat that remains.

Increased populations of anadromous fish that are expected to result from construction of the Restoration Project could increase the incidence of common salmonid pathogens, such as infectious hematopoietic necrosis virus (IHNV) in Battle Creek waters (USBR and SWRCB 2005a). Because spring-fed water supplies for the Jeffcoat East/West and Willow Springs units of Mount Lassen Trout Farms (MLTF) could be co-mingled with Battle Creek water seeping from Hydroelectric Project conveyance canals, and water supplies for Darrah Springs State Fish Hatchery could be exposed to anadromous fish in Baldwin Creek (a Battle Creek tributary), IHNV and other salmonid pathogens could be transmitted to trout in both hatcheries. Subsequent planting of these hatchery trout into other waters outside of the Battle Creek watershed could spread IHNV and other salmonid pathogens to fisheries residing in these waters. Additionally, the increased threat of IHNV to fish at MLTF and Darrah Springs State Fish Hatchery could reduce the beneficial uses of waters within the Battle Creek watershed, as well as relatively uninfected

waters outside of the Battle Creek watershed where the hatchery fish might be distributed. Aquaculture and support of cold water ecosystems are both beneficial uses of water protected by the Central Valley Regional Water Quality Control Board's Basin Plan (CVRWQCB 1998).

The Restoration Project's Final EIS/EIR provides more-detailed descriptions of adverse impacts to fisheries and aquatic resources that could result from implementing each of the four Restoration Project alternatives. The Restoration Project's ASIP and ASIP Addendum provide further discussion on effects relative to the No Action Alternative and the Proposed Action.

Upland and Wetland Resources

The following assessment assumes baseline conditions would be equivalent to those under the existing FERC license (i.e., without the interim agreement), which represents the NEPA baseline (future without the project). Although the Restoration Project is designed to primarily benefit anadromous fish and instream habitat, the ecosystem approach taken to develop restoration actions should produce benefits for riparian vegetation and non-piscine animal species associated with the stream and riparian corridor. These expected benefits would be derived primarily from higher instream flows, reduced unnatural fluctuations in instream flow, reduced entrainment of nutrients into Hydroelectric Project canals, and conversion of decommissioned Hydroelectric Project tunnels into new or enhanced bat habitat. Because less instream flow would be diverted under all action alternatives, the proposed flow regime would more closely resemble that of Battle Creek's natural, unimpaired hydrograph and should be better suited for the Battle Creek ecosystem than that under the No Action Alternative (see Gore and Mead 2001). However, incidental temporary and permanent impacts to upland and wetland resources also would occur during Restoration Project construction due to disturbance and removal of habitat.

Environmental benefits

Wetted habitat area. The prescribed minimum instream flow releases under the Proposed Action (BCWG flows) are 12 to 29 times greater in the North Fork and 8 to 17 times greater in the South Fork, depending on reach and time of year, compared to the No Action Alternative (FERC license conditions). Increased minimum flows would significantly increase the amount of wetted habitat area available in the mainstem, North Fork, and South Fork Battle Creek (total of 175.3 acres for Five- and Six Dam Removal alternatives and 168.3 acres for No-Dam and Three-Dam Removal alternatives, compared to 108.9 acres for the No Action Alternative) (USBR and SWRCB 2005b: Table 4.1-10).

Other expected benefits to wetted habitats include increased flows in Baldwin Creek (at least 5 cfs) and re-watering of lower channel sections of Soap and Ripley creeks (under normal conditions, all flows presently are diverted by the Hydroelectric Project). Additionally, several intermittent stream courses that are cut-off by the South Canal would be re-connected by decommissioning of the canal.

Increased wetted habitat area should benefit species using aquatic habitat for foraging, cover, or reproduction (e.g., northwestern pond turtle, foothill yellow-legged frog, and salamanders). Although not quantified, the affected areas of Soap, lower Ripley, and Baldwin creeks also would substantially increase. Greater wetted habitat area would be expected to provide greater

production of periphyton and aquatic macroinvertebrates, which form the basis of the food chain in stream ecosystems, and provide a primary food source for other species, such as turtles, frogs, and salamanders. Aquatic insects that metamorphose into aerial and terrestrial insects would contribute to the food supply of insectivorous wildlife, such as birds and bats that forage in riparian and adjacent habitats. Farther up the food chain, wildlife species that prey on amphibians and fish, such as green herons, common mergansers, bald eagles, osprey, racoons, and river otters also would benefit from increased wetted habitat area.

The Six-Dam Removal Alternative (BCWG flows) would provide somewhat higher flows and wetted habitat area downstream of the Eagle Canyon and Wildcat diversion dam sites and mainstem compared to the Proposed Action, due to removal of Eagle Canyon Dam (USBR and SWRCB 2005b: Table 4.1-10). The Three-Dam Removal Alternative (AFRP flows) would have less wetted area compared to the Proposed Action and Six-Dam Removal Alternative due to smaller flow releases at remaining diversion dams, and retainment of diversion dams on Soap and lower Ripley creeks. The No-Dam Removal Alternative (AFRP flows) also would generally have less wetted area than the Proposed Action and Six-Dam Removal Alternative, except downstream of Eagle Canyon and Wildcat diversion dams where it is higher during wet months (December through April); diversion dams on Soap and lower Ripley creeks would not be removed.

Wetted habitat temperature. Another potential benefit from increased flows under the Proposed Action is cooler water temperatures in summer, which should be more similar to seasonal temperatures in which species, such as amphibians and macroinvertebrates, evolved. Like fish, amphibians and macroinvertebrates can be adversely affected if water temperatures exceed their biological tolerances, and more-natural temperature regimes are more likely to provide optimal temperatures for these species' life cycles. All other action alternatives should also provide water temperature benefits to these species; however, it would be difficult to estimate relative temperature benefits among the alternatives, because temperature relationships for these species are not necessarily the same as for fish, and data for non-piscine species are not available for Battle Creek.

Wetted habitat stability. The reduced occurrence and rapidity of instream flow fluctuations that would occur under the Proposed Action compared to the No Action Alternative would be expected to further benefit non-piscine species of the stream and riparian corridor. Diverted water that normally would be contained within the Hydroelectric Project system, would be temporarily spilled or released into stream channels during canal or powerhouse outages. Resulting fluctuations of instream flow can adversely affect amphibians and macroinvertebrates through changes in water temperature and wetted habitat area. Spilled water from canals can become warmed as it runs overland and, upon draining into the creek, can increase creek temperatures to harmful levels. Alternating from spilling to normal conveyance can result in temperature fluctuations in natural stream channels (USBR and SWRCB 2005b), and such fluctuations can adversely affect macroinvertebrates (Gore and Mead 2001). Fluctuations in transitory wetted habitat that is created during spills, then de-watered as conveyance returns to normal, can adversely affect immobile biota that occupy this habitat during the wetted periods (e.g., sessile macroinvertebrates or eggs of macroinvertebrates and amphibians).

The proposed South Powerhouse bypass tunnel and tailrace connectors at the South and Inskip powerhouses are designed to reduce the potential for spills from the Hydroelectric Project conveyance system into Battle Creek during planned and unplanned facility outages. Rather than spill into the South Fork during a powerhouse outage, the bypass tunnel and/or tailrace connectors would route water back into the canal system beyond the powerhouses eliminating cold water inflow and flow fluctuations in reaches below the spills. Removal of South, Coleman, and Wildcat diversion dams, due to marginal hydroelectric values, should further reduce instream flow fluctuations resulting from planned or unplanned outages of diversions or canals associated with the dams (particularly South and Wildcat diversion dams).

Under the Six-Dam Removal Alternative, benefits of tailrace connectors are the same as under the Proposed Action. The Six-Dam Removal Alternative would provide the same benefits as Proposed Action for reduced instream flow fluctuations due to fewer canal outages, but with the added incremental benefit from removing Eagle Canyon Dam. The Three-Dam Removal Alternative would provide similar tailrace connector benefits as the Proposed Action, except that the tailrace separator channel at the South Powerhouse would be prone to spilling into the South Fork during higher than normal flows. This alternative also would provide benefits of fewer canal outages with respect to Wildcat, Eagle Canyon, and Coleman diversion dam removal, but would not provide reduced canal outage benefits from removal of Soap and Lower Ripley diversion dams. The No-Dam removal Alternative would not provide any benefits from tailrace connectors or dam removal.

Ramping rates prescribed by the Restoration Project for altering instream flows during Hydropower Project operations (0.1 ft/hr) would further benefit non-piscine species. Under the No Action Alternative (present FERC license), there is no requirement for rate of flow changes downstream of the dams. Rapid reduction of instream flows following a Hydroelectric Project outage could strand or isolate juvenile fish in the stream channel (Kier Associates 1999) and, by extension, could also strand or isolate early lifestage amphibians that might have colonized transitory habitat during temporary periods of higher flows. Ramping down instream flows more slowly when returning hydropower facilities to service following outages should help early amphibian life stages follow declining water elevations back to the normally wetted channel and, thereby, benefit amphibian populations downstream of dams, as well as populations of species that prey on amphibians and fish (e.g., green herons, common mergansers, bald eagles, osprey, racoons, and river otters). All action alternatives include the same prescribed ramping rates.

Riparian vegetation. Riparian ecosystems are maintained by groundwater and flood pulses (Ewing 1978, cited in The Instream Flow Council 2002). Therefore, improved flow regimes proposed under all action alternatives could help enhance riparian vegetation, in general, and SRA cover aquatic habitat, in particular, through improved geomorphological and ecological processes. Increased flows should help transport the fine sediments that riparian vegetation uses for seed germination. Also, potentially raised levels of ground water resulting from increased instream flows could enhance growth of existing riparian vegetation, and enable a wider riparian vegetation zone along Battle Creek to the benefit of wildlife species using the riparian zone.

SRA cover, as described above under *Biological Resources-Fisheries and Aquatic Resources*, is also important for amphibians and terrestrial wildlife that use riparian and stream edge habitat. This near shore aquatic area occurring at the stream-riparian habitat interface provides valuable resources, such as high quality food and cover (USFWS 1992). The amount of SRA cover present on Battle Creek is unknown, as it has not been inventoried. But because of the relatively small width of Battle Creek compared to the size of adjacent riparian vegetation, a high proportion of Battle Creek could probably be considered SRA cover. Relative enhancement of riparian habitat or SRA cover has not been evaluated among alternatives for the Restoration Project, but because riparian vegetation is especially sensitive to changes in minimum and maximum instream flows (Auble et al. 1994, cited in The Instream Flow Council 2002), it might be assumed that the higher minimum flows of the Proposed Action and Six-Dam removal alternatives, particularly during the drier summer months, would provide greater riparian habitat benefits than the No-Dam Removal and Three-Dam Removal Alternatives in reaches of Battle Creek where AFRP and BCWG flow regimes are most different.

Enhanced bat habitat. Many bats have been observed on the Restoration Project area and there is potential for an estimated seven species (all are Species of Concern) to be present. Creation or enhancement of bat habitat and potential increases in abundance and diversity of bats on the Project Area would help mitigate for potential adverse effects on bats during Restoration Project construction, and provide ecosystem level benefits to the Restoration Project area. Removal of the South Diversion Dam and associated facilities under the Proposed Action or Six-Dam Removal Alternative would result in termination of Hydroelectric Project water flow through the South Canal tunnels. Rather than seal off tunnel entrances, the entrances would be fitted with bat gates specifically designed to create proper microclimates for targeted (to be determined) bat species, and substantially increase roosting, breeding, or hibernating habitat (USBR and SWRCB 2005b). Under the Six-Dam Removal and Three-Dam Removal alternatives, decommissioning of Eagle Canyon Diversion Dam could provide potential bat habitat in the tunnel that connects the diversion with the Eagle Canyon Canal.

Adverse effects

In addition to environmental benefits, many components of the Restoration Project would result in incidental adverse effects on upland, riparian, and wetland habitats and their associated animal species, which would be similar among all action alternatives. Construction with heavy equipment would occur in both terrestrial and aquatic habitats on several restoration sites within the project area. Most of these effects would occur from construction of fish screens and ladders, construction of access roads and staging areas, and removal of dams and associated facilities at restoration sites. Habitat areas falling within the footprint of permanent project features (e.g., fish screens or ladders, maintenance areas, or permanent roads) would be permanently lost.

In addition to construction at restoration sites, construction also would occur at sites associated with MLTF (Jeffcoat East and Jeffcoat West units) and Darrah Springs State Fish Hatchery (Asbury Diversion Dam). Construction is needed at these sites to mitigate for increased potential for fish pathogens and reduced water quality at the water sources for these fish hatcheries (descriptions of mitigation activities for MLTF and Darrah Springs State Fish Hatchery are described below under *Mitigation for Fish Pathogens and Water Quality*).

Habitats and associated wildlife species could be either temporarily or permanently affected by all action alternatives of the Restoration Project. Amounts of particular habitats that would be affected and their locations vary by project alternative (Table 8). The proportions of impacts that would be temporary or permanent has not yet been determined, as specifics of project designs are not yet complete. However, with appropriate mitigation measures it should be possible to avoid, minimize, and compensate for incidental adverse effects, to the extent possible, and keep unavoidable adverse effects on restoration sites to an acceptable level.

Some of the most significant impacts involve riparian vegetation and wetlands. Much of the riparian habitat impact would be permanent. Impacts to riparian habitats could also affect wildlife species that use SRA cover, which provides valuable cover structure and shade that can moderate water temperatures (the amount of SRA cover that would be affected has not been estimated). Wetlands associated with the stream channel, which can provide similar wildlife benefits as SRA cover, would be lost by a small amount. However, the improved flow regime that is proposed under all action alternatives could help restore lost riparian and wetland habitat and enhance riparian and wetland habitat that remains (responses of riparian habitat to increased instream flows would be monitored under the AMP).

The Restoration Project Final EIS/EIR provides a summary of adverse impacts to botanical, wetland, and wildlife resources that could result from implementing each of the four Restoration Project alternatives, including at specific sites, where applicable.

Special Status Species

Environmental benefits

Because the purpose of the Restoration Project is to enhance and restore anadromous fish habitat, long-term effects on aquatic habitat and fisheries due to the Restoration Project would largely be beneficial. Benefits to winter-, spring-, and late fall-run Chinook salmon and steelhead are described above under *Fisheries and Aquatic Resources.*

Although the Restoration Project is designed to primarily benefit anadromous fish and instream habitat, the ecosystem approach taken to develop restoration actions also should be expected to produce benefits for terrestrial and wetland/riparian special status species. Benefits to habitats used by terrestrial and wetland/riparian special status species are described above under *Upland and Wetland Resources.* Federally listed species that might benefit from the Restoration Project include bald eagle (due to enhanced fisheries) and valley elderberry longhorn beetle (due to enhanced riparian vegetation–but see discussion of adverse effects, below). Other special status species that might benefit from enhanced fisheries and/or riparian habitat are foothill yellow-legged frog, northwestern pond turtle, golden eagle, osprey, Cooper's hawk, sharp-shinned hawk, American peregrine falcon, Vaux's swift, little willow flycatcher, and yellow-breasted chat.

Adverse effects

Some project construction activities could result in incidental adverse effects to listed species under the jurisdiction of the Service (valley elderberry longhorn beetle) and NOAA Fisheries (spring- and winter-run Chinook salmon and steelhead), which would be similar among the action alternatives. Potential effects to spring- and winter-run Chinook salmon and steelhead are

Table 8. Estimated upland and wetland habitat losses (acres) resulting from alternatives of the Battle Creek Salmon and Steelhead Restoration Project (USBR and SWRCB 2005a). Acreage includes both restoration sites and mitigation sites. Data are not yet available to distinguish temporary impacts from permanent impacts.

Habitat Type	Resource Category	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal
Restoration Sites					
Annual grassland	3	28.1	24.5	28.1	24.7
Mixed chaparral	3	4.2	2.9	4.2	4.2
Westside ponderosa pine	3	0	0	0	0
Live oak woodland	2	23.5	9.3	23.5	9.3
Blue oak woodland/savanna	2	47.5	22.4	48.5	24.9
Gray pine/oak woodland	2	2.5	0.8	2.5	2.5
Emergent wetland	2	0.6	0.6	0.6	0.6
Seasonal wetland	2	0.4	0.4	0.4	0.4
Emergent scrub wetland	2	0	0	0	0
Groundwater seep	2	0.1	0.1	0.1	0.1
Riparian forest/riparian scrub[1]	2	16.5	9.9	16.5	11.8
Mitigation Sites[2]					
Annual grassland	3	7.3	7.3	4.3	4.3
Mixed chaparral	3	0	0	0	0
Westside ponderosa pine	3	0	0	0	0
Live oak woodland	2	1.3	1.3	0.9	0.9
Blue oak woodland/savanna	2	6.2	6.2	0	0
Gray pine/oak woodland	2	0	0	0	0
Emergent wetland	2	0.1	0.2	0.1	0.1

Habitat Type	Resource Category	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal
Seasonal wetland	2	0.5	0.5	0	0
Emergent scrub wetland	2	2.3	2.3	0.3	0.3
Groundwater seep	2	0	0	0	0
Riparian forest/riparian scrub[1]	2	2.4	2.4	2.4	2.4
Total Restoration and Mitigation Sites					
Annual grassland	3	35.4	31.8	32.4	29.0
Mixed chaparral	3	4.2	2.9	4.2	4.2
Westside ponderosa pine	3	0	0	0	0
Live oak woodland	2	24.8	10.7	24.4	10.2
Blue oak woodland/savanna	2	53.7	28.7	48.5	24.9
Gray pine/oak woodland	2	2.5	0.8	2.5	2.5
Emergent wetland	2	0.7	0.8	0.7	0.7
Seasonal wetland	2	0.9	0.9	0.4	0.4
Emergent scrub wetland	2	2.3	2.3	0.3	0.3
Groundwater seep	2	0.1	0.1	0.1	0.1
Riparian forest/riparian scrub[1]	2	19.0	12.3	19.0	14.2

[1]Includes area of perennial drainages (USBR and SWRCB 2005b: section 4.2), which contains riparian vegetation; estimate is considered conservative, as not all area of perennial drainages is riparian vegetation cover.
[2]Represents the most conservative estimate of four mitigation options at Jeffcoat East/West site.

described above under *Fisheries and Aquatic Resources*. These effects should be temporary and minimal due to conservation measures that are identified in the Restoration Project's Final EIS/EIR (USBR and SWRCB 2005b), ASIP, and ASIP Addendum. Further discussion of conservation measures is provided below under *Mitigation*. Overall, the net effects of the Restoration Project on anadromous and resident fisheries should be considerably beneficial.

Vegetation and wildlife surveys conducted for the Restoration Project (JSA 2001a, 2001b; USBR and SWRCB 2005e) and evaluations of Restoration Project alternatives (USBR and SWRCB 2005b, 2005e) indicated that the Restoration Project was likely to adversely affect the valley elderberry longhorn beetle at both restoration sites and mitigation sites. Fifty-eight elderberry shrubs having stems at least 1 inch in diameter at ground level (qualifier for suitable habitat) have been found in the project area within or near these construction sites; 21 shrubs at restoration sites and 37 shrubs at mitigation sites. Nine elderberry shrubs would be directly or indirectly affected at restoration sites and would require transplanting per the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999). Eight of these shrubs occur along the South Canal and will lose their water supply when the South Canal is de-watered; one shrub occurs in the footprint of the new Eagle Canyon fish screen and ladder and would be removed. Shrubs occurring on roadsides at restoration sites would be avoided by road improvement activities through use of conservation measures. Shrubs occurring at the Coleman Diversion Dam, Inskip Diversion Dam/South Powerhouse, and lower Ripley Creek Feeder, likewise, would be avoided. It is estimated that 7 elderberry shrubs would be directly affected at mitigation sites. All other elderberry shrubs at mitigation sites are more than 100 feet from construction sites, except one, which is more than 20 feet from construction sites. This shrub will be avoided through use of conservation measures.

Pre-construction surveys would be performed at all sites where survey data is more than 2 years old when construction would begin; thus, additional shrubs may be found by construction time at the different sites (construction scheduling is provided in the Restoration Project ASIP). Reclamation has committed to follow the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999) for implementing the Restoration Project; these conservation commitments are described in the Restoration Project ASIP and ASIP Addendum. The Biological Opinion issued by the Service for the Restoration Project (USFWS 2005) authorized take of up to 26 elderberry shrubs containing up to 108 stems measuring over 1 inch in diameter at ground level. Bald eagles are known to nest at a site near CNFH, but surveys conducted during the 2000 and 2001 breeding seasons did not locate any active bald eagle nests in the Restoration Project area (JSA 2001a, 2001b, USBR and SWRCB 2005e). Bald eagles might forage along Battle Creek, as two individuals were observed flying over the area, but Reclamation estimates that the potential for disturbance of bald eagles by the Restoration Project probably is low due to low use of the area by bald eagles and availability of extensive alternative foraging sites (USBR and SWRCB 2005b). The Restoration Project has included a conservation measure in its ASIP that provides for pre-construction surveys and, if bald eagle nests are found, to establish buffers and limit construction activities. The Service has concurred that the Restoration Project is not likely to adversely affect bald eagles; however, if nesting bald eagles are found within 0.5 mile of Restoration Project sites, as viewed from a vertical projection, all work must cease until formal consultation is reinitiated (USFWS 2005).

Site assessments performed for the Restoration Project identified potentially suitable breeding habitat for the California red-legged frog at several restoration and mitigation sites (JSA 2001d, 2005). Service protocol-level surveys (USFWS 1997) were conducted for the California red-legged frog during April and June, 2005, and no California red-legged frogs were found. The Service has determined that the Restoration Project is not likely to adversely affect California red-legged frogs (USFWS 2005). Unless new information reveals effects of the proposed action that may affect the California red-legged frog in a manner or to an extent not considered, no further action pursuant to the ESA for this species is necessary. If California red-legged frogs are found on or near the Restoration Project site, all work must cease until formal consultation is reinitiated (USFWS 2005).

No slender Orcutt grass was observed, nor was potential habitat for this species documented during initial botanical surveys for the Restoration Project (JSA 2001a, 2001b). Because the Service limits validity of plant surveys to a period of 2 years (due to transient occurrence and delectability of plants), and because additional Restoration Project sites (mitigation sites) were identified after the 2000 surveys were completed, follow-up surveys at original survey sites having potential orcutt grass habitat and new surveys at the additional project sites were conducted in June, 2005. No slender Orcutt grass or potential habitat for this species were observed during these surveys. A second set of surveys is scheduled for the same areas in July, 2005. If slender orcutt grass is found during the July surveys, Reclamation would need to re-initiate consultation with the Service under section 7 of the ESA. Based on the May, 2005, survey results, the Service has concluded that, at this time, no slender orcutt grass exists within the project sites (USFWS 2005). If the July, 2005, surveys, or subsequent pre-construction surveys, indicate that slender orcutt grass exists within Restoration Project sites, all work must cease at these sites until formal consultation is reinitiated (USFWS 2005).

Delta smelt occur downstream of the project area in the Sacramento River watershed. However, quantity and quality of Battle Creek water entering the Sacramento River is not expected to change as a result of the Restoration Project and these species should not be affected by the Restoration Project.

Other special status species that are not federally listed also could be adversely affected by the Restoration Project. Those known to occur on the project area are the foothill yellow-legged frog; northwestern pond turtle; seven bird species, including three raptors; potentially eight bat species; and five species of plants (see *Biological Resources-Special Status Species*). These effects, which are summarized above under *Upland and Wetland Resources-Adverse effects*, and described in more detail the Restoration Project's ASIP and ASIP Addendum, should be temporary and minimal due to conservation measures identified in the Restoration Project's Final EIS/EIR, ASIP, and ASIP Addendum. The ASIP and ASIP Addendum also include a mitigation plan for sensitive natural communities pursuant to the State's Natural Communities Conservation Planning Act. Further discussion of mitigative measures is provided below under *Mitigation*.

Restoration Project Commitments

The Restoration Project's Draft EIS/EIR, ASIP, and ASIP Addendum provides a set of mitigation strategies and general environmental protection measures that would be implemented before and during construction, and that are consistent with the CALFED ROD (CALFED 2000b). The environmental protection measures were developed through coordination among the Service, Reclamation, NOAA Fisheries, CDFG, and PG&E. With full implementation of mitigative measures to avoid and minimize adverse effects, all unavoidable adverse effects presently known would be minor and short term or could be reduced to acceptable levels through compensation. All permanent adverse effects have been addressed with compensatory measures. Mitigation measures that are specific to various components of the Restoration Project or wildlife species are provided by the Service (see below).

Environmental protection measures for fisheries and water quality impacts emphasize avoidance and minimization of impacts to the extent practicable. Most potential direct impacts to salmon and steelhead would be avoided by restricting them to areas downstream of restoration sites during project construction, conducting instream work during low flow periods, and using best management practices (USBR and SWRCB 2005b, 2005d, 2005e). Environmental protection measures for vegetation and wildlife also begin with avoidance and minimization of impacts to the extent practicable (USBR and SWRCB 2005b, 2005d, 2005e). This would reduce loses of existing biological values in the project area, as well as planning, land acquisition, and funding needed for compensation. For example, although blue oak woodland/savanna and live oak woodland are not rare habitats in the project area, impacts to oak communities can be significant, as oaks communities take a relatively long time to mature and the compensation ratio is relatively high.

Mitigation for Fish Pathogens and Water Quality

The Restoration Project has proposed mitigation measures to ensure that MLTF and the Darrah Springs State Fish Hatchery fish will not be exposed to the IHNV (USBR and SWRCB 2005b). This mitigation would minimize potential for spread of fish disease to other waters of California and reduced water quality that could result from increased fish populations produced by the Restoration Project.

Proposed mitigation at the Jeffcoat East/West sites of MLTF includes diverting Eagle Canyon Canal water into a new watertight pipeline at a point along the canal that is sufficiently far enough upstream of the spring area to prevent canal water from mixing with MLTF spring water, and discharging the water back into Eagle Canyon Canal at a point downstream of the spring area (USBR and SWRCB 2005b). Two basic alignments have been identified–a cross-country alignment and an alignment follow the existing Eagle Canyon Canal. Each alignment has a variation, which diverts water into the pipeline farther downstream in Eagle Canyon Canal. Proposed mitigation at the Willow Springs site of MLTF includes four mitigation options: a) installation of an ultraviolet light disinfection facility; b) relocation of hatchery operations to raise trout at an equivalent facility; c) modification of operations at Willow Springs to raise fish other than trout, or raise trout for catch-and-take only; and d) acquiring the Willow Springs aquaculture

business. Proposed mitigation at the Darrah Springs State Fish Hatchery includes structural or operational modifications at either the Asbury Diversion Dam or constructed modifications to a waterfall downstream of Asbury Dam.

Plant communities and associated wildlife habitats that could be affected at these mitigation sites are summarized in Table 6. Potential effects on special status species are described above under *Special Status Species-Adverse Effects*. The same mitigation measures that are described herein for restoration sites also apply to these mitigation sites.

Mitigation Considerations and Enhancement Opportunities

Mitigation plan

An important aspect of the Restoration Project will be the development and implementation of the *Post Construction Mitigation/Compensation/Restoration and Reporting Plan*, as referenced in the Final EIS/EIR. The plan should be developed in consultation with the Service. In the Service's view, mitigation should equal or exceed the quality and quantity of habitat to be adversely affected by the project, and criteria should be developed for assessing the progress of mitigative measures. For example, assessment criteria for restoration of temporary upland impacts should include rates of plant growth, plant health and survival, and evidence of natural reproduction. A mitigation plan must include a timeframe for implementing the mitigation in relation to the proposed project, and mitigative measures should be implemented as soon as possible. If there will be a substantial time lag between project construction and completion of the compensation, a net loss of habitat values would result due to time lags in compensating for the lost habitat values. The plan should define how the site would be maintained during the vegetation establishment period, and how long the establishment would take.

It also would be important to identify what entity will perform the compensation activities, and what entity will ultimately own and manage the site. A mechanism to fund the maintenance and management of the compensation site should be identified and established. A permanent easement should be placed on the property used for the compensation that would preclude incompatible activities on the site.

In general, monitoring of the restored site should occur annually for at least the first 5 years, biennially for years 6 through 11, and every 5 years thereafter until the mitigation has met all success criteria. Remedial efforts and additional monitoring should occur if success criteria are not met during the first 5 years. Some projects could require monitoring throughout the life of the project. Reports should be prepared after each monitoring session.

Because of their very high value of wetlands to migratory birds, and ever-increasing rarity of wetlands in California, the Service's mitigation goal for wetlands (including riparian and riverine wetlands) is no net loss of in-kind habitat value or acreage, whichever is greater. As a result of their high value and reliance on suitable hydrological conditions, wetland restoration or creation would require development of additional information on the predicted hydrology of the mitigation site. The plan should describe the depth of the water table, and the frequency, duration, areal extent, and depth of flooding which would occur on the site. The hydrologic information should include an analysis of extreme conditions (drought and flooding) as well as typical conditions.

Compensation for lost habitat values

The purpose of the Restoration Project is to enhance and restore anadromous fish habitat, and effects on aquatic habitat and fisheries would be mostly beneficial. Incidental adverse effects (temporary and permanent) to the aquatic ecosystem would occur during construction, but these should be small relative to project benefits. On the whole, adverse effects should be outweighed by project benefits. For this reason, the Service believes that no compensation is needed for adverse effects on aquatic habitat and fisheries following construction, except that which could become necessary if unexpected adverse effects become evident during post project monitoring (e.g., detrimental movement of sediment built up behind removed diversion dams).

It should be possible to avoid adverse effects on most upland and wetland habitats located outside of permanent project features. However, it is recognized that some incidental adverse effects would be unavoidable. Post-project assessments would need to assess these impacts in greater detail than presently estimated in the Final EIS/EIR. The assessments should be conducted per the *Post Construction Mitigation/Compensation/Restoration and Reporting Plan.* The assessments should document the extent (area, distance), severity, and permanence (temporary or permanent) of adverse effects at each restoration and mitigation site following project construction, and determine needs for compensation. Pursuant to the Service's Mitigation Policy, the Service has developed the compensation ratios in Table 9 for temporary and permanent losses to upland, riparian, and wetland habitats.

Preliminary mitigation measures were provided by the Service in its Draft FWCA report (USFWS 2003). This draft report proposed compensation for adverse effects on upland and wetland habitats through restoration of degraded habitat areas at specified compensation ratios (e.g., the ratio for blue oak woodland/savanna is 5:1, which means 5 acres of degraded blue oak woodland/savanna would need to be restored for each acre lost due to project construction). To meet requirements of compensation ratios greater than 1:1, it is necessary to locate pre-existing degraded habitat on the construction site, or elsewhere, that is in need of restoration. However, due to escalating Restoration Project costs for both construction and mitigation, the Restoration Project Environmental Team explored a watershed-level, CALFED Program view (Program view) for compensation of adverse effects that would consider both Restoration Project benefits and benefits of CALFED-funded conservation easements within the Battle Creek watershed.

A Program view for compensation is consistent with the CALFED MSCS, which states that "ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures. If the restoration and enhancement actions culminate in an increase or improvement in a particular NCCP [Natural Community Conservation Plan] community, compensatory measures may not be required even if there is a temporary or limited adverse modification of the community or habitat type. Ultimately, the need for compensatory conservation measures for CALFED restoration and enhancement actions will depend on the type, location, timing, and success of the related actions" (CALFED 2000c).

With consideration to these MSCS provisions, the Environmental Team proposed that environmental compensation needs of the Restoration Project remaining after implementation of

Table 9. Compensation[1] developed by the Fish and Wildlife Service for upland and wetland habitat losses (USBR and SWRCB 2005b) resulting from the Proposed Action of Battle Creek Salmon and Steelhead Restoration Project. Data to distinguish permanent and temporary losses are not yet available. Estimates of compensation needs are conservative, as they are calculated from compensation ratios for permanent impacts. Actual compensation acreage needed will be determined when data to distinguish permanent and temporary losses become available.

Habitat Type	Resource Category	Compensation Ratios for Temporary Habitat Loss	Compensation Ratios for Permanent Habitat Loss	Habitat Loss (acres)[2]	Compensation Needed (acres)[3]	Compensation available from conservation Easement (acres)
Annual grassland	3	restore	1:1	35.4	35.4	310
Mixed chaparral	3	restore plus 2:1	3:1	4.2	12.6	unknown[4]
Westside ponderosa pine	3	restore plus 3:1	4:1	0	0	
Blue oak woodland/ savanna	2	restore plus 4:1	5:1	53.7	268.5	591
Live oak woodland	2	restore plus 4:1	5:1	24.8	124.0	588 (combined habitats)
Gray pine/oak woodland	2	restore plus 4:1	5:1	2.5	12.5	
Emergent wetland	2	restore	2:1	0.7	1.4	n/a
Seasonal wetland	2	restore	2:1	0.7	1.4	n/a
Emergent scrub wetland	2	restore	2:1	2.3	4.6	n/a
Groundwater seep	2	restore	avoid impacts[5]	0.1	n/a	n/a
Riparian forest/riparian scrub[6]	2	restore plus 4:1	3:1	19.0	57	57

[1]Compensation ratios are based on compensation needs calculated for like habitats in past project assessments at the proposed Auburn Dam (USFWS 1991) and Spring Creek Debris Dam (USFWS 1994) that used the Service's Habitat Evaluation Procedures (HEP). Ratios reflect biological values of lost habitats, existing biological values on conservation easement property, and time required to achieve replacement values on conservation easement property if those habitats would have been completely lost in the future, rather than protected.
[2]Habitat loss is the sum of construction losses at restoration sites and mitigation sites.
[3]Estimates for compensation needs are conservative, as they assume permanent impacts. Actual acreage needed from easement would be reduced by the acreage of temporary impacts, as this acreage would be restored on-site.
[3]Restore plus a ratio means to restore the impact site and then restore additional area elsewhere at the given ratio.
[4]It is highly probable that at least 10 acres of chaparral exists on conservation easement property.
[5]It is assumed that groundwater seeps cannot be successfully created and permanent losses would be unmitigable. It is expected that nearly all impacts to groundwater seeps will be temporary.
[6]Includes area of perennial drainages (USBR and SWRCB 2005b: section 4-2), which contains riparian vegetation; estimate is considered conservative, as not all area of perennial drainages is riparian vegetation cover.

other mitigative measures, such as avoidance and minimization of adverse effects, should be considered offset by environmental benefits of CALFED-funded conservation easements in the watershed (see *Program View for Determining Compensation*, Attachment F). The most appropriate conservation easement for this purpose was the Burton Ranch property adjacent to the mainstem Battle Creek. With consideration to the broader CALFED Program within the watershed, the size of the Burton Ranch, habitat types present on the property, and risk of detrimental future land uses that the easement might avert supported the concept of crediting easement benefits toward compensation for adverse effects of the Restoration Project. The Environmental Team determined that this Program-level approach would be valid in view of the following criteria:

- Restoration Project is making extensive efforts to avoid and minimize adverse effects.
- Unavoidable adverse effects of the Restoration Project are incidental to restorative actions for other ecosystem components.
- Loss of habitat will be mitigated on-site to the extent possible.
- The Restoration Project looked first for habitat compensation opportunities within the project area.
- Consideration of CALFED-funded easements within the watershed to offset Restoration Project impacts would be consistent with programmatic conservation measures in the CALFED MSCS.
- The Restoration Project and CALFED conservation easement occur in proximity to one another in the same watershed.
- The CALFED conservation easement provide gains biological value by averting probable future land development.
- The CALFED conservation easement would provide in-kind benefits to offset habitat values lost.
- The CALFED conservation easement would provide the magnitude of benefits needed to offset habitat values lost.

If it is assumed that existing habitat values protected from future detrimental land uses by a conservation easement are equivalent to values gained by restoration of degraded habitat, then compensation needed by the Restoration Project can be equally satisfied by either a conservation easement or restoration of degraded habitat. In the Program view for compensation proposed by the Environmental Team, the average annual habitat value of an acre protected by the conservation easement is equal to the average annual habitat value of a restored acre, for all applicable habitat types. Therefore, the mitigation ratios provided in Table 9 would apply for either restoration of degraded habitat or protection of habitat under conservation easements.

The Program view for compensation of adverse effects was adopted by the Restoration Project agencies and was considered to fully compensate for permanent losses of Restoration Project habitats included in the Environmental Team's compensation proposal (upland and riparian habitats) (Attachment F). The program-level compensation approach does not cover needs to restore areas where habitat losses are temporary (these impacts are to be mitigated through site restoration following project construction), but covers the additional compensation needs relative to compensation ratios. Neither does the Program view provide compensation credit for Restoration Project impacts on wetlands, because it was assumed that future wetland losses on the conservation easement property would be mitigated under section 404 of the Clean Water Act (i.e., wetlands on the conservation easement property were not assumed to be at risk from detrimental land uses, as were upland habitats; thus wetlands offered no compensation value for impacts of the Restoration Project). Riparian habitat was included in the program-level compensation approach because riparian habitats on the conservation easement property may or may not fall under jurisdiction of section 404 of the Clean Water Act, depending on whether they fall within the ordinary high water mark, and could be at risk from detrimental land uses.

Because the Restoration Project would potentially provide benefits to wetlands and waters of the United States, such as increased flows and wetted area in Battle and Baldwin creeks, release of springs into Battle Creek, re-watering of channel sections in Soap and Ripley creeks, and re-connection of several intermittent stream courses along South Canal, could help offset adverse effects to wetlands. Ultimately, the Department of the Army Corps of Engineers will determine minimum mitigation needs for wetlands and riparian habitats (within the ordinary high water mark) through the section 404 review process.

Specific mitigation measures

Several mitigation measures recommended by the Service have already been incorporated into the Restoration Project EIS/EIR. The Service has provided Reclamation with recommended mitigation measures for bats and migratory birds, with input from CDFG (Attachments B and C, respectively) for purposes of early project planning. The recommendations for migratory birds are supported in principle by existing Federal directives, as summarized in Attachment E. Some mitigation measures are site specific or dependent on real-time conditions, such as presence/absence of certain sensitive species, and must be considered on a case-by-case basis.

Under the Migratory Bird Treaty Act, migratory birds are protected from pursuing, hunting, taking, capturing, or killing. Nests and their contents also are protected. As a species group, birds are useful wildlife representatives for assessing and mitigating adverse impacts, as they occur within all terrestrial and wetland habitats on the project area. Consideration of these mitigation measures for bats and migratory bird should also provide protections for many other wildlife species that could be present. The mitigation measures for bats and migratory birds emphasize the reproductive season (a particularly sensitive period for wildlife), but also cover winter periods for bats. The Service continues to advocate these mitigation measures for all action alternatives of the Restoration Project (Attachments B and C). One key consideration is scheduling of vegetation removal, where necessary for construction, during the non-breeding season of migratory birds (Attachment B). These mitigation measures are intended for all action

alternatives and all project sites, as applicable. Implementing the measures might require further assessment of construction sites and activities to determine how the measures should be applied.

Opportunities for habitat mitigation and enhancement

Several opportunities exist to create or enhance wildlife habitat on the Restoration Project area in addition to the fisheries restoration benefits. These include creation and enhancement of bat habitat, preservation and enhancement of wetlands, and preservation of wildlife movement corridors. Creation and enhancement of bat habitat is described above under *Future Conditions with the Project/Upland and Wetland Resources*. Depending on topography and availability of hydrologically connected natural seeps or intermittent drainages, it might be possible to re-contour sections of the canals (the remainder would be filled in) to restore connectivity of intermittent stream channels. This could help mitigate for other project impacts to these resources. In other locations, such as the Inskip Powerhouse penstock and South Powerhouse tailrace, water conveyance facilities could be constructed to preserve animal movement corridors that would otherwise be blocked by the facilities (see Attachment D for site-specific details). These provisions for wildlife movements could help offset project impacts and enhance ecosystem processes associated with animal movements.

DISCUSSION

The Restoration Project is supported by several restoration plans and programs developed by State and Federal resource agencies for restoration of anadromous fisheries. In addition, the Restoration Project tiers from the CALFED ROD, and incorporates several ecosystem-level actions that target several ecosystem-level benefits consistent with the CALFED MSCS and ERP. Specific restoration needs and means to achieve them have been established through the Battle Creek Salmon and Steelhead Restoration Plan and the Restoration Project MOU. Therefore, a varied range of considerations are needed to evaluate Restoration Project alternatives. Particular attention should be directed to the Restoration Project Purpose and Need, pursuant to NEPA and CEQA provisions.

Restoration Project actions focused on increasing minimum instream flow requirements, improving upstream and downstream fish passage, restoring stream function, and applying adaptive management to address the project Purpose and Need, including a range of specific objectives (see *Background*). Expected ecological benefits pertain to increasing quality and quantity of spawning habitat, providing cold water refugia, reducing potential for false attraction during migration, facilitating passage for adults and juveniles past natural barriers and Hydroelectric Project facilities, improving habitat stability and continuity, and developing a process to help ensure Restoration Project success. The ecosystem approach taken for restoration also should provide benefits to riparian and wetland communities adjacent to the creeks.

Many restoration actions are similar among the Restoration Project Alternatives, but are modified and/or assembled into different packages. Other restoration actions are unique to particular

alternatives. An assessment that qualitatively compares the primary benefits of Restoration Project alternatives is provided in Table 10.

In general, the Proposed Action and Six-Dam Removal Alternative provide the most biological benefits. These include superior benefits to cold water refugia from spring releases, reduced false attraction of anadromous fish from a penstock bypass and tailrace connectors, improved adult passage at natural barriers from increased minimum flow, and improved instream habitat stability and continuity from a penstock bypass and tailrace connectors. Moreover, greater benefits to the riparian corridor ecosystem would be expected from BCWG flow prescriptions included in the Proposed Action and Six-Dam Removal Alternative. The Proposed Action has the added advantage of providing the greatest certainty for achieving desired results, due to its dedication of PG&E water rights to instream uses and its comprehensive AMP with identified funding sources for potential water acquisition and Hydroelectric Project facility modification.

Based on review of the expected benefits from each action alternative (Table 10) and associated potential incidental impacts and compensation (Table 9), the Service's concludes that the Proposed Action (Five-Dam Removal Alternative) would best achieve the Restoration Project Purpose and Need, which include minimizing loss of hydroelectric power production (see *Background*). The Proposed Action also would meet Restoration Project objectives and be consistent with objectives of several State and Federal anadromous fish restoration plans and the CALFED ERP (see *Background*).

Pursuant to the Service's Mitigation Policy, Restoration Project mitigation options for potential adverse effects on MLTF and Darrah Springs State Fish Hatchery (potential increased occurrence of fish pathogens and reduced water quality) that best avoid and minimize incidental adverse effects of their own, would be preferred. The Service's interpretation of current environmental analyses (USBR and SWRCB 2005b) suggests that the cross county alignment would best meet these criteria at the Jeffcoat East/West site (less potential for permanent adverse effects to riparian forest/scrub habitat). For the Willow Springs and Darrah Springs hatchery sites, any of the fish hatchery mitigation options could satisfactorily meet the criteria of avoiding and minimizing incidental adverse effects, while fulfilling the mitigation need. One important exception might be the relocation of Willow Springs operations, if relocation would result in significant adverse effects at the new site. For example, it has been proposed during Restoration Project meetings that Willow Springs operations could be moved to the Millseat Creek area and divert springs feeding the creek as the hatchery water supply. Ecological values of the headwater springs of Millseat Creek are exceptionally high and adverse effects could be significant, depending on where a water diversion would be established. A description of ecological conditions and values at Millseat Creek is provided in Attachment G, along with estimated potential impacts of diverting the springs or creek. Recommendations also are provided that might reduce impacts to an acceptable level, if this option were to be further pursued.

Table 10. Estimated relative benefits from the No Action, Five-Dam Removal, No-Dam Removal, Six-Dam Removal, and Three-Dam Removal alternatives of the Battle Creek Salmon and Steelhead Restoration Project. Magnitude of benefits should be compared only within rows and not across rows. A benefit designation with a plus sign (+) is estimated to have a moderately greater benefit than the same designation without a plus sign.

Benefit Category	Relative Benefit					Description[1]
	No Action	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal	
Increased Spawning and Rearing Habitat	None	Large +	Large	Large +	Large	Large benefit for all alternatives from increased minimum flows. Five- and Six-Dam additionally include benefits to steelhead and rainbow trout on South Fork, Soap Creek, lower Ripley Creek, and Baldwin Creek.
Increased Fry and Juvenile Production	None	Large +	Large	Large +	Large	Large benefit for all alternatives from increased minimum flows. Five- and Six-Dam provide greater benefit to steelhead fry on South Fork compared to No-Dam and Three-Dam.
Increased Area of Cold Water Refugia	None	Large	None	Large	Moderate	Large benefit for Five- and Six-Dam from release of spring water at Eagle Canyon, Soap Creek, lower Ripley Creek, and Baldwin Creek. Three-Dam releases only at Eagle Canyon and Baldwin Creek. No releases for No-Dam.

Benefit Category	Relative Benefit					Description[1]
	No Action	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal	
Reduced False Attraction	None	Large	None	Large	Moderate	Considerable benefits for Five-, Six-, and Three-Dam from tailrace connectors at South Powerhouse Inskip powerhouse. Five- and Six-Dam have greater benefit from penstock bypass at Inskip Powerhouse and more reliable tailrace connector at South Powerhouse compared to Three-Dam. No bypass or tailrace connectors for No-Dam.
Improved Adult Passage at Natural Barriers	None	Large	Moderate	Large	Moderate	Considerable benefits for all alternatives from increased minimum flow. Five- and Six-Dam have greater benefit from higher minimum flow regime compared to No-Dam and Three-Dam.
Improved Adult Passage at Diversion Dams	None	Large +	Large	Large +	Large	Large benefit for all alternatives from dam removal and/or new fish ladders. Five- and Six-Dam have greater reliability from more dams removed compared to No-Dam and Three-Dam.
Improved Juvenile Passage at Diversion Intakes	None	Large +	Large	Large +	Large	Large benefit for all alternatives from dam removal and/or new fish screens. Five- and Six-Dam have greater reliability from more dams removed compared to No-Dam and Three-Dam.

Benefit Category	Relative Benefit					Description[1]
	No Action	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal	
Improved Instream Habitat Stability and Continuity (tailrace connectors/ penstock bypass)	None	Large	None	Large	Moderate	Considerable benefits provided by Five-, Six-, and Three-Dam from tailrace connector at South Powerhouse and penstock bypass and tailrace connector at Inskip powerhouse. Five- and Six-Dam have greater benefit from more reliable tailrace connector at South Powerhouse compared to Three-Dam. No bypass or tailrace connectors for No-Dam.
Improved Instream Habitat Stability and Continuity (ramping rates)	None	Large	Large	Large	Large	Large benefit for all alternatives from prescribed ramping rates.
Assurance of Instream Flows (water rights dedication)	None	Large	None	None	None	Large benefit for Five-Dam from dedication of water rights. No other alternative dedicates water rights.
Assurance of Adaptive Management (funding)	None	Large	Moderate	Moderate	Moderate	Large benefit for Five-Dam from funded adaptive management plan and funded water acquisition account. Other alternatives include adaptive management but lack existing funding sources.

Benefit Category	Relative Benefit					Description[1]
	No Action	Five-Dam Removal (Proposed Action)	No-Dam Removal	Six-Dam Removal	Three-Dam Removal	
Increased or Enhanced Stream, Wetland, and Riparian Habitat (habitat area, wetted habitat temperature, and flow stability)	None	Large	Large	Large	Large	Large benefit for all alternatives from increased minimum flows, tailrace and penstock bypass facilities, prescribed ramping rates, and dam removal.
Increased Bat Habitat	None	Large	None	Large	Moderate	Large benefit for Five- and Six-Dam from decommissioning of South Canal tunnels. Three-Dam decommissions only shorter Eagle Canyon tunnels. No-Dam does not decommission tunnels.

[1]Biological benefits relative to facility features are more fully described in Table 2.

RECOMMENDATIONS

The proposed Restoration Project is designed to benefit anadromous fisheries and instream habitat, and also should benefit the adjacent riparian ecosystem. To help maximize the Restoration Project's contribution to fishery and overall ecosystem quality in the Restoration Project area, the Service provides the following recommendations:

1. Select and implement the Restoration Project's Proposed Action.

2. Avoid adverse impacts to fish and wildlife and their habitats to the fullest extent practicable, and minimize adverse impacts that are unavoidable, as provided for in the Restoration Project's mitigation strategies defined in the Final EIS/EIR, ASIP, and ASIP Addendum.

3. Implement Terms and Conditions and Conservation Measures for federally listed species, as described by the Service's Biological Opinion for Restoration Project (Attachment H).

4. Development and implement the *Post Construction Mitigation/Compensation/ Restoration and Reporting Plan*, as referenced in the Final EIS/EIR, in consultation with the Service, NOAA Fisheries, and CDFG. Include plan components and considerations described above under *Mitigation Considerations and Enhancement Opportunities-Mitigation plan*.

5. Adopt compensation ratios provided by the Service in Table 9 for implementing program-level compensation, as described above under *Mitigation Considerations and Enhancement Opportunities-Compensation for lost habitat values.*

6. Implement mitigation measures provided by the Service for migratory birds and bats (Attachments B and C, respectively).

7. Conduct vegetation removal, where necessary for construction, during the non-breeding season of migratory birds, as would be congruent with Migratory Bird Treaty Act Federal program directives for migratory bird conservation (Attachment E), and conservation measures provided by the Service in Attachment B.

8. Enhance other ecosystem components, such as re-connection of intermittent stream channels, bat habitat, and canyon and riparian corridor pathways, to the extent feasible (Attachment D).

9. Implement other site-specific mitigation measures proposed by the Service (Attachment D), as applicable, and to the extent practicable.

10. Select and implement the cross country pipeline alignment option as mitigation for increased fish pathogens and reduced water quality at the Jeffcoat East/West mitigation site.

11. Select and implement a mitigation option for increased fish pathogens and reduced water quality at the Willow Springs mitigation site that will avoid and minimize incidental impacts to other biological resources. Refer to Attachment G for discussion of biological values and potential impacts from possible relocation of hatchery operations to Millseat Creek.

12. Consider additional conservation measures that may be recommended by the Service, NOAA Fisheries, and CDFG in the future, as construction proceeds and specific impact information becomes available.

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ATTACHMENT A

Endangered and Threatened Species that May Occur in
or be Affected by Projects in the Quads Listed at the End of this Report
Battle Creek Salmon and Steelhead Restoration Project
May 27, 2005

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

delta smelt, *Hypomesus transpacificus* (T)

winter-run chinook salmon, Sacramento River, *Oncorhynchus tshawytscha* (E)

Invertebrates

Critical habitat, vernal pool tadpole shrimp, *Lepidurus packardi* (X)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

Critical habitat, slender Orcutt grass, *Orcuttia tenuis* (X)

slender Orcutt grass, *Orcuttia tenuis* (T)

Proposed Species

Fish

Critical Habitat, Central Valley spring-run chinook (Proposed), *Oncorhynchus tshawytscha* (PX)

Candidate Species

Mammals

fisher, *Martes pennanti* (C)

Birds

Western yellow-billed cuckoo, *Coccyzus americanus occidentalis* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C)

Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C)

green sturgeon, *Acipenser medirostris* (C)

Species of Concern

Mammals

California wolverine, *Gulo gulo luteus* (CA)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

Sierra Nevada snowshoe hare, *Lepus americanus tahoensis* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

long-legged myotis bat, *Myotis volans* (SC)

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

spotted bat, *Euderma maculatum* (SC)

Birds

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

American dipper, *Cinclus mexicanus* (SLC)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

California thrasher, *Toxostoma redivivum* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Lewis' woodpecker, *Melanerpes lewis* (SC)

Nuttall's woodpecker, *Picoides nuttallii* (SLC)

Vaux's swift, *Chaetura vauxi* (SC)

bank swallow, *Riparia riparia* (CA)

black swift, *Cypseloides niger* (SC)

ferruginous hawk, *Buteo regalis* (SC)

flammulated owl, *Otus flammeolus* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

loggerhead shrike, *Lanius ludovicianus* (SC)

long-billed curlew, *Numenius americanus* (SC)

oak titmouse, *Baeolophus inornatus* (SLC)

prairie falcon, *Falco mexicanus* (SC)

rufous hummingbird, *Selasphorus rufus* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

western burrowing owl, *Athene cunicularia hypugaea* (SC)

white-faced ibis, *Plegadis chihi* (SC)

white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Spea hammondii (was Scaphiopus h.)* (SC)

Fish

Sacramento splittail, *Pogonichthys macrolepidotus* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

river lamprey, *Lampetra ayresi* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Sacramento anthicid beetle, *Anthicus sacramento* (SC)

Plants

Ahart's whitlow-wort (=Ahart's paronychia), *Paronychia ahartii* (SC)

Boggs Lake hedge-hyssop, *Gratiola heterosepala* (CA)

Butte County catchfly (=long-stiped campion), *Silene occidentalis ssp. longistipitata* (SC)

Butte fritillary, *Fritillaria eastwoodiae* (SC)

silky cryptantha, *Cryptantha crinita* (SC)

valley sagittaria (=Sanford's arrowhead), *Sagittaria sanfordii* (SC)

Quads Used in Report:

627D
645D
626C
627A
627B
628A

KEY:

(E)	Endangered	Listed (in the Federal Register) as being in danger of extinction.
(T)	Threatened	Listed as likely to become endangered within the foreseeable future.
(P)	Proposed	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	Proposed Critical Habitat	Proposed as an area essential to the conservation of the species.
(C)	Candidate	Candidate to become a proposed species.
(SC)	Species of Concern	May be endangered or threatened. Not enough biological information has been gathered to support listing at this time.
(MB)	Migratory Bird	
(D)	Delisted	Delisted. Status to be monitored for 5 years.
(CA)	State-Listed	Listed as threatened or endangered by the State of California.

(*) Extirpated Possibly extirpated from this quad.
(**) Extinct Possibly extinct.
Critical Habitat Area essential to the conservation of a species.

ATTACHMENT B

Impact Mitigation Measures for Birds Potentially Affected by the Battle Creek Salmon and Steelhead Restoration Project

The following recommendations were developed to avoid and minimize, in that order of priority, adverse effects on bird species associated with the project area due to construction activities. Adverse effects could result from direct habitat destruction or disturbance from construction activity. These measures do not apply to listed or proposed species under the Federal or State Endangered Species Acts. If listed or proposed species may be affected by the project, it would be necessary to consult with the Fish and Wildlife Service (FWS) or California Department of Fish and Game (CDFG) before any impacts occur.

The mitigation approach is based on minimizing construction footprints, scheduling construction activities with consideration to seasonal habitat needs of birds, considering species sensitivities and tolerance to construction activity and noise, allowing birds to choose nesting sites given exposure to construction disturbance, and developing contingency measures for specific circumstances that must be handled on a case by case basis.

Hazing to prevent birds from establishing nests near construction sites generally is not recommended under this mitigation approach, but is an option in some situations during the first year of construction. Hazing is a last resort, as birds that are forced out of their selected nest sites may not find other suitable sites and risk a year of lost productivity. Instead the birds would be confronted with construction disturbance that would be typical of the site during the breeding season (February 1 through August 31), and left to choose whether to remain or look elsewhere. Those that remain despite construction disturbance may have a better chance to produce young than if forced off the site by hazing.

Table B-1 lists representative birds species that may occur at or near construction sites and summarizes habitats used, specific breeding dates, buffer sizes to minimize disturbance, and known occurrences on the study area. Mitigation measures emphasize raptors, as they are early nesters with a long breeding season, are particularly sensitive to disturbance, require relatively large breeding territories, and produce fewer offspring. These characteristics of raptors make them particularly vulnerable to significant impacts. Additional species are included in Table B-1 due to their rarity and Federal or State regulatory status as Species of Concern or Species of Special Concern, respectively. A general category comprising most other species that could occur on the study area also is included, as these species are protected under the Migratory Bird Treaty Act.

Once a nest is established and eggs or nestlings are present, the nest and its contents are protected under the Migratory Bird Treaty Act. Golden Eagles are also protected under the Bald Eagle Protection Act. Bald Eagles are protected under both aforementioned acts, and the Endangered Species Act.

Mitigation measures emphasize the breeding season, as this is generally the most sensitive period of the annual biological cycle. During other times of year, birds generally are more mobile and

less dependent on specific sites to meet their needs. However, species that depend on relatively rare habitat features, such as cavities in dead trees (snags) or stumps for roosting at night or during the winter, could be significantly affected at times outside of the breeding season if these sites are damaged or disturbed, as these features are often in short supply.

Mitigation Measures

The following mitigation measures should be implemented, as applicable, for all project construction:

- If pre-construction surveys are performed for California spotted owls, all other raptor nests and raptor activity observed during the surveys also should be recorded to help estimate the potential for occurrence of other raptors during construction.

- Construction footprints should be kept as small as possible

- Known or potential nesting and roosting sites, such as live trees with cavities and all snags and stumps, should be protected to the extent practicable year-round.

- Existing nests of raptors or any other bird should not be removed from their locations.

The following mitigation measures should be implemented for all project construction. During the first construction year, certain measures that would begin prior to July 15 may not be practicable. In this case, contingency measures are further provided below:

- Construction activities that could adversely affect nesting birds and rearing of young through take of nests, impacts to nesting habitat, or disturbance from noise or human activity, should be limited to the period between September 1 and February 1 to avoid the bird breeding season.

- Any habitat providing nesting cover for birds, such as grassland, mixed chaparral, live oak woodland, blue oak woodland, gray pine/oak woodland, and westside ponderosa pine, that must be removed for construction purposes, should be removed between September 1 and February 1 prior to construction.

- If construction at a site must occur between February 1 and August 31, it should begin by February 1, and typical levels of activity and noise disturbance that would occur at the site should be sustained on a routine basis through the end of August, or until construction is completed.

- Construction sites should be monitored for bird nesting activity during the breeding season.

- If raptors or any other birds appear at or near a construction site and attempt to nest, typical levels of construction noise and activity that will occur at the site during the breeding season should be sustained, such that the birds can accept or reject the site based on their assessment of the disturbance. Unless it is known that the nest site will be physically disturbed, the birds should be allowed to nest if they choose under the assumption that they will be able to tolerate construction noise and activity.

- If disturbance of a nest with eggs or young appears unavoidable, or nesting activity, such as incubation or feeding of young, may be affected, a project contact at FWS and DFG should be consulted before disturbance occurs.

- If potential nesting habitat must be impacted during the breeding season, a project contact at FWS and DFG should be consulted before disturbance occurs.

- If a project site meets buffer zone criteria in Table B-1 for an active nest during the breeding season, disturbance probably can be assumed insignificant, but FWS and DFG still should be contacted for known occurrences of these species on the project area.

The following mitigation measures should be implemented, as applicable, for all project construction during the first construction year, that due to scheduling constraints, cannot follow the preceding measures that require implementation prior to July 15:

- During the first construction year, regulatory compliance and construction contracting for the project is not expected to be completed until about April, 2002. Because it would be necessary to begin construction as early as possible (July 15 is the earliest possible starting date anticipated), it may be necessary to remove vegetated habitats and commence with potentially disruptive construction activities during the bird breeding season within the first construction year. If during the first year of project construction it would be necessary to impact potential nesting habitat or conduct disruptive construction activities between July 15 and September 1, the following measures should be implemented for birds other than ESA- listed species:

  a) Affected project sites should be monitored by a qualified biological monitor for breeding bird activity February 1 through August 1.

  b) If nesting behavior or nest building activity by birds is observed within habitat areas to be removed during the nesting season, or is observed near areas to be affected by construction, such that nesting success would be doubtful, nesting in those habitat areas should be discouraged, as necessary, unless egg laying has already begun. Nesting can be discouraged by hazing or removing partially constructed nests.

  c) Likelihood of nesting success and the necessity to discourage nesting in affected areas would depend on the species of bird, time of nest initiation, buffer

zone considerations, type of construction work involved, and time of construction initiation. This would be determined on a case-by-case basis by the biological monitor in coordination with DFG and FWS.

e) After August 1, monitoring of sites for breeding behavior and activity can be discontinued.

Table B-1. Habitats, breeding seasons, and buffer zones for birds that may be associated with the Battle Creek Salmon and Steelhead Restoration Project.

Species	**Habitat** (CDFG 1990, JSA 2001)	**Breeding Dates**	**Buffer Zone**[1]	**Known Occurrences** (JSA 2001)
Turkey Vulture	All open habitats with large trees, snags, or cliffs	Early May through August (CDFG 1990)	0.5 miles direct line of site (SFWOa)	Observed at all project sites
Osprey	Fish-bearing waters and associated conifer forest	Mid-March through August (CDFG 1990)	0.5 miles direct line of site (Richardson and Miller 1997)	Active nest 1.3 miles downstream of South Diversion Dam, south bank; several fly-overs in study area
White-Tailed Kite	Open oak woodland, grassland, and riparian	Early February through October (CDFG 1990)	0.25 miles direct line of site (SFWO)	Occurrence uncertain
Bald Eagle[2]	Blue oak woodland to ponderosa pine within 0.5 miles of large water bodies	Mid-January through July (SFWOb)	0.5 miles direct line of site (SFWOb)	No known nests in study area; single immature sighted at Coleman Diversion Dam; several fly-overs in study area

Sharp-Shinned Hawk	Conifer and riparian forest	Early April through August (CDFG 1990)	0.25 miles direct line of site (Richardson and Miller 1997)	Breeding unknown on study area; several observations on study area April and September during spring and fall migration
Cooper's Hawk	Deciduous, conifer, and mixed woodlands, usually near water	Early March through August (CDFG 1990)	0.25 miles direct line of site (Richardson and Miller 1997)	Breeding unknown on study area; single immature observed July, 2000
Red-Tailed Hawk	Most habitats on project area	Early February through August (CDFG 1990)	0.5 miles direct line of site (Richardson and Miller 1997)	Observed at all project sites
Golden Eagle	Grassland and blue oak woodland	Early February through August (Richardson and Miller 1997)	0.5 miles direct line of site (Richardson and Miller 1997)	Unused nests at headwaters of Soap Creek Feeder and across the creek from South Powerhouse; several fly-over individuals/pairs observed on study
American Kestrel	Most habitats	Early March through August (CDFG 1990)	0.25 miles direct line of site (Richardson and Miller 1997)	Observed at Coleman Diversion Dam and Inskip Diversion Dam/South Powerhouse

Peregrine Falcon	Cliffs and rocky canyons near open areas, especially with water	Early February through August (Richardson and Miller 1997)	0.5 miles direct line of site (Richardson and Miller 1997)	Occurrence uncertain
Barn Owl	Most habitats except dense forest; Out buildings	Early January through November (CDFG)	0.25 miles direct line of site (SFWOa)	Observed foraging in grassland areas
Western Screech Owl	Oak, riparian, and conifer forest edges	Early February through June (CDFG 1990)	0.25 miles direct line of site (SFWOa)	Observed foraging in grassland areas
Great-Horned Owl	Forest and shrub habitats, especially with edges and openings	Mid-January through June (CDFG 1990)	0.25 miles direct line of site (SFWOa)	Occurrence uncertain
Northern Pygmy Owl	Most forest types	Early April through August (CDFG 1990)	0.25 miles direct line of site (SFWOa)	Occurrence uncertain
California Spotted Owl	Dense, mature, multi-layered conifer forest; other conifer forest, conifer-hardwoods, and riparian forest in steep canyons	Early March through June (USDA 2001), but may extend through July	0.25 miles direct line of site (USDA 2001)	Occurrence uncertain
Vaux's Swift	Large hollow trees, snags, and stubs	Early May through mid-August (CDFG 1990)	Site specific determination, as necessary	Blue oak woodland fly-over near project area; pair observed at Lower Ripely Creek Feeder

Little Willow Flycatcher	Wet mountain meadows and riparian forest with standing water, languid streams, or seeps, and dense willows and associated vegetation	Early May through August (CDFG 1990)	Site specific determination, as necessary	Migrants observed at Eagle Canyon Dam and Lower Ripley Creek Feeder. Potential nesting habitat at Lower Ripely Creek Feeder
Yellow-Breasted Chat	Riparian habitats with dense shrubs and woody thickets, especially blackberry	Early May to mid-August (CDFG 1990)	Site specific determination, as necessary	Observed at Darrah Springs Feeder, Coleman Diversion Dam/Inskip Power House, Lower Ripely Creek Feeder, and Inskip Diversion Dam/South Power House
Other Migratory Bird Treaty Act Protected Species (e.g., Herons, Ducks, Vultures, Doves, Hummingbirds, Kingfishers, Woodpeckers, and Passerine Species)	Annual grassland, mixed chaparral, live oak woodland, blue oak woodland, gray pine/oak woodland, westside ponderosa pine	Early February through August, depending on species (CDFG 1990)	Site specific determination, as necessary	See JSA 2001 Appendix D for known occurrences

[1] Buffer distances may be less if landscape features obstruct line of sight to nests
[2] Project work that may affect this species will require consultation under the Federal Endangered Species Act of 1973, as amended.

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ATTACHMENT C

Mitigation Recommendations for Bats Potentially Affected by the Battle Creek Salmon and Steelhead Restoration Project

The subject mitigation recommendations provide preliminary information to assist in project planning. Additional detailed information from bat specialists and input from the California Department of Fish and Game will be needed to further develop a mitigation approach. These preliminary recommendations are consistent with the Fish and Wildlife Service's Mitigation Policy (Federal Register 46:15; January 23, 1981), which defines mitigation to include avoiding impacts, minimizing impacts, rectifying impacts. reducing impacts over time, and compensating for impacts. The Fish and Wildlife Service considers these elements to represent the most desirable sequence of steps in the mitigation planning process. The Mitigation Policy is not applied to project impacts on federally listed endangered or threatened species, which are considered separately, as provided for in the Endangered Species Act of 1973, as amended (ESA).

Many bat species potentially occurring on the project area are rare and have Federal or State regulatory status as Species of Concern or Species of Special Concern, respectively. Populations of many bat species have declined drastically in the U.S. and worldwide due to human actions (Harvey et al. 1999). This has resulted from mine closures, foraging habitat loss, vandalism, disturbance of hibernation and maternity colonies, and use of pesticides, among others. Bats aroused during hibernation use up critical stores of winter fat, which could lead to starvation. A single arousal could result in energy expenditure equal to 2-3 weeks of undisturbed hibernation (Harvey et al. 1999). Maternity colonies will not tolerate disturbance, and young flightless bats could be dropped to the ground and lost, or abandoned by the adults.

Bats on the project area could be adversely affected by direct habitat loss due to closure of tunnels, or disturbance from construction noise and human activity near tunnels used by bats. Bats also are susceptible to loss of other habitat features, such as cliffs, rocky outcrops, buildings, natural caves, and roosting trees, and human disturbance near these features. Bats can be impacted by adverse effects to foraging habitat, including loss of habitat and human disturbance during foraging hours.

Mitigation recommendations are based on ascertaining presence of bats and bat habitat on the project area, scheduling construction relative to seasonal habitat needs and sensitivity of bats to disturbance, considering species tolerance to construction activity and noise, and compensating lost habitat value with consideration to specific habitat needs of bats. Table C-1 lists Fish and Wildlife Service bat Species of Concern that may occur at or near construction sites, and summarizes temporal patterns, habitat requirements, and welfare factors and concerns.

The goal is to avoid impacts to bats to the extent practicable, minimize impacts that are unavoidable, and compensate lost bat habitat value, such that the project has no net adverse effect on bats. In addition due to the precarious population status of many bat species in California, the project should make all reasonable efforts to enhance habitat conditions for bats on the project area if such alternatives can be implemented at a financial cost comparable to other alternatives.

For example, if decommissioned tunnels can be preserved and fitted with bat gates at a cost less or comparable to sealing off the tunnels entirely, tunnel preservation should be selected.

Mitigation Measures

- Construction footprints should be kept as small as possible.

- All tunnels targeted for closure due to the project should be surveyed for present use, past use, and potential use by bats.

- Other tunnels near construction sites, as well as other potential bat habitat, should be surveyed for bats if bats could be adversely affected by construction noise or other disturbance. Susceptibility to disturbance would depend on factors such as type of disturbance, distance to construction site, bat species present, and purpose of use by bats (e.g., roosting, breeding, migration, hibernation).

- If bats are present in tunnels affected by the project, or in other tunnels or bat habitats within range of disturbance by construction activities, construction scheduling, buffer zones, and other mitigative measures to avoid disturbance should be developed in consultation with bat specialists and the Service before disturbance occurs.

- If disturbance of a site used by bats is unavoidable, appropriate mitigation measures should be developed in consultation with bat specialists and the Service before disturbance occurs.

- Mitigation measures for construction disturbance should be based on seasonal habitat needs and sensitivity of bats to disturbance. The preliminary mitigation approach recommended for breeding birds probably is not suitable for bats, as bat habitats are very specialized and alternative sites for bat use may rare on and near the study area (i.e., affected bats may not have alternative habitat available).

- Decommissioned tunnels should not be completely and permanently sealed if they are used by bats or have potential for use by bats. Instead, decommissioned tunnels should be modified, as appropriate, to preserve, enhance, or provide new bat habitat. This could include de-watering tunnels and installing bat gates.

- If permanent, complete closure of tunnels used by bats or tunnels providing potential bat habitat, appears necessary, Reclamation should consult with the Service to investigate alternatives and assess the potential for habitat compensation. If impacts to habitat are unavoidable, compensatory habitat of greater or equal value should be established as near the project site as possible.

- If other existing tunnels on the project area are proposed as compensatory bat habitat, tunnels should be surveyed for bat use to determine whether they are suitable for that

purpose. Suitability would depend of factors such as existing habitat suitability for bats, existing bat occupancy, species of preexisting bats, potential to provide compensatory habitat values for those lost (e.g., roosting, breeding, migration, or hibernation habitat), and potential for enhancing habitat value of compensatory tunnels to achieve a net gain equal to habitat value lost at impacted tunnels (habitat value enhancement can be measured by the numbers of additional bats that can occupy the enhanced tunnels, which should be at least equal to the numbers of bats that lost habitat).

- Construction sites should be monitored for bat activity throughout the year and through project completion to identify potential conflicts with bats that were previously unknown.

- Potential bat habitat, such as caves, large trees (dead or living), tree stumps, cliffs, rocky outcrops, etc., should be protected to the extent practicable year-round.

Table C-1. Life history and welfare factors and concerns for bat Species of Concern that may be associated with the Battle Creek Salmon and Steelhead Restoration Project.

Species	Temporal Patterns	Habitat Requirements	Welfare Factors & Concerns
Pale Townsend's big-eared bat [*Corynorhinus (=Plecotus) townsendii* pallescens]	Hibernation colonies begin forming late October; numbers peak by January (USDA 2001). Hibernation in clusters of a few to more than 100 bats (Harvey et al. 1999). Breeding starts within first 3 weeks of October (USDA 2001). Females congregate at maternity sites in March and June; males solitary at this time. Maternity colonies of one or more clusters up to 100 bats. Usually single pup born between May and July, fly within 3 weeks, and leave nursery roost after two months. Long distance migrations unknown (Harvey et al. 1999).	Primarily cave and mine use, but also buildings (USDA 2001). Require specific structural and microclimate conditions; not all caves or mines have these conditions. High roost site fidelity. Hibernate where temperature is 54 degrees F or less, but generally above freezing, and often near cave or mine entrances in well ventilated areas (Harvey et al. 1999). Females prefer cooler locations for hibernation; maternity colonies generally in darker, warmer locations (USDA 2001). Are aerial foragers concentrating on forest edges (Harvey et. al. 1999). Prefers native habitat and feeds primarily on moths. Requires access to free water (USDA 2001).	Substantial population declines have occurred over last 40-60 years (USDA 2001). Majority of roost loss due to human activity. Apparently limited by roost site availability and are very sensitive to human disturbances. If disturbance lasts more than a few seconds, entire colony takes flight. May abandon roost once disturbed. Respond readily to roost site protections such as gates. Conversion of native habitat and loss of riparian habitat pose a threat to foraging.

spotted bat (*Euderma maculatum*)	Capable of torpor, and hibernate in some areas (USDA 2001). Appear solitary but may hibernate in small groups. May make altitudinal migration from forest to lowlands in autumn. Emerge about an hour after dark and return to day roost about an hour before sunrise (Harvey et al. 1999). In the spring they spend 3-5 minutes foraging per clearing, but more time is spent around the same area in the summer. One young born per year in June (USDA 2001).	Strongly associated with rock features, such as cliffs and crevices (USDA 2001). Appear to have sexual segregation (females at higher elevations). Are generally solitary roosters high in cliff crevices, and occasionally found in caves and buildings. Foraging along mosaic edges of forest, riparian habitats associated with small to mid-size streams in narrow canyons, wetlands, and meadows. Feed in flight over water, along washes, and near ground.	One of rarest mammals in North America (USDA 2001). More restrictive roosting and foraging requirements than other bats. Roosts may be limited by lack of foraging habitat. Roost sites can be affected by human activities disturbing cliffs, rocky outcrops, caves, and buildings. An extremely fragile species can be injured during capture and handling (Oliver 2000).

fringed myotis bat (*Myotis thysanodes*)	Hibernation occurs from October to March (USDA 2001). Short local migrations may occur to suitable hibernacula, but extensive migrations are unlikely. A maternity group (typically 200 bats) may remain together through hibernation. Mating takes place in autumn and one young is born between late May and early July. After birth, young are placed in a separate cluster from adults; adults fly back and forth between roost and feeding young (Harvey 1999). Young can fly in 20 days (USDA 2001).	Habitat includes valley foothill hardwood, hardwood-conifer, and riparian areas (USDA 2001). Forage in flight over water, open habitats, and early succession vegetation. May glean from vegetation. Roost in tree cavities, caves, buildings, bridges, mines, and rock crevices on cliff faces. Separate day and night roosts may be used. Maternity colonies may be relatively cool and wet sites, and the sites may change in response to temperature in the roost. Adult males roost separate from maternity colonies (USDA 2001). Requires drinking water.	Highly sensitive to disturbance at roosting sites. Adversely affected by cave and mine exploration, and reduction of tree roosts (large snags) (USDA 2001). Heavy grazing may affect prey base and habitat.

long-eared myotis bat (*Myotis evotis)*	Thought to migrate to different elevations to hibernate (USDA 2001). Little is known of winter activity (CDFG 1990). Females form maternity colonies in summer, whereas, males and non-breeding females live singly or in small groups, occasionally occupying the same site as a maternity colony, but roosting apart from it (Harvey et al. 1999). One young is born in late June or early July. Species emerges at dusk to forage.	Roosting generalists, singly or in groups of less than 30 (USDA 2001). Found in buildings, cliff crevices, snag and live tree cavities, behind bark, caves, mines, rocky outcrops, and bridges. Caves usually used as night roosts (CDFG 1990). Foraging habitat includes forest edges, streams, riparian areas, open tree stands, and open areas without trees. Primarily a gleaner, also forage in flight, between and within treetops. Requires drinking water.	Show high roost site fidelity. Heavy grazing may impact prey through reduction in grasses and herbaceous vegetation. Adversely affected by cave and mine exploration, and reduction of tree roosts (large snags) (USDA 2001).

long-legged myotis bat (*Myotis volans*)	Relatively tolerant of cold temperatures, which may extend the pre-hibernation period (Harvey et al. 1999). Believed to make short, local migrations for hibernation (USDA 2001). There are usually more males than females at hibernation sites (Harvey et al. 1999). Maternity colonies are moderately gregarious, as are late summer swarming and hibernation groups. In Canada, they swarm in August and begin hibernation by late September (Nagorsen and Brigham 1993). Females give birth between May and August. Emerge early evening to forage and active throughout the night with peak activity in first 3-4 hours after sunset.	Roosting habitat generalist with preference for snags and large trees (USDA 2001). Also uses buildings, rock crevices, and under tree bark (USDA 2001). Caves and mines may be used as hibernacula (Harvey et al. 1999) and night roosts (USDA 2001). Maternal colonies usually occur in hollow trees, under bark, rock crevices, buildings (USDA 2001), and stream banks (Harvey et al. 1999). Foraging habitat includes edges, streams and riparian areas, and open stands. Prey caught in flight, generally 10 to 15 feet over water, close to trees and cliffs, and in openings in woodlands & forests (USDA 2001).	Adversely affected by reduction in roosting trees, urbanization, timber harvest, and insecticide use (USDA 2001).

small-footed myotis (*Myotis ciliolabrum*)	Movements to hibernacula probably local (CDFG 1990). Hibernate in groups of up to 50 or more bats, from November to March (USDA 2001). Maternity colonies of 12-20 individuals. Typically one, but sometimes two, young born between May and June (Harvey et al. 1999). Most young fly by mid-August (CDFG 1990). Males tend to roost singly (USDA 2001). Begin foraging at dusk shortly after sunset with peaks of activity between 10pm and 12pm and 1am and 2 am (CDFG 1990).	Seemingly prefer arid habitats (Harvey et al. 1999). Habitat occurs in deserts, chaparral, riparian zones, coniferous forest and other arid uplands, near water, up to 8,900 feet elevation. Use small, protected crevices that are hot and dry (Nagorsen and Brigham 1993), but may prefer humid roosts (CDFG 1990). Roosts in caves, buildings, mines, rock/cliff crevices, clay banks, spaces between rocky talus slopes and boulders, and occasionally under bridges and under bark (Harvey et al. 1999). Often hibernate in cold drafty places (USDA 2001). Maternity colonies can be found in caves, mines, and buildings. Riparian areas and open tree stands used for foraging. Forage over water, close to rocks and cliffs, and among trees. Requires water often; streams, ponds, springs, and stock tanks utilized for drinking (USDA 2001). May be found feeding or roosting with other bat species (CDFG 1990).	Adversely affected by mining, rock climbing, cave and mine exploration, reservoir construction, urbanization and other habitat loss or alteration activities (USDA 2001). Prey base may be affected by insecticide use.

Yuma myotis bat (*Myotis yumanensis*)	Winter habits poorly understood, but probably make local or short migrations to hibernation sites (CDFG 1990). In late May and early June nursery colonies form (Harvey et al. 1999). Males scatter and lead solitary lifestyle, foraging at higher elevations (Grinnel 1918). One young born in late May or early June (Harvey et al. 1999). Nursery roost abandoned in autumn, for migration (dispersal) (unknown location and distance). Emerge to forage when nearly dark. After feeding, it retreats to a temporary night roost near feeding area (Nagorsen and Brigham 1993).	Habitat generally in areas with open water, riparian areas, woodlands and open areas (Nagorsen and Brigham 1993). Roost in buildings, mines, caves, crevices, and under bridges (CDFG 1999). Nursery roosts may occur in buildings, caves, mines, and under bridges (Harvey et al. 1999), and warm, dark sites are preferred (CDFG 1990). Nursery colony cluster behavior known to relate to temperature changes, and bats pack close together when in cooler temperature (Nagorsen and Brigham 1993). Forage primarily over water (Nagorsen and Brigham 1993).	Nursery roost are quickly abandoned if disturbed (Harvey, et. al 1999).

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ATTACHMENT D

SPECIFIC MITIGATION MEASURES

North Battle Creek Feeder

- The proposed road to access the new fish screen and ladder should be as narrow and short as possible, so that only a minimal amount of the high value quality oak and riparian habitat would be lost or impacted.

- Construct drainage control for the road that would collect runoff and excessive levels of eroded sediment before it could enter the creek. This may require sediment basins that would occasionally need to be cleaned out.

- Construct staging and facility maintenance areas at the bottom of the road should be as small as possible to minimize impacts to the high value oak, riparian, and wetland habitat.

- Construct a retaining wall at bottom of road along the edge of the creek to minimize width of riprap area on streambank.

Eagle Canyon Diversion Dam

- Avoid impacts to natural seeps and springs, as these are high value habitats that may be difficult to restore or replace.

Wildcat Canal

- If the canal is to be filled during decommissioning, loss of existing wetland values should be minimized by preserving or creating wetland areas along the canal that have seeps or other sources of water (e.g., water table or natural runoff topography) to maintain them.

- Construct steel-grate walkways on footings to cross areas of spring flow on footpath into canyon.

South Canal

- Provide bat access to decommissioned tunnels using bat gates on tunnel entrances per Fianal EIS/EIR descriptions.

Inskip Diversion Dam/South Power House

- Avoid using the oak woodland site across the road from the powerhouse as a borrow area, as it is well established oak woodland habitat. Some excavation might be possible if it can be contained within the grassy area in the southwest portion of the site. However, the grassy area may be useful as staging area, if root zones of trees are fenced off and avoided.

- The permanent parking lot/construction staging area proposed near the new fish screen should be kept to minimal size to minimize impacts to high value oak woodland habitat. Large oak trees surrounding the parking/staging area identified in the project EIS/EIR

should be trimmed, as necessary, and preserved to extent feasible instead of removing the trees.

- The pipeline proposed at the outlet of the new bypass tunnel that would lead to South Fork Battle Creek could form an obstacle to movements of wildlife in the riparian corridor. If the pipe is constructed above ground, an underpass, such as elevating the pipeline on footings, should be provided for wildlife passage.

Coleman Diversion Dam/Inskip Powerhouse

- The penstock bypass proposed for the Inskip Powerhouse could form an obstacle to movements of wildlife on the open chute portion of the bypass. Provide overpasses for wildlife use, and consider establishing bridges of natural materials (e.g., large wooden beams or tree limbs) past the existing penstock to further provide for wildlife movements.

Mt. Lassen Trout Farms
Jeffcoat East/West

- Because a large number of elderberry shrubs have been identified on this site within 100 feet of the proposed pipeline corridor, but no estimates are yet available for which shrubs can be avoided by construction, make all efforts to avoid elderberry shrubs by at least 100 feet. Refer to the Service's Biological Opinion (Attachment H) for Terms and Conditions and Conservation Measures for the project.

- Avoid disturbance of the large oak trees (out to tree drip line) within and adjacent to the pipeline corridor, as practicable.

- Keep the pipeline corridor footprint as narrow as practicable.

- Conduct pre-construction surveys for black rails at Jeffcoat East/West and Willow Springs wetland sites identified in the Restoration Project's ASIP Addendum.

- Develop and implement a monitoring plan for yellow-breasted chats to ascertain project effects on this species. The yellow-breasted chat is a State species of special concern and is prevalent on the Jeffcoat East/West site. Little is known about yellow-breasted chat responses to construction disturbance and monitoring project effects on the species will help determine what effect the project has had on yellow-breasted chats. This monitoring should be conducted before and after project construction to compare a baseline with subsequent effects. Monitoring for yellow-breasted chats would be congruent with directives for Federal agencies regarding migratory birds (Attachment E), as follows:

  "Identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors, and develop and use principles, standards, and practices that will lessen the amount of unintentional take in

cooperation with the Service" (Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, Federal Register 66(11):3853-3856).

All Restoration Project Sites

- Consider use of areas previously occupied by decommissioned hydropower facilities for potential compensation sites for other project impacts.

ATTACHMENT E

CONSERVATION MEASURES FOR MIGRATORY BIRDS
SUPPORTED BY EXISTING DIRECTIVES

As Applicable to the Battle Creek Salmon and Steelhead Restoration Project

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds

Federal Register 66(11):3853-3856

Section 3(e):
(1) support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;

(2) restore and enhance the habitat of migratory birds, as practicable;

(3) prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable;

(4) design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts;

(5) within established authorities and in conjunction with the adoption, amendment, or revision of agency management plans and guidance, ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources, including the Food and Agricultural Organization's International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries;

(6) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;

(9) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that will lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the

Service. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations. The agency also shall inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts;

Section 3(f)
Notwithstanding the requirement to finalize an MOU within 2 years, each agency is encouraged to immediately begin implementing the conservation measures set forth above in subparagraphs (1) through (15) of this section, as appropriate and practicable.

U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Executive Order for the Conservation of Migratory Birds, Questions and Answers (selected) (http://migratorybirds.fws.gov/EO/QandA.html)

Does the MBTA apply to Federal agencies, and if so how do those prohibitions relate to this Executive Order?
Federal courts have recently affirmed that Federal agencies are subject to prohibitions in the MBTA, including restrictions on "take" of migratory birds. Nothing in the Executive Order would constitute legal authorization to take migratory birds. In other words, the requirements of the Executive Order are in addition to, not in lieu of, the prohibitions of the MBTA. Federal agencies are required to possess permits before taking migratory birds. Who will be affected by the Executive Order? The Executive Order will influence Federal agencies by requiring them to incorporate migratory bird conservation measures into their agency activities. Impacts on the States and private landowners are not expected to be significant.

You've stated that Federal agencies must obtain permits from the Service for activities covered by existing MBTA permits. How should Federal agencies proceed when an activity for which there is no existing permit may result in take of migratory birds?
Existing migratory bird permit regulations authorize take for specific types of activities, such as collecting birds for scientific or educational purposes, or lethal control of birds damaging agricultural crops or other personal property. They do not authorize take resulting from activities such as forestry or agricultural operations, construction or operation of powerlines, and other activities where an otherwise legal action might reasonably be expected to take migratory birds, but is not the intended purpose of the action.

Under the provisions of the MBTA, the unauthorized take of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. As such, even when engaged in an otherwise legal activity where the intent is not to kill or injure migratory birds, violations can occur if bird death or injury results.

The Service has enforced the MBTA with discretion, focusing on individuals or organizations that take birds with disregard for the law, particularly where no valid conservation measures have been employed. In doing so, the Service has been able to focus its limited resources on working

cooperatively with various industries, agencies and individuals to reduce impacts on migratory birds. When necessary, the Service has taken enforcement actions to stop activities that threaten migratory bird populations.

Agency compliance with the Executive Order and the MOUs developed in consultation with the Service, while not eliminating the possibility of violations of the MBTA, should ensure that migratory bird populations are safeguarded. By avoiding or minimizing the impact of activities on migratory bird populations and otherwise implementing the terms of the MOUs, agencies can reduce or eliminate the biological significance of any potential violation, as well as the possibility of enforcement action.

FWS Director's Order No. 72: Responsibilities of Federal Agencies to Protect Migratory Birds in Accordance with Executive Order 13186

Section 6

c. Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds within the scope of our statutory authorities.

d. Within established authorities and in conjunction with the adoption, amendment, and revision of Service management plans and guidance, ensure that our plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts. Examples include: Partners in Flight Bird Conservation Plans, the U.S. Shorebird Conservation Plan, the North American Waterfowl Management Plan, and the North American Waterbird Conservation Plan. These bird plans and other bird conservation planning efforts will be integrated through the North American Bird Conservation Initiative.

e. Ensure that environmental analyses of Federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

j. Provide technical assistance on migratory bird species and their habitats to other Federal agencies.

k. In conjunction with other Federal agencies, work to develop reasonable and effective conservation measures for key management actions that affect migratory birds and their natural habitats, with emphasis on species of concern.

Exhibit 2: Service Guidance to Conserve Migratory Birds- Federal Program Activities

1. Participate in early project planning to advance bird conservation, with emphasis on species of concern. Specifically: (a) identify bird-related goals, conservation measures, and comprehensive plans applicable to the project area; (b) advise on project impacts to migratory birds; (c) identify means and measures to avoid and/or minimize potential for take of migratory birds, eggs and active nests, including, but not limited to: (1) project modification or denial, (2) time of year restrictions on vegetation clearing, (3) avoidance of cavity trees, colonial bird nests, and other active nests, and (4) avoidance of nests of species of concern.

2. Ensure that environmental analyses of Federal actions required by the National Environmental Policy Act or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, particularly species of concern. This pertains to Service actions in addition to the review of other Federal agency actions. Utilize best available demographic, population, or habitat association data in the assessment of impacts on migratory birds.

4. Coordinate Federal project assessments with the Regional/CNO Migratory Bird Program when proposed activities may have a negative effect on migratory birds, particularly species of concern.

8. When completing project reviews, recommend to project applicants that they incorporate sufficient funding in project budgets for investigations and assessment of issues pertinent to migratory birds, particularly species of concern.

A Blueprint for the Future of Migratory Birds

U.S. Fish and Wildlife Service. 2004. A Blueprint for the Future of Migratory Birds: Migratory bird program strategic plan 2004-2014. Migratory Birds and State Programs, Arlington, VA.

Implementation Strategies: Habitat Conservation
B-3: Protect, restore and manage priority terrestrial, aquatic , and marine habitats for birds through the North American Wetlands Conservation Act, Neotropical Migratory Bird Conservation Act, Migratory Bird Hunting and Conservation Stamp Act, and other appropriate funding opportunities.

B-7: Provide technical assistance to Service field stations and private and public partners on the most effective protection, restoration and management practices for migratory bird habitats.

B-8: Coordinate with public and private partners that manage resources, such as agricultural land, timber, grasslands, fisheries, and energy, by communicating migratory bird requirements to minimize the adverse impacts and maximize the benefits of these programs to migratory birds.

Implementation Strategies: Consultation, Cooperation, and Communication
D-7: Provide technical assistance to partner agencies and organizations through federal project reviews and other means to integrate migratory bird conservation objectives into their project planning and implementation.

California Partners in Flight Conservation Plan---Riparian Joint Venture

RHJV (Riparian Habitat Joint Venture). 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/pdfs/riparian.v-2.pdf.

Habitat Protection Recommendations
-Protect and restore riparian areas with intact adjacent upland habitats.

Riparian-associated birds make use of grass, shrub and woodland habitats adjacent to riparian zones throughout their lives. Upland zones provide migratory stopover grounds, foraging habitat, and dispersal corridors for non-breeding adults and juveniles. These areas act as both flood refugia and supplemental foraging areas.

-Prioritize sites with an intact natural hydrology or the potential to restore the natural processes of the system.

Of the 11 focal riparian bird species that have suffered population declines, seven prefer to nest in early successional riparian habitat, particularly willow/alder shrub habitats with dense understory cover. To flourish, early successional habitats depend upon natural hydrology, including flooding, soil deposition, and point bar formation, for establishment (Sacramento River Advisory Council 1998). Seed dispersal and natural tree regeneration and growth also are sometimes compromised due to the absence of high peak flows or seasonal fluctuations in water levels (Smith et al. 1991, Stromberg and Patten 1992). Restoring or mimicking natural hydrology contributes to recreating the structural diversity found in natural riparian systems, increasing the habitat quality for native wildlife. Sites with intact natural hydrology or the potential to return to one should receive special consideration.

-Prioritize sites according to surrounding land use.

Management of riparian areas at a watershed-level is the best method for conserving bird populations. Landscape scale land use patterns may significantly affect the sustainability of riparian bird populations over the long term (Petit et al. 1995).

The following land uses within a riparian buffer zone are listed in general order of preference. This list provides only rules of thumb and must be considered in context with many other factors when assessing each unique conservation opportunity. The land uses generally beneficial with sustainable management are: o Natural habitat not used for commodity production (e.g., wilderness). o Unimproved parks/open space (provided substantial non-native species problems do not exist). o Commercially managed habitat (e.g., grazed oak woodlands or timber production forest).

-Ensure that the patch size, configuration, and connectivity of restored riparian habitats adequately support the desired populations of riparian dependent species.

The size and connectivity of riparian habitat patches may be limiting to bird species' occupancy and population size. A habitat patch is a contiguous area of similar vegetation, usually defined by the dominant vegetation (e.g., a cottonwood willow patch within the valley foothill riparian type). Patch sizes must not fall below the minimum necessary to support populations based on: o Territory size requirements. o Community dynamics. o Sensitivity of some species to fragmentation and edge effects (increased predation/parasitism rates).

Management Recommendations

-Manage riparian and adjacent habitats to maintain a diverse and vigorous understory and herbaceous layer, particularly during the breeding season.

Early successional habitats with a dense, shrubby understory and herbaceous groundcover are critical for successful nesting of nine of the 17 focal riparian species. Not surprisingly, shrub cover around the nest is an important variable in nest-site selection for many species (Table 8-3).

-Limit restoration activities and disturbance events such as grazing, disking, herbicide application, and high-water events to the nonbreeding season. When such actions are absolutely necessary during the breeding season, time disturbance to minimize its impacts on nesting birds.

The nesting season is a critical period for the maintenance of bird populations (Martin 1993). Some management activities, such as ground preparation for planting or water impoundment, can have serious consequences for breeding songbirds by destroying nests and nesting habitat or causing nest abandonment. Managers often have a degree of flexibility, allowing them to schedule these activities outside the breeding season while still achieving their management objectives. In general, the breeding season in California may begin as early as March and continue through August, depending on region, habitat type and elevation (Table 8-4).

-Increase protection and management actions to benefit severely declining or locally extirpated bird species in California.

California Partners in Flight Conservation Plan-Oak Woodland

CalPIF (California Partners in Flight). 2002. Version 2.0. The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California (S. Zack, lead author). Point Reyes Bird Observatory, Stinson Beach, CA. http://www.prbo.org/calpif/plans.html.

-Prioritize sites with intact oak regeneration and decay processes.

One of the greatest threats to oak woodland habitat in California is the lack of oak regeneration, specifically in blue, interior live, Oregon white, and valley oak communities. Habitats that presently harbor healthy bird populations will fail to support future generations of oak woodland-associated bird species if regenerative processes are not intact.

Regeneration may be considered to be adequate if the number of seedling and sapling oaks is sufficient to offset mortality (Standiford and Tinnin 1996). Oak recruitment may be episodic, and therefore sites that currently lack young oaks may still be viable in the future. Other important parts of an ecologically functioning oak woodland system are acorn production and oak tree decay. Four oak woodland-associated species, Acorn Woodpecker, Yellow-billed Magpie, White-breasted Nuthatch and Western Scrub-Jay, depend on acorn production as a food source

and in turn, are instrumental in the dispersal process needed for oak regeneration. Ten of the oak woodland-associated focal species depend on decaying trees and limbs for nest cavities and also, in the case of Acorn Woodpecker, Oak Titmouse and White-breasted Nuthatch, for storing food.

-Prioritize sites to include diverse age structure of oak trees, especially large old oak trees.

Protecting sites with a diverse age structure of oak trees will provide a continuum of seeding phenologies, preventing synchronous or wide-scale acorn crop failures. Maintaining large old oaks within a diverse age structure will provide decaying limbs necessary for bird nesting sites in addition to high output acorn production. McDonald (1990) demonstrated that Black Oaks much reach 30 years before producing viable acorns and seldom produce large quantities of acorns until they reach 80-100 years. Good acorn producing trees can continue abundant production up to 200 years. Territorial requirements for the Acorn Woodpecker, a species instrumental in acorn dispersal, include large central trees for nesting, granary and roosting, surrounded by a periphery of smaller or medium sized trees.

-Prioritize sites to represent a diversity of oak woodland types.

The full range of variation in oak woodland habitat types (and associated animal species) can be protected by: 1) protecting a diverse portfolio of sites located in different parts of the geographic and elevation range of oak woodlands, and 2) protecting individual sites that contain a variety of oak woodland types. Protecting the variety of oak woodland types may help protect the various birds that are associated with different types of oak woodland habitats. Some bird species also appear to occur in higher numbers when the diversity of oak woodland types present in the surrounding landscape is higher (Stralberg and Williams, 2002).

-Prioritize sites according to surrounding land use.

Certain uses of land adjacent to oak woodland habitat may negatively impact the quality of that habitat for native birds. For example, oak woodlands that are adjacent to pastures or residential developments may be more accessible to European Starlings, which compete for nest cavities with other secondary cavity nesters (Verner et al. 1997, Merenlender et al. 1998). Urban or suburban development may also have a negative effect on the presence or abundance of some bird species, including Lark Sparrow and Rufous-crowned Sparrow, in adjacent oak woodlands (Stralberg and Williams, 2002).

-Prioritize oak woodland sites adjacent to intact chaparral, grassland, pine or and riparian habitats.

Riparian areas are especially important to many species of birds and other wildlife that are also found in adjacent oak woodlands (RHJV 2000). An analysis using the California Wildlife Habitat relationships System (CWHR) predicted that 150 species of birds use riparian habitat within or adjacent to oak woodlands for breeding, feeding and/or cover (see Chapter 4 in Standiford and Tinnin 1996). Many birds that are more typical of chaparral or grassland habitats can also be

found in adjacent oak woodlands. Thus, the bird community found within oak woodland patches is strongly influenced by the type of habitat that surrounds them (Sisk et al. 1997).

-Prioritize sites according to landscape variables (patch size, shape, connectivity) that adequately support the desired populations of oak woodland-dependent species.

Large, unfragmented, and connected areas of oak woodland should have high priority for protection, for a number of reasons. Bird species composition can be altered by habitat fragmentation. For example, the proportion of neotropical migrant species in the bird community was found to be higher in undeveloped oak woodland than in ranchette developments (Merenlender et al. 1998). The same study found a number of bird species to be more abundant in subdivided oak woodlands. These include Western Scrub-Jay, a common predator on the nests of other birds, and European Starling, an exotic competitor of cavity nesting birds (Purcell and Verner 1999). Stralberg and Williams (2002) found several bird species, mostly neotropical and short distance migrants, to increase in abundance with the proportion of oak woodland habitat remaining in the surrounding landscape.

-Prioritize sites according to management options.

Sites in which management can be used to restore natural ecosystem processes should be given a high priority for protection. For example, sites in which a natural fire regime can be re-established might be assigned a higher priority than sites in which there is a need for strong fire suppression. Sites in which the impacts of grazing can be strictly managed may also be priorities for protection.

-Prioritize sites based on conservation threats and opportunities for protection.

The above guidelines are useful for identifying the highest quality oak woodland sites in the state, however, not all of these sites will be equally threatened by imminent habitat loss and degradation. Therefore, an analysis of impending threats and conservation funding potential should be included in the prioritization process. Habitat quality, vulnerability, and conservation potential all must be considered in designing the best conservation strategies.

Management Recommendations

-Limit restoration activities and disturbance events such as grazing, prescribed fire, firewood harvesting, disking, and herbicide to the non-breeding season (which varies by region, but is typically August through February in California).

Such disturbances during the breeding may have direct impacts on the nesting success of oak woodland species, especially ground or shrub nesters. These activities may be much less detrimental to birds if conducted during the non-breeding season. Grazing probably contributes to the long-term lack of oak recruitment in many areas, which will in time have serious consequences for bird populations. Thus, grazing should be managed so as to promote oak recruitment. There is some evidence suggesting that winter grazing is less damaging to blue oak seedlings than spring or summer grazing (Hall et al. 1992).

-Manage for a grass and shrub understory where bioregionally appropriate.

-Retain decaying or dead oak trees, limbs, snags and mistletoe.

Some cavity-nesting birds, such as the Plain Titmouse and White-breasted Nuthatch, nest primarily in natural cavities (Wilson et al. 1991). Therefore, the injured and decaying trees in which these cavities often form are an important habitat element for these species. Allowing dead limbs to remain on living trees may provide entry points for decay-enhancing organisms, which in turn allow birds to excavate cavities in the rotting wood. An analysis using the California Wildlife Habitat relationships System (CWHR) estimated that over 50 species of birds use snags for breeding, feeding and/or cover (Guisti et al. 1996). Mistletoe is known to be an important winter food for Western Bluebirds (see Species Account for details).

-Retain large oak trees whenever possible.

Acorn Woodpeckers will benefit from the presence of large diameter trees (> 50 cm DBH), which they prefer to use for nesting and as granary trees (Gutierrez and Koenig 1978, Wilson et al. 1991). One study in the Bay/Delta bioregion found that granaries were almost exclusively found in deciduous oaks greater than 75 cm in diameter (Wilson et al. 1991), while softwoods such as pines are preferred in other areas (see species account for more details). Sustaining Acorn Woodpecker populations is likely to be beneficial to secondary cavity nesting species, such as Western Bluebirds, which often use old excavated nests. Large trees often contain many natural cavities for nesting birds, and are disproportionately chosen for site sites by Red-tailed Hawks (Tietje et al. 1997a) . See recommendation 1.3. Large oak trees also produce more acorns than smaller trees, providing both a source of oak recruitment and food for wildlife. Therefore, in the absence of any data on actual acorn production, the largest trees should be retained. Also, certain individual trees may produce more acorns, have more large branches and produce larger snags and logs for wildlife use than other trees. Therefore, these especially valuable individual trees can be identified and retained to benefit birds and other wildlife.

-Support focused and creative action by the California Wildlife Conservation Board (WCB) in implementing the recently (2001) passed Assembly Bill No. 242, the Oak Woodland Conservation Act (the Act).

This bill authorizes the establishment of the Oak Woodland Conservation Fund for the protection and conservation of oak woodlands throughout the state of California, to be administered by the WCB. The Oak Woodland Conservation Fund may be used to offer financial incentives to private landowners to protect and promote biologically functional oak woodlands over time. Conservation easements, land improvement, and public education and outreach are some of the activities that may be funded as a result of this bill. The WCB program has exciting potential for working creatively and constructively with landowners to promote good land stewardship. A program to encourage and facilitate efforts to improve oak regeneration on private lands should be emphasized statewide.

California Partners in Flight Conservation Plan-Coastal Scrub and Chaparral

CalPIF (California Partners in Flight). 2004. Version 2.0. The Coastal Scrub and Chaparral Bird Conservation Plan: a Strategy for Protecting and Managing Coastal Scrub and Chaparral Habitats and Associated Birds in California (J. Lovio, lead author). PRBO Conservation Science, Stinson Beach, CA. http://www.prbo.org/calpif/plans.html.

Habitat Protection Recommendations

-Prioritize restoration/acquisition sites according to their proximity to existing high quality sites.

Restoration sites near existing high-quality sites and population sources may have a higher probability of being recolonized by locally extirpated bird species and by rare understory herb species. Also, for many species, fragment size may be a better predictor of recolonization than degree of isolation (Crooks et al. 2001).

-Prioritize restoration/acquisition based on surrounding land use.

Landscape-scale land use patterns may significantly affect the sustainability of coastal scrub bird populations (Stralberg and Bao 1999). Surrounding land use influences populations of predators such as domestic cats, jays, skunks, raccoons, ravens, and crows.

Management Recommendations

-Limit restoration activities and disturbance events such as prescribed burns, grazing, disking, herbicide application to the nonbreeding season.

The nesting season is a critical period for the maintenance of bird populations (Martin 1993). Some management activities, such as ground preparation for planting or burning, can have serious consequences for breeding songbirds by destroying nests and nesting habitat or causing nest abandonment. Managers often have a degree of flexibility, allowing them to schedule these activities outside the breeding season while still achieving their management objectives.

ATTACHMENT F

Habitat Compensation Approach For the Battle Creek Salmon and Steelhead Restoration Project: A Program View

Battle Creek Environmental Team
March 8, 2004

Background

Construction activities of the proposed Battle Creek Salmon and Steelhead Restoration Project will have incidental adverse effects on fish and wildlife habitat. Mitigative measures have been developed by the Restoration Project to avoid and minimize these adverse effects to the extent practicable, but compensation must be addressed for unavoidable adverse effects on several habitats. For the purpose of this discussion, (mitigation(is broadly defined as any action to avoid, minimize, or compensate for adverse effects; whereas, (compensation(is replacing lost environmental values.

Preliminary estimates of riparian and upland habitat impacts are provided in Table 1. These estimates are taken from the Restoration Project(s Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) (USBR and SWRCB 2003) and were made conservatively to represent the greatest perceived impact scenario. New estimates are presently being developed with updated information on project designs, and it is expected that projected impact areas will be reduced, especially for oak woodland habitats. Wetlands are not included in this proposal, as the section 404 permitting process will ultimately determine mitigation needs for wetlands.

General mitigation standards for CALFED Bay-Delta Program related projects are contained in the Program(s Programmatic Record of Decision (ROD) (CALFED 2000a) and Multi-Species Conservation Strategy (MSCS) (CALFED 2000b). Preliminary recommendations for mitigation of habitats also have been prepared by the Fish and Wildlife Service (FWS) specifically for the Restoration Project in its Draft Fish and Wildlife Coordination Act (FWCA) Report (USFWS 2001, 2003). These standards and recommendations include compensation ratios (Table 1) for adverse effects on habitats, whereby, the Restoration Project would restore or enhance additional area specified by the compensation ratio to offset the adverse effects. However in light of escalating Restoration Project costs for both construction and mitigation, other mitigation options might be developed that would consider Restoration Project benefits, and benefits of other CALFED-funded actions within the Battle Creek watershed.

A conference call among the Bureau of Reclamation, NOAA Fisheries, FWS, Department of Fish and Game (DFG), Pacific Gas and Electric Company (PG&E), and Metropolitan Water District was held on December 17, 2003, to discuss riparian and oak woodland mitigation. With consideration to goals of the CALFED Bay-Delta Program and Restoration Project, and expected adverse effects and benefits of the Restoration Project, conference call participants agreed that a reasonable compensation ratio for riparian forest/scrub would be 3:1, given that supporting criteria could be met.

Table 1. Preliminary estimates of potential impacts to riparian and upland habitats presented in the Restoration Project Draft EIS/EIR and presently recommended compensation ratios.

Habitat Type	Potential Impacts (acres)	Compensation Ratios (acres)	
		CALFED MSCS	Draft FWCA Report *
Riparian Forest/Scrub	7.2	2:1 to 5:1	5:1
Blue Oak Woodland/Savanna	49.6	2:1 to 5:1	5:1
Live Oak Woodland	25.9	2:1 to 5:1	5:1
Gray Pine/Oak Woodland	3.4	2:1 to 5:1	5:1
Mixed Chaparral	3.4	2:1 to 5:1	3:1
Annual Grassland	11.2	1:1 to 3:1	1:1

*FWCA report ratios assume permanent loss of all habitat value at impact sites

Specific compensation ratios were not proposed for oak woodland habitats during the conference call because the Restoration Project would not benefit oak woodlands. It was noted, however, that opportunities for oak woodland compensation within the Battle Creek watershed might be limited. It was decided that opportunities for oak woodland compensation should be further investigated, including use of conservation easements to protect oak woodland habitat. Further investigation of oak woodland compensation options did not identify any opportunities for restoring degraded oak woodland habitats in the Battle Creek watershed; however, several properties were identified in the Battle Creek watershed that were protected, or proposed for protection, through conservation easements funded, or partly funded by the CALFED Program.

A second conference call among FWS, DFG, PG&E, and The Nature Conservancy (TNC) was held on January 22, 2004, to discuss riparian monitoring needs for the Restoration Project(s Adaptive Management Plan and the potential for conservation easements to serve as compensation for Adverse effects the Restoration Project. The discussion addressed size of existing and potential conservation easement properties in the Battle Creek watershed, habitat types present, and risk of harmful future land uses that the easements might avert. These factors, considered together, appeared to support the concept of crediting easement benefits as compensation for adverse effects of the Restoration Project, when viewed in the context of the broader CALFED Program.

The proposed mitigation approach presented herein includes 1) consideration of project benefits for setting compensation ratios for impacts to riparian habitat and 2) consideration of other CALFED-funded actions in the watershed for meeting compensation needs for riparian and upland habitats. The following sections describe programmatic conservation measures provided by the CALFED Program, compensation views presented in the Draft FWCA report, and rationale for reconciling these guidelines into a balanced compensation approach.

CALFED Programmatic Conservation Measures

CALFED(s MSCS has incorporated conservation measures (CALFED 2000b:Attachment D) into the CALFED Program to avoid, minimize, and compensate for adverse effects of CALFED actions on natural communities covered by the Natural Community Conservation Planning Act. Accordingly, appropriate compensation commitments for NCCP habitats are presently being developed for inclusion in the Restoration Project(s Natural Community Conservation Plan (NCCP). MSCS guidance states that (conservation measures for NCCP communities are primarily directed at conserving the quality and quantity of natural habitats... Where CALFED actions would result in the permanent loss of natural NCCP habitats, restoration, enhancement, or protection of in-kind habitat would typically be required to compensate for the loss((CALFED 2000b:4-7).

The MSCS provides ranges of compensation ratios for restoring or enhancing in-kind habitat acreage for natural plant communities covered in the MSCS that are lost or degraded from actions taken under the CALFED program, such as Ecosystem Restoration Program (ERP) actions. All habitats affected by the Restoration Project are covered in the MSCS; compensation ratios are provided in Table 1. The MSCS does not provide direction for selecting a precise level of compensation for an NCCP habitat, but it might be assumed that the greater the degradation of habitat, the higher the compensation ratio should be.

However, the MSCS further provides that (ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures. If the restoration and enhancement actions culminate in an increase or improvement in a particular NCCP community, compensatory measures may not be required even if there is a temporary or limited adverse modification of the community or habitat type. Ultimately, the need for compensatory conservation measures for CALFED restoration and enhancement actions will depend on the type, location, timing, and success of the related actions((CALFED 2000b:4-7).

Draft FWCA Report Mitigation Recommendations

Mitigation recommendations provided by FWS in its Draft FWCA report were made pursuant to the FWS Mitigation Policy (Federal Register 46(15):7644-7663). Compensation ratios considered the quantity and quality of habitats over a period of time representing the life of the project, as conceptualized in FWS(s Habitat Evaluation Procedures (HEP). It was assumed that impacts on the estimated acreage would be (total(impacts (i.e., entire vegetation structure is removed on impact sites). The ratios represent the break-even points, where average annual habitat values lost are replaced with equal average annual habitat values from compensatory

actions. A HEP study was not performed for the Restoration Project, but the recommended compensation ratios were adopted from HEP assessments from other projects having similar habitats and impacts (primarily the proposed Auburn Dam and Spring Creek Debris Dam projects).

The Draft FWCA report further recommended that Restoration Project benefits not be considered toward compensation of adverse effects. This view favored maximizing Restoration Project benefits by fully compensating for adverse effects on habitats in order to restore the biological baseline, so that all project benefits would contribute to increasing the baseline. This view, which assumed sufficient project funding, would provide for the greatest contribution to CALFED Ecosystem Restoration Program goals and milestones. However, FWS recognizes realities of financial constraints and is not opposed to other mitigation approaches if appropriate criteria to justify them can be developed and met.

Determination of Mitigation Ratios for Riparian Habitat

Considering CALFED guidance, Draft FWCA report recommendations, and the goals and expected benefits of the Restoration Project, the Environmental Team proposes that a 3:1 mitigation ratio would be appropriate for compensating riparian woodland adversely affected by the Restoration Project. The following criteria are provided to support this view:

1. Restoration Project is Expected to Benefit Riparian Vegetation. Increased minimum instream flows from the Restoration Project would be expected to benefit riparian vegetation. To assume a benefit, present flow regimes must be assumed to limit the area and/or quality of riparian habitat. This would be a reasonable assumption because riparian ecosystems are maintained, in part, by groundwater (Ewing 1978). Higher minimum instream flows provided by the Restoration Project should increase levels of groundwater on Battle Creek, and enable establishment of riparian vegetation at higher elevations than at present. Because newly established vegetation in seedbeds must keep contact with groundwater as instream flows naturally recede in the summer, higher elevations of groundwater also should increase survival of newly established vegetation.

   In addition, research suggests that riparian vegetation is especially sensitive to minimum and maximum instream flows (Auble et al. 1994). Although maximum instream flows occurring in Battle Creek would not be affected by the Restoration Project, minimum flows, which would occur during the primary growing season of riparian vegetation, would be increased up to 10 times, depending on location. Because positive correlations between rate of instream flow and rate of tree ring growth have been observed for riparian vegetation in California (Stromberg and Patten 1990), increased minimum flows would be expected to increase growth rates of riparian habitat.

   However, effects of removing dams on riparian vegetation may not all be positive. Pulses of sediment stored behind removed dams can create new alluvial surfaces downstream that can be colonized by riparian vegetation, but also can bury existing riparian vegetation, which can die right away or over time due to anoxic soils and excessive nutrients

(Shafroth et al. 2002). Dominant species of late seral stages are likely to be less tolerant to burial by sediment than pioneering species. Eliminating the water pool behind dams can reduce groundwater levels in those zones stranding riparian vegetation, and downcutting of the stream through dam sediment and channel aggradation from sediment pulses can both create terraces that may not be immediately suitable for riparian vegetation. To assume a riparian habitat benefit from increased minimum flows combined with dam removal, it must be assumed that the net effect on riparian habitat over time would be positive due to large areas of increased instream flow provided by the Restoration Project and small areas affected by dam removal.

2. Spatial Extent of Expected Benefit is Large. Increased minimum instream flows that are expected to re-establish and/or enhance riparian habitat would occur over a substantial spatial area. The linear extent of increased instream flows would be about 33 miles of Battle Creek, plus reaches of Soap Creek, lower Ripley Creek, and Baldwin Creek (reaches below uppermost diversion dams affected by Restoration Project).

   The distance that riparian habitat would be benefitted perpendicular to the creeks is unknown, but would vary depending on geologic composition and topography (some creek reaches occur in narrow rocky canyons, while others occur in less steep areas with more substantial soil banks and wider flood plains). The land area that would be affected by increased groundwater and have suitable slopes and soils for establishing riparian vegetation also is unknown, but a positive correlation might exist between this area and wetted habitat Area. Minimum instream flows proposed by the Restoration Project would be 12 to 29 times greater in the North Fork and 8 to 17 times greater in the South Fork, depending on reach and time of year (USBR and SWRCB 2003:Fig. 3-2). This is expected to result in wetted area increases of about 61% (increase from 108.9 acres to 175.3 acres) (USBR and SWRCB 2003:Table 4.1-10).

3. Expected Benefit Would Occur in Proximity to Adverse Effects. The location of expected habitat benefits is within the Restoration Project area.

4. Expected Habitat Benefits Are In-kind. Benefits from the Restoration to riparian habitat would be in-kind with riparian habitat values lost. It is expected that riparian habitats that are re-established and/or enhanced due to increased instream flows would have similar plant composition and be used by similar assemblages of animal species as riparian habitats lost.

5. Expected Benefits to Riparian Habitat Would Benefit Fish and Wildlife. Establishment of new riparian habitat areas and enhanced growth of existing riparian vegetation would be expected to benefit fish and wildlife species affected by, or using, the riparian zone. The multiple layers of riparian vegetation along Battle Creek, in association with edges of adjacent plant communities and streams, create a diverse physical structure that provides food, water, cover, and shade for a diversity of amphibians, reptiles, birds, mammals, and invertebrates, including neotropical migrant birds, special status bats, and the valley

elderberry long-horn beetle (USFWS 2003). Riparian communities also function as dispersal and migration corridors for many wildlife species.

An important associate of riparian habitat is shaded riverine aquatic (SRA) cover, which has ecosystem-level values. This near shore aquatic area occurring at the stream-riparian habitat interface consists of vegetation that either overhangs or protrudes into the water; instream woody debris, such as leaves, logs, branches and roots; and often substantial amounts of detritus (USFWS 1992). SRA cover provides high quality food and cover for fish, amphibians, and terrestrial wildlife that use riparian and stream edge habitat (USFWS 1992). The amount of SRA cover present on Battle Creek has not been inventoried, but because of the relatively narrow width of Battle Creek, compared to the height and density of adjacent riparian vegetation, a high proportion of Battle Creek could probably be considered to have SRA cover. Because SRA cover is largely associated with riparian vegetation and wetted habitat area, higher minimum instream flows from the Restoration Project would be expected to enhance SRA cover.

6. The Restoration Project is Expected to Benefit Riparian Ecological Processes. Dam removal and changes in flow regime may not restore riparian ecosystems to pre-dam conditions (Shafroth et al. 2002), but may restore valuable components of riparian ecosystems. Enhanced SRA cover would be expected to provide greater input of leaves, woody material, and insects into the stream ecosystem. Increased minimum flows should better transport and distribute these materials downstream.

   Lastly, increased minimum flows could also help sustain wetlands and associated riparian vegetation in side channels and backwater areas associated with the more alluvial floodplain reaches of Battle Creek. These habitats, combined with other riparian habitats on Battle Creek, could provide better connectivity of riparian habitat, and more effective filtering of sediment in runoff entering the creek.

7. Expected Riparian Benefits Would Begin Immediately. Minimum instream flows would be increased immediately following Restoration Project construction.

8. Expected Riparian Habitat Benefits Would be Monitored. The Restoration Project would develop a strategy to monitor riparian habitat for both benefits and adverse effects from the Restoration Project. This strategy would become part of the Restoration Project(s Adaptive Management Plan.

During the January 22, 2004, conference call it was proposed that monitoring should include 3 components: 1) aerial photograph analyses of riparian habitat throughout the project area for existing conditions and at 5- and 10-year intervals following Restoration Project construction; 2) on the ground monitoring of the riparian vegetation community (to be combined with sediment monitoring); and 3) monitoring of riparian tree growth using tree ring analysis. Specific parameters that could be monitored include:

- Area of new riparian vegetation establishment on reaches with increased flows;
- Area of riparian vegetation established at higher elevations than at present;
- Survival and growth rates of seedlings established on new seedbeds, including any occurring at higher elevations than present;
- Measurement of structure of new riparian habitat (e.g., cover and height of trees, shrubs, and herbaceous vegetation and species composition);
- Area of SRA cover compared to area compared to that at pre-Restoration Project minimum instream flows; and
- Possible indirect effects from dam removal, such as excessive sedimentation on nearby riparian habitat.

Results of monitoring would be used by the Restoration Project agencies to determine whether additional mitigative measures should be taken. Potential additional mitigative measures might include:

- Remove invasive plant species in project area riparian zones;
- Exclude cattle from riparian zones through use of conservation easements;
- Construct structures to reduce bank erosion, if needed;
- Planting and nurturing riparian vegetation in areas of degraded condition.

Program View for Determining Compensation

The Environmental Team proposes that the balance of environmental compensation needs of the Restoration Project that remain following implementation of other mitigative measures should be considered offset by environmental benefits of CALFED-funded conservation easements in the watershed. The Environmental Team believes that this approach would be valid in view of the following criteria:

1. Restoration Project Is Making Extensive Efforts to Avoid and Minimize Adverse Effects. The Restoration Project committed to mitigation measures early in planning to avoid and minimize adverse effects at construction sites, such as fencing off sensitive habitat areas and providing an on-site biologist to monitor construction activities. The estimated area of impacts that could not be avoided are shown in Table 1. However, subsequent to these estimates, further assessment of project designs determined that projected areas of impact might be reduced by decreasing the projected width and length of the construction footprint along the South Canal. Additional project revisions being considered for reducing construction footprints include replacing the proposed new road to the North Battle Creek Feeder with an inclined elevator, not grading and filling some or all sections of the South Canal, and avoiding removal of some of the largest oak trees at Inskip Diversion Dam. These footprint reductions would substantially reduce impacts, primarily to oak woodland habitats, although the amount is not yet known.

2. Unavoidable Adverse Effects of the Restoration Project Are Incidental to Restorative Actions for Other Ecosystem Components. As an activity of CALFED(s ERP, the purpose and objectives of the Restoration Project are for restoration of significant

components of the Battle Creek ecosystem. Adverse effects are only incidental to the Restoration Project, which means to restore about 48 miles of stream habitat and self-sustaining populations of chinook salmon and steelhead in the watershed.

3. Loss of Habitat Will Be Mitigated On-site to the Extent Possible. Adverse effects to habitats that are not within the footprints of permanent project features will be restored following construction.

4. The Restoration Project Looked First for Habitat Compensation Opportunities Within the Project Area. The Environmental Team investigated opportunities for habitat compensation, both within and outside of the Battle Creek watershed, which would be needed in addition to on-site compensation. No candidate sites for compensation (e.g., degraded sites suitable for restoration), including mitigation banks, have been found for the most-affected habitat type(oak woodland. Opportunities for compensating other habitat types are still being investigated, although none are known at this time. Other approaches, if available, would probably require a new conservation easement with a private landowner.

5. Consideration of CALFED-funded Easements Within the Watershed to Offset Restoration Project Impacts Would Be Consistent with Programmatic Conservation Measures in the CALFED MSCS. There are 3 habitat conservation easements (completed or in progress) in the Battle Creek watershed in which the CALFED ERP has taken part: the Transuniversal property (a.k.a. Wildcat Ranch) owned in fee title by TNC, McCampbell Ranch, and Burton Ranch (a.k.a. Miller Ranch). A fourth potential easement is being investigated, which also could be partly funded by CALFED. However, the Transuniversal property and McCampbell easement were funded through the ERP with funds from the Iron Mountain Mine fund; therefore, protected habitat values on these lands are already spoken for by impacts at Iron Mountain Mine, and are not available for the Restoration Project. The Burton conservation easement was funded by the ERP and is held by TNC. This property's conservation easement will protect biological values for fish and wildlife species and NCCP communities on lands totaling about 1,500 acres.

   As described above under CALFED Programmatic Conservation Measures, The MSCS states that (ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures.(Depending on the type, location, timing, and success of the related actions, compensatory measures may not be required (CALFED 2000b:4-7).

   The Environmental Team proposes that the Burton conservation easement, considered together with the Restoration Project, should culminate with sufficient net benefits to preclude additional compensation from the Restoration Project beyond on-site restoration of temporary impacts. This view is further supported by the following additional criteria:

6. The Restoration Project and CALFED Conservation Easement Occur in Proximity to One Another in the Same Watershed. The Burton conservation easement property is situated within the Restoration Project area on the mainstem Battle Creek. Therefore, the Restoration Project and Burton conservation easement are not only geographically linked in the watershed sense, but functionally linked in the interactive riverine-upland ecosystem sense. In this way, the Restoration Project and Burton conservation easement complement one another and expand the total area of ecosystem benefit.

7. The CALFED Conservation Easement Provide Gains Biological Value by Averting Probable Future Land Development. Lands within the Battle Creek watershed are at risk of land development that would adversely affect biological values of associated natural habitats. Biological gains from the easement are realized by maintaining present values over time, relative to assumed degraded conditions in the future without the easements. The easements provide protection of biological values through restrictions on land use that are attached to the property in perpetuity.

   Under the Burton conservation easement, TNC has rights to preserve, protect, identify, monitor enhance, and restore in perpetuity the property's conservation values (TNC 2003). ?Any activity on or use of the property that is inconsistent with the conservation purposes (including, without limitation, any activity or use that diminishes or impairs the conservation values) is prohibited? (TNC 2003). Example restricted uses of the property include use of hazardous materials; construction of structures, roads, levees, or ditches; dividing, partitioning, or resale as separate parcels; use of motorized vehicles off designated roadways; removal or destruction of native vegetation; establishment of commercial or industrial uses, such as orchards and vineyards; and intensity and location of livestock grazing. In addition, compliance monitoring and reporting is conducted by TNC to ensure the terms of the conservation easement are met.

   The pertinent portion of the watershed lies within the transition zone of the Central Valley, one of the fastest growing areas of the state. It is estimated that by the year 2040, an additional 1.6 million acres of agricultural land will be lost to outlying development and growth (American Farmland Trust 1995). Residential and commercial development in the Manton area has exponentially increased in the last five years, a trend that is expected to continue in the future. Recreational development in seasonal camping, hunting, and fishing resorts is expanding. Creek-side properties are particularly attractive for human uses. Habitat fragmentation due to subdivisions or other development is a primary threat to this area. Lands within the watershed have been subdivided into ranchettes, while other lands have gone into vineyards. Analyses for risk of development conducted by TNC concluded that the subject easement properties were vulnerable.

8. The CALFED Conservation Easement Would Provide In-Kind Benefits to Offset Habitat Values Lost. The Burton Ranch, adjacent to the mainstem Battle Creek midway between the confluence of the Battle Creek forks and Coleman National Fish Hatchery. This property totals about 1,500 acres and contains the following habitats: foothill woodland,

foothill savannah, riparian woodland/scrub, groundwater seep wetland, foothill annual grassland, and irrigated pasture. The property also contains other wetland types, but they are not yet mapped.

Classification of habitats mapped on the subject easement property is not entirely compatible with that used in the Restoration Project EIS/EIR, but given the similarity of habitat classifications and the size (1,500 acres) and location (adjacent to Battle Creek) of the conservation easement property, it is expected that each property has a mosaic of habitat types that includes those projected to be adversely affected by the Restoration Project (Table 1).

9. The CALFED Conservation Easement Would Provide the Magnitude of Benefits Needed to Offset Habitat Values Lost. Projected habitat losses provided in Table 1 are the best estimates presently available. The Environmental Team is presently working to refine the estimates based on new project design/footprint information. It is expected that estimated losses will be reduced, with oak woodland having the highest probability for significant reductions. Based on existing information, Table 2 provides compensation needs using compensation ratios provided in Table 1, and the acreage of corresponding natural habitats protected (or to be protected) by the Burton conservation easement.

The compensation scenario in Table 1 that requires the greatest amounts of compensation is represented by the Draft FWCA report, which is equivalent to the high end of the range from the MSCS (except for chaparral and annual grassland). If it is assumed that existing habitat values protected from future detrimental land uses by a conservation easement is equivalent to values gained by restoration of degraded habitat, then compensation acreage needed can be equally satisfied by either a conservation easement or habitat restoration. This is the view proposed by the Environmental Team, and means that the average annual value of a conservation easement acre is equal to the average annual value of a restored acre, for all habitat types. Given that the easement property has a greater area of protected habitat than is needed for the proposed compensation, there should still be a net benefit remaining from the easement following offsets for the Restoration Project.

Table 2. Estimates of compensation needed for adverse effects of the Restoration Project and amount of riparian and upland habitat protected by CALFED-funded conservation easement.

Habitat Type	Potential Impacts (acres)	Compensation Needed* (acres)		CALFED (Burton Ranch) Conservation Easement acreage**
		CALFED MSCS	Draft FWCA Report	
Riparian Forest/Scrub	7.2	21.6	21.6	57
Blue Oak Woodland/ Savanna	49.6	99.2 to 248.0	248.0	591
Live Oak Woodland	25.9	51.8 to 129.5	129.5	588
Gray Pine/Oak Woodland	3.4	6.8 to 17.0	17.0	
Mixed Chaparral	3.4	6.8 to 17.0	10.2	unknown
Annual Grassland	11.2	11.2 to 33.6	11.2	310
Total	100.7	197.4 to 466.7	437.5	1,546

*Based on presently considered compensation ratios from the CALFED MSCS and Draft FWCA report, except for riparian forest/scrub, which the Environmental Team recommends should have 3:1. The ratio for riparian forest/scrub will be reduced to 3:1 in Final FWCA report
**Acreage represents the best fit possible from cross-walking the original easement habitat classification with that of the Restoration Project Draft EIS/EIR. Other habitat types present but not listed in table, include non-seep emergent wetlands and irrigated pasture.

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USFWS. 2001. Administrative Draft Fish and Wildlife Coordination Act Report. Battle Creek Salmon and Steelhead Restoration Project. October. Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, Sacramento, Calif.

USFWS. 2003. Draft Fish and Wildlife Coordination Act Report. Battle Creek Salmon and Steelhead Restoration Project. July. Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, Sacramento, Calif.

ATTACHMENT G

Bart Prose

05/18/2005 04:39 PM

To: mmarshall@mp.usbr.gov
cc: jgoodwin@mp.usbr.gov, David Harlow/SAC/R1/FWS/DOI@FWS
Subject: MLTF Willow Springs Mitigation Option B: Relocation

To follow-up on our earlier discussions on the feasibility of relocating the Mount Lassen Trout Farm's Willow Springs unit to Millseat Creek and installing a diversion on the creek as a water supply for the hatchery, I would like to submit the following assessment.

These are my initial impressions of the Millseat Creek site based on photographs near the headwaters area (attached) [omitted]. I was not able to attend the site visit, but the photographs clearly depict high ecological values at the locations photographed. The setting comprises freshwater springs that form Millseat Creek, gallery riparian forest with a well developed, diverse understory and stream channel. Habitat elements include freshwater springs that form Millseat Creek; a gallery (multiple tree layers) riparian plant community with complex tree, shrub, and herbaceous vegetation layers; and a diverse substrate, including rock outcrops, downed woody vegetation, moss beds, ferns, and moist soils. The spring-fed stream channel provides persistent aquatic habitat and moist microclimate.

Taken as a whole, the diversely structured riparian habitat shown in the photographed locations would be expected to support a highly diverse and species-rich wildlife community. Riparian zones typically support higher species richness and diversity than less complexly structured habitats. Wildlife present likely include a variety of birds, mammals, reptiles, amphibians, insects, crustaceans, and mollusks (not sure about fish). Because surrounding habitat areas are hot and dry much of the year, spring-fed corridors such as this (apparently perennial and drought resistant) are unique and serve as an "oasis" for many wildlife species. Many smaller animals, such as reptiles, amphibians, and small mammals have small home ranges and may not be able to access alternative areas for aquatic and riparian resources that they obtain at Millseat Creek. Special status species known to occur on the Restoration Project area that could occur in riparian habitat on Millseat Creek include little willow flycatcher (State endangered), northwestern pond turtle (State and Federal species of concern, CALFED NCCP), foothill yellow-legged frog (State, Federal, and CALFED species of concern), yellow-breasted chat (State species of concern), several species of bats (Federal species of concern), as well as habitat for the valley elderberry longhorn beetle.

While the riparian corridor of the Millseat Creek is clearly a valuable habitat area, especially at locations like those depicted in the photographs, I also would consider the corridor "fragile" or "sensitive," in that riparian habitat is dependent on its associated water supply. Altering the water supply would alter ecosystem structure and, arguably, its function. The degree to which this would occur is unknown, but I would speculate that the degree of impact below the point of diversion would be at least equal to the proportion of spring flow diverted. This is because the extent and maintenance of habitat components on the surface, such as aquatic habitat, shallow rooted plants, mosses, wet rock outcrops, and downed wood are dependent on the corridor's wetted surface area, which is related to volume of flow. If flows are reduced, these habitat features would diminish. The same might be true for deeper rooted plants (mostly trees and shrubs) farther from the stream channel, which depend on groundwater. If surface spring water seeps back into groundwater is as it flows downstream, then reducing surface flow could reduce groundwater availability to deeper rooted plants downstream. There also would be an impact from the diversion structure footprint.

Because the proposed diversion would be part of a mitigative action by the Restoration Project, diverting part (or all) of this spring would be a re-direction of impacts. A diversion on Millseat Creek also could be inconsistent with the program-level compensation approach being used by the Restoration Project at the Burton Ranch, which includes a Restoration Project commitment to make efforts to avoid and minimize project impacts. Because the Restoration Project already is creating a significant impact to highly

valuable habitat at the North Battle Creek Feeder with construction of the access road into the canyon, the proposed action at Millseat would further the level of impacts to highly valuable habitat.

Although constructing a diversion farther downstream could reduce the level of riparian impact, if the Millseat Creek spring is diverted at the headwater area where ecological values appear highest, there probably would be no sufficient compensation available (I don't know of any way to replace a spring-fed creek and riparian corridor). From the biological view, I would recommend that the headwaters of the creek be left undisturbed. This is consistent with the Fish and Wildlife Service's Draft Fish and Wildlife Coordination Act Report for the Restoration Project (Appendix Q in the Draft EIS/EIR), which recommended that impacts to groundwater seeps be avoided.

Since the lower end of Millseat Creek is presently collected for hydropower production, a diversion at the lower end for a hatchery water supply would minimize the impact to groundwater spring/riparian habitat values. Although overflow from Keswick Ditch (which contains water exposed to trout, but not anadromous fish) above Millseat Creek could enter the hatchery water supply if the diversion were located at the lower end of the creek, the hatchery's present water supplies at the Willow Springs and Jeffcoat units already use a water supply exposed to trout. Thus a lower Millseat Creek supply might be as high in quality as supplies used by the hatchery now and in the past. Potential for disease organisms in Keswick Ditch might be further reduced by screening both ends of the Ditch to eliminate trout. If relocation of Willow Springs hatchery facilities to Millseat Creek is to be pursued, an additional site visit by agency staff and representatives from Mount Lassen Trout Farms and PG&E would be useful to evaluate potential diversions sites that might be suitable for the hatchery and avoid and minimize impacts to the riparian corridor.

I hope that this information is helpful. Please contact me for any questions or clarifications.
Thanks,

Bart Prose
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ATTACHMENT H

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
1-1-04-F-0190

JUN 20 2005

Memorandum

To: Regional Environmental Officer, Mid-Pacific Regional Office, Bureau of Reclamation, Sacramento, California

From: For Acting Assistant Field Supervisor, Endangered Species Division, Sacramento Fish and Wildlife Office, Sacramento, California Cliff Morgans

Subject: Battle Creek Salmon and Steelhead Restoration Project, Shasta and Tehama Counties, California

This is in response to Bureau of Reclamation's (Reclamation) April 20, 2004, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the Battle Creek Salmon and Steelhead Restoration Project (Restoration Project), in Shasta and Tehama counties, California. Your request was received in our office on May 10, 2004. This document represents the Service's biological opinion on the effects of the action on the threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act). The proposed project is not located within either of the two areas designated as critical habitat for the species (U.S. Fish and Wildlife Service 1980); therefore no designated or proposed critical habitat for the species will be adversely modified or destroyed.

This memorandum also includes our concurrence with your determination that the Restoration Project is not likely to adversely affect the threatened bald eagle (*Haliaeetus leucocephalus*). Surveys conducted in the 2000 and 2001 breeding season did not locate an active bald eagle nest in the project area. Bald eagles are known to forage along North Fork and South Fork Battle Creek during the winter, and bald eagles outside of the project area are known to forage in Battle Creek during the breeding season. Reclamation has included mitigation measure EBAEA1, Perform Preconstruction Surveys, Limit Construction Activities, and Establish Buffers, as identified in the April 2004, *Battle Creek Salmon and Steelhead Restoration Project, Draft Action Specific Implementation Plan* (ASIP) to avoid effects of construction- and restoration-related activities on the bald eagle. A series of three surveys at each project site will be conducted during the breeding season prior to construction activities to determine if an active bald eagle nest is in the area. If nesting bald eagles are found within 0.50 mile of the Restoration Project site, all work must cease until formal consultation is reinitiated.

Your April 20, 2004, letter requesting formal consultation did not address the federally threatened California red-legged frog (*Rana aurora draytonii*). Site assessments performed for the Restoration Project identified potential suitable breeding habitat. These results were reported in the March 2001, *Site Assessment for the California Red-Legged Frog, Battle Creek Salmon and Steelhead Restoration Project* (Jones and Stokes 2001); and subsequent January 2005, *Site Assessment for California Red-legged Frog for the Battle Creek Salmon and Steelhead Restoration Project, Jeffcoat East and West, Willow Springs, and Asbury Project Sites* (Jones and Stokes 2005a). Service protocol-level surveys were conducted for the California red-legged frog in April and June 2005, and none were found. Therefore, we have determined that the Restoration Project is not likely to adversely affect the California red-legged frog. Unless new information reveals effects of the proposed action that may affect the California red-legged frog in a manner or to an extent not considered, no further action pursuant to the Act for this animal is necessary. If California red-legged frogs are found on or near the Restoration Project site, all work must cease until formal consultation is reinitiated.

Your April 20, 2004, letter requesting formal consultation did not address the threatened slender orcutt grass (*Orcuttia tenuis*). Plant surveys were conducted in 2000, and the species was not observed and potential habitat for the plant was not documented (Jones and Stokes 2000). New project sites have been identified since the 2000 plant surveys were conducted. Additional plant surveys were completed in early June 2005 for the new project sites, and no slender orcutt grass was found. A second set of surveys for the same project areas are scheduled to be completed by July 2005, after the issuance of this biological opinion. In addition, pre-construction surveys will be conducted at project sites that contain potential habitat if previous surveys were conducted more than three years from planned construction. Based on the June 2005 survey results, the Service concludes that, at this time, no slender orcutt grass exists within the project sites. If the July 2005 surveys, or subsequent pre-construction surveys, indicate that slender orcutt grass exists within the Restoration Project, all work must cease at the specific project site until formal consultation is reinitiated.

The Service is aware that Reclamation has been in contact with NOAA Fisheries regarding the potential effects of the Restoration Project on the Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), and Central Valley steelhead (*Oncorhynchus mykiss*).

The findings and recommendations in this consultation are based on: (1) the March 2005 *Administrative Draft Addendum to the Draft Action Specific Implementation Plan for the Battle Creek Salmon and Steelhead Restoration Project* (ASIP Addendum), prepared by Jones and Stokes; (2) the April, 2004, *Battle Creek Salmon and Steelhead Restoration Project, Draft Action Specific Implementation Plan* (ASIP), prepared by Jones and Stokes; (3) the April 2001, *Final Biological Survey Summary Report, Volumes*
I and II, Battle Creek Salmon and Steelhead Restoration Project; and (4) other information available to the Service.

Consultation History

April 11, 2000. Bart Prose of the Service sent Mary Marshall of Reclamation an e-mail regarding comments on the Battle Creek field protocols.

May 13, 2001. The Service received the May 2, 2001, *Site Assessment for the California Red-Legged Frog, Battle Creek Salmon and Steelhead Restoration Project, Shasta and Tehama Counties, California,* prepared by Jones and Stokes.

September 18, 2001. The Service received the August 2001, *Draft Preliminary Delineation of Waters of the United States for the Battle Creek Salmon and Steelhead Restoration Project*.

February 15, 2002. A memorandum was sent to Mary Marshall and Dave Gore of Reclamation from Jones and Stokes regarding the site assessment of the Battle Creek Salmon and Steelhead Restoration Project Area, and the assessment of wildlife conservation measures.

August 4, 2003. Bart Prose of the Service sent Mary Marshall of Reclamation an e-mail requesting additional information for the ASIP/biological assessment.

August 15, 2003. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding potential project effects on elderberry shrubs.

August 19, 2003. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Peter Epanchin of the Service regarding conservation measures for the valley elderberry longhorn beetle at the Battle Creek project sites.

March 8, 2004. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding the biological opinion and the valley elderberry longhorn beetle surveys.

April 14, 2004. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding bald eagle survey recommendations.

May 10, 2004. The Service received the April, 2004, *Battle Creek Salmon and Restoration Project, Draft Action Specific Implementation Plan*.

July 29, 2004. An e-mail between Bart Prose of the Service and Colleen Lingappaiah of Jones and Stokes regarding the need for California red-legged frog site assessments near the proposed Eagle Canyon alignment.

August 6, 2004. An e-mail between Bart Prose of the Service and Mary Marshall of Reclamation summarizing a meeting regarding the California red-legged frog site assessments.

August 8, 2004. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding the site assessment for the proposed Eagle Canyon pipeline alignment.

August 10, 2004. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding elderberry shrubs near the proposed Eagle Canyon pipelines alignment.
August 11, 2004. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding special-status plant surveys.

September 28, 2004. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes requesting additional information needs for the ASIP Addendum and schedule.

January 14, 2005. An e-mail between Kathy Brown of the Service and Jennifer Alvarez of Jones and Stokes regarding the California red-legged frog site assessment.

January 14, 2005. The Service received the January 2005, *Site Assessment for California Red-legged Frog for the Battle Creek Salmon and Steelhead Restoration Project, Jeffcoat East and West, Willow Springs, and Asbury Project Sites* from Jones and Stokes.

February 21, 2005. Jennifer Alvarez of Jones and Stokes sent an e-mail to Kathy Brown and Bart Prose of the Service regarding comments for the California red-legged frog site assessment.

March 2, 2005. The Service received the February 2005, *Battle Creek Salmon and Steelhead Restoration Project, Draft Supplemental Environmental Impact Statement/Revised Environmental Impact Report,* prepared by Jones and Stokes.

March 8, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding biological surveys identified for 2005.

March 15, 2005. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding the Service's comments on the biological surveys identified for 2005.

March 28, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Kathy Brown and Bart Prose of the Service regarding the preliminary draft of the ASIP Addendum.

April 6, 2005. Jennifer Alvarez of Jones and Stokes sent an e-mail to Kathy Brown and Bart Prose regarding locations were protocol-level surveys would be conducted.

April 11, 2005. A meeting between Kathy Brown and Bart Prose of the Service, and Jennifer Alvarez and Colleen Lingappaiah of Jones and Stokes regarding California red-legged frog surveys.

April 20, 2005. Bart Prose of the Service sent an e-mail to Colleen Lingappaiah of Jones and Stokes regarding California red-legged frog surveys.

April 20, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose and Kathy Brown of the Service regarding updates to the preliminary draft ASIP Addendum.

April 21, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding floristic surveys.

April 21, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose and Kathy Brown of the Service regarding California red-legged frog surveys.

May 4, 2005. Thomas Lovullo of the Federal Energy Regulatory Commission (FERC) sent an e-mail to Bart Prose of the Service regarding consultation issues.

May 6, 2005. Jennifer Alvarez of Jones and Stokes sent an e-mail to Kathy Brown and Bart Prose of the Service summarizing results of protocol level surveys at all Restoration Project sites

except Jeffcoat East and West and Willow Springs.

May 17, 2005. The Service sent a draft biological opinion to Mary Marshall of Reclamation for review.

May 27, 2005. Mary Marshall of Reclamation sent an e-mail to Bart Prose of the Service regarding California red-legged frog surveys at Jeffcoat and Willow Springs sites.

June 1, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding the schedule of remaining surveys for special status plants and California red-legged frogs.

June 9, 2005. The Service received e-mail comments from Reclamation on the draft biological opinion.

June 9, 2005. Colleen Lingappaiah of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding special status plant survey results.

June 16, 2005. Jennifer Alvarez of Jones and Stokes sent an e-mail to Bart Prose of the Service regarding the results of the remaining California red-legged frog surveys.

BIOLOGICAL OPINION

Description of the Proposed Action

The following project description was derived mainly from information presented in the ASIP and ASIP Addendum. Additional information is from sources in the Service's administrative record.

Reclamation and the State Water Resources Control Board (State Water Board) are proposing the Restoration Project, which is identified in the CALFED Bay-Delta Program Programmatic Record of Decision as a fish passage action in support of the CALFED Ecosystem Restoration Program. The Restoration Project proposes to reestablish approximately 42 miles of salmon and steelhead habitat on Battle Creek, plus an additional 6 miles of habitat on its tributaries. Restoration would be accomplished primarily through the modification of the Battle Creek Hydroelectric Project, FERC Project No. 1121 facilities and operations, including instream flow releases. Any proposed changes to the Battle Creek Hydroelectric Project will trigger the need for the Pacific Gas and Electric Company (PG&E) to seek a license amendment from FERC**.** The existing FERC license of the Battle Creek Hydroelectric Project does not expire until 2026.

The Restoration Project lies within the Battle Creek watershed, which is situated on the volcanic slopes of Mt. Lassen in southeastern Shasta and northeastern Tehama Counties, and is located on lands south of Shingletown and State Route (SR) 44, and north of Paynes Creek and SR 36. The proposed Restoration Project will be accomplished through the modification of Battle Creek Hydroelectric Project facilities and operations, including instream flow releases. Habitat restoration would enable safe passage for naturally produced salmonids and would facilitate their growth and recovery in the Sacramento River and its tributaries. These salmonids include

Central Valley spring-run Chinook salmon, state- and federally listed as threatened; Sacramento River winter-run Chinook salmon, state- and federally listed as endangered; and Central Valley steelhead, federally listed as threatened. Battle Creek Hydroelectric Project facilities that would be modified under the Restoration Project include North Battle Creek Feeder, Eagle Canyon, Wildcat, Coleman, Lower Ripley Creek Feeder, Inskip, Soap Creek Feeder, South, and Asbury Diversion Dams; the Eagle Canyon, Wildcat, Coleman, Inskip, and South Canals; and the Inskip and South Powerhouses.

Under the Five Dam Removal Alternative, considered to be the proposed action, Wildcat, South, Soap Creek Feeder, Lower Ripley Creek Feeder, and Coleman Diversion Dams would be removed. In addition, fish screens and ladders would be installed at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams. Tailrace connectors will be installed to convey water directly from the Inskip and South Powerhouses to downstream canals to meets fishery restoration goals. A penstock bypass facility would be placed to bypass the Inskip Powerhouse. Asbury Diversion Dam would be modified to include structures that will provide for a continual minimum flow release of at least 5 cubic feet per second (cfs) and to prevent anadromous fish from passing the dam. Fish rearing facilities at Mount Lassen Trout Farm's Willow Springs location will be modified by constructing water treatment systems and/or fish raceways and ponds, relocating facilities to an off-site location, modifying operations at the facilities to raise fish other than trout, or acquiring (purchasing) and dismantling the facilities with project funds. Mount Lassen Trout Farm facilities at Jeffcoat East and West locations would be modified by constructing a pipeline across the property at either of two primary alignments to bypass Eagle Canyon Canal water around the farm's spring-fed water supply. Permanent and temporary roads will be constructed, and existing roads will be improved to provide access for construction and maintenance activities. Areas temporarily disturbed by construction would be restored to pre-project conditions. Staging areas will be graded and protected with erosion control methods if necessary. Debris from construction and dam removal activities will be removed and either placed along the stream channel or deposited offsite. Canals will be filled or left as is depending on their location. Helicopters will be utilized to transport materials to areas that are not accessible by vehicle. Types of equipment that will be used for construction activities may include bulldozers, excavators, cranes, loaders, backhoes, and other transportation vehicles.

Construction of the Restoration Project is anticipated to begin in spring 2006 and end by summer 2009 (Jones and Stokes 2005b). The current construction schedule for each project site follows:

- North Battle Creek Feeder Diversion Dam—Begin construction in May 2006 and end by August 2007.

- Eagle Canyon Diversion Dam—Begin construction in May 2006 and end by August 2007.

- Wildcat Diversion Dam—Begin construction in July 2006 and end by November 2006.

- South Diversion Dam—Begin construction in August 2008 and end by

January 2009.

- Soap Creek Feeder—Complete construction during August 2008 and end by October 2008.

- Inskip Diversion Dam/South Powerhouse—Begin construction in May 2006 and end by February 2009.

- Lower Ripley Creek Feeder Diversion Dam—Complete construction during June 2007.

- Coleman Diversion Dam/Inskip Powerhouse—Begin construction in May 2006 and end by July 2009.

- The construction schedule for the Mount Lassen Trout Farm's facilities are not yet determined, but would occur within the timeframe for the rest of the Restoration Project.

- Asbury Dam—Begin construction summer of 2007.

A complete description of the project elements and construction considerations, sequence and scheduling can be found in the ASIP and ASIP Addendum.

As reported in the 2004 ASIP, nine shrubs (Shrubs 1-8 and 14) that are capable of providing habitat for the valley elderberry longhorn beetle will be directly or indirectly affected by project construction- and restoration-related activities. Shrubs 1-8 are located on the South Canal, and will be affected by the permanent dewatering of this canal. These shrubs will be transplanted. Shrub 14 will be removed as a result of project construction, and will not be transplanted because of its location at Eagle Canyon Diversion Dam. Twelve shrubs (9-13 and 15-21) are within 100 feet of the proposed activities but will be avoided by implementing avoidance measures. Table 1 shows a summary of the compensation ratios for the affected shrubs.

New project elements were presented in the March 2005 ASIP Addendum that were not included in the 2004 ASIP, and include construction-related actions to reduce the likelihood for disease transmission from Battle Creek to Mount Lassen Trout Farm's Jeffcoat and Willow Springs aquaculture facilities, and to the Darrah Springs State Fish Hatchery. No elderberry shrubs were located in the vicinity of the new project elements with the exception of the Jeffcoat aquaculture facility. In the ASIP Addendum, four alternatives (Alternatives A-D) were presented for the pipeline alignments at the Jeffcoat Mitigation Site. At the time of issuance of this biological opinion, Alternative A was the preferred alternative. Therefore, for the purposes of analysis, this opinion will assume that Alternative A will be implemented, and will analyze the effects of that alternative. All shrubs will be transplanted.

As reported in the April 20, 2005 *Valley Elderberry Longhorn Beetle* summary prepared by Jones and Stokes, an additional eight shrubs containing 30 stems that are capable of providing habitat for the valley elderberry longhorn beetle may be directly or indirectly affected by the

Jeffcoat Mitigation Site project construction- and restoration-related activities (Shrubs 22, 27-30, 40, 45 within Alternative A).

Table 1. Elderberry Shrub Compensation - Shrubs 1-8 and Shrub 14

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	13	26	26
		Yes	4:1	2:1	0	0	0
Riparian	stems >3" & <5"	No	3:1	1:1	7	21	21
		Yes	6:1	2:1	0	0	0
Riparian	stems ≥5"	No	4:1	1:1	8	32	32
		Yes	8:1	2:1	0	0	0
Total					28	**79**	**79**
Total Elderberry shrubs directly and indirectly affected					**9**		

Table 2 shows a summary of the compensation ratios for the affected shrubs for Alternatives A, which the Service will use as the alternative for shrubs affected as the result of this project.

Table 2. Elderberry Shrub Compensation for Alternatives A - Shrubs 22, 27-30, 40, 45

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	26	52	52
		Yes	4:1	2:1	0	0	0
Riparian	stems >3" & <5"	No	3:1	1:1	3	9	9
		Yes	6:1	2:1	0	0	0
Riparian	stems ≥5"	No	4:1	1:1	1	4	4
		Yes	8:1	2:1	0	0	0
Total					30	**65**	**65**
Total Elderberry shrubs directly and indirectly affected					**7**		

Because an extended period of time has passed since the original field surveys were performed (2001), and because some plants were inaccessible at the time of survey, and because surveys are only valid for a period of two years (Service 1996), it is anticipated that there will be additional elderberry shrubs that will be identified during pre-construction surveys. For purposes of this analysis, it is estimated that no more than 10 additional shrubs, or no more than 50 additional stems, will be identified by Reclamation as needing removal during the life of the project. Compensation will be completed prior to removal of stems that have been determined to be affected by the Restoration Project and cannot be avoided. ***Therefore, the Restoration Project***

may remove up to 26 shrubs, or no more than 108 stems. Total shrubs that may be removed was derived by adding 10 shrubs to the 16 shrubs estimated in Tables 1 and 2, and total stems to be removed was derived by adding 50 stems to the 58 stems estimated in Tables 1 and 2.

Proposed Conservation Measures

The Restoration Project includes the following conservation and minimization measures for the project's adverse effects on the valley elderberry longhorn beetle.

- A qualified biologist designated by Reclamation, in consultation with the Service, will conduct pre-construction surveys at each Restoration Project construction site if previous surveys were completed more two years from the date of actual construction activities. The surveys will begin before, or during, the November–February transplant season, before construction begins, so that any necessary transplanting can be done before the end of the transplant season. If additional shrubs are located from these pre-construction surveys that may be affected by the project, Reclamation must contact the Service and reinitiate formal consultation under this biological opinion prior to any ground-breaking activities.

- For elderberry shrubs that will be avoided, a qualified biologist will identify and mark all shrubs with stems 1.0 inch or more in diameter within 100 feet of the impact area. A 100-foot buffer will be established around all elderberry shrubs, and no construction activities will be permitted within the buffer zone unless approved by the Service. In areas where encroachment on the 100-foot buffer has been approved by Service, no ground-disturbing activities will be permitted within 20 feet of the dripline of each elderberry shrub. No riparian vegetation within 100 feet of elderberry shrubs will be removed by construction activities.

- Orange fencing will be placed around all shrubs to avoid inadvertent effects.

- Signs will be erected every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. The Endangered Species Act of 1973, as amended, protects this species. Violators are subject to prosecution, fines, and imprisonment." The signs will be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.

- An environmental education program will be presented to all construction personnel to brief them on the status of the valley elderberry longhorn beetle, the need to avoid effects on the beetle and its habitat, and the penalty for not complying with these requirements.

- Reclamation and/or the construction contractor will implement the following dust control measures along all dirt access roads and construction sites to minimize the effects of dust on nearby elderberry shrubs:

- All disturbed areas, including storage piles, that are not actively used for construction purposes, will be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, tarp or other suitable cover or vegetative ground cover.

- All on-site unpaved roads and off-site unpaved access roads will be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.

- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled of fugitive dust emissions by applying water or by presoaking.

- When materials are transported off site, all material will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container shall be maintained.

- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized of fugitive dust emissions using sufficient water or chemical stabilizer/suppressant.

- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.

- Throughout project construction, a qualified biologist will routinely monitor construction near the 100-foot no-disturbance buffer between potential valley elderberry longhorn beetle habitat and construction activities to prevent removal and disturbance of elderberry shrubs not approved by the Service.

- Reclamation intends to use the Stillwater Plains Mitigation Bank near Redding, California, to compensate for project-related effects on valley elderberry longhorn beetle habitat that cannot be avoided. Mitigation bank arrangements will be completed prior to groundbreaking activities.

- Prior to groundbreaking activities at sites where effects on valley elderberry longhorn beetles are assumed, all elderberry shrubs with one or more stems measuring 1.0 inch or more in diameter that will be directly affected by construction activities (i.e., that would otherwise be destroyed) will be transplanted to Stillwater Plains Mitigation Bank in accordance with Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Conservation Guidelines) (U.S. Fish and Wildlife Service 1996).

- Prior to groundbreaking activities at each site that will affect elderberry shrubs, compensation will be completed with Stillwater Plains Mitigation Bank prior to construction activities at that site.
- Reclamation will provide the Service with an annual report, prepared by a qualified

biologist, to document project progress, compensation activities, and results of pre-construction surveys required. Each report will also address project sites scheduled for the following construction season and state whether effects at the sites would be within the limits set forth in this biological opinion. Reclamation will reinitiation formal consultation if effects to the valley elderberry longhorn beetle are determined to be greater than the levels set forth in this biological opinion.

Status of the Species and Environmental Baseline

On August 8, 1980, the valley elderberry longhorn beetle was listed as a threatened species (Service 1980). Critical habitat for this species was designated and published at 50 CFR §17.95. Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. These designated areas of critical habitat are the American River Parkway Zone, an area along the lower American River at Goethe and Ancil Hoffman Parks, and the Sacramento Zone, an area located approximately one-half-mile from the American River downstream from the American River Parkway Zone. In addition, an area along Putah Creek, Solano County, and the area east of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to the Recovery Plan for the beetle (Service 1984). These critical and essential habitat areas support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

The beetle is dependent on its host plant, elderberry, which is a common component of the remaining riparian forests of the Central Valley. Use of the plants by the animal, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva just prior to the pupal stage. Recent field work along the Cosumnes River and in the Folsom Lake area indicates that larval galleries can be found in elderberry stems with no evidence of exit holes; the larvae either succumb prior to constructing an exit hole or are not far enough along in the developmental process to construct an exit hole. Larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level. The Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984) and Barr (1991) contain further details on the valley elderberry longhorn beetle's life history.

Population densities of the beetle are probably naturally low (Service 1984); and it has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle is a poor disperser. Low density and limited dispersal capability may cause the beetle to be vulnerable to the negative effects of the isolation of small subpopulations due to habitat fragmentation.

The beetle, though relatively wide-ranging, is in long-term decline due to human activities that have resulted in widespread alteration and fragmentation of riparian habitats, and to a lesser extent, upland habitats, that support the beetle. The primary threat to survival of the beetle continues to be loss and alteration of habitat, by agricultural conversion, levee construction, stream and river channelization, removal of riparian vegetation, rip-rapping of shoreline, urban, recreational, and industrial development, and grazing. Insecticide use and vegetation control in agricultural areas and along rights-of-way may be factors limiting the beetle's abundance and

distribution.

When the beetle was listed as threatened in 1980, the species was known from less than ten localities along the American River, the Merced River, and Putah Creek. By the time the *Valley Elderberry Longhorn Beetle Recovery Plan* was prepared in 1984, additional species localities had been found along the American River and Putah Creek. As of 2004, the California Natural Diversity Data Base (CNDDB) included 190 occurrences for this species in 44 drainages throughout the Central Valley, from a location along the Sacramento River in Shasta County southward to an area along Caliente Creek in Kern County (CNDDB 2004). The beetle continues to be threatened by habitat loss and fragmentation, invasion by Argentine ants (*Linepithema humile),* and possibly other factors such as pesticide drift, exotic plant invasions, and grazing.

Environmental Baseline

Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Huxel *et al.* 2001; Katibah 1984; Roberts *et al*. 1977; Thompson 1961). Since colonization, these forests have been "...modified with a rapidity and completeness matched in few parts of the United States" (Thompson 1961). As of 1849, the rivers and larger streams of the Central Valley were largely undisturbed. They supported continuous bands of riparian woodland four to five miles in width along some major drainages such as the lower Sacramento River, and generally about two miles wide along the lesser streams (Thompson 1961). Most of the riverine floodplains supported riparian vegetation to about the 100-year flood line (Katibah 1984). A large human population influx occurred after 1849, however, and much of the Central Valley riparian habitat was rapidly converted to agriculture and used as a source of wood for fuel and construction to serve a wide area (Thompson 1961). By as early as 1868, riparian woodland had been severely affected in the Central Valley, as evidenced by the following excerpt:

> "This fine growth of timber which once graced our river [Sacramento], tempered the atmosphere, and gave protection to the adjoining plains from the sweeping winds, has entirely disappeared - the woodchopper's axe has stripped the river farms of nearly all the hard wood timber, and the owners are now obliged to rely upon the growth of willows for firewood" (Cronise 1868, in Thompson 1961).

The clearing of riparian forests for fuel and construction made land available for agriculture. Natural levees bordering the rivers, once supporting vast tracts of riparian habitat, became prime agricultural land (Thompson 1961). As agriculture expanded in the Central Valley, needs for increased water supply and flood protection spurred water development and reclamation projects. Artificial levees, river channelization, dam building, water diversion, and heavy groundwater pumping further reduced riparian habitat to small, isolated fragments (Katibah 1984). In recent decades, these riparian areas have continued to decline as a result of ongoing agricultural conversion as well and urban development and stream channelization. As of 1989, there were over 100 dams within the Central Valley drainage basin, as well as thousands of miles of water delivery canals and streambank flood control projects for irrigation, municipal and

industrial water supplies, hydroelectic power, flood control, navigation, and recreation (Frayer *et al*. 1989). Riparian forests in the Central Valley have dwindled to discontinuous strips of widths currently measurable in yards rather than miles.

Some accounts state that the Sacramento Valley supported approximately 775,000 to 800,000 acres of riparian forest as of approximately 1848, just prior to statehood (Smith 1977; Katibah 1984). No comparable estimates are available for the San Joaquin Valley. Based on early soil maps, however, more than 921,000 acres of riparian habitat are believed to have been present throughout the Central Valley under pre-settlement conditions (Huxel *et al* 2001; Katibah 1984). Another source estimates that of approximately five million acres of wetlands in the Central Valley in the 1850s, approximately 1,600,000 acres were riparian wetlands (Warner and Hendrix 1985; Frayer *et al*. 1989).

Based on a California Department of Fish and Game riparian vegetation distribution map, by 1979, there were approximately 102,000 acres of riparian vegetation remaining in the Central Valley. This represents a decline in acreage of approximately 89 percent (Katibah 1984). More extreme figures were given by Frayer *et al*. (1989), who reported that woody riparian forests in the Central Valley had declined to 34,600 acres by the mid-1980s (from 65,400 acres in 1939). Although these studies have differing findings in terms of the number of acres lost (most likely explained by differing methodologies), they attest to a dramatic historic loss of riparian habitat in the Central Valley. As there is no reason to believe that riparian habitat suitable to the beetle (elderberry shrubs) would be destroyed at a different rate than other riparian habitat, we can assume that the rate of loss for beetle habitat in riparian areas has been equally dramatic.

A number of studies have focused on riparian vegetation losses along the Sacramento River, which supports some of the densest known populations of the beetle. Approximately 98 percent of the middle Sacramento River's historic riparian vegetation was believed to have been extirpated by 1977 (DWR 1979). The State Department of Water Resources estimated that native riparian habitat along the Sacramento River from Redding to Colusa decreased from 27,720 acres to 18,360 acres (34 percent) between 1952 and 1972 (McGill 1975; Conrad *et al*. 1977). The average rate of riparian loss on the middle Sacramento River was 430 acres per year from 1952 to 1972, and 410 acres per year from 1972 to 1977. In 1987, riparian areas as large as 180 acres were observed converted to orchards along this River (McCarten and Patterson 1987).

Barr (1991) examined 79 sites in the Central Valley supporting valley elderberry longhorn beetle habitat. When 72 of these sites were re-examined by researchers in 1997, seven no longer supported valley elderberry longhorn beetle habitat. This loss represents a decrease in the number of sites with valley elderberry longhorn beetle habitat by approximately nine percent in six years.

No comparable information exists on the historic loss of non-riparian valley elderberry longhorn beetle habitat such as elderberry savanna and other vegetation communities where elderberry shrubs also occur (oak or mixed chaparral-woodland, or grasslands adjacent to riparian habitat). However, all natural habitats throughout the Central Valley have been heavily adversely affected within the last 200 years (Thompson 1961), and we can therefore assume that non-riparian beetle

habitat also has suffered a widespread decline. This analysis focuses on loss of riparian habitat because the beetle is primarily dependent upon riparian habitat. The riparian acreage figures given by Frayer *et al*. (1989) and Katibah (1984) included oak woodlands concentrated along major drainages in the Central Valley, and therefore probably included lands we would classify as upland habitat for the beetle adjacent to riparian drainages.
Between 1980 and 1995, the human population in the Central Valley grew by 50 percent, while the rest of California grew by 37 percent . The Central Valley's population was 4.7 million by 1999, and it is expected to more than double by 2040. The American Farmland Trust estimates that by 2040, more than 1 million cultivated acres will be lost and 2.5 million more put at risk (Ritter 2000). With this growing population in the Central Valley, increased development pressure is likely to result in continuing loss of riparian habitat.

While habitat loss is clearly a large factor leading to the species' decline, other factors are likely to pose significant threats to the long term survival of the beetle. Only approximately 20 percent of riparian sites with elderberry observed by Barr (1991) and Collinge *et al*. (2001) support beetle populations (Barr 1991, Collinge *et al*. 2001). Jones and Stokes (1988) found 65 percent of
4,800 riparian acres on the Sacramento River have evidence of beetle presence. The fact that a large percentage of apparently suitable habitat is unoccupied suggests that the beetle is limited by factors other than habitat availability, such as habitat quality or limited dispersal ability.

Destruction of riparian habitat in central California has resulted not only in a significant acreage loss, but also has resulted in beetle habitat fragmentation. Fahrig (1997) states that habitat fragmentation is only important for habitats that have suffered greater than 80 percent loss. Riparian habitat in the Central Valley, which has experienced greater than 90 percent loss by most estimates, would meet this criterion as habitat vulnerable to effects of fragmentation. Existing data suggests that beetle populations, specifically, are affected by habitat fragmentation. Barr (1991) found that small, isolated habitat remnants were less likely to be occupied by beetles than larger patches, indicating that valley elderberry longhorn beetle subpopulations are extirpated from small habitat fragments. Barr (1991) and Collinge *et al*. (2001) consistently found valley elderberry longhorn beetle exit holes occurring in clumps of elderberry bushes rather than isolated bushes, suggesting that isolated shrubs do not typically provide long-term viable habitat for this species. Local populations of organisms often undergo periodic colonization and extinction, while the metapopulation (set of spatially separated groups of a species) may persist (Collinge 1996).

Habitat fragmentation can be an important factor contributing to species declines because: (1) it divides a large population into two or more small populations that become more vulnerable to direct loss, inbreeding depression, genetic drift, and other problems associated with small populations; (2) it limits a species' potential for dispersal and colonization; and (3) it makes habitat more vulnerable to outside influences by increasing the edge: interior ratio (Primack 1998).

Small, isolated subpopulations are susceptible to extirpation from random demographic, environmental, and/or genetic events (Shaffer 1981; Lande 1988; Lande 1993; Primack 1998).

While a large area may support a single large population, the smaller subpopulations that result from habitat fragmentation may not be large enough to persist over a long time period. As a population becomes smaller, it tends to lose genetic variability through genetic drift, leading to inbreeding depression and a lack of adaptive flexibility. Smaller populations also become more vulnerable to random fluctuations in reproductive and mortality rates, and are more likely to be extirpated by random environmental factors.

The beetle is a specialist on elderberry plants, and tends to have small population sizes and occurs in low densities (Barr 1991; Collinge *et al*. 2001). Collinge *et al*. (2001) compared resource use and density of exit holes between the beetle and a related subspecies, the California elderberry longhorn beetle (*Desmocerus californicus californicus*). The valley elderberry longhorn beetle tended to occur in areas with higher elderberry densities, but had lower exit hole densities than the California elderberry longhorn beetle. With extensive riparian habitat loss and fragmentation, these naturally-small valley elderberry longhorn beetle populations are broken into even smaller, isolated populations. Once a small valley elderberry longhorn beetle population has been extirpated from an isolated habitat patch, the species may be unable to re-colonize this patch if it is unable to disperse from nearby occupied habitat. Insects with limited dispersal and colonization abilities may persist better in large habitat patches than small patches because small fragments may be insufficient to maintain viable populations and the insects may be unable to disperse to more suitable habitat (Collinge 1996).

Studies suggest that the beetle is unable to re-colonize drainages where the species has been extirpated, because of its limited dispersal ability (Barr 1991; Collinge *et al*. 2001). Huxel and Hastings (1998) used computer simulations of colonization and extinction patterns based on differing dispersal distances, and found that the short dispersal simulations best matched the 1997 census data in terms of site occupancy. This suggests that dispersal and colonization are limited to nearby sites. At spatial scales greater than 6.2 miles, such as across drainages, valley elderberry longhorn beetle occupancy appears to be strongly influenced by regional extinction and colonization processes, and colonization is constrained by limited dispersal (Collinge *et al*. 2001; Huxel and Hastings 1998). Except for one occasion, drainages examined by Barr that were occupied in 1991 remained occupied in 1997 (Collinge *et al*. 2001; Huxel and Hastings 1998) drainages found by Barr (1991) to be unoccupied in 1991 were also unoccupied in 1997. This data suggests that drainages unoccupied by the valley elderberry longhorn beetle remain so. Habitat fragmentation not only isolates small populations, but also increases the interface between habitat and urban or agricultural land, increasing negative edge effects such as the invasion of non-native species (Huxel *et al*. 2001; Huxel 2000; Soule 1990) and pesticide contamination (Barr 1991). Several edge effect-related factors may be related to the decline of the valley elderberry longhorn beetle.

Numerous elderberry shrubs in both upland and riparian habitats occur within and adjacent to the Restoration Project area. CNDDB records document an occurrence of elderberry shrubs with old exit holes 0.7 mile east of Paynes Creek, approximately 5 miles from the project site. Therefore, given the biology and ecology of the valley elderberry longhorn beetle, the presence of suitable habitat within and adjacent to the action area, as well as the records of the valley elderberry

longhorn beetle (exit holes), the Service believes it is reasonable to assume the animal inhabits the action area.

Effects of the Proposed Action

The proposed action may affect all beetles inhabiting no more than 26 elderberry shrubs, each with at least one stem measuring 1.0 inch or greater in diameter at ground level, or no more than 108 elderberry stems measuring 1.0 inch or greater in diameter at ground level due to routine maintenance activities during the project. Any early-stage individuals of the beetle occupying plants that will be transplanted may be injured or killed when the plants are moved. Physical damage and physiologic stress to elderberry plants reduces their value as habitat for the beetle. Mortality of transplanted elderberry plants or cuttings would preclude their future use by the beetle. Branches containing larvae may be cut, broken, or crushed as a result of the transplantation process. Although compensation for effects on the beetle includes creation (plantings of seedlings or cuttings) or restoration (transplanting) of habitat (plants), it generally takes five or more years for elderberry plants to reach a size conducive to use by the beetle, and it generally takes 25 years or longer for riparian habitats to reach their full value (Service 1984). Currently, none of the surveyed elderberry shrubs that will be affected by the Restoration Project contain exit holes.

Temporal loss of habitat will reduce the amount of habitat available to beetles, which could cause fragmentation of habitat and isolation of subpopulations. Indirect effects to the beetle will also result from habitat fragmentation through removal of elderberry plants. Habitat fragmentation can inhibit dispersal and colonization of beetles between remaining habitat areas. Fragmentation may lead to population declines and localized extinctions by dividing a population into smaller, isolated subpopulations in restricted areas (Collinge *et al.* 2001). These smaller populations may then be adversely affected by inbreeding depression, genetic drift, and other problems associated with small population size (Primack 1998).

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed Restoration Project are not considered in this section, because they require separate consultation pursuant to section 7 of the Act.

The Service is not aware of any other specific projects that might affect the beetle or its habitat that are currently under review by State, county, or local authorities. Nevertheless, continued human population growth in the Central Valley and the foothills, is expected to drive further development of agriculture, cities, industry, transportation, and water resources in the foreseeable future. Since 1990, census estimates for Shasta and Tehama Counties, show about 10% and 12% growth, respectively (U.S. Census Bureau). Increasing human population pressures of land conversion, development, resource use, and pollution will likely result in continuing loss, degradation, and fragmentation of riparian habitat. Some of these activities will not be subject to Federal jurisdiction and are likely to result in loss of riparian and other habitats where elderberry shrubs and the valley elderberry longhorn beetle occur.

Conclusion
After reviewing the current status of the beetle, the environmental baseline for the area covered by this biological opinion, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the Restoration Project, as proposed, is not likely to jeopardize the continued existence of the beetle. The proposed project will not result in destruction or adverse modification of beetle critical habitat, as none is present on the action area.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take
The Service anticipates incidental take of the beetle will be difficult to detect or quantify. The cryptic nature of these species and their relatively small body size make the finding of an injured or dead specimen unlikely. The species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of valley elderberry longhorn beetles that will be taken as a result of the proposed project, the Service is quantifying take incidental to the project as all beetles inhabiting or otherwise utilizing the elderberry shrubs containing stems 1.0 inch or greater in diameter at ground level located within the action area where avoidance measures are not implemented. Therefore, the proposed project may incidentally take all beetles inhabiting up to 26 elderberry shrubs, containing no more than 108 stems measuring over one inch in diameter, on the proposed Restoration Project site.

Upon implementation of the following reasonable and prudent measures, incidental take

associated with the proposed Restoration Project on the valley elderberry longhorn beetle in the form of harm, harassment, injury or mortality from habitat loss or direct mortality will become exempt from the prohibitions described under section 9 of the Act for direct and indirect effects.

Effect of the Take
In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy to the beetle or result in destruction or adverse modification of critical habitat. We base our determination on the implementation of the Conservation Measures as described in the project description.

Reasonable and Prudent Measures
The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the valley elderberry longhorn beetle:

> Minimize the project effects to the valley elderberry longhorn beetle and to elderberry shrubs (habitat) throughout the action area.

Terms and Conditions
In order to be exempt from the prohibitions of section 9 of the Act, Reclamation must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

a. Reclamation shall minimize the potential for incidental take of the beetle resulting from the project related activities by implementation of the conservation measures as described in the ASIP and the project description of this biological opinion.

b. Reclamation shall include a copy of this biological opinion within its solicitations for design and construction of the proposed project making the prime contractor responsible for implementing all requirements and obligations included within the biological opinion, and to educate and inform all other contractors involved in the project as to the requirements of the biological opinion. A copy of the solicitations containing the biological opinion also will be provided to the Chief of Endangered Species (Forest-Foothills) at the Sacramento Fish and Wildlife Office.

c. If requested, before, during or after completing ground breaking, Reclamation shall allow access by Service and California Department of Fish and Game personnel to the project site to inspect the effects on listed species and their habitats.

d. Reclamation shall adhere to the reporting requirements as described below in this biological opinion.

Reporting Requirements

Reclamation will provide the Service with an annual report, due by March 1 of each year and prepared by a qualified biologist, to document project progress, compensation activities, and results of pre-construction surveys required. Each report will also address project sites scheduled for the following construction season and state whether effects at the sites would be within the limits set forth in this biological opinion. The content and format of the report will be agreed upon between Reclamation and the Service prior to the completion of the first report due.

The Service shall be notified immediately by facsimile or telephone and in writing within one (1) working day of any unanticipated take of beetle, and of the take or suspected take of listed wildlife species not authorized in this opinion. Notification must include the date, time, and location of the incident of the incident or of the finding of a dead or injured animal, and any other pertinent information. The Service contact persons are the Chief of the Endangered Species Division, at (916) 414-6600 and the Resident Agent-in-Charge of the Service's Law Enforcement Division at (916) 414-6660.

Any dead or injured beetles must be relinquished to the Service. Any killed species that have been taken shall be properly preserved in accordance with the techniques recommended by the Entomology Department of the California Academy of Sciences. Information concerning how the animal was taken, length of the interval between death and preservation, and any other relevant information should be written on 100% rag content paper with permanent ink and included in the container with the specimen. Preserved specimens shall be delivered to the Service's Division of Law Enforcement at 2800 Cottage Way, Room W-2928, Sacramento, California 95825-1846, phone (916) 414-6660.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and databases.

Reclamation should continue to assist the Service in the implementation of recovery efforts for the valley elderberry longhorn beetle.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the proposed Battle Creek Salmon and Steelhead Restoration project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action

is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; (4) the construction outlined in the project description is not initiated within two (2) years of the date of this biological opinion; or (5) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Please contact Kathy Brown or Roberta Gerson, Forest-Foothills Branch Chief, of this office at (916) 414-6600, if you have any questions regarding the Battle Creek Salmon and Steelhead Restoration project.

cc:
ARD (ES), Portland, Oregon
Mary Marshall, Bureau of Reclamation, Regional Office, Sacramento, California
Doug Kleinsmith, Bureau of Reclamation, Regional Office, Sacramento, California

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