Isabella Lake Dam Safety Modification Project Environmental Impact Statement
Draft

Volume II – Appendices

March 2012

U.S. Army Corps of Engineers,
Sacramento District – Lead Agency

US Army Corps of Engineers®

U.S. Department of Agriculture, Forest Service
Sequoia National Forest – Cooperating Agency

Forest Service

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PUBLIC SCOPING REPORT (ABRIDGED)

Isabella Lake Dam Safety Modification Environmental Impact Statement

Public Scoping Report

September 2011

Prepared for:

U.S. Army Corps of Engineers,
Sacramento District

Prepared by:

Tetra Tech, Inc.

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OVERVIEW

OVERVIEW

This Public Scoping Report documents continuing efforts by the US Army Corps of Engineers (Corps), Sacramento District to present information to the public and solicit public comments regarding the Isabella Lake Dam Safety Modification (DSM) Project Environmental Impact Statement (EIS). This report provides an overview of scoping process and a review of the scoping and public participation activities conducted to date. It also includes a compilation of all of the materials associated with three Public Scoping Meetings conducted in May 2011 in Kernville, Lake Isabella and Bakersfield, additional scoping comments and an updated mailing list.

Scoping is a public process designed to determine issues and alternatives to be addressed in a NEPA document. The scoping process for the EIS began on February 5, 2010, with the publication of the Notice of Intent (NOI) in the *Federal Register*. The NOI provided formal notification to the public and agencies that an EIS would be prepared for this project. The US Environmental Protection Agency provided the only written comment to the Corps in response to the publication of the NOI.

In May 2010, two Initial Public Meetings were held, one in Kernville and the other in Bakersfield. These meetings were conducted to brief the public on the deficiencies identified in the Isabella Lake DSM Project and to report on the ongoing investigations and activities being conducted at the facility, to outline the process going forward, and to provide an opportunity to submit questions and general comments on the Isabella Lake DSM Project. Summaries of these two meetings and the materials presented by the Corps are contained in the *Initial Public Scoping Meetings, Scoping Report, Isabella Lake DSM Project,* dated August 2010.

A second set of Public Information Meetings were held in December 2010 in Lake Isabella and Bakersfield. The Corps provided an update on the status of the Isabella Lake DSM Project, including the dam safety investigations and the preliminary risk reduction measures under consideration in formulating remediation alternatives. There was also a discussion of the environmental review process and the environmental studies being prepared in support of the project. Again, the public was given an opportunity during the meetings to provide input regarding issues of concern and to ask questions of the panel. Summaries of these two information meetings and the materials presented by the Corps are contained in the *Preliminary Public Participation Report, Isabella Lake DSM Project,* dated January 2011.

Three Public Scoping Meetings were held May 17-19, 2011, in Kernville, Lake Isabella, and Bakersfield to present the Alternative Risk Management Plans (RMPs) being considered and evaluated in the EIS, and to seek input on the issues, resource concerns, alternatives and potential impacts that should be considered in the EIS. At the meetings, the Corps described the Alternative RMPs that are being evaluated that address seismic, seepage and hydrologic deficiencies at Isabella's Main and Auxiliary Dams. The potential environmental impacts associated with these alternatives will be evaluated in the EIS. Summaries of these three meetings and the materials presented by the Corps are presented in this report.

Public interest in the project is high, and the Corps will continue public participation efforts throughout the EIS development process. After a Notice of Availability and a Draft of the Isabella Lake DSM Project EIS are released in early 2012, public hearings will be scheduled during the comment period in Kernville, Lake Isabella, and Bakersfield to receive public comment on the Draft EIS.

The Corps maintains mailing and e-mail distribution lists to communicate and coordinate with stakeholders, including government entities and officials, tribal groups, water users, media, and those who have signed up at public meetings or otherwise asked to be added to the mailing list.. The Corps also maintains a public website on Isabella Lake and the DSM project, http://www.spk.usace.army.mil/projects/civil/Lake_Isabella_Dam/Index.html, and posts monthly situation reports and other materials summarizing Corps activities in support of the Isabella Lake DSM Project. From the public scoping meetings and the other public meetings and interagency coordination conducted to date by the Corps, the following issues have been identified so far as key concerns and questions relevant to the scope of the EIS:

- The urgency of the need to address public safety;
- The specific RMPs, project details and the time frames for implementation of the DSM Project;
- The construction and long-term effects on lake levels, flood control and irrigation water storage;
- The downstream effects on hydropower and Kern River rafting;
- The construction and long-term effects on water quality, fisheries and natural resources;

- The impacts on lake-based recreation, recreation opportunities, and the local recreation-based economy;
- The impacts on current grazing allotments;
- The offsite borrow sources under consideration;
- The positive and negative socioeconomic effects on the Kern River Valley economy and workforce from construction;
- Cultural resource impacts and tribal concerns with the project;
- The potential real estate acquisitions and relocations associated with the project;
- Worker housing during construction; and
- Impacts on traffic, noise, and air quality during construction.

This report is divided into eight sections including this overview. The next section includes copies of the press release, advertisement and mailer that were distributed to publicize all of the meetings. The advertisement was placed in three local newspapers. The press releases and mailers were distributed both electronically and by regular mail, as appropriate.

The next section includes the poster displays, handouts and PowerPoint presentation that were common to all the meetings. The following three sections include the notes, sign-in sheets, comment sheets and speaker signups for the Kernville, Lake Isabella, and Bakersfield meetings. Next are the comments received by the Corps subsequent to the public meetings. The final section is a printout of the master mailing list, current as of August 25, 2011.

KERNVILLE
PUBLIC SCOPING MEETING;
NOTES AND MEETING MATERIALS

MAY 17, 2011

ISABELLA LAKE DAM SAFETY MODIFICATION EIS
US ARMY CORPS OF ENGINEERS
PUBLIC SCOPING MEETING
ODD FELLOWS HALL
KERNVILLE, CALIFORNIA
MAY 17, 2011

- Attendance: ±46
- 6 Display Panels welcomed the residents
- Attendees were asked to sign in and given an agenda and handouts
- Comment Forms were provided; five (5) were submitted
- No speakers signed up

Meeting Notes

An Open House with display panels, handouts, and US Army Corps of Engineers (Corps) personnel took place from 6:00 pm until 6:30 pm.

David Broadfoot, Tetra Tech Project Manager under contract with the Corps, acted as moderator and began the meeting at 6:30 p.m. with opening remarks and an introduction of the project. Introductions of Corps and US Forest Service personnel in attendance were made. The presentation panel consisted of Veronica Petrovsky, Corps Project Manager; David Serafini, Corps Lead Engineer; and Mitch Stewart, Corps Environmental Lead, and Marci Jackson, Planning Corps Lead. Mr. Broadfoot explained the purpose and goals of the Scoping Process then introduced Mitch Stewart at 6:35 to begin the presentation.

Mr. Stewart began the presentation accompanied by power point slides. Mr. Stewart discussed the purpose and goals of the Scoping Process, the environmental process and current status of how the Corps was moving forward. Ms. Veronica Petrovsky discussed the primary purpose of the dams, the current deficiencies and consequences of dam failure. David Serafini assisted Ms. Petrovsky in the presentation with technical and hydrologic information, discussion of the alternatives. Marci Jackson presented the required alternative plans and EPA requirements.

Questions from the floor during the presentation – *What type of filter is being referred to with the auxiliary dam and what is the purpose? Is it necessary to drain the lake during remediation of the auxiliary dam?*

The presentation highlighted the goals and expectations, the dams' deficiencies and primary issues, the potential consequences of a catastrophic failure, interim risk reduction measures (IRRM) to date, the alternatives being analyzed, environmental considerations, and timelines.

The presentation was concluded at 7:40 p.m.

Mr. Broadfoot thanked the Corps and asked if there were any speakers in the audience who wished to sign up. Mr. Broadfoot discussed the importance of public input and comments and encouraged all to submit comments by mail, e-mail, fax, or in person.

Mr. Broadfoot opened the meeting to a Question and Answer period:

Question from Mr. Ernie Anderson, Kernville resident
Will the Forest Service office be relocated? How will this be addressed?

- David Broadfoot indicated that the US Forest Service (USFS) and USACE buildings would be relocated.

Question from Mr. Tom Teofilo owner of the Lodge at Painted Rock and Keyesville resident
Is a traffic study part of the EIS? If so, then the traffic on 155 needs to be analyzed, and the study should include how it would affect economics.

Question from Mr. Darl Snyder, Kernville resident
If the dam is being raised, effects on adjacent land need to be analyzed.

Question from Mr. Rex Keeling, Kernville resident
The traffic study should address impacts on 178 through the canyon and at the mouth of the canyon, not just on local road around the lake.

Question from Mr. Darl Snyder, Kernville resident
Project should consider using local contractors and employees. I am a contractor who specializes in blasting, mining, and construction.

Comments from Mr. Rick Larson with the USFS
When can we provide comments?

- David Broadfoot indicated that the sooner we receive comments, the better.

Comments from Mr. Richard Rowe, resident of Wofford Heights
Several items need to be addressed in the DEIS

1. *Economic impacts during construction to the entire Kern River Valley area*
2. *What are the impacts of the construction worker who take up all available restaurant and lodging?*
3. *With auxiliary alternative and the land buttress, how is the CORPS going to mitigate wetlands disturbance. Habitat mitigation needs to be developed.*

Question from Mr. Steven Mayer, Bakersfield Californian reporter
What is the purpose of raising the dam, why are there several alternatives?

- David Serafini explained that the options look at optimizing the dam and modifications and minimizing the impacts

Question from Ms. Barbara Hinkey, Kernville resident
If the height of the dam is raised, will lake level also be raised?

- Veronica Petrovsky indicated this is not the intent, but to prevent a catastrophic event

Question from Ms. Cathy Perfect, Kern Valley Sun Managing Editor and Lake Isabella resident
When the dams are fixed, will the pool restriction be lifted?

- Response by David Serafini is yes, as soon as modifications are completed.

Comment from Mr. Tom Teofilo, owner of the Lodge at Painted Rock and Keyesville resident
Wants the fiscal impacts addressed in documents. What are the associated annual additional costs once the modifications are complete? The cost factors need to be identified in the DEIS.

- Veronica Petrovsky responded that with the removal of the Borel Canal, costs would actually be reduced. The Corps is currently responsible for the maintenance of the canal.

Question from Mr. Cody Norris, US Forest Service
What is the maximum outflow of the spillway currently and without the spillway & failure?

- The outflow is 10,000-12,000 cfs. If the dam failed there would be millions of cfs

Comment from Mr. Darl Snyder
The Corps needs to hire local contractors and workers

Seeing no additional questions or comments, Mr. Broadfoot asked for anyone who wished to speak to come forward if desired.

Mr. Broadfoot asked for additional questions and/or discussion. Seeing none, Mr. Broadfoot reminded the attendees of the importance of submitting their comments to the Corps.

The meeting was concluded at 8:00 p.m.

Kernville Scoping Meeting Materials

Sign In Sheets
Submitted Comment Forms
Speaker Sign-In

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG®

Isabella Lake Dam Safety Modification Study

Kernville
Public Scoping Meeting

Tuesday May 17, 2011

SIGN IN SHEET

Name	Affiliation (optional)	Email	Would you like to receive project updates? ☐ by Mail ☐ by Email
STEVEN MAYER	THE BAKERSFIELD CALIFORNIAN	SMAYER@BAKERSFIELD.COM	

Address	City	State	Zip	Phone
PO BOX 440	BAKERSFIELD	CA	93302	395-7353

Name	Affiliation (optional)	Email	Would you like to receive project updates? ☐ by Mail ☐ by Email
Terry Fallesen	SCE		

Address	City	State	Zip	Phone
300 N. Lone Hill	San Dimas	Ca	91773	909-394-8938

Name	Affiliation (optional)	Email	Would you like to receive project updates? ☐ by Mail ☐ by Email
Trenton Jenett			

Address	City	State	Zip	Phone
601 Sirretta st	Kernvile	CA	93238	(760)376 1185

Name	Affiliation (optional)	Email	Would you like to receive project updates? ☐ by Mail ☐ by Email
Brian Cossgrove		blasttmann@AOL.COM	

Address	City	State	Zip	Phone
PO Box 1941	KERNVILLE	CA	93238	760549 3760

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Kernville
Public Scoping Meeting

Tuesday May 17, 2011

SIGN IN SHEET

Name: Gene Hawkins
Affiliation (optional): SCE
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 300 N. Lone Hill Ave
City: San Dimas
State: CA
Zip: 91773
Phone: 909 394 8525

Name: Richard Rowe
P O Box 8 Wofford Hts CA
Affiliation (optional): KRVR
Email: owoeinkrv@occhsi-lol
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address: Angie DelGado
City: Kernville
State:
Zip:
Phone:

Name: John + Jenny Hanley
Affiliation (optional): KRVR-Kernville Residents
Email: JHanley999@msn.com
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address:
City:
State:
Zip:
Phone:

Name:
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address:
City:
State:
Zip:
Phone:

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
Heather Jackson	USACE		☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
1325 J St	Sacramento	CA 95814	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Pam Koidahl	Citizen		☒ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
PoBox 1215	Kernville	CA 93238	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Kimberley Cushman	Lake Isabella KOA	Kcushman2@gmail.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
PO BOX 663	Kernville	CA	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Ernie Anderson	USGS (ret)		☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
PO Box 347	Kernville		760 376 3662

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
JOHN NOVOSEL		NONE	[x] by Mail [ ] by Email

Address	City	State	Zip	Phone
PO BOX 471	KERNVILLE	CA	93238	760-376-2816

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Brenda Ehmann	U.S.F.S.	behmann@fs.fed.us	[ ] by Mail [x] by Email

Address	City	State	Zip	Phone
109 Whitney Rd.	Kernville	CA	93239	760·376·3781

Name	Affiliation (optional)	Email	Would you like to receive project updates?
BARB HINKEY		BARBARA@RIVERCHILDREN.NET	[ ] by Mail [x] by Email

Address	City	State	Zip	Phone
POBx 1193	KERNVILLE	CA	93283	760-376-2963

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Rex Keeling		rexcavation@aol.com	[ ] by Mail [ ] by Email

Address	City	State	Zip	Phone
Box 37	Kernville	CA	93238	760-376-1452

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
J. J. Barm	USACE		☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
1325 J. Street	Sacramento	CA	95814	916 5576656

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Tyler Willsey	~~Sacramento~~		☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
	Sacramento	Ca	95825	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Harry Kohler	Sacramento	CA 95825	☐ by Mail ☐ by Email

Address	City	State	Zip	Phone

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Bill Jewell			☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
P.O. Box 562	Kernville	Ca		

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Tuesday May 17, 2011

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
Sharon Bonorden		tosaddleahorse@yahoo.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
P.O. Box 1657	Weldon	CA 93283	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
DARL SNYDER		DARLSNYDER@HOTMAIL.COM	☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
5471 S. KELSO VALLEY	WELDON	93283	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Cody Norris	Forest Service	csnorris@fs.fed.us	☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
4875 Ponderosa Dr.	Lake Isabella	CA 93240	(760) 384-8017

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Bob Barnes	KRV Heritage Found.	bbarnes@lightspeed.net	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
1009 Las Cruces Ave.	Ridgecrest	CA 93555	760-382-1260

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Kernville
Public Scoping Meeting

Tuesday May 17, 2011

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Name: Martha Jackson
Affiliation (optional): USACE SPK-PD-WW
Email: martha.c.jackson@USACE.ARMY.MIL
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 1325 J. Street
City: Sacramento
State: CA
Zip: 95814
Phone: (916)557-6709

Name: CATHY PERFECT
Affiliation (optional): KERN VALLEY SUN
Email: editor@kvsun.com
Would you like to receive project updates? ☐ by Mail ☑ by Email
Address: P.O. Box 3074
City: L.I.
State: CA.
Zip: 93240
Phone: 760-379-3667, ext. 14

Name: DAVID SERAFINI
Affiliation (optional): USACE (SPK)
Email: david.c.serafini@usace.army.mil
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 1325 J. St
City: Sacramento
State: CA
Zip: 95814
Phone: (916) 557-7564

Name: MICHAEL V. WELCH
Affiliation (optional): PORTERVILLE
Email:
State: CA
Would you like to receive project updates? ☐ by Mail ☐ by Email
Phone: 605-760-3041
Address:
City:
Zip:

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Name: Martin Milobar
Affiliation (optional): BuenaVista W.S.D
Email: mmilobar@bvh2o.com
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 525 N. Main St.
City: Buttonwillow
State: Ca
Zip: 93206
Phone: 661-301-8107

Name: Tom Teofilo
Affiliation (optional): Lodge at Painted Rock
Email: Tom@Teofilo.com
Would you like to receive project updates? ☐ by Mail ☒ by Email
Also -Address: Lives in Kernville —
2908 Pearl Harbor Dr., Lake Isabella
City:
State: CA
Zip: 93240
Phone: 562 413-5664

Name: Brian Mauer
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 2 Spruce Kernville Ca 93238
P.O. Box 1412 Kernville Ca.
City: Kernville
State: Ca
Zip: 93238
Phone: 760-376-8806

Name: Leann Norris
Affiliation (optional):
Email: leann_hari@hotmail.com
Would you like to receive project updates? ☒ by Mail ☐ by Email
Address: 2407 Alta Sierra Ave
City: Lake Isabella
State: CA
Zip: 93240
Phone: 270-804-8572

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Name: Laura Berry
Affiliation (optional): Weldon
Email: mountainmiss@mchsi.com
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address:
City:
State: CA
Zip: 93283
Phone: 661 332 7704

Name: Robert Burkhart
Affiliation (optional): Resident
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: P.O Box 1533
City: Kernville
State: Ca
Zip: 93238
Phone:

Name: Bill HEINZE
Affiliation (optional): SCE
Email: HEINZEWFD SCE.com
Would you like to receive project updates? ☐ by Mail ☑ by Email
Address: Box 1650
City: KERNVILLE
State: CA
Zip: 93238
Phone: 760 376 3883

Name: Matt Sheskier
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address:
City:
State:
Zip:
Phone: 720-398-7525

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Public Scoping Meeting

COMMENT FORM

Name: Brian Cosgrove

Address: PO Box 1941 KERNVILLE CA 93238

Email: blasttmann@AOL.com Affiliation (If Any):

Comment (Please Print): please define the type of foundation treatment IE. slurry wall grout curtain etc.

Thanks

Send email

5/17

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

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Public Scoping Meeting

COMMENT FORM

Name: Robert Burkhart

Address: P.O. Box 1533 - Kernville, Ca 93238

Email: NONE Affiliation (If Any): Resident

Comment (Please Print): #1 When Constuction starts the inflax of workes as it was when Dam was built some 50+ years ago - between the ACE & RMK-BMJ - the construction Company, a housing area for temp. maybe up to maybe 5 years as it was in the 50's a mobile / R.V. Park could be built in a selected area, to be used for all workers + familys and when construction is over Park could be sold to some one.

#2 "Constuction" unlike during build of the Dam - there is "a Life" in the Kern River Valley & this Life is realy alive - Many People depand on this Dam - Lake for Life - a Living - Some for many years - and Some want too for many more years. How to & Where & When work we hope will disturb the Livley hood of the people that live & work here. As to Roads of travel as we have at this time on the back side of the Lake -

Construction - Employment - Like our Logo/Slogan - "Shop Local" - "Employ Local" please

5/17

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Public Scoping Meeting

COMMENT FORM

Name: Laura Berry

Address: 4167 Kelso Creek Rd Weldon 93283

Email: mountainmiss@mchsi.com Affiliation (If Any):

Comment (Please Print): When construction starts when will each phase of each alternative be complete? Will one altertaive take less time than another one or will they all take the same amount of time to complete each phase?

5/17

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COMMENT FORM

Name: Tom Teofilo

Address: 2908 Pearl Harbor Dr., Lake Isabella (Keyesville)

Email: Tom@Teofilo.Com Affiliation (If Any):

Comment (Please Print):

Please consider potential adverse affects of construction to new executive retreat facility in Keyesville.

See website: www.LodgeAtPaintedRock.com

5/17

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COMMENT FORM

Name: Bob Barnes

Address: 1009 Las Cruces Ave., Ridgecrest, CA 93555

Email: bbarnes@lightspeed.net Affiliation (If Any): Arthur + Sidney R. Barnes Fam. Found

Comment (Please Print):

Housing for workers over a long term — weeks, months, years...

Need to mitigate for use of limited motel room availability + impacts on local tourism industry. Depending chosen solution the # of workers over a long time preventing use of X number of rooms for tourism.

Other -

mitigate if wetlands impacted

U.S. ARMY CORPS OF ENGINEERS

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Isabella Lake Dam Safety Modification Study

Kernville Public Scoping Meeting

Tuesday May 17, 2011

SPEAKER SIGN-UP

If you would like to present a verbal comment or ask a question of the panel, please sign up here:

	Name *(Please print)*	Affiliation	
1			☐
2			☐
3			☐
4			☐
5			☐
6			☐
7			☐
8			☐
9			☐
10			☐
11			☐
12			☐
13			☐
14			☐
15			☐
16			☐
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20			☐
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27			☐
28			☐

LAKE ISABELLA
PUBLIC SCOPING MEETING:
NOTES AND MEETING MATERIALS

MAY 18, 2011

ISABELLA LAKE DAM SAFETY MODIFICATION EIS
US ARMY CORPS OF ENGINEERS
PUBLIC SCOPING MEETING
KERN RIVER VALLEY SENIOR CENTER
LAKE ISABELLA, CALIFORNIA
MAY 18, 2011

- Attendance: ±42
- 6 Display Panels welcomed the residents
- Attendees were asked to sign in and given an agenda and handouts
- Comment Forms were provided; ten (10) were submitted
- Three (3) speakers signed up

Meeting Notes

An Open House with display panels, handouts, and US Army Corps of Engineers (Corps) personnel took place from 6:00 pm until 6:30 pm.

David Broadfoot, Tetra Tech Project Manager under contract with the Corps, acted as moderator and began the meeting at 6:30 p.m. with opening remarks and an introduction of the project. Introductions of Corps and US Forest Service personnel in attendance were made. The presentation panel consisted of Veronica Petrovsky, Corps Project Manager; David Serafini, Corps Lead Engineer; and Mitch Stewart, Corps Environmental Lead, and Marci Jackson, Planning Corps Lead. Mr. Broadfoot explained the purpose and goals of the Scoping Process then introduced Mitch Stewart at 6:40 to begin the presentation.

Mr. Stewart began the presentation accompanied by power point slides. Mr. Stewart discussed the purpose and goals of the Scoping Process, the environmental process and current status of how the Corps was moving forward. Ms. Veronica Petrovsky discussed the primary purpose of the dams, the current deficiencies and consequences of dam failure. David Serafini assisted Ms. Petrovsky in the presentation with technical and hydrologic information, discussion of the alternatives. Marci Jackson presented the required alternative plans and EPA requirements.

The presentation highlighted the goals and expectations, the dams' deficiencies and primary issues, the potential consequences of a catastrophic failure, interim risk reduction measures (IRRM) to date, the alternatives being analyzed, environmental considerations, and timelines.

The presentation was concluded at 7:35 p.m.

Mr. Broadfoot thanked the Corps and asked if there were any other speakers in the audience who wished to sign up and noted that speakers would follow a question and answer period. Mr. Broadfoot discussed the importance of public input and comments and encouraged all to submit comments by mail, e-mail, fax, or in person.

Mr. Broadfoot opened the meeting to a Question and Answer period:

Question from Mr. Chris Morgan
If the fill material is coming from both upstream and downstream, how long will the lake level have to be lowered and by how much more?

- Veronica Petrovsky stated that the Corps was working on the sequencing of the construction to minimize impacts. This information will be included in the Draft Environmental Statement (DEIS).

- David Serafini stated that there is a possibility that the lake may not be required to be lowered at all and that the Corps was also looking into this possibility.

Question from Mr. Bill Blanton with the Salvation Army and Lake Isabella resident
Where would the spillway be dumping the water and where could he get a copy of the inundation map?

- David Broadfoot responded that the spillway water would go back into the Kern River

- Veronica Petrovsky responded that the map was available on the Kern County website

Question from Mr. John Ream, Lake Isabella/Bodfish Homeowners Association, Lake Isabella resident
Is the Borel Canal sufficient for outflow from the main dam?

- David Serafini responded that the outflow was bifurcated and that the Borel Canal is not designed or used for outflow.

Question from Mr. Lanny Borthick, Kernville resident
Does the Borel Canal need to remain?

- Veronica Petrovsky stated that the Borel Canal was required to remain per a Southern California Edison contract, although was analyzed as being de-commissioned with one of the Main Dam alternatives.

Question from Mr. Bob Robinson, Lake Isabella resident
How much borrow material and what is the source?

- David Broadfoot indicated that the Corps was formulating an amount.

- David Serafini responded that current approximations are 2-3 million cubic yards

- Veronica Petrovsky stated that the Corps was looking at sites with material as close as possible to the construction area to reduce impacts. She also directed attention to the display panel that illustrates the four borrow sites currently under consideration.

Seeing no additional questions or comments, Mr. Broadfoot asked for those speakers who signed up to come forward if desired.

The first speaker was Mr. Fred Roach, Kern River Valley Chamber of Commerce and Lake Isabella resident. *Mr. Roach began by questioning the 4-7 year timeframe for completion of the project. Mr. Roach indicated that there were several items that he would like to see addressed in the DEIS:*

1. *There has been a lot of discussion regarding downstream economics (Bakersfield). He wants to see the economic impacts to the Kern River Valley discussed.*
2. *There is some confusion on what exactly is "an active fault" We have earthquakes every day in California.*
3. *Are there seepage issues or "potential" seepage issues?*
4. *Will the lake have to be lowered even further than present? It is still not clear.*
5. *What is the proven data that the lowered lake level even alleviates the problem, and will they have to live with this for the next 7 Years? [emphasis]*
6. *His major concern is the 7 years of lake restriction. The lower lake level was forced on the residents of the Kern River Valley with no public process.*

- David Serafini responded to the question regarding the definition of an "active" fault by stating that active meant there had been movement on the fault within recent (3,000) years.

<u>Comment from the floor by Mr. Lanny Borthick</u>
With the lake level being lowered (possibly even more during construction) the additional shoreline dust impacts need to addressed. There are higher dust levels with the lowered lake level.

<u>Comment from the floor by Cheryl Borthick, President of the Kernville Chamber of Commerce and Kernville resident</u>
We are concerned about the undermining of the roads and road closures. This needs to be addressed because we are locked into this valley with very few routes in and out. We also question the reduced pool level. Who picked this number?

The second speaker was <u>Mr. Rex Emerson with the Kern River Valley Chamber of Commerce and Lake Isabella resident.</u>
Mr. Emerson asked if the Forest Service structures and residences were being eliminated and questioned whether the Corps, in looking at all of the alternatives took this impact into account.

<u>Comment from the floor by Elaine Roach, Lake Isabella resident.</u>
Why not borrow from under the South Fork Bridge [which is currently flooded]?

- Veronica Petrovsky responded that the farther away the borrow sites are located, the possibility of more significant impacts.

<u>Comment from the floor by Dorothy Williams, Lake Isabella resident.</u>
Will the project create jobs for people in the Kern River Valley? We want to see a local labor force.

<u>Comment from the floor by Ron Vance, Wofford Heights resident.</u>
If the Corps is going to raise the dam, will the lake level also be raised?

- David Broadfoot responded that there is no plan to raise the lake level capacity.

<u>The third speaker was Mr. Don Fitch, Lake Isabella resident.</u>
I am a resident of the mobile home park located below the auxiliary dam and will continue to come to these meetings. To date nothing has been addressed. There is quite an economic impact to us.

- David Broadfoot assured Mr. Fitch that this would definitely be analyzed in the DEIS.

Comment from the floor from Mr. Bill Bland.
If the dam is designed for approximately 150 years, then becomes ineffective after that, why not spend the money now to extend its longevity?

- David Serafini responded that the Corps would examine the use of the dam with using different or more sand.

Comment from the floor from Mr. John Ream
Have they considered processing gold if the Corp cleans out the lake? It has been done in San Gabriel.

Comment from the floor Cheryl Borthick
I am concerned about the three (3) years of construction and where the workers will be staying. Currently there is an agreement with the fire service that firefighters are given priority if necessary. What if there is a fire, where will the workers stay then? This should be addressed.

Comment from the floor from Rick Stockton
I am concerned about the length and width of the spillway alternatives. No mention of the length, will this require the bridge to be raised with the additional spillway?

Mr. Broadfoot asked for additional questions and/or discussion. Seeing none, Mr. Broadfoot reminded the attendees of the importance of submitting their comments to the Corps. The meeting was concluded at 8:00 p.m.

Lake Isabella Scoping Meeting Materials

Sign In Sheets
Submitted Comment Forms
Speaker Sign-In

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Lake Isabella
Public Scoping Meeting

Wednesday May 18, 2011

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Name	Affiliation (optional)	Email			Would you like to receive project updates?
JON REAM	LAKE ISABELLA / BODFISH HOME OWNERS ASSOC.	JRFREE@EARTHLINK.NET			☐ by Mail ☒ by Email
Address	**City**	**State**	**Zip**	**Phone**	
Name	**Affiliation (optional)**	**Email**			**Would you like to receive project updates?**
ELAINE ROAD FRED ROAD	KRV CHAMBER of COMMERCE	FROAD@VERIZON.NET			☐ by Mail ☐ by Email
Address	**City**	**State**	**Zip**	**Phone**	
BOX 3643	LAKE ISABELLA	CA	93240	760-223-0488	
Name	**Affiliation (optional)**	**Email**			**Would you like to receive project updates?**
Rex Emerson	Kern River Valley Chamber of Commerce	emerson@lakeisabella.net			☐ by Mail ☑ by Email
Address	**City**	**State**	**Zip**	**Phone**	
PO Box 3156	Lake Isabella	CA	93240	760-417-2838	
Name	**Affiliation (optional)**	**Email**			**Would you like to receive project updates?**
Don Fitch		DonCloisMaggie@AOL.Com			☐ by Mail ☒ by Email
Address	**City**	**State**	**Zip**	**Phone**	
2959 Eva Ave	Lake Isabella	CA	92869	(714) 221 3983	

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Name JOE GRIELLO | Affiliation (optional) KRVR | Email KRV-REV@EARTHLINK.NET | Would you like to receive project updates? ☐ by Mail ☐ by Email

Address | City | State | Zip | Phone

Name | Affiliation (optional) | Email | Would you like to receive project updates? ☐ by Mail ☐ by Email

Address | City | State | Zip | Phone

Name | Affiliation (optional) | Email | Would you like to receive project updates? ☐ by Mail ☐ by Email

Address | City | State | Zip | Phone

Name | Affiliation (optional) | Email | Would you like to receive project updates? ☐ by Mail ☐ by Email

Address | City | State | Zip | Phone

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Name: LANE ROBINSON
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
Address: P.O. BOX 1208
City: WOFFORD HEIGHTS,
State: CA
Zip: 93285
Phone: 760 3762474

Name: Velma Jones
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
105 Roby Ln P.O. Box 3975 Wofford Hgts Ca
Address:
City:
State:
Zip:
Phone:

Name: Judy Hyatt
Affiliation (optional): Supervisor McQuiston
Email: hyattj@co.kern.ca.us
Would you like to receive project updates? ☐ *by Mail* ☒ *by Email*
Address:
City:
State:
Zip:
Phone:

Name: SCOTT CARTA
Affiliation (optional): WOFFORD HEIGHTS, CA
Email: Scott@KERNRIVERRADIO.com
Would you like to receive project updates? ☐ *by Mail* ☒ *by Email*
Address:
City:
State:
Zip:
Phone:

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Name: Robert Robinson
Affiliation (optional): Desert Mountain RC&D upper Kern River watershed coordinator; Co-Chair & Historic Preservation office, Kern Valley Indian Community/Council
Email: brobinson@iwvisp.com
Would you like to receive project updates? ☐ by Mail ☑ ~~by Email~~
Address: 7030 Lake Isabella BLVD #14
City: Lake Isabella
State: CA
Zip: 93240
Phone: 760 549 2131

Name: Michael Batelaan
P.O. 1145 Wofford Heights CA 93285 Kern River Courier office@kernrivercourier.com
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: Dorothy Williams 2112 Pecos Ave.
City: Lk. Isabella
State: Ca.
Zip: 93240 ~~93240~~
Phone: 760-376-2860 760-379-4199

Name: Claire Hartley 2227 Hawthorne St.
Affiliation (optional): DAC-Democrat Club L.I.
Email: ceileenhartley@yahoo.com
Would you like to receive project updates? ☐ by Mail ☑ ~~by Email~~
Address:
City:
State:
Zip:
Phone:

Name:
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address:
City:
State:
Zip:
Phone:

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Name	Affiliation (optional)	Email		Would you like to receive project updates? ☐ by Mail ☐ by Email
Jono Slade				
Address	**City**	**State**	**Zip**	**Phone**
Surhe rd	Lake Isabella	CA	93240	

Name	Affiliation (optional)	Email		Would you like to receive project updates? ☐ by Mail ☐ by Email
Elisabeth McGuirk				
Address	**City**	**State**	**Zip**	**Phone**
Surhe Rd	Lake Isabella	CA	93240	

Name	Affiliation (optional)	Email		Would you like to receive project updates? ☐ by Mail ☐ by Email
Deborah Hess	SCE			
Address	**City**	**State**	**Zip**	**Phone**

Name	Affiliation (optional)	Email		Would you like to receive project updates? ☐ by Mail ☐ by Email
Ron Vance				
Address	**City**	**State**	**Zip**	**Phone**
P.O. Box 3733	Woff. Hts	CA	93285	376-3807

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Name: William Blanton
Affiliation (optional): THE SALVATION ARMY
Email: servicecenter@GMAIL.COM
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
Address: P.O. Box 2786 LAKE ISAbella 93240 CommChristian
City:
State:
Zip:
Phone: 760-379-5160

Name: TOBIN GIBSON
Affiliation (optional): SCE
Email: TOBIN.GIBSON@SCE.COM
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
Address: 15171 SIERRA WAY
City: KERNVILLE
State: CA
Zip: 93238
Phone: 760-376-8306

Name: Penelope Shibley
Affiliation (optional): USFS
Email: pshibley@fs.fed.us
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
Address: 105 Whitney Rd
City: Kernville
State: CA
Zip: 93238
Phone: 760-376-3781

Name: LARRY L. LANTZ
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ *by Mail* ☐ *by Email*
Address: 3301 Seclusion Rd.
City: L.I.
State: CA.
Zip: 93240
Phone: 379-4373

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Name: Michael Sullivan
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 4890 Larsen Rd.
City: Lake Isabella
State: CA
Zip: 93240
Phone: 760-223-2843

Name: RICHARD STOCKTON
Affiliation (optional):
Email:
Would you like to receive project updates? ☑ by Mail ☐ by Email
Address: 4040 PEARL HARBOR DR.
City: KEYESVILLE
State: CA.
Zip: 93240
Phone: 760-379-2733

Name: John Petty
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: Swirke Rd
City: Lake Isabella
State: CA
Zip: 93240
Phone: 870-365-7649

Name: A.J. Lockwood
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Lake Isabella CA 93240 208-860-2921
Address: Surhe St.
City:
State:
Zip:
Phone:

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Name: MELFORD HEARN
Affiliation (optional):
Email:
Would you like to receive project updates? ☒ by Mail ☐ by Email
Address: 4926 FORD ST
City: LI
State: CA
Zip: 93240
Phone: 3783290

Name: Jo Anne Luntz
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 3301 Seclusion Rd
City: LI
State: CA
Zip: 93240
Phone: 379.4373

Name: Matt Sheskies
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address:
City:
State:
Zip:
Phone: 720-398-7525

Name: RICK S. STOCKTON
Affiliation (optional): KEYESVILLE
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
(760) 812-7196
Address:
City:
State:
Zip:
Phone:

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
JACK BERNARDIN		Jackbdamm@localnet.com	☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
2959 EVA AVE	LAKE ISABELLA	CA.	93240	760-5490054

Name	Affiliation (optional)	Email	Would you like to receive project updates?
EVA HOLLMANN		BOARDLADY@GMAIL.COM	☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
2620 CRESTVIEW AVE,	LI.	CA	93240	(760)379-9198

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Cheryl Borthick	President Kernville Chamber of Commerce		☑ by Mail ☐ by Email

Address	City	State	Zip	Phone
151 Sirretta St	Kernville	Ca	93238	760-376-4124

Name	Affiliation (optional)	Email	Would you like to receive project updates?
LANNY Borthick	Contractor Concerned citizen		☐ by Mail ☐ by Email

Address	City	State	Zip	Phone
151 Sirretta St.	Kernville	Ca	93238	760-376-4124

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COMMENT FORM

Name: EVA HOLLMANN

Address: 2620 CRESTVIEW, LI, CA 93240

Email: BOARDLADY@GMAIL.COM Affiliation *(If Any)*:

Comment *(Please Print)*:

IF YOU MUST TAKE SAND AWAY FROM THE AUX DAM REC AREA, FINISH IT SLOPED, NOT TERRACED, SO WE CAN FOLLOW THE EDGE OF THE LAKE UP & DOWN SEAMLESSLY.

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COMMENT FORM

Name: William BLANTON

Address: P.O. Box 2786 LAke Isabella 93240

Email: CommchristianServicecenter@gmAiL.Com

Affiliation (If Any): THE SALVATION ARMY LakeIsAbella UNIT

Comment (Please Print):

Consider Removing SAnd for dAm Construction from bottom of hake Thus extending life of dam

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COMMENT FORM

Name: JON REAM

Address: 2533 STEENSEN ST. LAKE ISABELLA CA 93240

Email: JREBEE@EARTHLINK.NET Affiliation (If Any): LAKE ISABELLA / BODFISH PROPERTY OWNERS ASSOC.

Comment (Please Print):

1. KILL OFF ALL THE LARGE MOUTH BASS. THEY EAT ALL OTHER SPECIES AND ARE OUT OF CONTROL.
2. PLEASE BENCH BLAST RATHER THAN JACK HAMMER. QUICK IS BETTER
3. WINDS ARE USUALLY OUT OF THE SOUTH. DUST WILL GO EAST AND NORTH WITH LITTLE IMPACT. WHEN WINDS ARE OUT OF THE NORTH, SUSPEND OR REDUCE DUSTY ACTIVITIES.
4. CYRUS CANYON HAS SOME SAND AND LOW GRADE ROCK THAT CAN BE CRUSHED.
5. THERE ARE OTHER WAYS FOR THE VALLEY TO MAKE A LIVING. THERE WILL HAVE TO BE DISCUSSIONS AND REMEDIATIONS.
6. TO DEFINE THE AUXILIARY DAM FAULT, IT WOULD BE EASIER TO SAY; ACTIVE MEANS THERE IS A POTENTIAL FOR MOVEMENT. IT HAS NOT DONE SO IN 70,000 YEARS BUT IT CAN. ALSO, IF THE LAKE FILLS THERE HAS BEEN AND WILL BE MORE EARTHQUAKES (M1-2.5) OFF ENGINEER POINT AND AT HUNGRY GULCH. CAL TECH CAN RUN A TEMPORAL PROJECTION OF ALL THE PAST QUAKES AND YOU COULD CORRELATE WITH HIGH WATER LEVELS.
7. HAVE YOU THOUGHT OF BREACH CONTAINMENT IN THE EVENT OF A FAULT SLIP

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COMMENT FORM

Name: Michael Sullivan

Address: 4890 Larsen Rd. Lake Isabella CA 93240

Email: Affiliation (If Any): RED'S Kern Valley Marina

Comment (Please Print): Soil & SAND Removal From South Fork Rec. & Aux Dam, Either Location I would Like to work w/the Army core to Develope A Bay For Marina safty. A Teared step removal of soil, w/rock setti.

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COMMENT FORM

Name: EVA HOLLMANN

Address: 2620 CRESTVIEW AVE, LI, CA 93240

Email: BOARDLADY@GMAIL.COM Affiliation *(If Any)*: LAKE USER

Comment *(Please Print)*:

I UNDERSTAND THAT CORING @ AUXILIARY DAM RECREATION AREA CONFIRMED THAT THE SAND THERE IS PERFECTLY SUITED AS FILL FOR THE DAM. PLEASE UNDERSTAND, THAT AUX DAM BEACH IS THE GOLDEN CASH COW OF THE COMMUNITY. IF YOU WERE TO HAUL OFF THAT SAND, YOU WOULD SERIOUSLY JEOPARDIZE THE LOCAL ECONOMY. SURELY, OTHER SOURCES SUCH AS THE SAND ACCUMULATED AT THE BOTTOM OF THE LAKE, AND AT THE MOUTH OF THE KERN NEAR THE CEMETARY WOULD SERVE AS WELL!

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COMMENT FORM

Name: JACK BERNALDIN

Address: 2959 EVA AVE. #36 (P.O. BOX 1219) LAKE ISABELLA CA 93240

Email: jackbdamm@localnet.com Affiliation (If Any):

Comment (Please Print): WHAT ABOUT THE PEOPLE WHO LIVE IN THE MOBILE HOME PARK IN FRONT OF THE AUXILIARY DAM. THIS A LOW INCOME PARK, WITH MANY PEOPLE ARE RETIRED OR ON LIMITED INCOME. ARE THEY EXPECTED TO LIVE THERE WHILE WORK IS GOING ON. THEY CANT BE MOVED BECAUSE THESE HOMES ARE OLD, AND WOULD FALL APART!!

NO BODY WANTS TO BUY, BECAUSE OF DAM SEEPAGE. AND NO REAL ESTATE AGENT, WILL ~~[illegible]~~ LIST THEM; BECAUSE THEY WOULD HAVE TO DISCLOSE DANGERS, CONSTRUCTION, ETC.

PEOPLE HAVE SOLD ~~[illegible]~~ OUT AT A HUGE LOSS NOT EVEN HALF OF THERE WORTH. ~~[illegible]~~

THANK YOU

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COMMENT FORM

Name: Don Fitch

Address: 2954 Eva Ave Space 35 Lake Isabella, CA.

Email: Don Elois Maggie@Aol.Com Affiliation (If Any):

Comment (Please Print):

Trailer Park at Base of Auxiliary dam — low income Housing, SSI, disability income.

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COMMENT FORM

Name: Robert Robinson

Address: 7050 Lake Isabella BLVD. #14, Lake Isabella, CA 93240.

Email: brobinson@iwvisp.com Affiliation (If Any): Desert Mountain RC&D upper Kern River watershed coordinator / Co-chair & Historic Preservation officer, Kern Valley Indian Community

Comment (Please Print):

1.) As Much material as possible to come from below the Take Line of the lake.

2.) Distribute taking of Fill Material from as many burrow sites as possible without impacting any one site in excess

3.) all due diligence to avoid prehistoric Cultural Resource sites, Sacred sites and traditional gathering sites on BLM, Corp & USFS & private Properties involved in the Dam Modification Project

4.) Employ Local Tribes, Kern Valley Indian Community P.O. Box 1010, Lake Isabella, CA 93240 & Tubatulabals of Kern Valley in all ~~[illegible]~~ stages of the Project effecting ground disturbance ~~& site~~ burrow site sellection

[signature]

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COMMENT FORM

Name: CATHY PERFECT

Address: P.O. BOX 3074, LAKE ISABELLA, CA. 93240

Email: editor@kvsun.com Affiliation (If Any): KERN VALLEY SUN

Comment (Please Print):

SUGGESTION: WHEN CONSTRUCTION BEGINS INSTALL TWO OR THREE VIDEO CAMERA, PROGRAMMED TO CAPTURE A NUMBER OF SHOTS PER HOUR/PER DAY. TIME-LAPSED PHOTOGRAPHIC RECORD OF THE DAM MODIFICATION. HISTORIC. GREAT PR, TOO.

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COMMENT FORM

Name: SCOTT COSTA

Address: PO BOX 844 W.H., CA 93285

Email: SCOTT@KERNRIVERRADIO.COM Affiliation *(If Any)*: NEWS DIRECTOR ALTA SIERRA BROADCASTING

Comment *(Please Print)*: DON'T DRAIN THE LAKE.

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Wednesday May 18, 2011

SPEAKER SIGN-UP

If you would like to present a verbal comment or ask a question of the panel, please sign up here:

	Name *(Please print)*	Affiliation	
1	Don Fitch		☐
2	FRED ROACH	KRV CHAMBER of COMMERCE	☐
3	Rex Emerson	Kern River Valley Chamber	☐
4			☐
5			☐
6			☐
7			☐
8			☐
9			☐
10			☐
11			☐
12			☐
13			☐
14			☐
15			☐
16			☐
17			☐
18			☐
19			☐
20			☐
21			☐
22			☐
23			☐
24			☐
25			☐
26			☐
27			☐
28			☐

BAKERSFIELD
PUBLIC SCOPING MEETING:
NOTES AND MEETING MATERIALS

MAY 19, 2011

ISABELLA LAKE DAM SAFETY MODIFICATIONS
US ARMY CORPS OF ENGINEERS
PUBLIC SCOPING MEETING
BOARD OF SUPERVISORS' CHAMBERS
BAKERSFIELD, CALIFORNIA
MAY 19, 2011

- Attendance: ±32
- 6 Display Panels welcomed the residents
- Attendees were asked to sign in and given an agenda and handouts
- Comment Forms were provided; two (2) were submitted
- Two (2) speakers signed up

Meeting Notes

An Open House with display panels, handouts, and US Army Corps of Engineers (Corps) personnel took place from 6:00 pm until 6:30 pm.

David Broadfoot, Tetra Tech Project Manager under contract with the Corps, acted as moderator and began the meeting at 6:30 p.m. with opening remarks and an introduction of the project. Introductions of Corps and US Forest Service personnel in attendance were made. The presentation panel consisted of Veronica Petrovsky, Corps Project Manager; David Serafini, Corps Lead Engineer; and Mitch Stewart, Corps Environmental Lead, and Marci Jackson, Planning Corps Lead. Mr. Broadfoot explained the purpose and goals of the Scoping Process then introduced Mitch Stewart at 6:35 to begin the presentation.

Mr. Stewart began the presentation accompanied by power point slides. Mr. Stewart discussed the purpose and goals of the Scoping Process, the environmental process and current status of how the Corps was moving forward. Ms. Veronica Petrovsky discussed the primary purpose of the dams, the current deficiencies and consequences of dam failure. David Serafini assisted Ms. Petrovsky in the presentation with technical and hydrologic information, discussion of the alternatives. Marci Jackson presented the required alternative plans and EPA requirements.

The presentation highlighted the goals and expectations, the dams' deficiencies and primary issues, the potential consequences of a catastrophic failure, interim risk reduction measures (IRRM) to date, the alternatives being analyzed, environmental considerations, and timelines.

The presentation was concluded at 7:30 p.m.

Mr. Broadfoot thanked the Corps and asked if there were any speakers in the audience who wished to sign up. Mr. Broadfoot discussed the importance of public input and comments and encouraged all to submit comments by mail, e-mail, fax, or in person.

Mr. Broadfoot opened the meeting to a Question and Answer period:

Questions from Ms. Stephanie Foe, Bakersfield resident

Is there any correlation between priority for funding and expediting the process with the status of the dam?

- Veronica Petrovsky indicated that the Isabella dam is in the top ten and is in a good position to get approval and funding.

Question from Ms. Nora Weber Bakersfield resident

Are you saying that Isabella Dam is not number 1 in the nation? That is what we have been told.

- Ms. Veronica Petrovsky indicated that the confusion may result from the different Classes of dams. Isabella is a Class I, which may give us priority for funding.

Question from Mr. Bob Atkinson, Salvation Army Disaster Services and Bakersfield resident

What level of seismic event being analyzed?

- David Serafini responded that analysis of a magnitude and duration of 6.5 with 0.3 G and greater was used for analysis. The shallow layer of the auxiliary dam is more prone to liquefaction

Comment from Mr. Calvin Foster

The DEIS should explain how the Isabella dam is one the first dams screened in with this new process.

Question from Mr. Greg Iger, Bakersfield resident

Regarding the Borel Canal relocation- Is it public or private and why shouldn't SCE pay for relocation? Is there enough money to decommission?

- Veronica Petrovsky responded that there was not enough money, nor was SCE interested in decommissioning

- David Broadfoot indicated that negotiating with SCE would add too much time onto the process.

Question from Ms. Nora Weber

What is the notification timeframe for a dam failure and inundation?

- Veronica Petrovsky indicated the information was located on the Kern county website.

Question from Ms. Stephanie Foe

There must be some timeframe to indicate inundation, how much time?

- Veronica Petrovsky indicated that the flooding would not be instantaneous; a lot of action and forecasting for advance notice will occur if the dam fails. If there is a seismic event, there would be no notification.

- David Serafini stated that according to the inundation maps, that Bakersfield would have 7 hours before the floodwaters hit and recommended looking to the County maps for further clarification.

<u>Question from Mr. Jim Smith, Smith Engineering and Bakersfield resident</u>
What is the purpose of the filters? Can you explain the process for cleaning as these seem tremendously large?

- David Serafini explained that erosion moves particles and the filter stops them from moving or migrating, but allows water though. They filter out earthen material, don't require maintenance, and are designed to withstand a seismic event.

<u>Question from Mr. Jim Isbell. Bakersfield resident</u>
Is the seepage through the dam or alluvial sediment?

- David Serafini responded that the seepage was exclusively through the foundation and seepage lines.

<u>Question from Mr. Greg Iger</u>
What exactly is the seepage danger? Has it been gradual over the years?

- Response by David Serafini is that over time and it becomes more accelerated. It is dominated by a higher pool. This may be a trend in some areas, but they haven't been able to test. They have enough data with a full lake.

<u>Question from Mr. John Reed</u>
Has the Corp considered a membrane on the upstream side?

- David Serafini responded that the most effective solution was on the downstream side.

<u>Question from Mr. Jim Smith</u>
After core drilling and testing, how did the Corps remediate the holes?

- Some had piezometers installed with wells or were grouted bottom to top.

<u>Comment from Mr. Darl Snyder</u>
The Corps needs to hire local contractors and workers

Seeing no additional questions or comments, Mr. Broadfoot asked if there were any additional speakers, who had not signed up. Seeing none David Broadfoot requested that the two speakers to come forward.

The first speaker was <u>Mr. Jim Smith, Smith Engineering and Bakersfield resident.</u> *Mr. Smith commented on the core drilling that had taken place by the Corps. A road was built across the face of the dam to drill the cores and conduct testing. Rocks that were in place to protect the dam were removed to construct the road. Once the dam construction is complete and the water level is higher, this road will be under water. Rocks will be falling onto this road area. You have then caused a failure point in the dam.*

- David Broad foot stated that this was a good point and would be addressed in the DEIS.

The second speaker was <u>Mr. John Ream, Lake Isabella resident.</u> *I attended the meeting in Lake Isabella last night, but have few additional comments, after sleeping on it last night. If the Corps re-routes the Borel Canal flume from the auxiliary dam, than there would be no outflow and the water behind the auxiliary dam would stagnate. This will cause damage to large mouth bass with the water backing up. The water would not be clean, flowing or circulating. This needs to be discussed in the DEIS. In* *addition, during the planning stage the Corps should consider constructing a building for worker's quarters at Lake Isabella Blvd and ST 155. This could be used as a visitor center for residents and visitors alike. You could consider a western motif.*

The third speaker was <u>Mr. Marvin Dean, longtime Bakersfield resident.</u> *I want several items addressed in the DEIS: A notional preparedness training center is in the works, but construction is 4-5 years down the road. There is the likelihood of an earthquake, before construction even starts. What is the local government doing to inform the public; have drills, be prepared?*

<u>Question from Ms. Nora Weber</u>
Why is it taking so long if this is so imminent?

- David Broadfoot responded that this is a short timeframe from the normal process, with an expedited schedule. We must first identify all the deficiencies, and then analyze the possible solutions.

<u>Comment from Mr. John Ream</u>
It is not THAT [emphasis]. We want to do it right.

<u>Question from Mr. Greg Iger</u>
Are there any other similar dams that have failed?

- David Serafini responded that there have been none in the United States, but had worked with others throughout the world where failures had occurred. Possibly we are all thinking of the Grand Teton failure, which is not similar.

Mr. Broadfoot asked for additional questions and/or discussion. Seeing none, Mr. Broadfoot reminded the attendees of the importance of submitting their comments to the Corps. Veronica Petrovsky thanked everyone for coming and asked them all to please submit comments.

The meeting was concluded at 8:00 p.m.

Bakersfield Scoping Meeting Materials

Sign In Sheets
Submitted Comment Forms
Speaker Sign-In

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Isabella Lake Dam Safety Modification Study

Bakersfield
Public Scoping Meeting

Thursday May 19, 2011

SIGN IN SHEET

Name: Chuck Lackey
Affiliation (optional): County of Kern
Email: chuckl@co.kern.ca.us
Would you like to receive project updates? ☐ by Mail ☑ by Email
Address: 2700 M
City: Bakersfield
State: CA
Zip: 93301
Phone: 661-862-5100

Name: Sigrid Harris
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 400 Oak Fair Way
City: Bakersfield
State: Ca
Zip: 93309
Phone:

Name: Greg Iger
Affiliation (optional):
Email: gregiger@aol
Would you like to receive project updates? ~~☐ by Mail~~ ☑ by Email
Address: 5500 Shadow Hills Dr.
City: Bak
State:
Zip: 93308
Phone: 661-327-2768

Name:
Affiliation (optional):
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address:
City:
State:
Zip:
Phone:

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
PAUL FULLER		cattleroad410@hotmail.com	☐ by Mail ☒ by Email
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PO Box 11358	BAKERSFIELD	CA 93384	661-334-2001

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Eric Fuller			☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
PO Box 11368			661-599-2470

Name	Affiliation (optional)	Email	Would you like to receive project updates?
CURT DOUGLAS	Calif. Hospital Assn.	curtrdouglas@aol.com	☐ by Mail ☑ by Email
Address	**City**	**State / Zip**	**Phone**
10900 Craigton Ct.	Bakersfield	CA 93311	661-665-1741

Name	Affiliation (optional)	Email	Would you like to receive project updates?
			☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**

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Name: ART CHIANELLO
Affiliation (optional): CITY OF BAKERSFIELD
Email: achianel@bakersfieldcity.us
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address: 1000 BUENA VISTA BLVD.
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State: CA
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Phone: (661) 326-3715

Name: MARTIN MILOBAR
Affiliation (optional): Buena Vista WSD
Email:
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 675 N Main
City: Buttonwillow
State: CA
Zip: 93206
Phone: 661-301-8107

Name: JON REAM
Affiliation (optional): LAKE ISABELLA/BODFISH PROPERTY OWNERS ASSOC.
Email: JRFREE@EARTHLINK.NET
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address:
City:
State:
Zip:
Phone:

Name: Jim Isbell
Affiliation (optional):
Email: jimisbelljunk@gmail.com
Would you like to receive project updates? ☐ by Mail ☒ by Email
Address: 709 Sand Creek Dr.
City: Bakersfield
State: CA
Zip: 93312
Phone:

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
Debbie Naworski			☑ by Mail ☐ by Email

Address	City	State	Zip	Phone
6280 ALFRED HARRELL HWY	Bakersfield	CA	93308	661-3335655

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SHAUN BEASLEY	KERN CO. SHERIFF'S OFFICE	BEASLEYS@KERNSHERIFF.COM	☐ by Mail ☒ by Email

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
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Address	City	State	Zip	Phone
704 RiVER OAKS DR.	BAKERSfield	CA	93309	661-861-9829

Name	Affiliation (optional)	Email	Would you like to receive project updates?
			☐ by Mail ☐ by Email

Address	City	State	Zip	Phone

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
Chuck Williams	KR Watermaster	cwilliams@northkernwsd.com	☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
33380 Cawelo Ave ~~PO Box~~	Bakersfield	CA 93380	661 393-2696

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Stephanie Foe		stephaniefoe@gmail.com	☒ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
5900 Alfred Harrell	Bkfld	93308	661 428-3981

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Lauren Bauer	KCWA	lbauer@kcwa.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
P.O. Box 58	BKFLD	CA 93308	(661) 634-1411

Name	Affiliation (optional)	Email	Would you like to receive project updates?
CALVIN Foster	CORPS		☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
SUCCESS/ISABELLA - SOA			

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Name	Affiliation (optional)	Email	Would you like to receive project updates?
Bob Atkinson	The Salvation Army	robert.atkinson@usw.salvationarmy.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
206 Ethrum Ave	Bakersfield	CA 93307	301-4071

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Clark Farr	Local Engineer	CFarr@Bak.rr.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
8605 Landover Ln	Bakersfield	CA 93311	(661) 345-8021

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Gene Bogart	City of Bakersfield		☐ by Mail ☐ by Email
Address	**City**	**State / Zip**	**Phone**
1000 Buena Vista Rd		CA	

Name	Affiliation (optional)	Email	Would you like to receive project updates?
Dana Munn	North Kern WSD	northkern@aol.com	☐ by Mail ☒ by Email
Address	**City**	**State / Zip**	**Phone**
33380 Cawelo Ave	Bakersfield	CA 93308	393-2696

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Name: MARVIN DEAN
Affiliation (optional): SB CERT
Email: MARVIN DEAN LLC of sbcglobal.net
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City:
State:
Zip:
Phone:

Name: Don Richardson
Affiliation (optional): City Water Resources
Email: drichard@Bakersfieldcity.us
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Address:
City:
State:
Zip:
Phone:

Name: Ron Hunter
Affiliation (optional): Insight Environmental
Email: rhunter@insenv.com
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address: 5500 Ming Ave. Ste. 360
City: BFD,
State: CA
Zip: 93309
Phone: 661-282-2200

Name: JAMES SMITH
Affiliation (optional):
Email:
Would you like to receive project updates? ☒ by Mail ☐ by Email
Address: 909 ROCKWOOD
City: BAKERSFIELD
State: CAL.
Zip: 93308
Phone: 661-399-9280

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Name SCOTT KUNEY
Affiliation (optional)
Email
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address
City BAKERSFIELD
State CA
Zip 93301
Phone 661 327-9661

Name Jean E.C. Laborde
Affiliation (optional) (Real Estate Salesman & Land owner)
Email Jeanlaborde@WatsonRealty.com
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address 504 Pheasant Ave
City Bakersfield
State CA.
Zip 93309
Phone 661-397-0304-Res
661 303-3260-Cell

Name
Affiliation (optional)
Email
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address
City
State
Zip
Phone

Name
Affiliation (optional)
Email
Would you like to receive project updates? ☐ by Mail ☐ by Email
Address
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Zip
Phone

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5/19

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Public Scoping Meeting

COMMENT FORM

Name: JON C. REAM

Address: 2533 STEENSEN ST. LAKE ISABELLA, CA 93240

Email: JRFREE @ EARTHLINK.NET Affiliation (If Any): LAKE ISABELLA / BODFISH PROPERTY OWNERS ASSOC.

Comment (Please Print): AT THE CLOSE OF THE MEETING ON 5-18-2011, MICHAEL BATELAAN, EDITOR OF THE KERN RIVER COURIER STATED A PROBLEM WITH THE FLUME OUTFLOW.

IF THE FLUME INTAKE IS ROUTED TO THE MAIN DAM, THERE WILL BE NO OUT FLOW OR CIRCULATION IN THE AUXILARY SIDE.

THE LAKE IS IN TROUBLE NOW BECAUSE OF PREVIOUS FIRES IN THE HIGH MOUNTAINS. ALSO; LARGE MOUTH BASS ARE EATING ALL THE SMALL ANIMALS THAT CLEAN THE WATER. THE CONSERVANCIES ARE NOT MAINTAINING THE DRAINAGE, THUS THERE IS NO CLEAR SOUTH LAKE INFLOW.

A WORSENING OF THE LAKE WATER QUALITY WOULD EFFECT THE RIVER AND THUS IT USE IN BAKERSFIELD.

I CAN'T THINK OF ANY SOLUTION TO THE WATER QUALITY ISSUE. WOULD A DEEP CHANNEL HELP COOL THE AUXILLARY DAM WATER?

WOULD A VINYL OR P.V.C. MEMBRANE HELP TO PREVENT A BLOW OUT AND SEAPAGE?

HOW WILL THE BUTTRESS FOUNDATION EFFECT THE HOT SPRING WATER.

*WE WOULD LIKE TO RE-DO THE JUNCTION OF THE 155 HWY AND LAKE ISABELLA BLVD TO BE A TOURIST DESTINATION. COULD YOU BUILD WESTERN THEME BUILDINGS TO HOUSE WORKERS.

* SEE "THE BOB POWERS GATEWAY PROJECT" A VISITORS CENTER IS IN THE PLANNING STAGE. CAL POLY IS WORKING ON THE PRINT NOW.

5/19/11

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COMMENT FORM

Name: MARVIN DEAN

Address: P.O BOX 2367, Bak CA. 93303

Email: MARVIN Dean LLC @ sbcglobal.Net Affiliation (If Any): National Emergency Preparedness Training Group

Comment (Please Print):

1) will their be ANY Public/community preparedness Drill/Excerise so that the greater Public resident know what to do if their was A DAM Breach?

2) If NOT currently Planning to inform the Public on what to do why NOT?

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Bakersfield Public Scoping Meeting

Thursday May 19, 2011

SPEAKER SIGN-UP

If you would like to present a verbal comment or ask a question of the panel, please sign up here:

	Name *(Please print)* **Affiliation**
1	Jim Smith - Smith Engineering
2	Jon Ream - Lk Isabella - Citizen
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ADDITONAL PUBLIC SCOPING COMMENTS

Clark Farr Comments - e-mail attachment and figure – received 6/13/11

COMMENTS

Isabella Lake Dam Safety Modification Study

- What is the current maximum pool capacity (at the spillway, still water) of the reservoir behind Isabella Dam?
  - The literature still references the dam's start-up capacity (568,100 acre-ft), but after 50+ years and 10 floods (large enough to harm Bakersfield if the Dam were not in place), it is unlikely that large amounts of sediment have not moved into the lake.
  - The County's 2010 aerials (available on the County's GIS site) show dramatic aggrading in the South Fork area. Though the photo is clearly during a period of very low lake level, the sediment deposition patterns are indicative of deposition since the dam's construction.
- It was noted that the new overflow structure design was taking into account the impact on lake level with the specific concern being the impact to natural habitat in the South Fork area of the lake.
  - Photos from the 1966 (67) flooding show that a then robust riparian forest was laid waste by the ~35,000 cfs (based on recollection, hopefully close to accurate) flow of that event.
  - The design flood for the spillway design is ~400,000 cfs.
  - Assuming that ~300,000 cfs comes from the North Fork, then the remaining ~100,000 cfs will originate from the South Fork.
  - 5-10 ft of additional, short duration, backwater into the South Fork area will damage nothing the 100,000 cfs flowing through has not already destroyed.
    - Backwater into the South Fork riparian area may actually reduce flood damage by reducing the effective slope of the flow passing through the area and thus reducing the velocity and erosive power of the flow.
  - Within the last 10 yrs (again based upon a poor memory) environmental groups have tried to have the operational lake level lowered in order to enhance the habitat for the Southwestern Willow Fly Catcher.
  - Any argument that lake level damages the environmental habitat needs to clearly define its boundaries and assumptions lest it be used as pseudo-science to prove an otherwise un-provable point.
- How will the 25 ft of uphill flow be accomplished?
  - Modification of the Borel Canal inlet is an obvious necessity.

    - The Borel exits the auxiliary dam at its toe, ~100 ft below the crest, in an open channel.
    - The Main Dam outlet leaves the Main Dam near its toe, ~125 ft below the crest.
    - The Robust Option calls for the connection from the Main Dam Outlet to the Borel Canal.
- Was consideration given to placing the Borel canal, and its inlet works, around the left abutment of the auxiliary dam (see attached graphic)?
  - Given the length of construction and obvious complexity of carving a tunnel through rock (required of the Robust Alternative)
  - Similar difficulties associated with the Life Safety Alternatives.
  - The left abutment is alluvium, easily excavated and/or tunneled.
  - Waters would be conveyed from behind the auxiliary dam, thus mitigating lake circulation issues.
  - A left abutment alignment could (maybe) be constructed prior to the dam remediation, thus limiting downtime for the SCE Power plant.
- Can an analysis of the long term aggrading on the South Fork of the Kern River be under taken?
  - Not prior to the dam remediation work! Not concurrent with the dam remediation work! After the analysis, design, and funding of the dam remediation work.
  - The aggrading of the South Fork is directly attributable to the lake.
  - At the Sierra Way Bridge the channel has aggraded ~8 ft. Bridge and roadway reconstruction are required. To do so without knowing the extent of probable future correction would be … unwise.

Thank you for the opportunity to comment on this important project.

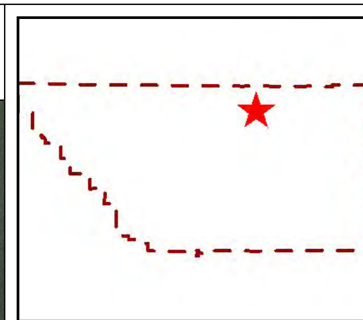
Clark Farr, RCE 038112

8605 Landover Lane
Bakersfield, CA 93311

cfarr@bak.rr.com

Kern County
Online Mapping System

Alternate Borel Canal Intake



Legend

100 ft Contours

- Index
- Contour

Roads

- Arterial
- Collector
- Highway
- Local
- Ramp
- Unpaved

County of Kern

Aerial Photo 2008

N

Scale: 1:12,570

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Printed: May 20, 2011

From: Chris Horgan [mailto:chris@stewardsofthesequoia.org]
Sent: Tuesday, July 05, 2011 7:30 AM
To: Petrovsky, Veronica V SPK
Cc: Lorelei H. Oviatt; Bruce Whitcher
Subject: Dam Project Questions

Dear Veronica,

Some questions have come to mind regarding the Dam Project that I hope you can answer:

1. Will the proposed removal of the Ca Edison Flume from the Auxiliary Dam cause increases in algae blooms or any other conditions due to lack of circulation?
2. Can the plan include a method to allow for circulation of water in the Auxiliary Dam area in order to promote public health and reduce the levels of nutrients?
3. How will the dam project help to address the 303(d) impaired water body listing of Lake Isabella?
4. How will the dam project help to delist Lake Isabella from the impaired status?

Thanks

--
Chris Horgan
Executive Director
Stewards of the Sequoia
Division of CTUC 501c3 Non Profit

Classification: UNCLASSIFIED
Caveats: NONE

-----Original Message-----
From: Jon Ream [mailto:jrfree@earthlink.net]
Sent: Monday, July 18, 2011 12:33 AM
To: Petrovsky, Veronica V SPK
Subject: Lake Isabella

Veronica Petrovsky

My name is Jon Ream. I appeared at the last E.I.S. meeting in Bakersfield and spoke on the state of the lake if the auxiliary out flow is moved to the main Dam side.

I have been talking to local representatives about another proposal. Getting the rock needed for the Dam from the Lakes upper delta and processing it for Gold which can fund the dam re-fit. So far I have not heard back from Kevin McCarthy or Supervisor McQuestin. Shannon Grove's people were there also. Still no answer.

This is very lengthy for an email, but I don't see any reason for borrowing money from China when there are millions in Gold in the delta. This would leave a deeper, cleaner lake and provide the perfect kind of rock and gravel. The McCarthy representative said regulations would not be a problem. "War, for the good of the Nation," and that sort of thing. As a past Public Lands for the People, Executive Board member I know the Federal can and will set aside all regulations to get what they need. The delta would also provide an ideal place to locate the machinery to process the rock, gravel and cement. I know they do not like to respond on a good idea and I am fine with them getting all the credit, but I would like to see Kern County and the Valley get a share of the Gold for improvements. I do have 40 some years as a Gold prospector and the P.L.P. has more expertise than the Federal Government in this matter, yet I as nothing at all for my self.

Lastly, a few of us have been talking about all the drownings in the lake and river. Some one mentioned putting a creek on the auxiliary side of the valley. I liked the idea and thought it through. We have the drainage, we just need a river bed and water. The water could come from the new (slightly larger) connection from the main dam to the Edison canal. The bed should be able to handle two feet of water, perhaps twelve to fifteen feet wide. No water proof bottom might handle the wetlands mitigation in that area and a connection to the Powers Gateway pond would eliminate the Mosquito problem with their artificial pond. The rafting companies would handle the raft rentals and insurance. Near the Dan would make a good tourist and construction worker habitat along the creek. This area is County Park and private land. This is just a though right now, but I would like to hear if you think this is viable. This should save some lives and give people safe water to play in. Thanks. Jon Ream

Classification: UNCLASSIFIED
Caveats: NONE

From: Jon Ream [mailto:jrfree@earthlink.net]
Sent: Tuesday, July 19, 2011 8:50 AM
To: Petrovsky, Veronica V SPK
Subject: Re: Lake Isabella

Dear Veronica Petrovsky

Thanks for the timely response. I was not suggesting replacing the Edison canal, just allowing more water through the ridge to feed a creek. There the water would then separate to the Edison canal and the creek. The Edison canal would take percedence during a time of low water, should the pressure drop. I assume the main dam connection would be a pressure feed to raise the water to the auxiliary Dam base level. The pressure feed would then pool and feed the Edison canal. The excess from this pool, if any, could then feed the creek. The connection and pool could be made near the step down below the auxiliary Dam.

Second, I suggested the delta, near the airport, as a source for the larger project ahead. A Mississippi River type dredge could be used along the existing river channels East side. The deeper the dredge went on each pass, the better it would be for Gold and lakes health. The dredge would stop before reaching the Kernville River Park as the boulders would be too large to process.This would also accelerate flow through Kernville in time of high water and lessen flood hazard. As I have said. It gets complicated.
There is however this one chance to get at the delta Gold. There will never again be a reason to remove the over burden covering the millions in Gold that is surely there. That is a pity. Thanks again. Jon Ream

USDA United States Department of Agriculture

Forest Service

Sequoia National Forest
Giant Sequoia National Monument

Kern River Ranger District
Lake Isabella Office
P.O. Box 3810
Lake Isabella, CA 93240
(760) 379-5646
www.fs.fed.us/r5/sequoia/

Kernville Office
P.O. Box 9
Kernville, CA 93238
(760) 376-3781

File Code: 1580

Date: August 31, 2011

Veronica Petrovsky
Project Manager, Isabella Lake DSMS
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

Dear Ms. Petrovsky:

Please accept this letter as the Kern River Ranger District (District) initial response to scoping. As the project planning progresses, the District, Sequoia National Forest and Giant Sequoia Monument will have other opportunities to respond including responding to the Draft EIS. The draft will include refined alternatives including a proposed alternative.

Sincerely,

BRENDA EHMANN
Deputy District Ranger

cc: Penny Caldwell Realty Specialist Real Estate Division, Mitch Stewart Senior Environmental Manager Environmental Resources Branch

Attachment

Isabella Lake Dam Safety Modification Project

Response to Scoping- Potential Issues of Concern

Kern River Ranger District, Sequoia National Forest and Giant Sequoia National Monument

Please accept this letter as the Kern River Ranger District (District) initial response to scoping. As the project planning progresses, the District, Sequoia National Forest and Giant Sequoia Monument will have other opportunities to respond including responding to the Draft EIS. The draft will include refined alternatives including a proposed alternative.

The District only responded to concepts 2A and 2B since they appear to be the most likely alternatives, considering social, environmental and economic issues. Both concept A with a wide auxiliary spillway and concept B with a narrow auxiliary spillway have similar impacts to National Forest system lands and forest visitors. Concept A and concept B relocate Borel Tunnel, include labyrinth weirs, and operate under extreme flood events.

The two major differences between the two conceptual plans as they affect the National Forest are Plan A does not require a crest raise but requires more excavation; Plan B requires a crest raise for freeboard but less excavation. As the borrow locations have not yet been identified, impacts for these sites will be determined after locations have been identified.

The District input is based on projected forest needs over the next 15 to 20 years to mitigate effects of the dam remediation project. Most significantly, it appears that both option A or B will render the Lake Isabella Office Compound and Main Dam Campground unusable. South Fork Marina and fee sites at South Fork Recreation Area, Auxiliary Dam, and Old Isabella will most likely be impacted as will many existing sites and programs. The following lists projected impacts to USFS sites and operations that should be considered for mitigation as part of this project.

Impacts, Issues, Losses and Possible Mitigations - by Resource Area

- **Range**
  - The Lake Isabella Grazing allotments exist along the South Fork areas between Kissack Bay, to Patterson Lane at the western edge of the South Fork Wildlife Area, and Hanning Flat. Activities such as the creation of borrow sites or campground improvements in these areas could impact grazing. There will be a potential significant loss of forage in the Patterson Lane portion of the Lake Grazing Allotment if the area is used as a borrow site.
  - The Lake Isabella Grazing Allotment is a significant part of the livestock permit holder cattle grazing operation. Any permanent loss of the Lake Isabella Allotment is subject to at least a one year notification to the affected permit holder prior to the loss (this does not include seasonal adjustments due to drought, fire etc.). The permitted area is utilized by one permit holder as follows:
    - September 16 to February 28 – 118 head; October 16 to January 15 – 115 head; June 1 to June 30 - 150 head.

- On/off dates can vary each season by 2 weeks depending on forage conditions of other Forest Service/BLM grazing allotments.

- Possible Mitigation of Impacts to Range :
  - Consider utilizing the Forest Service portions of the South Fork Wildlife Area if the Lake Isabella allotment were lost due to excavation of the area for borrow. This would require extensive reconstruction of the existing perimeter fence that surrounds the South Fork Wildlife Area and environmental analysis for this project including grazing the South Fork Wildlife Area.

- **Cultural Resources**
  - A NAGPRA plan of action between the United States Forest Service (FS) and United States Army Corps of Engineers (COE), tribal communities, and federally recognized and unrecognized tribes is needed to complete reviews of areas to be impacted.
  - Probable areas to be impacted are the Lake Isabella Office Compound located at Isabella Lake, the recreation areas at Auxiliary Dam, Old Isabella, South Fork, and the Borel Canal that are not eligible for listing.
  - Archaeology sites including human artifacts located at the Main Dam campground and at Piney Point and these sites may be eligible for the National Register of Historic Places. Main Dam Campground has archaeological material near the entrance of the campground.
  - Depending on final design and borrow site locations, more sites may be located.
  - The COE is planning to continue to meet the need of Tribal Consultation.
  - The project area includes a relatively high incidence of prehistoric and historic-era sites and resources. Within the Lake Basin, modern facilities often overlay these resources--often occupying the same space--and create challenging resource management issues for resource managers. The current undertaking must take into account the full range of potential effects to cultural resources that project activities may create during all phases of the project.

- **Natural Resources- Fisheries and Water Quality**
  - The district requests that the COE retain access to limnologist and fisheries expertise during the design phase to ensure that lake dynamics and options for maintaining or improving fisheries are incorporated into early phases of the design for the project.
  - Eliminating Borel Canal (maximum assurance concept) may change water flow dynamics, create slack or stagnant water near Auxiliary Dam, and result in further reduction of dissolved oxygen levels that are already below water quality standards. Options to maintain or improve water quality should be considered and would likely take evaluation and input from a limnologist and fisheries biologist.
  - The restoration of disturbed forest system land after construction is completed needs to be addressed especially at borrow sites.
  - For protection or enhancement of habitat design of borrow sites should address heat gain, especially for roosting and nesting habitat for fisheries shorebirds and waterfowl. This may be done in part by creating islands within the deeper borrow pits where pelicans or other birds can rest protected from predation or disturbance from terrestrial intrusions by water, nest structure for osprey and bald eagles, replacement or creation of new fisheries cover structure and spawning sites or structures.
  Isabella Lake is currently designated by the California Regional Water Quality Control Board under section 303(d) of the Clean Water Act as an impaired water body due to both low dissolved oxygen levels and high pH.

http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml

- Project design should look at options to reduce heat gain from shallow depths and increase dissolved oxygen. This may be done in part by using waste rock for wave energy dissipaters which can increase dissolved oxygen as a result of wave action against rocks.

• **Office Replacement**

The Forest Service requests that COE provide a range of possible relocation sites for the District compound that is currently located at Isabella Lake for the Main Dam Campground, for launch sites, for day use sites, and for all sites impacted by Isabella Lake Dam Safety Modification Project. The District requests that the COE complete preliminary investigative work, feasibility studies and meet NEPA requirements for all relocation sites that have been agreed upon by the District.

- The concept plans A and B would render the Kern River Ranger District compound located at Isabella Lake unusable. The Forest requests that the 50 acre Lake Isabella Office Compound is replaced in whole to includes office space, an engine bay, visitor information service, a work center, storage yards, and a rappel tower, out buildings, garages, workshops, parking, a water system, and leach or sewer system.
- The USFS requests early identification of site alternatives for a single new administrative compound that is easily accessible to the majority of visitors to the Kern River Valley.
- The District has completed some preliminary assessments of facility requirements such as setting, layout and design, parking, and security needs.
- Fire module response time should be maintained or improved as a result of the facility relocation.
- Highways 155 and 178 going through the town of Kernville serves as the southern gateway to the Giant Sequoias including the Trail of 100 Giants. It is important for the District to have a presence in this gateway community.
- Build on existing forest system land if possible, although other suitable sites may be considered.
- There is a possible new facility location on land near auxiliary dam in the NW1/4, S29, T26S. R33E. It appears to be forest system land but would need ownership/boundary clarification.
- Consider co-locating with other USFS buildings or other agencies (Kern County, Bureau of Land Management (BLM), and COE). The District has approximately 60 permanent employees to be located or co-located, in addition to a five- to seven- person engine module.
- Please consider locating Kern River Ranger District personnel to a new permanent compound prior to the start of construction to minimize staff disruptions.
- Consider Federal, Forest Service and USDA guidelines in choosing a building location and construction planning. For example, any new Compound must meet requirements as described in Executive Order 13514 such as location near rural town centers, accessibility to transportation corridors, and not located on environmentally sensitive areas. Forest Service Manual (FSM) 1241.03 provides guidelines to FS building locations, including collocation with other agencies. Department of Homeland Security has standards for building locations and physical security standards of design.

• **Recreation**

The Main Dam Campground closure constitutes a District loss of 82 popular and shaded camp sites, a water system, a dump station, an oxidation pool, and revenue. Before and during construction there will also be diminished capacity and revenue (from the Southern Sierra Pass) at Auxiliary, Old Isabella and South Fork Recreation Areas that include a dump station, boat launches, and a water system including a leach field. Launch 19 ramp may not be accessible for three to four years during construction.

- The District requests installing holding tanks in recreation areas instead of septic tanks with leach lines to improve water quality.
- The District requests that Main Dam Campground be replaced. A suggestion is to replace the value of lost facilities, thinking about future needs. Look at the quality of current demand rather than quantity. Look at improving existing sites commensurate with ability to maintain those sites. This is preferable to replacing in-kind.
- It is also a preference of the District that recreation facilities are designed to meet current demand. This would include accommodating a greater number of large RV sites with hookups, that are lakefront, that have boat trailer parking, and that boating facilities include ramps, marinas, and fish cleaning stations.
- Consider including a landscape architect as part of the core team.
- Consider improving or relocating existing impacted dispersed areas, including Hanning Flat especially if it is used as a borrow site.
- Consider developing Engineer's Point; there may be a potential for a marina, a launch, boat parking, and lakefront RV camping if it re-contoured and developed.
- Consider developing Stine Cove.
- The District requests that all launch areas are upgraded to compensate for the time Launch 19 is out of service and that Launch 19 is restored to original or upgraded condition after construction is completed.
- There will be loss of income for District recreation and all marina Special Use Permit holders.
- Consider revisiting the COE Master Plan for Isabella Lake, to compare trails in the Master Plan with the trail system discussed in the new Kern River Valley Specific Plan, adopted by the Kern County Board of Supervisors on June 28, 2011. The District requests the COE to improve or construct trails as shown in the COE Master Plan.
- Consider replacing or addressing the loss of sites at Boulder Gulch and Tillie Creek Campgrounds that are under water at high lake levels. This might be accomplished by building up areas north of the current campground locations.
- Consider replacing the area to be lost at Auxiliary Dam, Old Isabella, South Fork Recreation Area, the water system, marina, dump station and leach field.
- If the BLM Keysville launch site is closed for this project, the District launch sites will experience increased use. District launch sites at Sandy Flat CG, Miracle, and Democrat may need to be enhanced to accommodate increased use.
- Borrow Site Possibilities that could have a positive impact to recreation:
    - Dredging or deepening the water below gross pool elevation for borrow material at French Gulch and Red's Marina could improve access, but may impact wind/wave action for boats.
    - Taking borrow material from South Fork Recreation Area may deepen the channel for boats.
    - Auxiliary Dam Day Use and Engineer Point both have potential to re-grade site, and re-design the landscape and campground layout at the same time

MAILING LIST

MAILING LIST

This updated mailing list was generated on 8/27/2011 from a master file prepared and maintained by Tetra Tech. The master compiled list was created in Excel from the following sources:

- The mailing list provided by the Corps to Tetra Tech in September 2010;
- The e-mail distribution list provided by the Corps to Tetra Tech in September 2010;
- Sign-in sheets for the public informational meetings held by the Corps in May of 2010 and input by Tetra Tech;
- Sign-in sheets for the public informational meetings held by the Corps in December of 2010 and input by Tetra Tech;
- Sign-in sheets for the public informational meetings held by the Corps in May of 2011 and input by Tetra Tech; and
- Additional names and addresses forwarded by the Corps for inclusion.

The list is organized into logical categories. Information is entered as provided (including omissions) with duplications and obvious errors corrected. Corps staff and Corps contractors attending meetings have been eliminated from the list, and those entries from multiple sources are noted. The list also includes the stakeholder’s notification and document preferences (electronic or mail) when provided.

Tetra Tech will continue to maintain, update and make the list available to the Corps for the duration of the contract.

Stakeholder	Prefix	First Name	Last Name	Title	Organization
Business Association	Mr.	Richard	Chapman	President	Kern Economic Development Corporation
Business Association	Mr.	Rex	Emerson		Kern River Valley Chamber of Commerce
Business Association	Mr.	Tom	McKinney		Kern River Valley Chamber of Commerce
Business Association	Ms.	Debra	Moreno	President	Greater Bakersfield Chamber of Commerce
Business Association	Mr. and Mrs.	Elaine and Fred	Roach		Kern River Valley Chamber of Commerce
Business Association	Ms.	Jill	Sloan		Kernville Chamber of Commerce
Business Association	Ms.	Michelle	Sweet	Office Manager	Kernville Chamber of Commerce
Business Association	Mr.	Ray	Thurm	President	Kern River Valley Chamber of Commerce
Business Association					Kern River Valley Chamber of Commerce
Business Association					Kernville Chamber of Commerce
Business Association					Kernville Chamber of Commerce
Business Association					Lindsay Chamber of Commerce
Business Association					Porterville Chamber of Commerce
Business Association					Porterville Chamber of Commerce
Business Association					Ridgecrest Chamber of Commerce
Business Association					Springville Chamber of Commerce
Environmental Organization	Mr.	Chris	Horgan	Executive Director	Stewards of the Sequoia
Environmental Organization	Ms.	Georgette	Theotig	Chair	Sierra Club - Kern-Kaweah Chapter
Environmental Organization	Mr.	Reed	Tollefson	Preserve Manager	Kern River Preserve
Federal Elected	U.S Senator	Barbara	Boxer	Senator	U.S Senate
Federal Elected	U.S Senator	Dianne	Feinstein	Senator	U.S Senate
Federal Elected	U.S. Representative	Kevin	McCarthy	U.S. Representative	U.S House of Representatives
Federal Elected	Mr.	Ben	McFarland	Staff	Congressman Kevin McCarthy
Federal Elected	Mr.	Sam	Ray	Staff	Congressman Kevin McCarthy
Federal Government	Mr.	Ernie	Anderson		United States Geological Survey (retired)
Federal Government	Ms.	Der Hsien	Chang	Archaeologist	USDA Forest Service
Federal Government	Mr.	Dirk	Charley		United States Forest Service
Federal Government	Ms.	Brenda	Ehmann		USDA Forest Service
Federal Government	Ms.	Brenda	Ehmann	Deputy District Ranger	USDA Forest Service
Federal Government		Jody	Lyle		National Park Service
Federal Government	Ms.	Susan	Moore	Field Supervisor	U.S. Fish and Wildlife Service
Federal Government	Mr.	Cody	Norris	PAO	USDA Forest Service - Sequoia National Forest - Kern River District
Federal Government	Ms.	Alexandra	Picavet		National Park Service
Federal Government	Ms.	Valerie	Pillsbury		National Park Service
Federal Government	Ms.	Sue	Porter		Bureau of Land Management - Bakersfield Field Office
Federal Government	Ms.	Cathy	Purchis		National Park Service
Federal Government	Mr.	Jeremy	Redding		U.S. Fish and Wildlife Service
Federal Government	Ms.	Debbie	Santiago		Bureau of Land Management
Federal Government	Ms.	Penelope	Shibley		USDA Forest Service
Federal Government					U.S. Department of Agriculture - Bakersfield Service Center
General Public	Mr.	Scott	Alten		
General Public	Mr.	Gary	Amstutz		
General Public	Mr.	Ron	Anderson		
General Public	Mr.	Bob	Barnes		Arthur & Sidney R. Barnes Family Foundation; KRV Heritage Foundation
General Public	Mr.	Jack	Bernardin		
General Public	Ms.	Laura	Berry		
General Public	Ms.	Sharon	Bonorden		
General Public	Mr.	Tom	Bosmans		
General Public	Mr.	Chris	Brayman		
General Public	Mr.	Robert	Burkhart		
General Public	Mr.	Robert	Butterton		
General Public	Mr.	Thomas J.	Caldwell		
General Public	Mr.	Carl	Cappelen		
General Public	Mr.	Brian	Cosgrove		
General Public	Mr.	Jim	Davis		
General Public	Mr.	Marvin	Dean		
General Public	Ms.	Angie	Delgado		
General Public	Mr.	Curt	Douglas		California Hospital Association
General Public	Mr.	Rod	Eisenbraun		
General Public		K.	Evans		
General Public	Mr.	Clark	Farr	Local Engineer	
General Public	Ms.	Dawn	Ferguson		
General Public	Mr.	Ken	Ferguson		
General Public	Mr. and Mrs.	Don and Carol	Fink		
General Public	Mr.	Don	Fitch		

Stakeholder	Prefix	First Name	Last Name	Title	Organization
General Public	Ms.	Stephanie	Foe		
General Public	Mr.	Henry	Fountain		
General Public	Mr.	Paul	Fuller		
General Public	Mr.	Eric	Fuller		
General Public	Mr.	Ron	Fussy		
General Public		D.R.	Gaskin		
General Public	Ms.	Ingrid	Harris		
General Public	Ms.	Claire	Hartley		PAC Democratic Club
General Public	Mr.	Gary	Hasen		
General Public	Ms.	Jaymee	Hasty		
General Public	Mr.	Milford	Hearn		
General Public	Ms.	Barb	Hinkey		
General Public	Ms.	Eva	Hollman		
General Public	Mr.	Chris	Horgen		
General Public	Mr.	Greg	Iger		
General Public	Mr.	Jim	Isbell		
General Public	Mr.	Trenton	Jenette		
General Public	Mr.	Bill	Jewell		
General Public	Ms.	JoAnn	Jones		
General Public	Mr.	Bill	Jones		
General Public		V.	Jones		
General Public	Mr.	Melford	Kearn		
General Public	Mr.	Rex	Keeling		
General Public	Mr.	John	Keyes		
General Public	Mr.	Rob	Kirbach		
General Public	Mr.	Wallace	Kleck		
General Public	Ms.	Pam	Koidahl		
General Public		B.	Kubisiak		
General Public	Mr.	Scott	Kuney		
General Public	Ms.	Jean	Laborde		
General Public	Mr.	Mike	Lanza		
General Public	Mr.	Gary	Levy		
General Public	Mr.	A.J.	Lockwood		
General Public	Mr.	Larry	Luntz		
General Public	Mrs.	JoAnne	Luntz		
General Public	Mr.	Brian	Mauer		
General Public	Mr.	Saul	McGarity		
General Public	Ms.	Elizabeth	McGuirk		
General Public	Mr.	Rollie	Moore		
General Public	Ms.	Debbie	Naworski		
General Public	Ms.	Leann	Norris		
General Public	Mr.	John	Novosel		
General Public	Mr.	Craig	Parish		
General Public	Ms.	Denise	Peters		
General Public	Mr.	John	Petty		
General Public	Mr.	David	Prince		
General Public	Ms.	Suzette	Ramirez		
General Public	Mr.	Jon	Ream		
General Public	Ms.	Marily	Reese		
General Public	Mr.	Lane	Robinson		
General Public	Ms.	Merry	Shaines		
General Public	Mr.	Matt	Sheskies		
General Public	Mr.	Jono	Slade		
General Public	Mr.	James	Smith		
General Public	Mr.	Terry	Snow		
General Public	Mr.	Darl	Snyder		
General Public	Mr.	Richard	Stockton		
General Public	Mr.	Rick S.	Stockton		
General Public	Mr.	Steve	Story		
General Public	Mr.	Tom	Suggs		
General Public	Mr.	Ron	Vance		
General Public	Ms.	Nora	Weber		
General Public	Mr.	Michael	Welch		
General Public	Mr.	Horace	Wells		
General Public	Ms.	Sandra	Wieser		
General Public	Ms.	Dorothy	Williams		
General Public	Ms.	Ruthie	Heuer		
General Public	Mr. and Mrs.	Carol and Robert	Siliicz		Carol and Robert Silicz
Local Association	Mr.	Bob	Atkinson		Salvation Army
Local Association	Mr.	William	Blanton		Salvation Army
Local Association	Ms.	Cheryl	Borthick	President	Kernville Chamber of Commerce
Local Association	Ms.	Lorraine	Castro	CEO	American Red Cross - Kern Chapter

Stakeholder	Prefix	First Name	Last Name	Title	Organization
Local Association	Mr.	Joe	Ciriello	President	Kern River Valley Revitalization
Local Association	Mr.	Joe	Ciriello		Kern River Valley Revitalization
Local Association	Mr.	David	Dear		Kern Valley Progressive Alliance for Change , Kern River Valley Revitalization
Local Association	Mr.	Robert	Estrada		International Mt. Biking Association
Local Association	Mr. and Mrs.	John and Jenny	Hanley		Kern River Valley Revitalization
Local Association	Ms.	Deborah	Hess	President	Desert Mountain RC&D Council
Local Association	Mr.	Tom	Klein		Kern River Valley Community Emergency Reponse Team
Local Association	Mr.	Matthew	Park	Executive Director	Kern County Farm Bureau
Local Association	Mr.	Jon	Ream		Lake Isabella/ Bodfish Homeowners Association
Local Association	Mr.	Robert	Robinson	Upper Kern River Watershed Coordinator;	Desert Mountain Resource and Conservation Development; and Historict Preservation Office, Kern Valley Indian Community Council
Local Association	Mr.	Richard	Rowe		Kern River Valley Revitalization, Kern Valley Bike Path
Local Association	Mr.	Chuck	White		Kern River Valley Revitalization
Local Association					Lake Isabella Public Library
Local Association					Sequoia Crest Association
Local Elected	Council Member	Sue	Benham	Member City Council	City of Bakersfield
Local Elected	Council Member	Irma	Carson	Member City Council	City of Bakersfield
Local Elected	Council Member	David	Couch	Member City Council	City of Bakersfield
Local Elected	Mayor	Harvey	Hall	Mayor	City of Bakersfield
Local Elected	Council Member	Harold	Hanson	Member City Council	City of Bakersfield
Local Elected	Supervisor	Don	Maben	Supervisor	Kern County
Local Elected	Supervisor	Mike	Maggard	Supervisor	Kern County
Local Elected	Supervisor	John	McQuiston	Supervisor	Kern County
Local Elected	Supervisor	Michael	Rubio	Supervisor	Kern County
Local Elected	Council Member	Zack	Scrivner	Member City Council	City of Bakersfield
Local Elected	Council Member	Jacquie	Sullivan	Member City Council	City of Bakersfield
Local Elected	Supervisor	Ray	Watson	Supervisor	Kern County
Local Elected	Council Member	Ken	Weir	Member City Council	City of Bakersfield
Local Elected	Sheriff	Donny	Youngblood	Sheriff	Kern County Sheriffs Department
Local Government	Ms.	Georgianna	Armstrong		Kern County Emergency Services
Local Government	Mr.	David	Barker		Kern County Sheriffs Department
Local Government	Mr.	Shaun	Beasley		Kern County Sheriffs Department
Local Government	Mr.	Gene	Bogart		City of Bakersfield
Local Government	Mr.	Art	Chianello		City of Bakersfield
Local Government	Chief	Nick	Dunn	Fire Chief	Kern County Fire Department
Local Government	Ms.	Judy	Hyatt	Staff	Kern County Supervisor Jon McQuiston
Local Government	Mr.	Ted	James	Director	Kern County Planning Department
Local Government	Mr.	Allan	Krauter	Public Information Officer	Kern County
Local Government	Mr.	Chuck	Lackey		County of Kern
Local Government	Mr.	Jim	Maples		Tulare County
Local Government	Mr.	John	Nilon	County Administrator	Kern County
Local Government	Mr.	Alan	Tandy	City Manager	City of Bakersfield
Local Government	Mr.	Peter	Smith		Kern Council of Governments
Local Government					Kern County Air Pollution Control District
Media	Ms.	Susan	Barr		Kern Valley Sun
Media	Mr.	Michael	Batelaan		Kern River Courier
Media		C.	Bedell		Bakersfield Californian
Media	Mr.	Denny	Boyles		Fresno Bee
Media	Mr.	David	Castellon		
Media	Mr.	Scott	Costa	News Director	Kern River Radio
Media		C.	George		Bakersfield Californian
Media	Mr.	Mark	Grossi		Fresno Bee
Media	Mr.	Otis	Jennings		Kern High School District
Media	Mr.	Steven	Mayer		Bakersfield Californian
Media	Ms.	Cathy	Perfect	Editor	Kern Valley Sun
Media		C.	Petersen		Bakersfield Californian
Media	Mr.	Peter	Samore		KUZZ Radio
Media	Ms.	Kelsey	Thomas	Reporter	KGET Channel 17 - NBC
Media					Bakersfield Californian
Media					CBS 29 KBAK
Media					Daily Independent
Media					Daily Independent
Media					Daily Independent

Stakeholder	Prefix	First Name	Last Name	Title	Organization
Media					Fresno Bee
Media					Fresno Bee
Media					Fresno Bee
Media					Hot Springs Newsletter
Media					KABE Channel 39 - Univision
Media					Kaweah Commonwealth
Media					KBAK Channel 29 - CBS
Media					KBFX Channel 58 - FOX
Media					KBTF Channel 31 - Univision
Media					Kern Radio
Media					Kern River Courier
Media					Kern Valley Sun
Media					Kern Valley Sun
Media					Kern Valley Sun
Media					KERO Channel 23
Media					KERO Channel 23 - ABC
Media					KFSN Channel 30
Media					KGET Channel 17
Media					KGET Channel 17 - NBC
Media					KGPE Channel 47
Media					KNZR Radio
Media					KRV Publishing
Media					KSRW Radio
Media					KTIP Radio
Media					KVPR Radio
Media					Mountainyop B&B
Media					News Review
Media					Porterville Recorder
Media					Porterville Recorder
Media					Porterville Recorder
Media					QAB Media
Media					South Valley Bee - Fresno Bee
Media					South Valley Bee - Fresno Bee
Media					South Valley Bee - Fresno Bee
Media					Southern Sierra Messenger
Media					Southern Sierra Messenger
Media					Tule Times
Media					Univision 21
Media					Univision 39
Media					Upper Tule News
Media					Valley Voice
Media					Visalia Times Delta
Media					Visalia Times Delta
Media					
Other Business	Ms.	Nicole	Baker		Mountain and River Adventures
Other Business	Mr.	Lanny	Borthick		Contractor
Other Business	Ms.	Debbie	Campbell		California Land Management Services
Other Business	Mr.	Bill	Chase		North Fork Marina
Other Business	Ms.	Debra	Chase		French Gulch Marina
Other Business	Ms.	Kimberly	Cushman		Lake Isabella KOA
Other Business	Mr.	Richard	Huffman		Harris and Associates
Other Business	Mr.	Ron	Hunter		Insight Environmental
Other Business	Mr.	Rick	Igor		GEI Consultants
Other Business	Ms.	Dawn	Jordan		Kern River Outfitters
Other Business	Mr.	Scott	Kuney		Law Offices of Young Wooldridge
Other Business	Ms.	Jean	Laborde		Watson Reality
Other Business	Mr.	Tim	Lassen		Lassen Resources, Civil Engineering
Other Business	Ms.	Pamela	Leablemann	Manager	Beyond Juice
Other Business	Mr.	Tony	Lusich		Lusich and Associates
Other Business	Ms.	Sue	Roefer		The Kern Lodge
Other Business	Mr.	John	Stallone		Mountain and River Adventures
Other Business	Mr.	Luther	Stephens		Kern River Outfitters
Other Business	Mr.	Michael	Sullivan	Owner	Red's Marina
Other Business	Ms.	Sarah	Teed		Kern River Outfitters
Other Business	Mr.	Tom	Teofilo		Lodge at Painted Rock
Other Business	Ms.	Beth	Ubil		Century 21 - Lake Isabella
Other Business					Lakeside Village Mobile Home Park
Other Business					Springville Inn
Power	Mr.	Jimmy	Davis		Rio Bravo Power Plant
Power		Terry	Fallesen		Southern California Edison Company - Hydo Generation Division
Power	Mr.	Toby	Gibson		Southern California Edison Company
Power	Mr.	Gene	Hawkins		Southern California Edison Company

Stakeholder	Prefix	First Name	Last Name	Title	Organization
Power	Mr.	Bill	Heinze		Southern California Edison Company
Power	Ms.	Deborah	Hess		Southern California Edison Company
Power	Mr.	Brain	McGurty		Southern California Edison Company - Hydo Generation Division
Power	Mr.	Rush	Van Hook		Isabella Partners
State Elected	State Senator	Roy	Ashburn	State Senator	California State Senate
State Elected	Assembly Member	Jean	Fuller	Assembly Member	California State Assembly
State Government	Ms.	Lisa	Gymer	Scientist	California Department of Fish and Game - Central Region
State Government					Caltrans - District 6
State Government					Central Valley Regional Water Quality Control Board
State Government					Office of Historic Preservation - State Historic Preservation Officer
Tribal	Ms.	Arlene	Apalatea	Tribal Co-Chair	Kern River Paiute Council
Tribal	Mr.	Ruben	Barrios	Tribal Chairman	Santa Rosa Rancheria - Tachi Yokuts
Tribal	Mr.	Monte	Bengochia	Santa Rosa Rancheria-Tachi Yokuts	Santa Rosa Rancheria - Tachi Yokuts
Tribal	Mr.	Lawrence	Bill		Sierra Nevada Native American Coalition
Tribal	Mr.	Joel "Buck"	Carothers	Vice Chairman	Tule River Indian Reservation
Tribal	Mr.	Willie	Carrillo	Tule River Tribal Council	Tule River Indian Reservation
Tribal	Ms.	Kellie	Carrillo	Tule River - Yokut Archaeology Advisory Team (YAAT)	Tule River Tribe
Tribal	Ms.	Vivian	Christman	Tribal Clerk	Tule River Indian Reservation
Tribal	Ms.	Janice	Cuara	Santa Rosa Rancheria-Tachi Yokuts	Santa Rosa Rancheria - Tachi Yokuts
Tribal	Ms.	Danielle	Flowers	Cultural Resources Specialist	Table Mountain Rancheria
Tribal	Mr.	Lalo	Franco	Santa Rosa Rancheria-Tachi Yokuts	Santa Rosa Rancheria - Tachi Yokuts
Tribal	Mr.	Ryan	Garfield	Tribal Chairman	Tule River Indian Reservation
Tribal	Mr.	Joseph	Garfield	Environmental Assistant	Tule River Indian Reservation
Tribal	Mr.	Ray	Gonzalez	Santa Rosa Rancheria-Tachi Yokuts	Santa Rosa Rancheria - Tachi Yokuts
Tribal	Ms.	Christina	Gonzalez	Museum Registar	Table Mountain Rancheria
Tribal	Mr.	Fred	Grund	Tribal Administrator	Tule River Indian Reservation
Tribal	Ms.	Patricia	Henry	Tribal Co-Chair	Kern River Paiute Council
Tribal	Ms.	Mary	Herimeo	Chairwoman	Tule River Tribal Elders Committee
Tribal	Mr.	Carlos	Hernandez	Vice Chairman	Big Pine Paiute Tribe of Ownes Valley
Tribal	Mr.	James	Hunter	Tule River - Yokut Archaeology Advisory Team (YAAT)	Tule River Tribe
Tribal	Ms.	Rhonda	Hunter		Tule River Tribal Elders Committee
Tribal	Mr.	Melvin	Joseph	Tribal Chairman and Environmental Officer	Lone Pine Paiute-Shoshone Indian Reservation
Tribal	Ms.	Rosabel	Lopez	Tribal Clerk	Tule River Indian Reservation
Tribal	Mr.	Charles	Lwenya	Tribal Natural Resource Director	Tule River Indian Reservation
Tribal	Ms.	Jennifer	Malone	CIBA Board Member	California Indian Basket Weavers Association
Tribal	Mr.	J.R.	Manuel	Tule River - Yokut Archaeology Advisory Team (YAAT)	Tule River Tribe
Tribal	Ms.	Mandy	Marine		Dunlap Band of Mono Indians-Historical Preservation Society
Tribal	Ms.	Charmaine	McDarment	General Council	Tule River Indian Reservation
Tribal	Ms.	Donna	Miranda-Begay	Tribal Chairwoman	Tubatulabals of Kern Valley
Tribal	Mr.	Virgil	Moose	Tribal Chairman	Big Pine Paiute Tribe of Ownes Valley
Tribal	Mr.	Bob	Pennell	Cultural Resources Specialist	Table Mountain Rancheria
Tribal	Ms.	June	Price	Tribal Chairwoman	Kern Valley Indian Council
Tribal	Ms.	Samantha C.	Riding-Red-Rorse		Tubatulabals of Kern Valley
Tribal	Mr.	David Laughing Horse	Robinson	Tribal Chairman	Kawaiisu Tribe
Tribal	Mr.	Brian	Rueger	Tribal Forester	Tule River Indian Reservation
Tribal	Mr.	Shane	Santos	Fire Chief	Tule River Indian Reservation
Tribal	Mr.	Eddie "Tupishna"	Sartuche		California Native American Indians
Tribal	Ms.	Josephine	Stone		White Blanket Allotment

Stakeholder	Prefix	First Name	Last Name	Title	Organization
Tribal	Ms.	Ruby	Vargas		Eshom Gathering c/o Stephan Gamboa
Tribal	Mr.	William	Vega	Tribal Chairman	Bishop Paiute Tribe
Tribal		Kerri	Vera	Environmental Director	Tule River Indian Reservation
Tribal	Ms.	Leanne	Walker-Grant	Tribal Chairwoman	Table Mountain Rancheria
Tribal	Mr.	Ron	Wermuth		Monache Intertribal Association
Tribal	Mr.	Shawn	Williams		Tule River Tribal Elders Committee
Tribal					Tule River Indian Reservation
Water	Ms.	Lauren	Bauer		Kern County Water Agency
Water	Mr.	James	Beck	General Manager	Kern County Water Agency
Water	Mr.	Florn	Core	Director	City of Bakersfiled - Water Resources Department
Water	Mr.	Steven	Dalke	President	Water Association of Kern County
Water	Mr.	Brent	Graham	Manager	Tulare Lake Basin Water Storage District
Water	Mr.	Martin	Milobar		Buena Vista Water Storage District
Water	Mr.	Martin	Milobar		Buena Vista Water Storage District
Water	Mr.	Mark	Mulkay	Engineer-Manager	Kern Delta Water District
Water	Mr.	Dana	Munn	Engineer-Manager	North Kern Water Storage District
Water	Mr.	Don	Richardson		City of Bakersfield - Water Resources Department
Water	Mr.	John	Ryan		City of Bakersfield - Water Resources Department
Water	Mr.	Chuck	Williams	Watermaster	Kern River Watermaster

APPENDIX B

2011 ANNUAL WATER QUALITY REPORT FOR ISABELLA LAKE

APPENDIX B

2011 Isabella Lake DSAP Monitoring Summary Report

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Environmental Engineers
U. S. Army Corps of Engineers
Sacramento District
December 2011

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I. Introduction

Isabella Lake is a reservoir made up of two earthen dams on the Kern River about 35 miles northeast of Bakersfield, between the towns of Lake Isabella and Kernville in California. The dams were completed in 1953 at a federal cost of $22 million to provide flood control, irrigation, and recreational benefits. The Main Dam is 185 feet high and 1725 feet long while the Auxiliary Dam, 2,000 feet away, is 100 feet high and 3257 feet long. Together, the dams provide 570,000 acres-feet of storage space at full capacity. The dams protect more than 300,000 people located in the Bakersfield area and about 350,000 acres of agricultural land and oilfields. The dams are operated and maintained by the U.S. Army Corps of Engineers (Corps), while the park facilities are operated and maintained by the US Forest Service.

The Kern River is broken up into two stems: the North Fork and South Fork. Mountain ridges of 10,000 feet elevation separate the north and south streams. The north fork runs through Mt. Whitney and drains into Isabella Lake contributing approximately 85% of the total flow. Precipitation typically falls as rain at elevation levels less than 5,000 feet and as snow at higher elevations. Generally, rainfall inflows begin during the winter and last till mid spring (November to April). Snowmelt inflows begin on April and last throughout the summer. Snowmelt has a greater volume of inflow into Isabella Lake with volume peaks between April and July.

Through a series of seismic investigations done from 2003 to 2006, studies showed that both the Main and Auxiliary Dam have possibilities of dam failure. The dams have been classified as DSAC I (the highest risk rating): urgent and compelling (unsafe), due to seismic and seepage issues and the large population located downstream within the inundation zone. The Corps will be evaluating alternatives to reduce the dam's safety risks prior to the design and construction phases. Further investigation and safety alternatives are being considered. Remedial action is expected to begin in the year 2015. In the mean time, on April 27, 2006, the Corps implemented a pool restriction based on the seepage concerns. The lake elevation will be limited until the Corps completes the design of the permanent solution alternative and construction commences. The current pool restriction is 20 feet below full pool level (elevation of 2585.5 feet), or 63% of full capacity. This condition and further impacts that may occur during remediation are likely to have an impact on water quality in the reservoir and downstream.

Water quality has been monitored at Isabella Lake by the Corps as part of an environmental monitoring program since 1974. The monitoring program was implemented to determine the water quality level for both recreation and environmental health and to satisfy the Department of Army Engineering Regulation 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects" which was written under the authority of the Federal Pollution Control Act (FWPCA), the Clean Water Act, and the Water Quality Act. Over time, the program has expanded to include more parameters and wet samples have been collected since 2001 to look for constituents such as metals, nutrients, solids, and more. By collecting data, a water quality profile can be developed for Isabella Lake and the Corps can check compliance with federal and state regulations for drinking water and aquatic life limits as well as more local objectives set by the Tulare Basin Plan. In the future, with the anticipated remediation activities, other water quality regulations will need to be adhered to such as the California Construction General Permit (CGP) and applicable discharge permits.

Historical data and more recent monthly and continuous water quality monitoring activities suggest that there are some existing concerns regarding the water quality of Isabella Lake that may be exacerbated by remediation activities depending on the selected alternative. The main areas of concern for water quality based on historical data include compliance with state and federal regulations now and in the future, the possible implications of construction activities around a lake that remains fully-mixed throughout the seasons, arsenic levels in the lake that are near and sometimes above the drinking water limit, and hazardous algal blooms which are suspected to have caused fish and bird kills in the past. Analyzing the historical water quality data also showed that there is a need for tighter resolution of data to help understand and capture conditions that are expected during any construction activities. The first phase of a supplemental monitoring program was implemented in April of 2009 to begin capturing parameters once a month and wet samples at least quarterly. Another phase of monitoring was implemented in April 2011 in which a buoy housing a water quality sonde captures hourly readings at the Main Dam, a time resolution that will be more relevant to expected conditions that need to be analyzed during any remediation activities.

II. Regulatory Setting

The Corps has a national policy to protect and enhance the quality of air, water, and land resources. The protection and enhancement of these resources can include developing water quality management programs and compliance with all federal, state, interstate, and local requirements (ER 1110-2-8154, May 1995). Water quality management objectives of the Corps listed in ER 1110-2-8154 that are related to the Isabella Lake DSAP project include to "define baseline water quality conditions for each project…, establish and maintain a water quality monitoring and data evaluation program that ensures achievement of water quality management objectives and to evaluate project performance and water quality trends…, and integrate water quality considerations into all water control management decisions." The authorities for this Department of Army ER come from the Federal Pollution Control Act (FWPCA) of 1948, the Clean Water Act of 1977, and the Water Quality Act of 1987.

Isabella Lake is subject to compliance with the guidelines as established by state and federal water quality goals (CVRWQCB, 2008) and additional requirements within the Tulare Basin Plan (CVRWQCB, January 2004). Water quality goals set by state and federal agencies that are relevant to Isabella Lake mainly involve fresh water aquatic life limits and human health limits for drinking water and/or recreational waters. Specific limits can be found in the "Water Quality Limits for Constituents and Parameters" document prepared by the California Central Valley Regional Water Quality Control

Board and the California Environmental Protection Agency and recently updated in July 2008. Applicable standards and limits to the constituents tested at Isabella Lake can be found in the following section on “Affected Environment.” The State of California approved “Tulare Basin Plan”, which includes Lake Isabella, contains both general and area specific goals for various water quality parameters. The plan can be found at the following website:
http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/tlbp.pdf

The Tulare Basin Plan establishes guidelines to ensure reasonable protection of Lake Isabella’s beneficial uses: hydropower generation, water contact recreation, non-contact water recreation, warm freshwater habitat (WARM), cold freshwater habitat (COLD), wildlife habitat, and freshwater replenishment. Objectives have been established for water quality parameters such as: dissolved oxygen, electrical conductivity, turbidity, pH and a variety of metals. Although, the lake is responsible for both COLD and WARM beneficial uses, coldwater fish species find it difficult to breed and survive year round in Isabella Lake due to the warm summer water temperatures. Specific goals for water quality parameters can be found in the next section on the “Historical Monitoring Program.”

III. Existing Conditions

Generally Isabella Lake near the Main Dam has a depth of less than 100 feet during the sampling events and is considered a mesotrophic lake when characterized by its clarity. A mesotrophic lake is one that has qualities between an oligotrophic (clear and nutrient limited, example Lake Tahoe) and a eutrophic lake (low clarity and high in nutrients, example Clear Lake). Unlike many of the eutrophic lakes that are monitored by the Corps, Isabella Lake can maintain aerobic conditions (available dissolved oxygen, DO) at the bottom depths during warm late summer months. Similar to many eutrophic lakes, Isabella is warm (>20ºC) in the late summer. Due to the high late summer temperatures, only warm water fish species could reliably survive in the lake year round. Warm water fish species include bass, carp, perch, bluegill, crappie, and catfish. Although clearer than eutrophic (nutrient rich) lakes, mesotrophic lakes also can have low water clarity due to algal blooms. Being relatively shallow, the clarity of the lake is subject to being diminished by sediments suspended by wind action. Water clarity is often measured in terms of Secchi Disc depth (SD). Historically, the water clarity in Lake Isabella is good with only ~14.3% of the samples not meeting the recreational goal of 4 feet or greater.

Historical data and more recent monthly and continuous water quality monitoring activities suggest that there are some existing concerns regarding the water quality of Isabella Lake that may be exacerbated by remediation activities depending on the selected alternative. The main areas of concern for water quality based on historical data include: compliance with state and federal regulations now and in the future, the possible implications of construction activities around a lake that remains fully-mixed throughout the seasons, arsenic levels in the lake that are near and sometimes above the drinking water limit, and hazardous algal blooms which are suspected to have caused fish and bird kills in the past. Analyzing existing water quality data also showed that there may be a need for modeling of data to help understand and capture conditions that are expected during any construction activities. The first phase of a supplemental monitoring program was implemented in April of 2009 to begin capturing parameters once a month and wet samples at least quarterly. Another phase of monitoring was implemented in April of 2011 to capture hourly readings of parameters at the surface of the water near the Main Dam, a time resolution that will be more relevant to expected conditions that need to be analyzed during any remediation activities.

Other water quality concerns are related to specific phases of construction such as a cofferdam placed in the dry footprint of the lake that will be utilized to conduct work near the dam for approximately 8-9 months. The pool elevation will be lowered to 2540 feet to construct the cofferdam and probably during construction of an upstream berm and during deep foundation treatment at the Auxiliary Dam. The water quality impacts of these specific activities will be discussed further in the Analysis of Alternatives section.

As part of the ongoing monitoring program, biannual samples and electronic sensor readings are taken at the lake inflows (North and South fork of the Kern River) and near the deepest part of the lake (near the Main Dam for Isabella Lake) at the surface and bottom. Also, a profile of the lake is taken to capture water quality levels at 1-meter intervals. In April 2009, water quality monitoring efforts were expanded to monitor approximately every month at the above locations, at the outlets of both dams, and record profiles upstream of both dams at their presumed deepest locations at 1-meter intervals. The main outflow monitoring location is a short distance downstream from the dam at an existing station used by the Corps and where there is a dissolved oxygen monitoring station installed and seasonally operated by a hydro electric power plant. The selected Main Dam monitoring location allows for increased comparability with the limited historical data. The need to perform additional testing immediately at the dam outflow is currently under consideration. These procedures are outlined in a Sampling Analysis Plan (SAP) prepared by the Corps, Sacramento District (Isabella SAP, 2010). Figure 1 shows the monitoring locations where the following water quality parameters are obtained: water temperature, depth (profiles only), pH, conductivity (salinity), dissolved oxygen (DO), nitrate and turbidity. Wet samples for various organics, inorganics, and metals are also collected approximately once every season. The monitoring program was again enhanced in April of 2011 to include a buoy floating near that Main Dam that houses a water quality sonde capturing hourly data on the water quality approximately 1 meter below the water surface. The sonde has the following sensors: temperature, conductivity, optical DO, pH, depth, integrated chlorophyll, ORP and a self cleaning turbidity sensor. In the future, a buoy may also be placed at the Auxiliary Dam containing the same features as the one at the Main Dam. Data collected from the new monitoring equipment as well as results from anticipated additional laboratory samples will be used for modeling potential impacts of each design alternative.

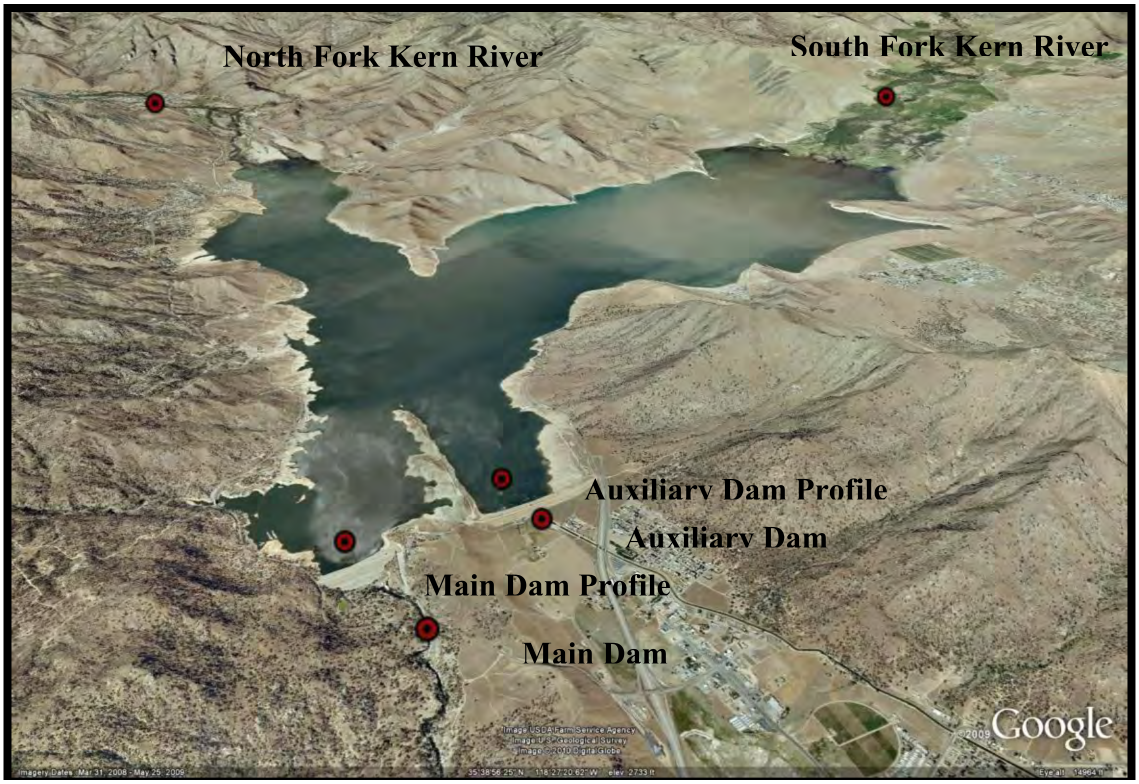

Figure 1: Current Monitoring Locations

Following is a brief description of the historical and more recent data for each parameter including as much data as possible through July 2011 unless otherwise noted. The water quality goals referenced below are from the Tulare Basin Plan unless otherwise indicated. Table 4 shows the seasonal ranges of each parameter collected during the Main Dam's profiles between April 2009 and July 2011 with the associated acceptable levels in the Tulare Basin Plan.

A. Secchi Disk Depth

Water clarity is often measured in terms of Secchi Disk depth (Figure 2). A measurement of water clarity is useful for determining the nutrient level of the lake. Isabella Lake can be classified as a mesotrophic lake when classified by its historical water clarity (Welch, 1992). Isabella Lake, for the most part, has met the recreational lake clarity goal of 4 feet. Historically, there have been a few instances where Secchi depths were less than 4 feet; however, from 2004 to the present, depths have met the Tulare Basin Plan goals.

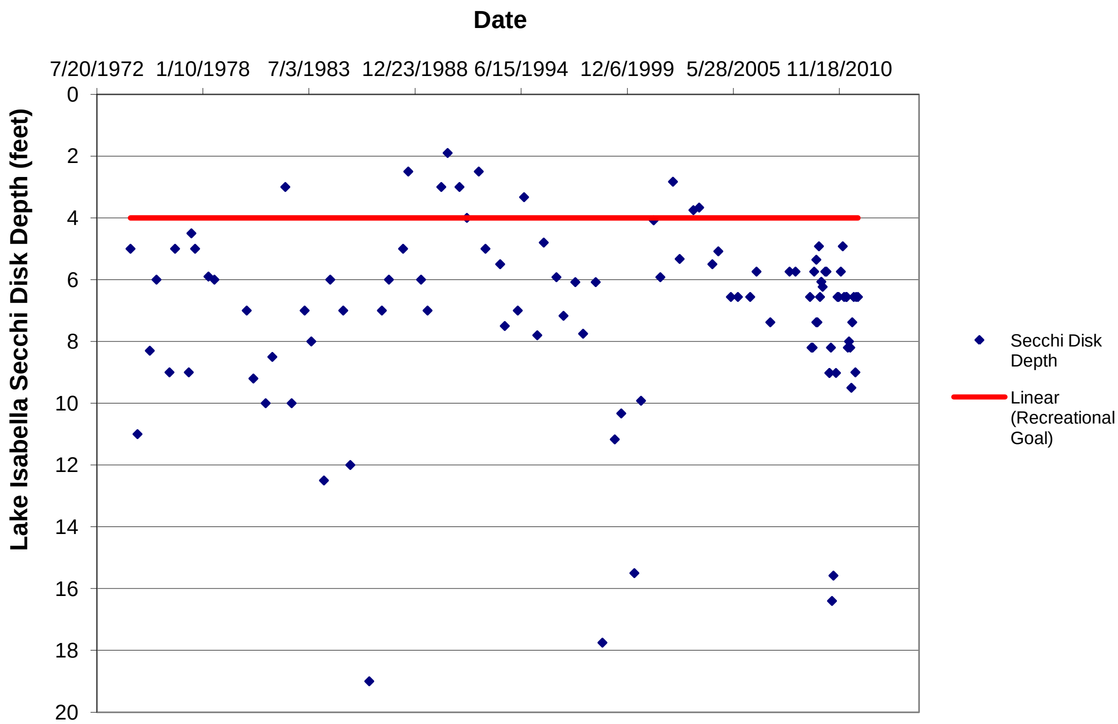

Figure 2: Secchi disk depths from 1974 to 2011. The Tulare Basin Plan lists a recreational secchi depth goal of 4 feet or greater.

B. Water Temperature

The spring temperature profiles for Isabella Lake at the Main Dam and Auxiliary Dam are indicative of a well-mixed lake. Figures 5 and 6 show a graph of the surface and bottom temperatures from April 2009 to July 2011. The temperatures used in the graphs are from the shallowest reading (usually 1 foot below the surface) for the surface value and the deepest reading (usually right above the bottom of the reservoir) for the bottom value. This same technique is used for the surface and bottom values of all water quality parameters. Temperature values for spring (Figure 3) are nearly uniform along the water column with slight variations. Temperature values for fall (Figure 4) also appear to show uniformity although there is some temperature variability from surface to bottom. There are brief periods of stratification during the summer where small metalimnion and hypolimnion layers are present in the bottom 4 meters of the lake, but the water column was still mixed in our sample locations. This observed pattern will likely to lead to water quality issues during construction.

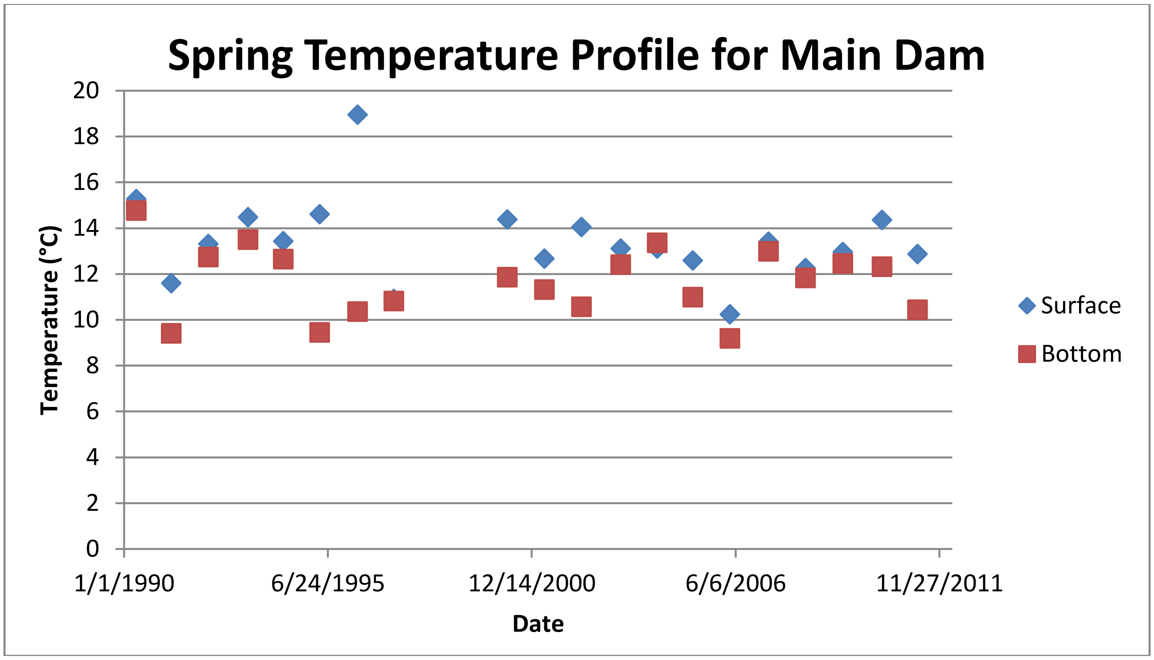

Figure 3: Temperature profiles for spring at the Main Dam. Temperature values are missing from 1998 to 2000.

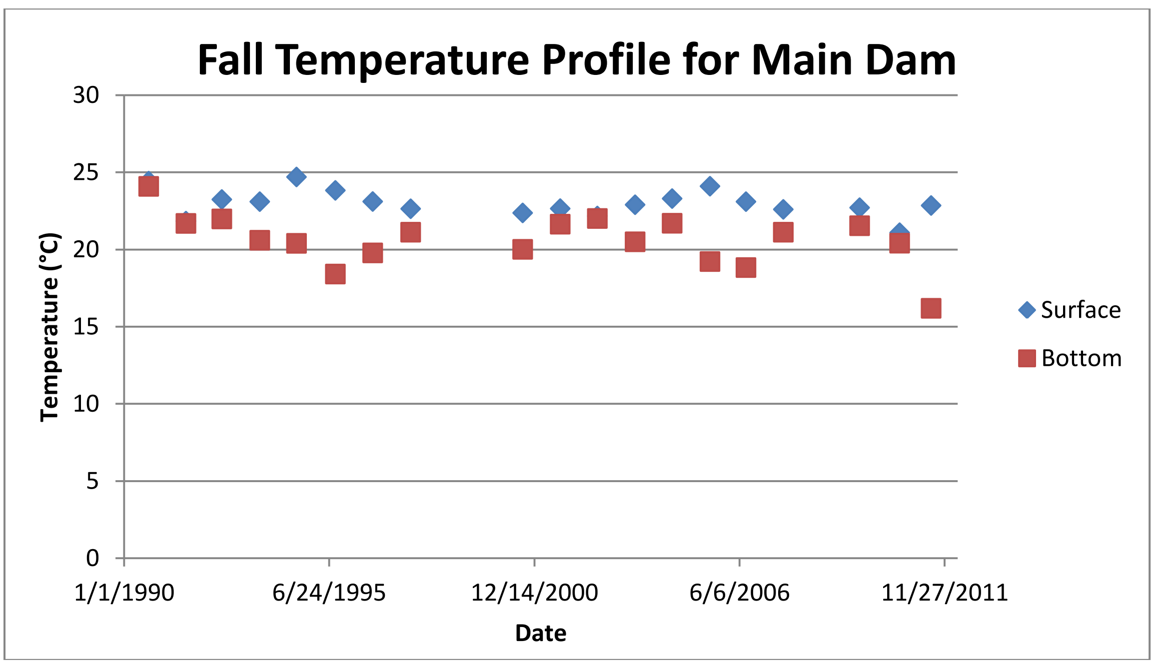

Figure 4: Temperature profiles for fall at the Main Dam. Temperature values are missing from 1998 to 2000.

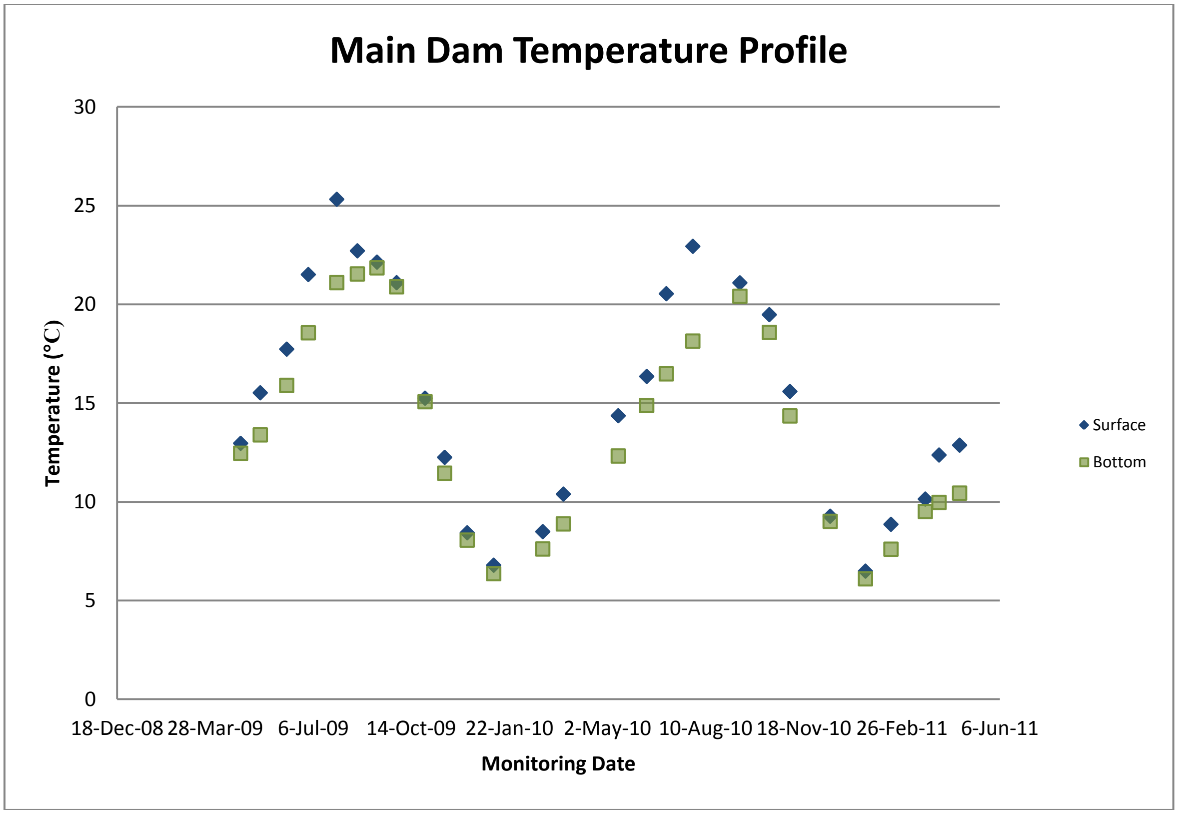

Figure 5: Main Dam temperature profiles since monthly monitoring began in April 2009.

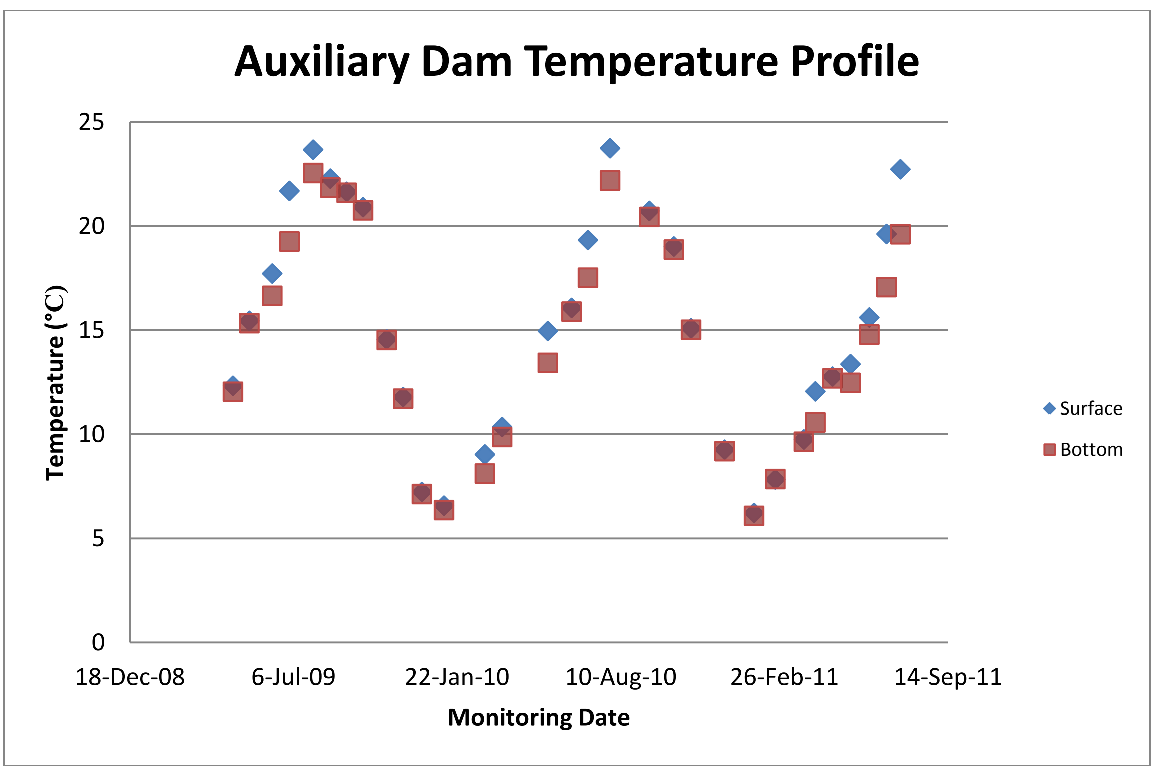

Figure 6: Auxiliary Dam temperature profiles since monthly monitoring began in April 2009.

Lakes similar in altitude and latitude as Isabella Lake are classified as warm monomictic thermal lakes (Wetzel, 2001). These lakes typically circulate freely once a year in the winter at or above 4°C, and are stably stratified for the remainder of the year. Stable stratification is a result of the water column thermally dividing into three regions which are typically resistant to mixing with each other, as seen in Figure 7.

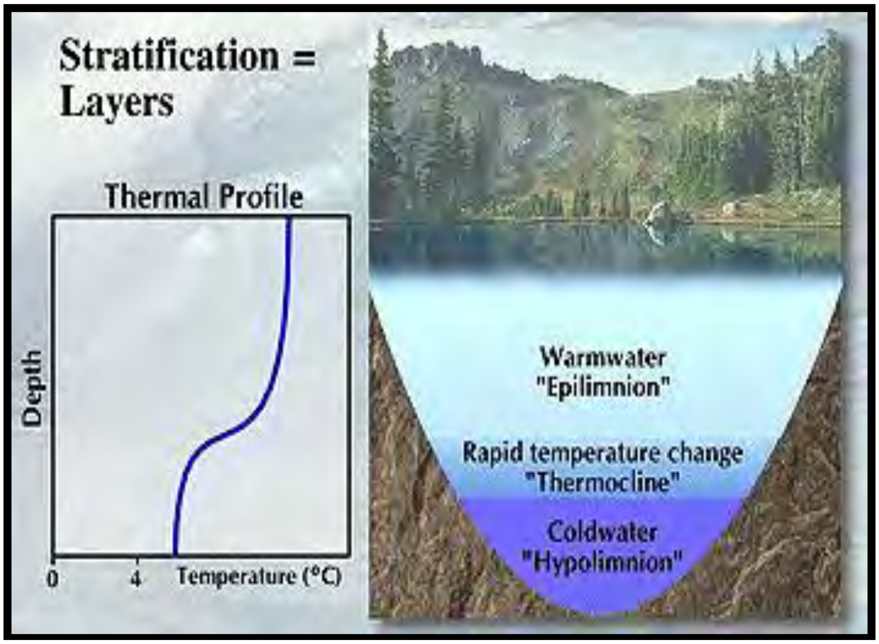

Figure 7: Typical Thermal Stratification (figure from www.aquatic.uoguelph.ca/lakes/season/seasnfm.html)

The lowest stratum, the hypolimnion, is made up of a cold, dense, relatively undisturbed layer of water. The upper stratum, the epilimnion, is made up of uniformly warm, circulating, and fairly turbulent waters. The middle stratum, the metalimnion, is characterized by a strong temperature gradient as the upper and lower stratums intersect. Isabella Lake does not follow the warm monomictic characteristics as is expected from its location. As seen in Figures 8, the temperature profile for Isabella Lake represents a polymictic thermal lake type which is characterized by frequent or continuous periods of mixing per year.

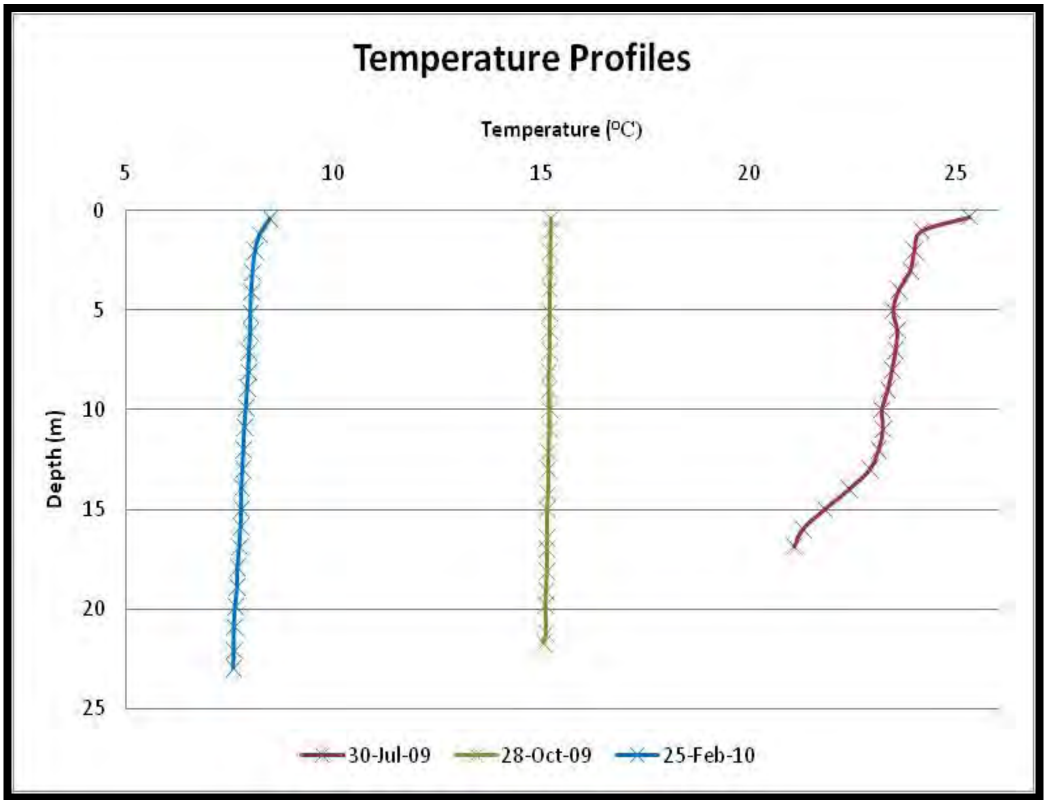

Figure 8: Example temperature profiles at the Main Dam.

As a comparison, nearby lakes Kaweah and Success are of similar altitude and latitude as Isabella Lake but have the profile characteristics of warm monomictic thermal lake types. Figure 9 displays the temperature profile of all three lakes during monitoring events in spring of 2009. Lake Isabella's curve represents a completely mixed water column while the curves from Lakes Kaweah and Success show evidence of the three strata. This pattern has been observed throughout the period of supplemental monitoring.

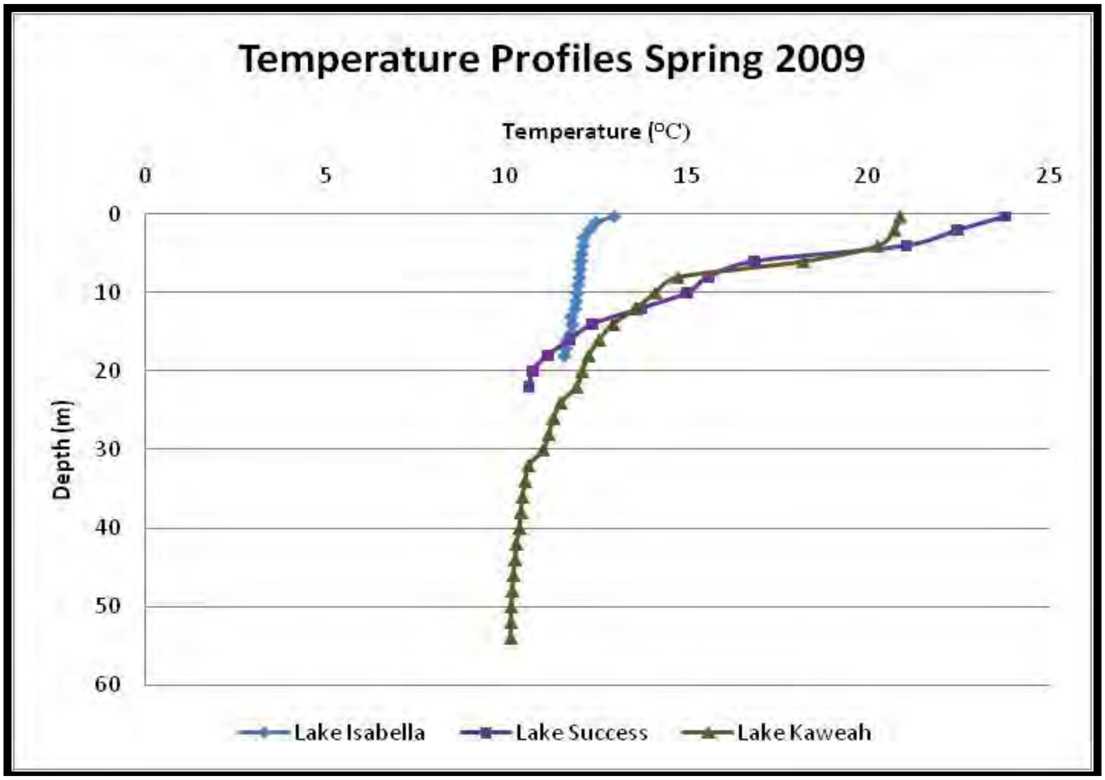

Figure 9: Temperature Profiles of Lakes Isabella, Kaweah and Success during the spring of 2009.

Isabella Lake is regularly subjected to high winds which are the most likely cause of the unique mixed characteristics of the lake. Wind energy mechanically distributes most of the heat in the epilimnion with the use of waves to mix the water. As wind blows over the surface for a substantial period of time, wind drift causes water to pile up, with a rise in surface level at the lee end of the lake. During this process the thermocline level lowers, which increases the upper mixed layer of the lake. In the past fifteen years, the predominant winds have been south southwest with an average wind speed of approximately 4.3 mph. However, since 2007, the wind has averaged faster than previous years with an average of almost 6 mph from 2007-2011. This increase in wind speed is due to a change in equipment used to capture wind data. The data was collected by a contractor for the Corps and it is the opinion of both the Corps and the contractor that the newer equipment and therefore the data available since 2007 is the most accurate. When the wind direction is south southwest, the wind is blows water in the lake towards the Auxiliary Dam. As the water reaches the dam, waves crash against the rip rap and create aeration of the water. This effect helps produce higher levels of dissolved oxygen in the lake. Figure 10 shows the monthly averages of wind speed from 1995 – 2011 with the high storm of December 2002 and January 2003 excluded to provide a proper scale.

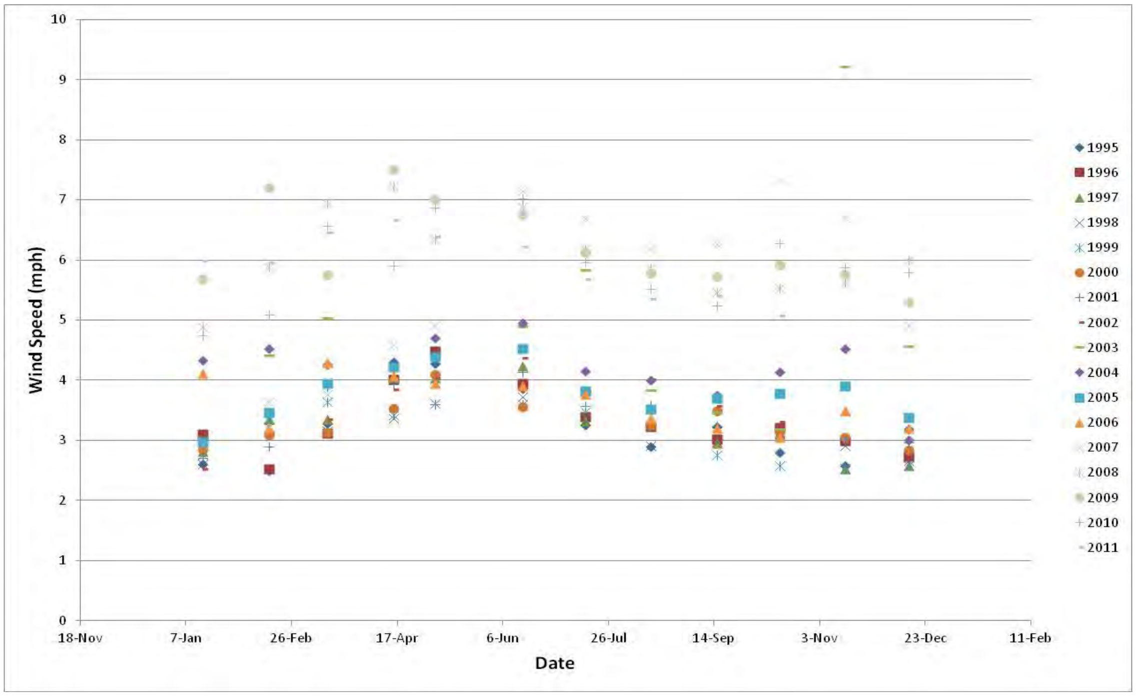

Figure 10: Average wind speed at Isabella Lake from 1995 – 2011. Data was collected daily.

Isabella Lake receives the majority of its water from rainfall in the winter and spring and snowmelt in the summer. It is a warm climate lake with summer water temperatures greater than 20°C. Warm water fish species found in the lake include hardheads, Sacramento pikeminow, Sacramento sucker, riffle sculpins, smallmouth bass, largemouth bass, channel catfish, carp, bluegill and crappie. Due to the warmth of the water, coldwater fish species would find it difficult to breed and survive year round. Under the Tulare Basin Plan, Isabella Lake is responsible for both cold water and warm water fish (beneficial use designation COLD and WARM); however, mainly warm water fish dwell in the lake year round.

The temperatures at the Main and Auxiliary Dam outflows are very similar, bounded between 5 and 25 degree Celsius. The data follows a sinusoidal pattern throughout the season with the highest temperatures seen in September and the lowest in January (Figure 11).

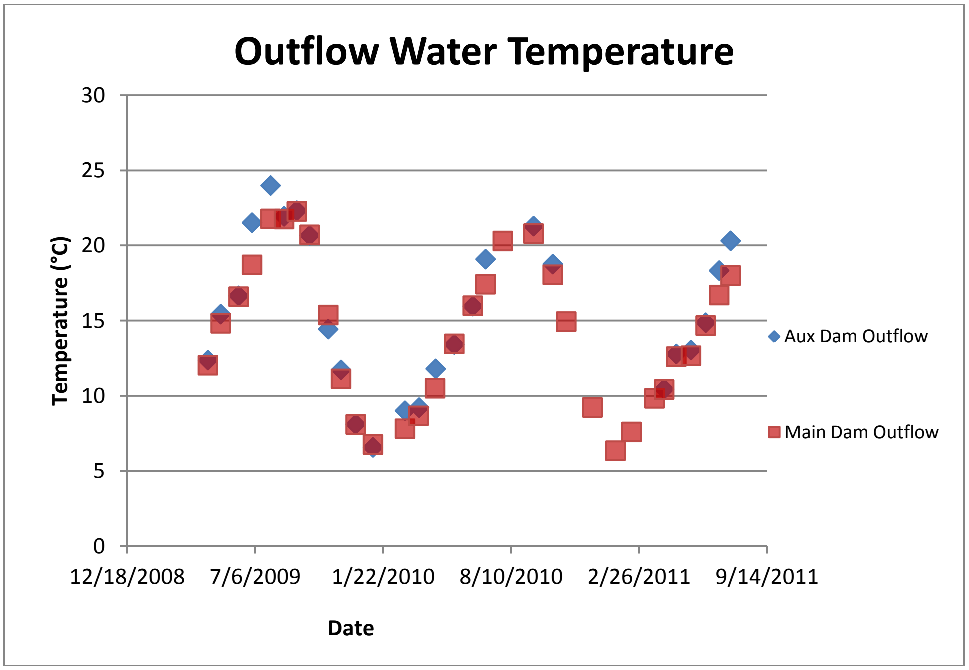

Figure 11: Water temperature values recorded at the Isabella Lake Outflows from April 2009 – July 2011

C. Dissolved Oxygen (DO)

Dissolved oxygen levels in the lake near the Main Dam clearly differ between spring and fall season (Figures 12 & 13). Spring season had an average DO level of 9.9 mg/L and 7.7 mg/L for surface and bottom, respectively. Fall season had an average DO level of 7.6 mg/L and 1.9 mg/L for surface and bottom, respectively. The Tulare Basin Plan specifies a preferred DO level of 5 mg/L for lakes with a beneficial use designation for warm water fish, 7 mg/L for lakes with a beneficial use designation for cold water fish, and a goal of 8 mg/L for Isabella Lake specifically. Isabella Lake meets the desired DO levels for fish for surface and bottom during the spring; however, DO levels in the fall only meet the minimum of 7mg/L near the surface but bottom DO levels fall short of even the lowest goal of 5 mg/L. Both spring and fall averages of DO either at the surface or bottom or both are not high enough to reach the Isabella Lake specific goal of 8 mg/L. There have even been instances during the fall season where DO levels at the bottom of the reservoir are less than 1 mg/L. This can be detrimental to aquatic life and can lead to other undesirable conditions. Low DO levels can be a result of low circulation, high temperatures, and high levels of organic decomposition at the bottom of the lake.

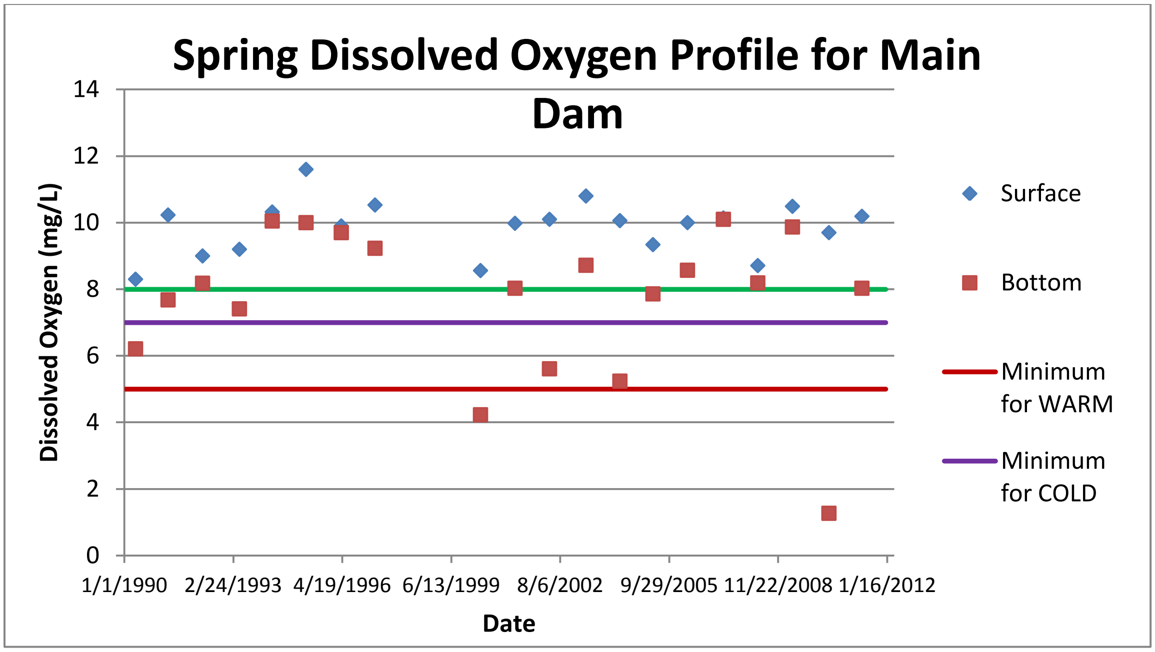

Figure 12: Dissolved oxygen (DO) values for spring at the Main Dam. Tulare Basin Plan states a goal for DO levels no less than 5 mg/L for beneficial use of WARM and 7 mg/L for COLD and 8 mg/L specifically for Isabella Lake. DO values are missing between 1998 and 2000.

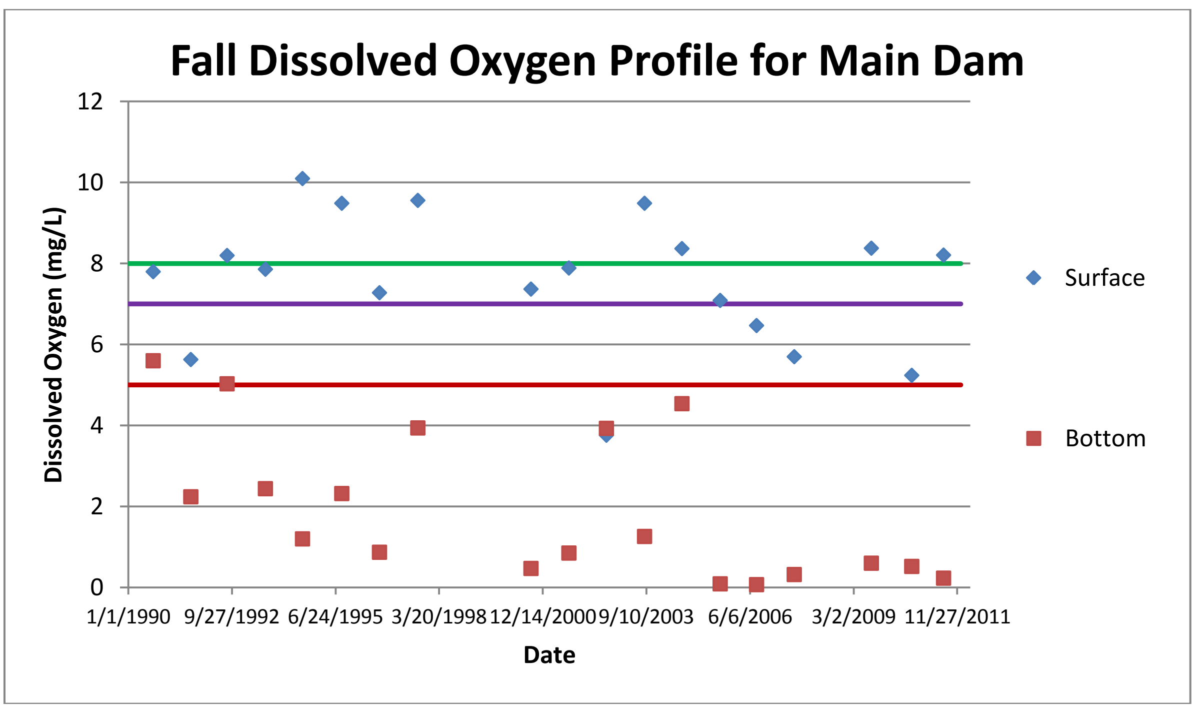

Figure 13: Dissolved oxygen (DO) values for fall at the Main Dam. Tulare Basin Plan states a goal for DO levels no less than 5 mg/L for beneficial use of WARM and 7 mg/L for COLD and 8 mg/L specifically for Isabella Lake. DO values are missing between 1998 and 2000.

Monitoring of the Auxiliary Dam began in April of 2009 with the implementation of the supplemental monitoring program. The results of the dissolved oxygen profiles of the Auxiliary Dam show higher levels of DO at the surface and bottom of the reservoir than profiles of the main dam. Over the last two years, the average DO at the surface was 10.1 mg/L and 9.0 mg/L at the bottom. These averages include readings taken approximately once a month. The lowest DO (4.5 mg/L) was observed at the bottom of the reservoir in August of 2009. Figure 14 shows the Auxiliary Dam profiles for DO. This remarkably higher DO than the Main Dam may be the result of a shallower part of the lake where wind causes nearly constant mixing of the water column. Most of the DO readings at the Auxiliary Dam meet the DO requirements for WARM and COLD beneficial uses and the minimum proposed for Isabella Lake; however, there are still times in the late summer and early fall when these goals are not met.

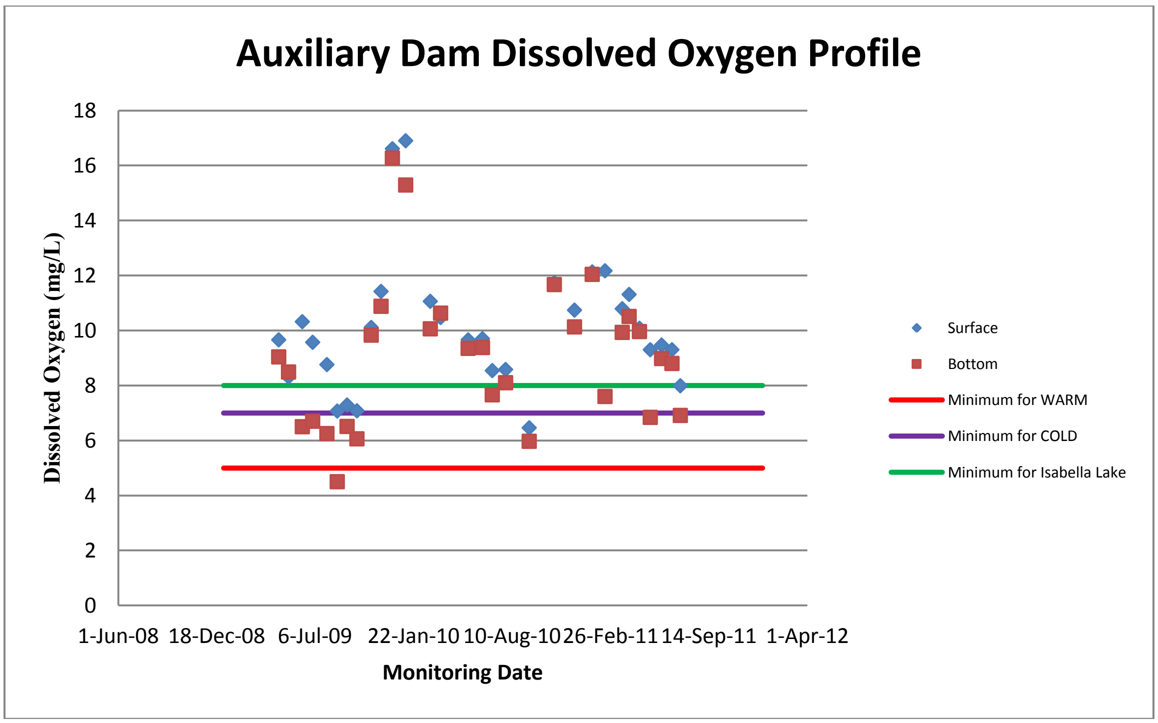

Figure 14: Dissolved oxygen (DO) values for the Auxiliary Dam since monitoring began in April 2009. The Tulare Basin Plan states goals for DO levels at no less than 5 mg/L for beneficial use of WARM and 7 mg/L for COLD and 8 mg/L specifically for Isabella Lake.

The lake's DO levels, especially near the Main Dam, are prone to be outside of the basin plan's water quality objectives. However, the DO at the outflows of both the Main and Auxiliary Dams tends to be more in line with the water quality objectives. The outflow Auxiliary Dam monitoring location is immediately adjacent to the outflow structure. Dissolved oxygen levels at the outflows are usually above the more stringent DO minimum for Isabella Lake of 8 mg/L, but levels fall below this value in the summertime. The requirements are met at the Auxiliary Dam outflow nearly 100% of the time. Figure 15 shows the DO at both outflows from April 2009 to September 2011.

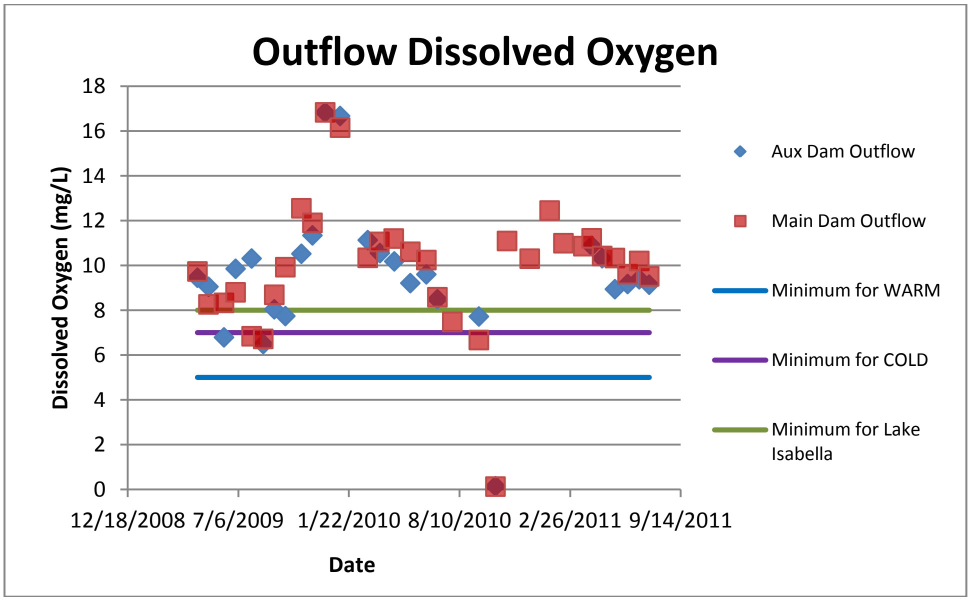

Figure 15: Dissolved Oxygen values recorded at the Isabella Lake Outflow from April 2009 – July 2011

D. pH and Electrical Conductivity (EC)

The pH values at the Main Dam of Isabella Lake are mostly well within the 6.5 to 8.3 zone as desired in the Tulare Basin Plan (Figure 16 & 17). The surface and bottom pH values were similar during the spring season. More variation between surface and bottom pH values can be observed during the fall season.

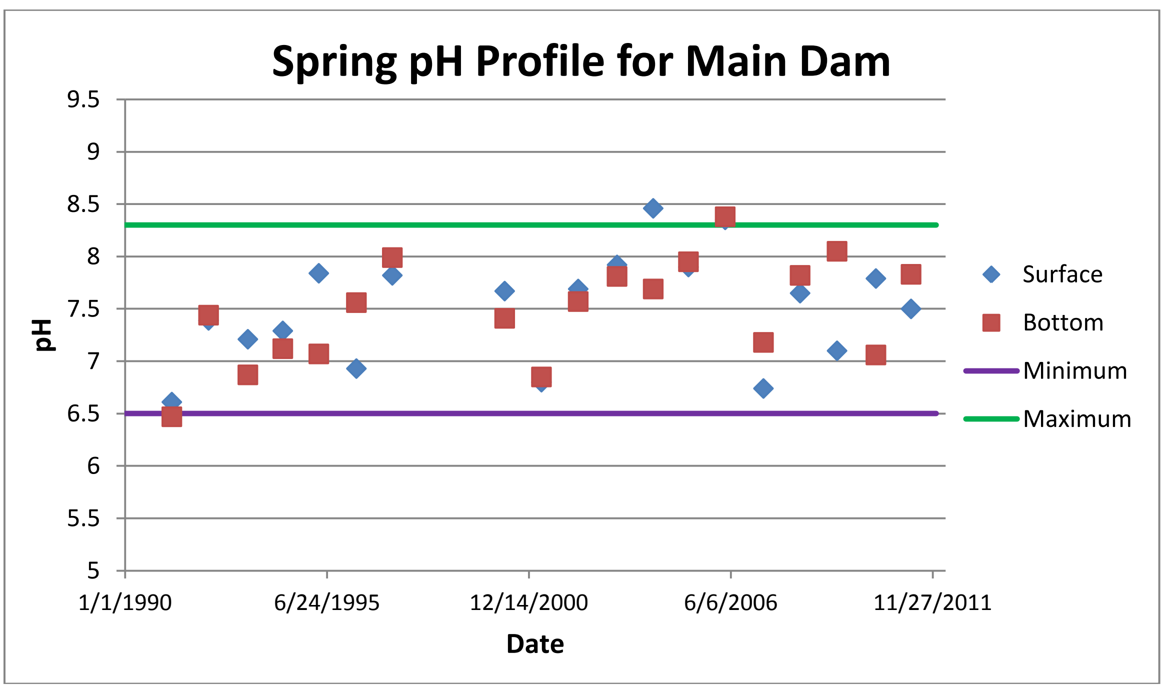

Figure 16: PH values for spring at the Main Dam. Tulare Basin Plan specifies desired pH levels between 6.5 and 8.3. PH values are missing from 1998 to 2000.

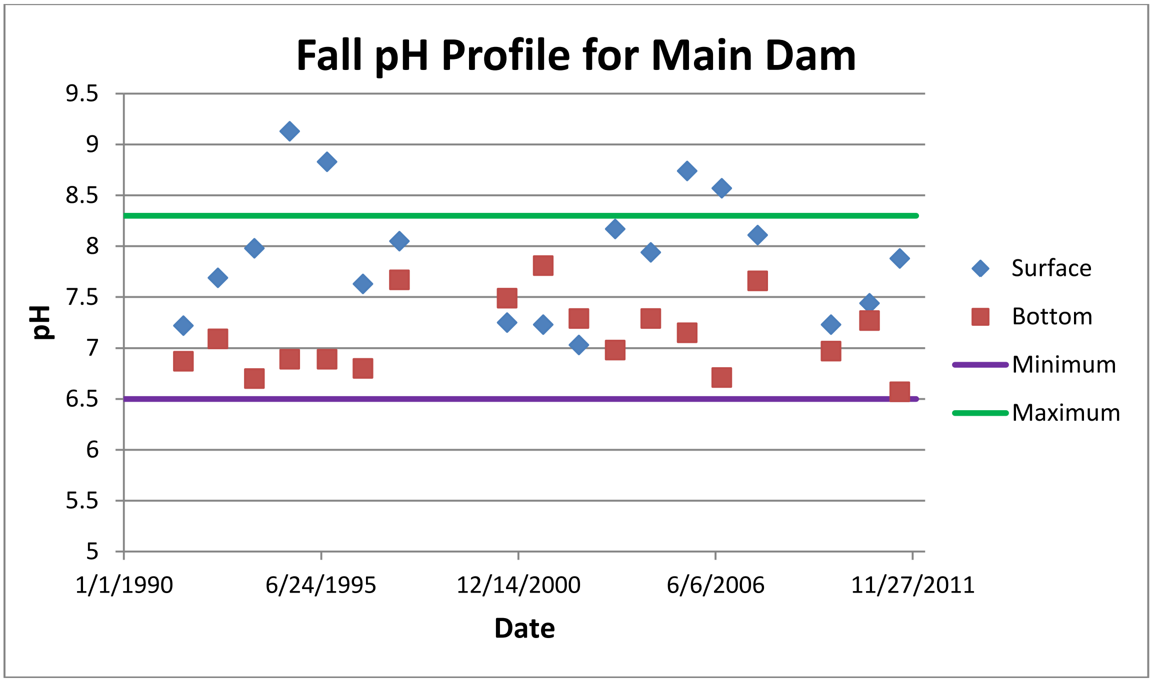

Figure 17: PH values for fall at the Main Dam. Tulare Basin Plan specifies desired pH levels between 6.5 and 8.3. PH values are missing from 1998 to 2000.

Contrary to what is commonly seen in reservoirs, the pH at the bottom of the reservoir near the Auxiliary Dam is consistently at or above pH values observed on the surface. In most water bodies, the surface pH values are the highest due to photosynthesis occurring and the interface with the atmosphere is unable to make up the use of carbon dioxide. This trend may be due to the well-mixed characteristics of the lake and the much shallower depth seen at the Auxiliary Dam as compared to the Main Dam. Shown in Figure 18 are the pH profiles observed monthly at the Auxiliary Dam from April 2009 to September 2011. The figure shows that the surface values of pH fall below the 6.5 minimum, whereas the bottom pH levels are always in the preferred range.

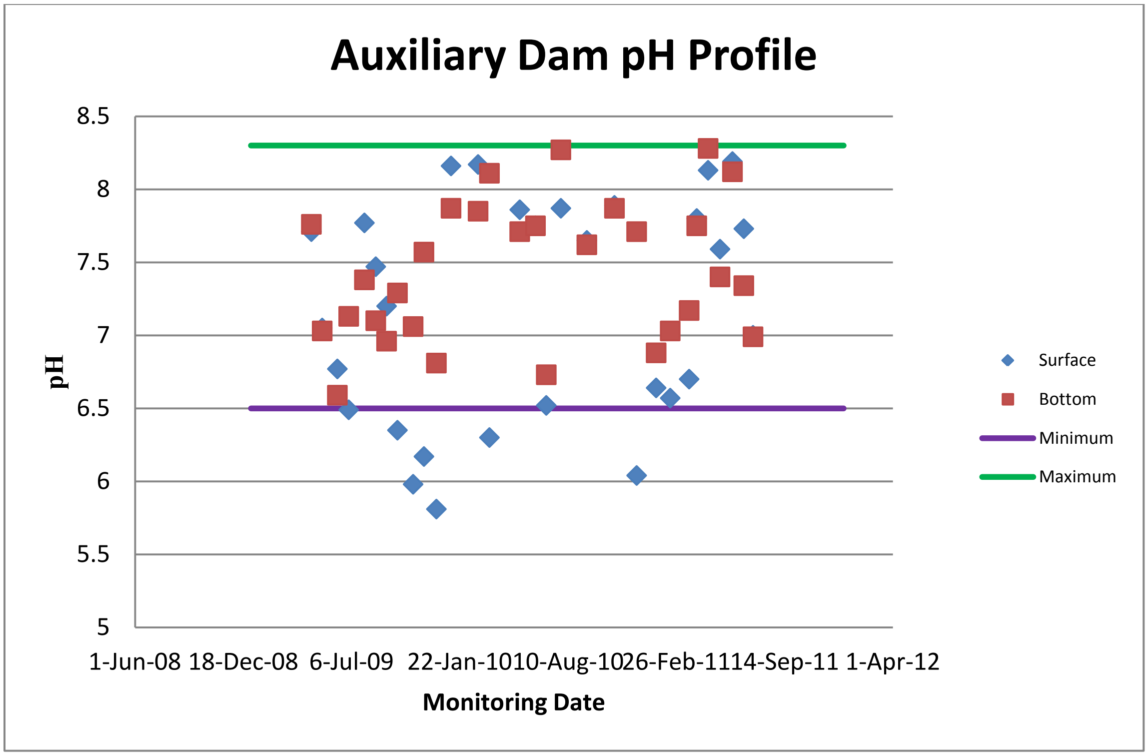

Figure 18: PH values for the Auxiliary Dam since April 2009. The Tulare Basin Plan specifies desired pH levels between 6.5 and 8.3.

The Main and Auxiliary Dam outflows also follow this trend. If the values are not in the range, it is mainly the Auxiliary Dam outflow that is above 8.3 and the Main Dam outflow that is below 6.5. Figure 19 shows the pH values at both outflows from April 2009 to September 2011.

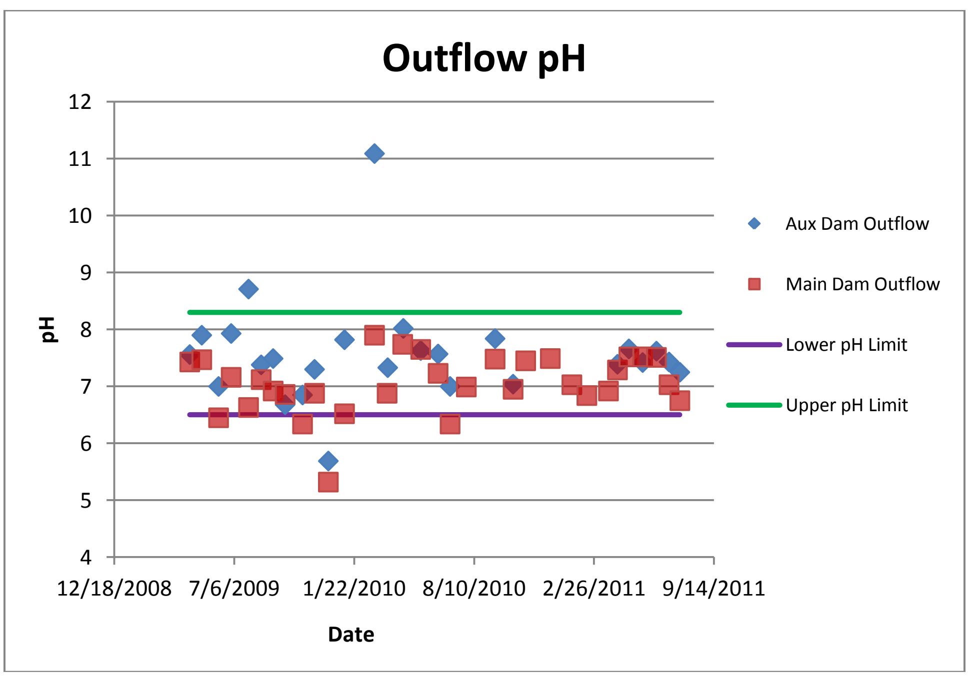

Figure 19: pH values recorded at the Isabella Lake Outflows from April 2009 – July 2011

Electrical Conductivity values averaged 134 uS/cm for the spring and 108.5 uS/cm for the fall at the Main Dam. Conductivity at the surface and bottom of the reservoir are consistently within about 1-5 µS/cm and thus were averaged together to find the spring and fall season averages. Spring and fall EC values were well below the 300 uS/cm goal set forth in the Tulare Basin Plan (Figures 20 & 21).

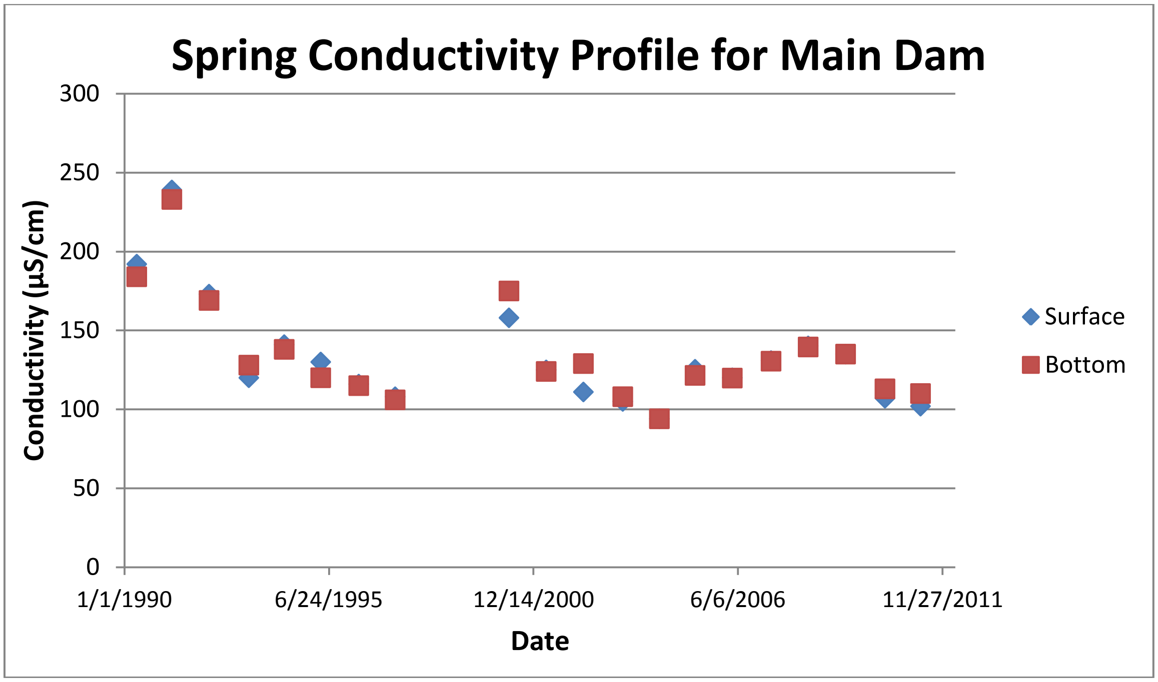

Figure 20: Electrical conductivity values for spring at the Main Dam. Tulare Basin Plan establishes a goal for conductivity values to be no greater than 300 µS/cm. Values are missing for 1998 to 2000.

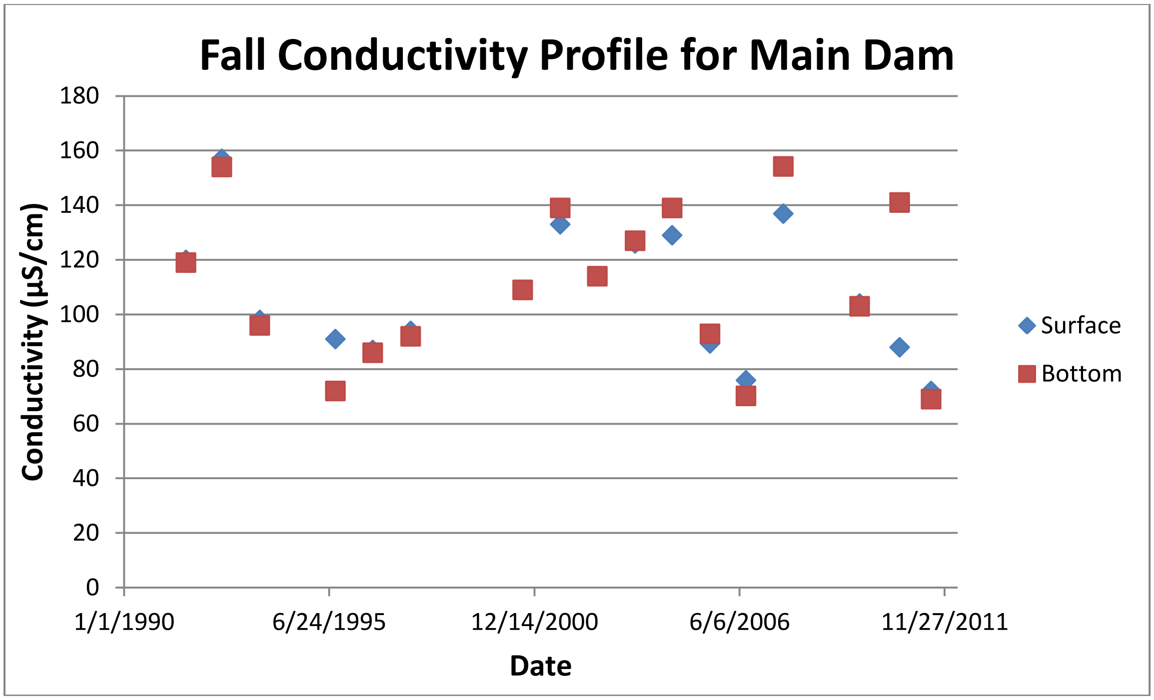

Figure 21: Electrical conductivity values for fall at the Main Dam. Tulare Basin Plan specifies conductivity value objective is to be no greater than 300 µS/cm. Values are missing for 1998 to 2000.

E. Turbidity

Turbidity has only been consistently monitored at Isabella Lake since the supplemental monitoring program began in April 2009. The Auxiliary Dam exhibits the highest turbidity values with an average over the last two years of 8.3 NTU at the surface and 63.3 near the bottom. The Main Dam averages 5.7 NTU at the surface and 16.7 NTU at the bottom. The averages for reservoir bottom values are not always reliable due to the increase in turbidity caused by the sonde hitting the bottom and creating turbidity around it before the reading is taken. The sampling crew attempts to mitigate this effect by waiting for the turbidity to settle out, but this technique is not always effective. At the outflows of the Main and Auxiliary Dams, the values of turbidity averaged 3 NTU and 6.3 NTU respectively over the last two years of monthly monitoring.

The Tulare Basin Plan does not specify specific goals of turbidity for natural conditions, but does provide recommendations for how much the turbidity can be increased from background conditions. These goals will be important during construction. See Table 1 for the exact turbidity loading goals based on existing conditions.

	Temperature (°C)		Dissolved Oxygen (mg/l)		pH (units)		Conductivity (µS/cm)		Turbidity (NTU)	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
Spring	11.55 – 17.73	11.35 – 15.9	8.55 – 10.49	2.95 – 10.22	6.87 – 8.32	6.49 – 8.23	87 – 135.4	77 – 135	2.1 – 62.5	7.4 – 84.1
Summer	21.51 – 25.32	18.56 – 21.85	7.00 – 9.74	0.6 – 7.04	6.31 – 8.81	6.89 – 7.11	96 – 111	91 – 112	2.3 – 30.6	10.9 – 40.8
Fall	8.43 – 21.10	8.06 – 20.89	6.20 – 16.44	0.02 – 14.22	5.06 – 6.69	6.27 – 7.62	118 – 159	124 – 159	3.4 – 7.5	11.2 – 17.3
Winter	6.79 – 10.34	6.36 – 8.79	10.96 – 15.58	9.01 – 14.34	6.41 – 8.25	7.63 – 7.81	122 – 139	124 – 135.9	3.5 – 3.5	6 – 39.4
Acceptable Tulare Basin Plan Levels	Natural Temperature of waters shall not be altered.		Min for Lake Isabella: 8 Min for WARM: 5 Min for COLD: 7		6.5-8.3		Not to exceed 300		Natural Turbidity (NTU)	Increase not to exceed
									0 – 5	1 NTU
									5 – 50	20 %
									50 – 100	10 NTU
									> 100	10%

Table 1: Seasonal ranges obtained from the Main Dam's profile's water quality parameters and acceptable Tulare Basin Plan values

F. Inorganics

Wet samples are collected in the field and analyzed by a contracted laboratory. Inorganics wet samples are taken at the lake surface and bottom as well as in the inflows as part of the biannual sampling event. Inorganic parameters that have been tested historically include: alkalinity, ammonia, chloride, nitrate, total and ortho phosphate, sulfate, kjeldahl nitrogen, chemical oxygen demand (COD), total dissolved solids (TDS), total suspended solids (TSS), and total solids (TS). Inorganic levels were within safe limits according to the "Water Quality Limits for Constituents and Parameters" as outlined by state and federal regulations and water quality goals (Tables 2-4).

Date	Alkalinity	Ammonia as Nitrogen	Chloride	Nitrate + Nitrite as Nitrogen	Total P	Ortho P	Sulfate	Kjeldahl Nitrogen	COD	TSS	TDS	Total Solids
4/17/2001	60	ND	5	0.1	ND	ND	7.8	0.3	ND	5	80	100
8/21/2001	50	ND	2	0.2	ND	ND	4	2	ND	ND	ND	90
04/16/2002	60	ND	ND	ND	ND	ND	8.9	0.2	ND	4	110	110
08/20/2002	50	ND	6	0.7	ND	ND	5.9	0.4	ND	ND	80	98
5/6/2003	60	0.1	8	0.4	ND	ND	7.7	0.3			100	100
9/23/2003	50	0.1	4	ND	ND	ND	6.1	0.5	ND	ND	90	80
4/28/2004	50	ND	5	ND	ND	ND	6.9	ND	ND	ND	80	90
8/18/2004	70	ND	2	ND	ND	ND	7.5	0.5	ND	3	60	30
4/12/2005	55	0.23	4	ND	J.026	J.008	12	0.32	ND	ND	100	100
8/23/2005	83	J.088	3.8	.091J	J.025	ND	7.6	0.47	ND	ND	100	110
4/11/2006	50	ND	3.4	ND	0.057	ND	6.6	0.84	ND	ND	ND	160
8/8/2006	33	0.14	2	ND	0.057	ND	4	ND	ND	ND	70	120
4/25/2007	53	0.0028	3.7	ND	ND	ND	7.3	~	ND	ND	82	100
4/22/2008	60	1.2	5.6	ND	0.053	ND	3.7	ND	10	5	96	70
8/12/2008	46	0.22	3.2	0.11	0.074	0.048	4.9	ND	11	8	96	88

Table 2: Inorganic samples collected at the surface of Isabella Lake. ND indicates a non detect and J flag indicates an estimated value between the method detection limit and the reporting limit.

Date	Alkalinity	Ammonia as Nitrogen	Chloride	Nitrate + Nitrite as Nitrogen	Total P	Ortho P	Sulfate	Kjeldahl Nitrogen	COD	TSS	TDS	Total Solids
4/17/2001	40	ND	2	ND	ND	NA	4.8	0.8	ND	ND	40	80
8/21/2001	60	~	4	~	~	NA	5.9	~	~	ND	70	100
04/16/2002	20	ND	ND	ND	ND	NA	2.8	ND	ND	ND	60	60
8/20/2002	60	~	10	~	~	NA	9.8	~	~	4	100	140
5/6/2003	40	ND	6	ND	ND	NA	4	0.1	ND	11	70	80
9/23/2003	50	~	5	ND	~	NA	9.3	~	~	10	110	120
4/28/2004	30	ND	2	ND	~	NA	2.8	0.2	ND	100	40	160
8/18/2004	70	ND	4	ND	ND	ND	8.7	0.1	~	ND	70	60
4/12/2005	36	0.13	2	0.11	J0.06	0.011J	8.5	0.15	ND	5	75	89
8/23/2005	73	ND	3.6	0.11	J.025	0.01J	6.8	0.32	ND	ND	100	98
4/11/2006	40	ND	1.7	J0.03	0.044	ND	4	0.7	ND	6	ND	210
8/8/2006	33	0.1	2	J0.02	0.034	ND	4.4	ND	ND	ND	70	90
4/25/2007	40	0.00034	0.0031	~	ND	ND	0.0059	~	ND	ND	82	100
4/22/2008	32	1.2	~	~	ND	ND	~	~	10	5	50	68
8/12/2008	55	0.16	4.3	ND	0.037	ND	7	ND	ND	15	90	110

Table 3: Inorganic samples collected where the North Fork Kern River flows into Isabella Lake. ND indicates a non detect and J flag indicates an estimated value between the method detection limit and the reporting limit. NA indicates the data is not available.

Date	Alkalinity	Ammonia as Nitrogen	Chloride	Nitrate + Nitrite as Nitrogen	Total P	Ortho P	Sulfate	Kjeldahl N	COD	TSS	TDS	Total Solids
4/17/2001	70	ND	12	ND	ND	ND	8.7	0.2	ND	ND	120	110
04/16/2002	90	ND	9	ND	ND	ND	11	0.1	ND	3	180	170
5/6/2003	70	0.1	11	ND	0.1	ND	7.7	0.3	ND	4	140	140
9/23/2003	~	~	~	~	~	ND	~	~	~	~	~	~
4/28/2004	20	ND	8	ND	~	.05J	8.8	0.2	ND	14	140	180
8/18/2004	~	~	~	~	~	ND	~	~	~	~	~	~
4/12/2005	54	0.21	5.7	0.16	J0.096	.065J	13	0.4	ND	5	110	120
8/23/2005	160	ND	8.8	J0.032	J0.022	ND	7.9	0.47	ND	ND	190	190
4/11/2006	62	ND	~	~	0.079	ND	~	ND	ND	ND	ND	180
8/8/2006	130	0.15	8.5	ND	0.24	0.054	5.5	ND	21	ND	170	210
4/25/2007	~	~	0.013	~	0.15	0.13	~	~	~	ND	220	230
4/22/2008	63	1.2	NA	NA	0.099	0.062	NA	NA	NA	ND	120	110

Table 4: Inorganic samples collected where the South Fork Kern River flows into Isabella Lake. ND indicates a non detect and J flag indicates an estimated value between the method detection limit and the reporting limit.

G. Organics and Metals

Wet samples are also collected in the field for organics and metals and analyzed by a contracted laboratory. Organics and metals wet samples are taken at the lake surface and bottom as well as in the inflows. Organic and metal parameters include: total organic carbon, aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. There is no evidence of serious contamination in Isabella Lake for organic and metal constituents. There have been some cases where levels exceeded the aquatic life limit and/or human health requirements; however, negative effects have not been observed and levels usually returned to safe levels below the criteria. The comparison criteria used is based on drinking water limits, but according to the Basin Plan, Isabella Lake is not used as a municipal water source. Downstream from the dam, the Kern River is used as a source of drinking water. Thus, using drinking water limits for the lake is a conservative approach.

There are some constituents that may be of concern in the reservoir. Historically, dissolved iron and manganese have periodically exceeded fish habitat and drinking water standards. Since 2001, dissolved iron levels have exceeded drinking water standards six times (Figure 22).

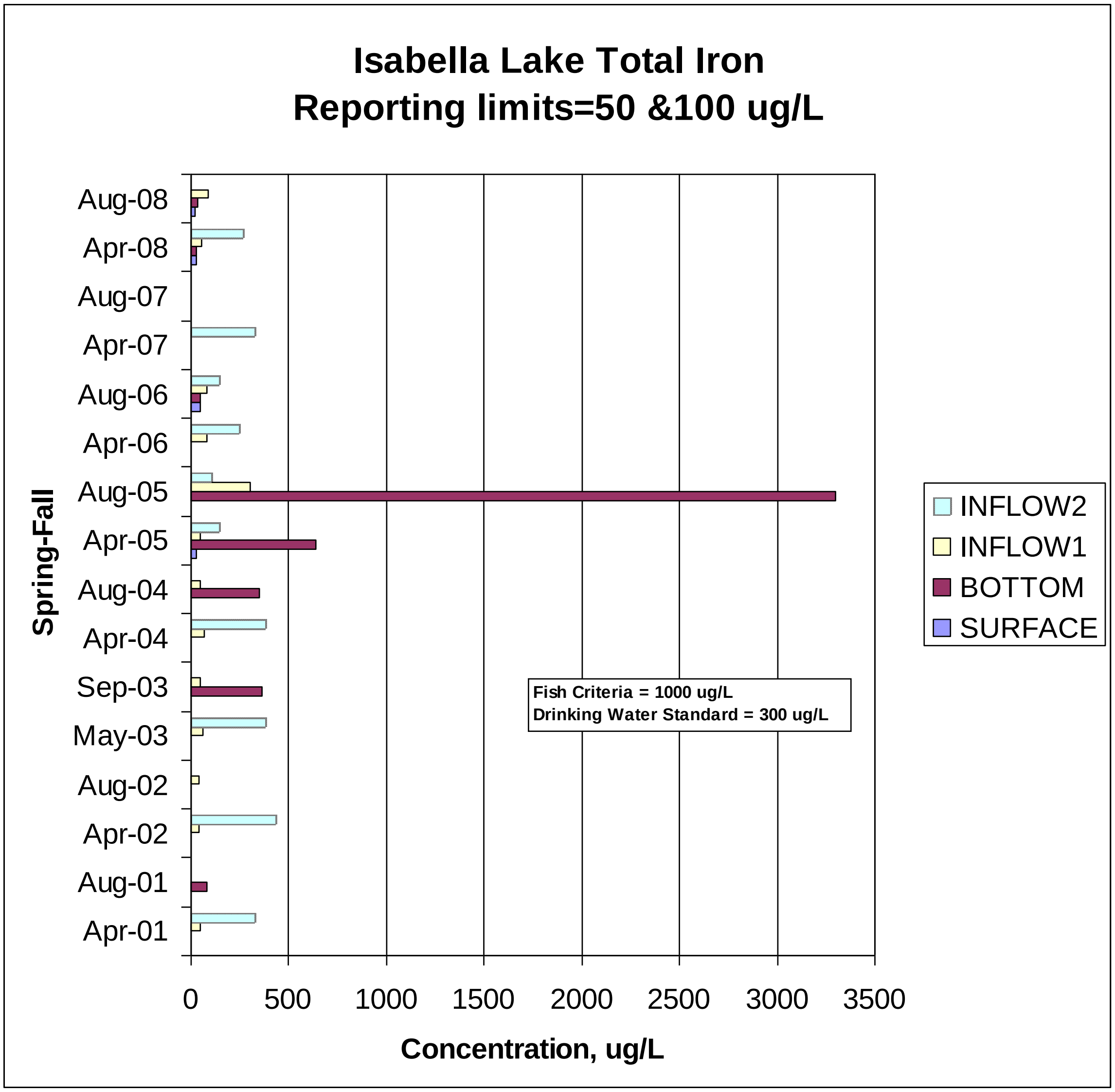

Figure 22: Total Iron levels from 2001 - 2008

Manganese levels exceeded both the drinking water and fish habitat standard in 2001 and yearly from 2003-6 (Figure 23).

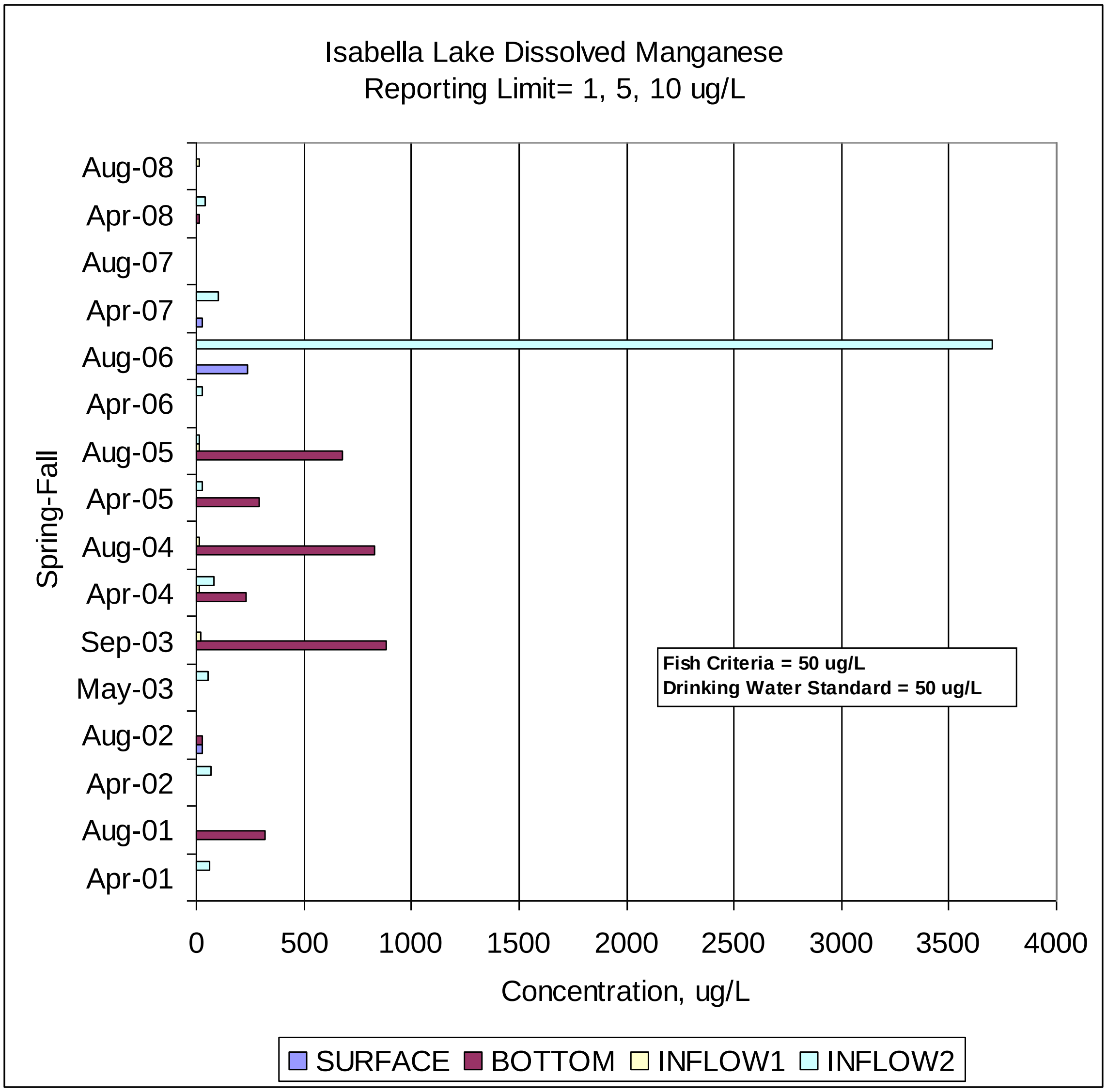

Figure 23: Dissolved Manganese levels from 2001 - 2008

Although iron and manganese are less harmful than other metals such as copper, very high levels of either constituent can be toxic to humans.

A constituent of specific concern within the reservoir and related areas is arsenic. Currently, the Corps tests for total arsenic levels as part of metals wet sampling but not for arsenic speciation or specifically dissolved arsenic concentrations. Arsenic levels exceeded the drinking water standard in the lake in 2001, 2003, and 2004 but levels have fallen to or below the 10 ug/L drinking standard limit since (Figure 24).

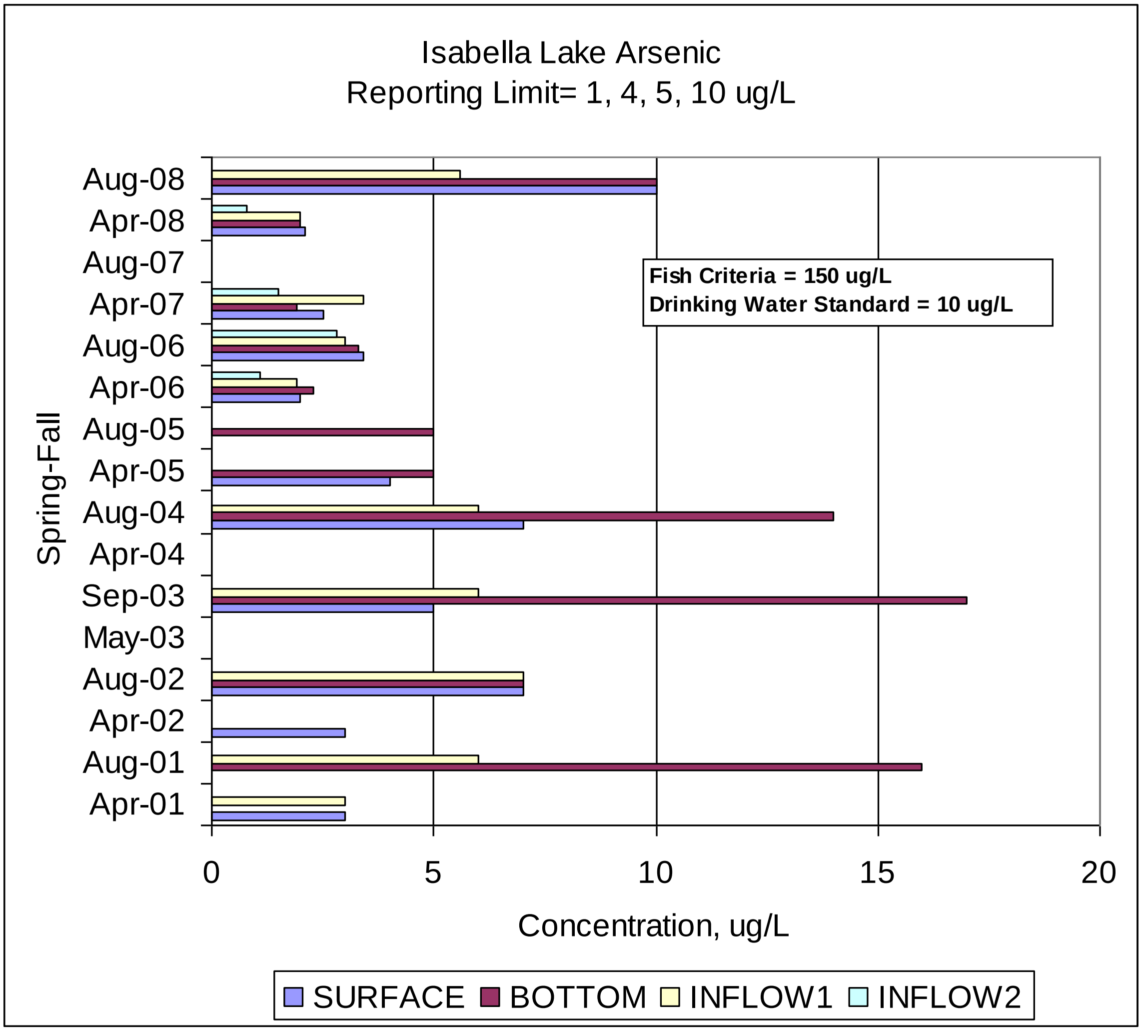

Figure 24: Arsenic levels from 2001 - 2008

The bottom of Isabella Lake has had the highest arsenic levels out of all the sampling locations and is the only sample location that has exceeded the standard, although the surface and inflow concentrations are also frequently near the MCL. Historically, the MCL has only been exceeded in the summer and fall months.

The Tulare Lake Basin has had continual problems with arsenic, specifically in the ground water. Because of this, many studies investigating arsenic in the area have been completed. In 2010 EPA launched an arsenic mitigation pilot project in Lake Isabella, CA in a local well (Wang, 2010). EPA reported arsenic concentrations as high as 40 ug/L in its pilot project well. Other studies have found groundwater concentrated at up to 590 ug/L in the Tulare Basin (Gao, 2007). Studies have suggested that the arsenic in the groundwater is coming from minerals locked in marine sedimentary rock in surrounding mountains. Phosphate and iron oxide can both competitively bind, releasing previously mineral-bound arsenic into the ground water (Levy, 1997). The water table surrounding Isabella Lake is fairly high, with ground water as shallow as 2 meters below the surface reported in some areas (Gao, 2006). Due to the high water table, during the year when lake levels are low and the water table is above surface water levels, ground water likely seeps into the lake and inflows. This provides a source of arsenic in Isabella Lake. As the summer continues, lake water evaporates and further concentrates arsenic levels via evapotranspiration (Levy, 1997). In the spring during snowmelt, lake levels rise again and it is likely that lake water seeps into the groundwater aquifers. This process could decrease arsenic in the lake as well as refreshing the groundwater aquifers, explaining why levels are higher in the summer as well as at the bottom of the lake.

Arsenic is extremely toxic to humans and can cause bladder, lung, and skin cancer even at low concentrations. In 2001, EPA lowered drinking water standards for arsenic from 50 ug/L to 10 ug/L after determining that the potential health risks associated with arsenic contaminated drinking water were more severe than originally anticipated (USEPA, 2001). At the current 10 ug/L MCL, 1-3 people out of every 10,000 consuming 1 L/day of the water will contract cancer (USEPA, 2001). To avoid continued health risks, arsenic levels will be regularly monitored at Isabella Lake.

H. Phytoplankton

The phytoplankton biovolume data is only available through 2005, as can be seen in Figures 25 & 26. Diatoms seem to dominate in the spring, while green algae and diatoms seem to dominate in the late summer. Diatoms play a major role in the lake food chain, and both greens and diatoms are unlikely to cause water quality problems. The one report of floating algae on the surface of the lake in late summer 2001 corresponded with an unusually large bloom of blue green algae. In a later report, fish and bird kills were reported in late August, early September of 2005. The deaths may have been linked with toxins released after the sudden increase and die off of cyanobacteria (blue-green algae), specifically aphanizomenon flos aquae (Figure 26). Hazardous algal blooms such as the suspected blue-green bloom in 2005 are common in high temperatures and can be exacerbated by high turbidity, pH, and nutrient levels.

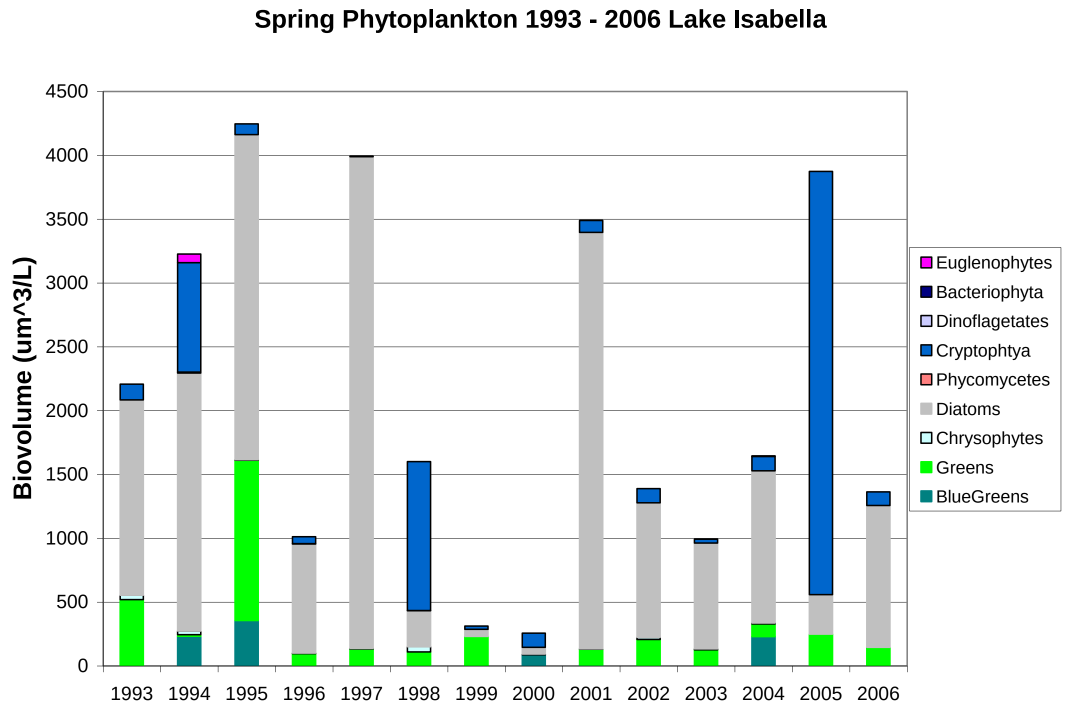

Figure 25: Phytoplankton biovolume for spring at Isabella Lake surface waters from 1993 - 2006

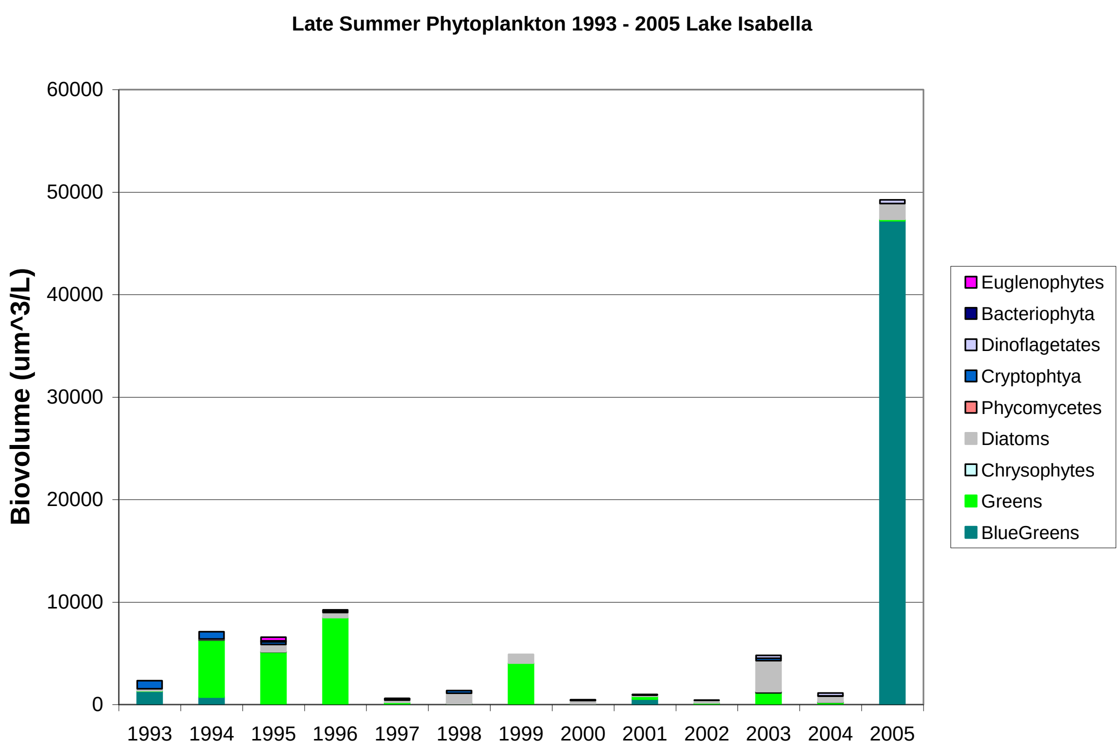

Figure 26: Phytoplankton biovolume for summer at Isabella Lake surface waters from 1993 – 2005

IV. Areas of Concern

The main areas of concern for water quality based on existing data include meeting the water quality goals within the Tulare Basin Plan, the possible implications of construction activities around a lake that remains fully mixed throughout the seasons, compliance with state and federal water quality limits specifically for arsenic levels, and hazardous algal blooms. Analyzing the historical water quality data also showed that there is a need for tighter resolution of data to help understand and capture conditions that are expected during construction. With the implementation of hourly monitoring at the surface of the lake near the Main Dam that began in April 2011, the Corps is working on developing this tighter resolution. Two additional buoys have been purchased and will provide the same resolution of data for the Auxiliary Dam and another location to be determined.

Impacts from a Lowered Pool Elevation

If the selected remediation alternative involves construction, Isabella Lake's pool level will be lowered to an elevation of 2540 ft to fully expose the dams for repair. The reservoir has not reached or gone below this level in the last 10 years (Figure 27). Table 1 shows that the Tulare Basin Plan water quality objectives are not always met under existing conditions with a restricted maximum pool elevation of 2585.5 ft. For example, there have been several years in which surface levels of DO were observed below recommended values for the lake. During the fall, DO levels at the bottom of the reservoir are consistently depleted. This may be the result of the decomposition of organic matter occurring on the bottom, along with a lack of oxygen replenishment due to warm temperatures and low circulation. The Central Valley Regional Water Quality Control Board listed Isabella Lake on the Clean Water Act 303(d) list in 2010 for pH and dissolved oxygen due to their inability to meet the Basin Plan's water quality objectives and impacting cold freshwater habitats (CVRWQCB, 2010). TMDLs are anticipated to be completed in 2021.

The potential decrease in dissolved oxygen levels combined with a lowered pool level will also have other effects. A lack of available oxygen in the water column will make it harder for fish to survive. A lowered pool level may also lead to warmer temperatures in the lake due to the shallower waters, causing even more unsuitable conditions for fish. These construction-related effects are confined to the reservoir and there are no considerable impacts on fishery and minimum flow requirements below the dam. Also, due to the lake's unique mixed characteristics under natural conditions, a lowered pool level combined with high winds will likely result in the resuspension of bed load sediments. Consequently, it is expected that the lake's sediment load will increase which will likely cause undesired water quality effects. Fish population levels and survival have been linked to levels of turbidity, and prolonged exposure to high levels of suspended sediment could create a loss of visual capability of fish in the reservoir, leading to a reduction in feeding and growth rates; a thickening of the gills, potentially cause the loss of respiratory function; clogging and abrasion of the gills; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995). High turbidity levels could also result in exacerbated increases in water temperature and in turn affect

DO concentrations, both effects thereby stressing respiration of reservoir fishes. Also, high levels of suspended organic sediments could cause an increase in biological oxygen demand (associated with microbial decomposition), thereby resulting in further reduced DO concentrations.

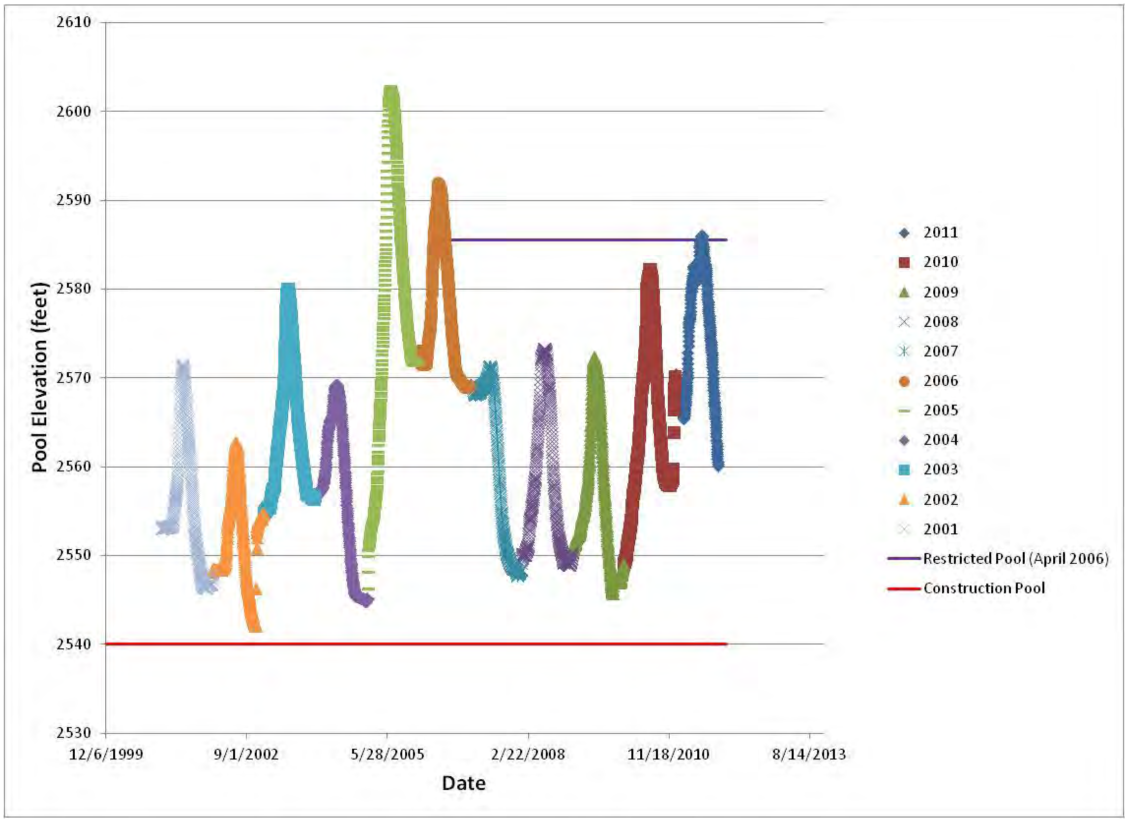

Figure 27: Pool elevations from 2001 – 2011. Restricted pool elevation is 2585.5 feet and the proposed construction pool elevation is 2540 feet.

Arsenic

The Corps' historical water quality monitoring has also discovered periods of high arsenic levels at the bottom of the lake which exceed drinking water standards. Arsenic levels have exceeded the drinking water standard in 2001, 2003, and 2004 but levels have fallen below or to the 10 ug/L drinking standard limit since (Figure 19). Although levels have seemed to drop, they still hover around the drinking water standard and are considerably higher than other lakes in the Tulare Basin. The comparison criteria used is based on drinking water limits, but according to the Basin Plan, Isabella Lake is not used as a municipal water source. However, downstream from the dam, the Kern River is used as a source of drinking water. Thus, using drinking water limits for the lake is a conservative approach.

If lake levels are lowered for an extended period of time, groundwater seepage could contribute arsenic to the lake, without the seasonal influxes to dilute the arsenic as described above. This could cause arsenic levels near summer highs for the duration of DSAP activities, as well as cause increases in arsenic levels in nearby groundwater if the lake cannot seasonally flush aquifers. Although dewatering activities have not caused arsenic increases to date, it could simply be that dewatering to 63% is not enough to disrupt natural cycling. Higher concentrations of arsenic would cause higher health risk to humans; the National Academy of Sciences has suggested that arsenic even at 50 ug/L in drinking water can pose a combined cancer risk as high as 1% (Macler, 2001).

The arsenic MCL for fish is currently 150 ug/L. Similarly, studies have shown that aquatic invertebrates can survive and reproduce in arsenic concentrations of 200 ug/L and higher, so it is unlikely that aquatic wildlife in Lake Isabella will be impacted by any arsenic increases that occur (Huddleston, 2009).

In order to fully understand the potential impacts on arsenic levels in Isabella Lake from a lowered pool additional data is necessary. It would be useful to test arsenic speciation as well as solubility in the wet samples, since certain forms of soluble arsenic are more toxic than others and arsenic levels are likely to increase more if the arsenic is in particulate form rather than dissolved in the lake. Consistent ORP data would also provide clues to arsenic speciation, as arsenic exists in different oxidation numbers based on the redox environment. Additionally, it would be useful to know if arsenic is in fact seeping into the lake via ground water and if so in what quantity. Having more frequent wet sampling events, including at the outflows, accurate flow data, and sampling adjacent groundwater would allow for seepage amounts to be calculated. From this information, one could potentially calculate how much water could be removed from the lake before arsenic levels increase to detrimental concentrations. In the meantime, arsenic levels will continue to be monitored closely and a detailed study may need to be conducted for further understanding.

Hazardous Algal Blooms

In fall 2005, large amounts of fish and birds were killed at Isabella Lake; the suspected cause of the deaths was toxins released by a hazardous algal bloom. Water quality data found a huge spike in cyanobacteria (blue-green algae, specifically *Aphanizomenon flos-aqua*) more than five times historical volume (Figure 21). The Corps suspected that higher nutrient inputs from run-off for a successive number of days triggered the nuisance algae bloom. As a result, fish were suspected to have been poisoned by the neurotoxins released after the algae died. However, subsequent testing after the fish kill by the California Fish and Game was inconclusive. Most phytoplankton types associated with toxin production (primarily blue-green algae species) are dominant at higher ambient temperatures. Species of algae that produce toxins are generally referenced as Hazardous Algal Blooms (HABs). HABs can bloom and crash within a matter of hours. The primary hazard associated with HABs does not occur during the bloom, but rather during the death of the algae population. When the hazardous algae die they rapidly release neurotoxins into the water, which at certain concentrations can cause fish kills, other animal deaths, and even serious health effects or death in humans. During a significant phytoplankton bloom the pH levels can be elevated due to plant photosynthesis and subsequent utilization of available carbon dioxide in the water. This relationship between plant growth and pH can be used as an indicator during monitoring. The Corps will continue to address these concerns as part of the alternative selection.

Phytoplankton samples have been collected since 2005, but have not yet been analyzed. These samples are planned to be analyzed as soon as a contract is in place.

Data Gaps

Also apparent from analysis of historical data is that the time resolution of biannual sampling is not tight enough to develop an understanding and capture the expected condition of the lake during construction. Historical data provides an annual snapshot of conditions during one day during the spring and late summer. There are gaps in the data including any information on the water quality for the fall and winter seasons. In order to fill the gaps and determine a more complete background of the baseline water quality at the lake, further efforts have been made and are planned in data collection and analysis. For example, a supplemental monitoring program to capture monthly water quality data was implemented in April of 2009 and hourly data began to be captured in April 2011 at the Main Dam. Hourly monitoring will continue through construction. However, before construction begins, additional monitoring buoys will be installed at the Auxiliary Dam and another location to be determined to monitor data hourly.

V. Conclusions

Water quality at Isabella Lake will continue to be monitored and data collected to determine baseline parameters which will be used for compliance during construction. Monitoring activities will allow further study of major issues of concern such as compliance with state and federal regulations now and in the future, the possible implications of construction activities around a lake that remains fully-mixed throughout the seasons, arsenic levels in the lake that are near and sometimes above the drinking water limit, and hazardous algal blooms which are suspected to have caused fish and bird kills in the past. Water quality parameters such as dissolved oxygen do not always meet the Tulare Basin Plan objectives under existing conditions. During construction, these major areas of concern will likely be exacerbated due to an even further reduced pool elevation and possible disturbance of soils and other materials around the lake.

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Appendix A: Glossary of Sample Types

Glossary of Sample Types

This glossary of sample types is intended to provide a general background and indicate the importance of each sample in determining water quality. These are meant to be brief and basic. If a further explanation is desired please refer to the list of references provided in this report.

Secchi Depth

One of the oldest and easiest methods to determine lake clarity is the Secchi Disc depth (SD). The SD is determined by dropping a Secchi Disc into a water body and determining the depth that it is last visible from the surface of the water. Secchi Discs are generally white and 20 cm in diameter. Secchi depth values are most impacted by the light intensity at the time of sampling and the scattering of light by solid particulates within the water column. Algal growth (phytoplankton) and sediment re-suspension are often major constituents of solid particulates within the water column. Secchi depth values can be used to estimate the trophic state or the nutrient levels within the lake. The more nutrients are available, the larger likelihood of algal blooms that limit water clarity. Due to recreational concerns for safety, the goal for Secchi depth values is four feet or greater.

Temperature Profiles and Data Points

The temperature profile of a lake provides information how a lake is operating and the potential for aquatic biota to live within the lake. The temperature profile is a direct indicator of if a lake is stratified. Stratification in lakes is created generally by temperature affecting the density of water molecules. Stratification is usually indicated by a region of similar temperature nearer the surface of the water (epilimnion), then a region of temperature transition (metalimnion), to another layer of nearly constant temperature at the bottom of the lake (hypolimnion). Each layer in a stratified lake is important, but the existence of a hypolimnion can drastically impact how well a lake can handle warmer temperatures such as those found in northern California during the summer. The hypolimnion acts as a buffer against large temperature shifts. The nature of dam operation is that water is discharged near the bottom, releasing the hypolimnion, and eliminating stratification. This operation limits the ability of reservoirs to regulate their temperature during the summer months. Stratification isn't always desirable. When a lake isn't stratified and is instead well mixed, the required nutrients near the bottom of the lake become available to phytoplankton for growth. Temperatures within lakes also indicate which species of fish will survive within a lake. Coldwater species of fish require temperatures below 20 degrees C in order to spawn and survive. If a lake is often above 20 degrees C, then only warmwater fish species will survive.

Dissolved Oxygen (DO) Concentration Profiles

DO is required by organisms for respiration and for chemical reactions within lake waters. The recommended minimum level for DO for most aquatic species survival is 5mg/L. In lakes, biota waste (detritus) falls to the bottom of the lake to be utilized by bacteria. The bacteria need oxygen and will deplete levels near the bottom of a lake, especially during warm temperature, high respiration conditions. For nutrient rich (eutrophic) lakes more organisms will grow, create wastes, and cause oxygen depleted regions at the lowest areas. Under these conditions only aquatic species that can survive low DO conditions in warm water near the surface will survive.

PH Profiles

The pH profiles of the lakes indicate the potential for certain chemical reactions to occur. In high pH (greater than pH = 7 or basic) aquatic systems, metal pollutants tend to form into insoluble compounds that fall onto the lake floor. In low pH (less than pH = 7 or acidic) systems or areas metal ions become soluble and available for uptake into aquatic organisms. Other compounds like ammonia that are introduced into a low pH aquatic environment will transform into soluble nitrate and be utilized by organisms.

Phytoplankton Analysis

Phytoplankton analysis indicates the health, nutrients, and biodiversity within a lake. Lakes that have few nutrients available (Oligotrophic) will generally have a much lower quantity of phytoplankton (and high Secchi depth) but the number of phytoplankton species seen will be large. In a lake that is nutrient rich (eutrophic) there are generally large phytoplankton blooms (and low Secchi depth), but they are made up of a couple of phytoplankton species. Certain species of phytoplankton are preferred food sources for zooplankton (small invertebrates). Generally species like diatoms and green algae can be consumed by the filter-feeding zooplankton, but species like bluegreen algae are low in nutrients and are difficult to consume. Some species like the dinoflagellates can grow horn like points to discourage potential predators. In nutrient rich waters where there is plenty of phosphorous, nitrogen can be limited for biological growth. While most species can't grow due to the lack of nitrogen, bluegreen algae (cyanobacteria) have the ability to utilize nitrogen from the atmosphere when required. This gives bluegreen algae the ability to dominate in many eutrophic lakes.

Soluble Metals Analysis

The soluble metals analysis indicates the exposure of humans and aquatic organisms to toxic metals. These metals often build up as they are consumed through the food chain. Water samples provide an indicator for additional problems. Soluble forms of metal ions are more prevalent in low pH (pH <7, or acidic) environments.

Inorganic Analysis

Alkalinity

Alkalinity is measured in terms of mg/L of calcium carbonate. It indicates a lakes ability to buffer incoming acidic pollution and situational changes.

Ammonia

Ammonia is a gas that is toxic to fish and is more visible at a higher pH. Ammonia is created through anthropogenic inputs, bacteria cell respiration, and the decomposition of dead cells. Due to being a gas, given time ammonia will volatilize from the water. At a lower pH, much of the ammonia is converted to ammonium (a nutrient for root bound plant life) and utilizes DO in the nitrification process.

Chloride

The chloride ion is an indicator of any salinity increases within a lake. Most fresh water aquatic species are sensitive to salinity changes.

Nitrate

Nitrate is the nitrogen product created through the nitrification of ammonium. Nitrate is a soluble form of the nutrient nitrogen and is utilized by phytoplankton.

Total Phosphorous

The total phosphorous provides a measure of both utilized and soluble phosphorous within water samples. Phosphorous is a required nutrient for plant growth and development.

Ortho Phosphorous

Ortho phosphorous is the soluble form of phosphorous that is utilized by free-floating aquatic plants (phytoplankton).

Kjeldahl N

Kjeldahl nitrogen or total Kjeldahl nitrogen (TKN) is a measure of the total concentration of nitrogen in a sample. This includes ammonia, ammonium, nitrite, nitrate, nitrogen gas, and nitrogen contained within organisms.

COD

Chemical Oxygen Demand (COD) is a measure of the total oxygen required to complete the chemical and biological demands of a sample.

Lake Code Designation

Laboratory Reports are provided in the previous sections.

Sample ID is "XX-YY-ZZ" where

XX designation:	YY designation	ZZ designation
BB for Black Butte	SP for Spring	S for surface of Lake
EA for Eastman	SU for Summer	B for bottom of Lake
EN for Englebright		I-1 for inflow1
HE for Hensley		I-2 for inflow 2
IS for Isabella		O for outflow
KA for Kaweah		
ME for Mendocino		
MC for Martis Creek		

NH for New Hogan
PF for Pine Flat
SO for Sonoma
SU for Success

Example: BB-SU-S is for a water sample taken from Black Butte in the Summer on the Lake's Surface.

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APPENDIX C

USFWS PLANNING AID LETTER
FISH AND WILDLIFE COORDINATION ACT REPORT

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:
81420-2010-CPA-0079

MAY 10 2011

Alicia E. Kirshner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95825-2922

Dear Ms. Kirshner:

The U.S. Army Corps of Engineers has requested coordination under the Fish and Wildlife Coordination Act for the Lake Isabella Dam Safety Modification Project. The proposed dam modifications would occur on Lake Isabella, in Kern County, California. The enclosed report constitutes the U.S. Fish and Wildlife Service's planning aid letter for the proposed project.

If you have any questions regarding this report on the proposed project, please contact Tyler Willsey at (916) 414-6577.

Sincerely,

Daniel Welsh
Acting Assistant Field Supervisor

Enclosure

cc:
Mitchell Stewart, COE, Sacramento, CA
Marci Jackson, COE, Sacramento, CA
Regional Manager, CDFG, Fresno, CA
Central Valley Flood Protection Board, Sacramento, CA

PLANNING AID LETTER
LAKE ISABELLA DAM SAFETY MODIFICATION PROJECT
April 2011

This is the Fish and Wildlife Service's (Service) planning aid letter on the effects of the proposed Lake Isabella Dam Safety Modification (Isabella DSM) Project 35 miles northeast of Bakersfield, California. This report has been prepared under the authority of, and in accordance with, the provisions of the Fish and Wildlife Coordination Act (48 stat. 401, as amended: 16 U.S.C. 661 et seq.).

BACKGROUND

Lake Isabella Dam was placed into operation in 1953, but is currently unable to hold the amount of water for which it was authorized due to an interim risk reduction measure (IRRM) reducing the lake elevation from the authorized gross pool of 2605.5 feet to 2585.5 feet. Investigations and analysis of the auxiliary and main dam deficiencies were culminated with the release of the October 2009 report entitled "Potential Failure Mode Assessment - Isabella Main and Auxiliary Dams." Based on current engineering knowledge, U.S. Army Corps of Engineers (Corps) determined that the Lake Isabella main dam, spillway, and auxiliary dam have a high risk of failure due to significant seismic, seepage, and hydrologic issues. The project likely has the highest annualized life loss risk of any dam in the Corps' nationwide inventory, and has considerable public and congressional interest. The Corps has determined remediation of the dam safety deficiencies is necessary.

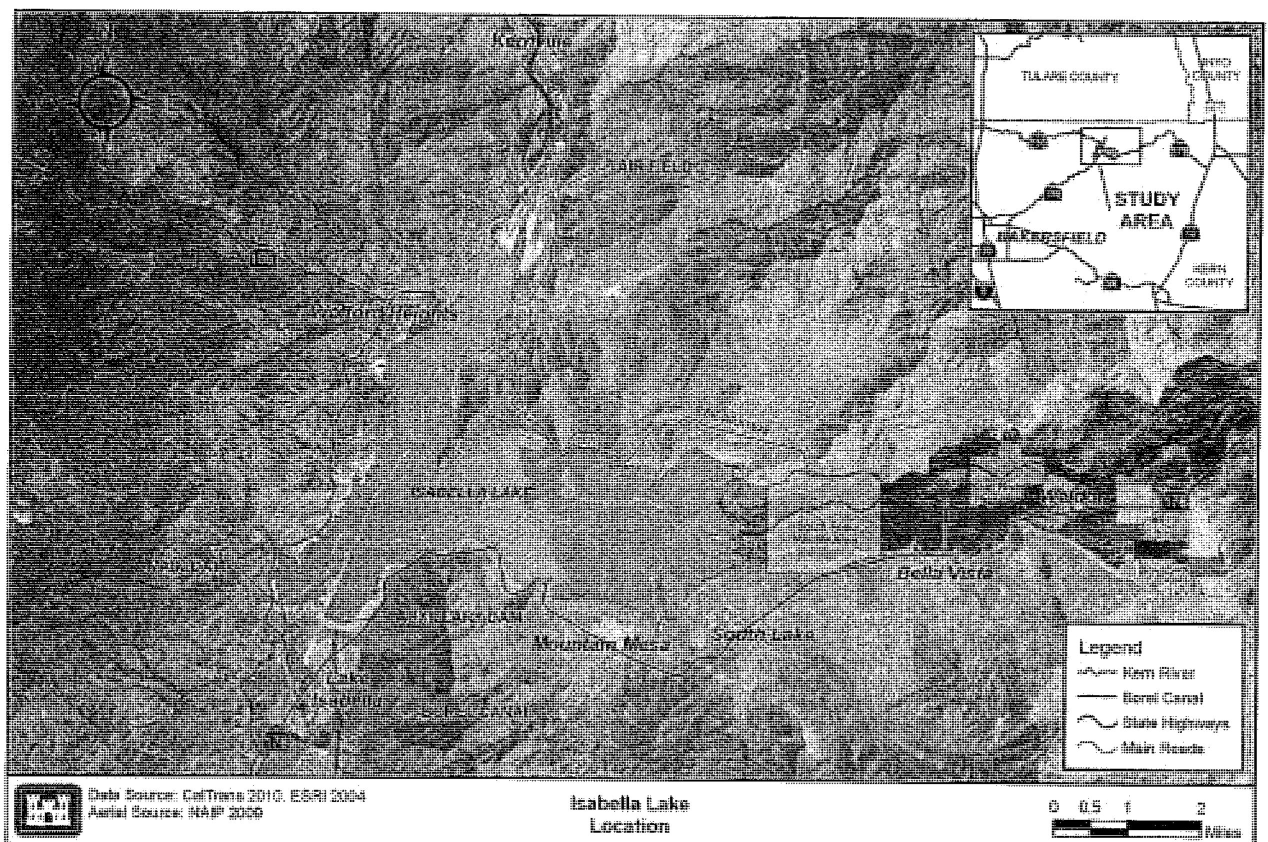

Figure 1: Map of the Lake Isabella Area

PROJECT DESCRIPTION

Lake Isabella Dam is located in between the towns of Kernville and Lake Isabella in Kern County, California east of Bakersfield. The remediation options being investigated by the Corps are listed below:

ALTERNATIVES EVALUATED

No Action Alternative

Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Isabella Main Dam, Spillway, or Auxiliary Dam. Isabella Dam would continue to be operated in accordance with the established Water Control Plan and Flood Control Diagram. In accordance with Draft Engineering Regulations 1110-2-1156, the lake capacity (gross pool elevation) would be returned to, and the Dam would be operated at, the pre-IRRM elevation of 2,605.5 feet. However, under the No Action Alternative, one or both dams would be almost certain to fail under normal operations in the near-term without intervention.

Main Dam Alternatives

Alternative 1a- Roller-Compacted Concrete (RCC) Dam/Spillway

With this alternative, the earth-filled Main Dam would be replaced with a RCC Dam, just downstream of the existing dam, and the existing Dam and Spillway would be removed. The new RCC Dam would incorporate a spillway built into the RCC Dam. The existing bifurcated outlet structure and the privately owned power station downstream of the Main Dam would be retained.

This alternative would require elevating a portion of Highway 155 that would otherwise pass through the right abutment area of the new RCC Dam. This would involve a cooperative effort between the Corps and the California Department of Transportation. Once the RCC Dam is completed, the material excavated from the Main Dam would be available for reuse for the remedial work on the Auxiliary Dam (Figure 2).

Alternative 1b- Main Dam and Spillway Remediation In-Place

Under this alternative, the Main Dam would be retained and the deficiencies would be remediated in place. The measures involved in this remediation include installing crack stopper treatment with a downstream filter/drain system, adding a rockfill buttress to the downstream side of the Dam face and toe, and upgrading other structures (e.g., outlet tower) in order to remediate the potential for differential settling and seepage.

The various rock materials needed for the upgrades to the Main Dam would come from the Main Dam Campground, the area of the current spillway adjacent to the U.S. Forest Service (USFS) compound, and possibly Engineers Point if additional material is needed. The concrete needed to construct new structures or for upgrading existing structures (e.g., Main Dam intake and outlet structures) would be supplied from a mixing plant that would be located on the Main Dam Campground. Cement and mix materials for making the concrete would be trucked to the project site from commercial suppliers (refer to Figure 2).

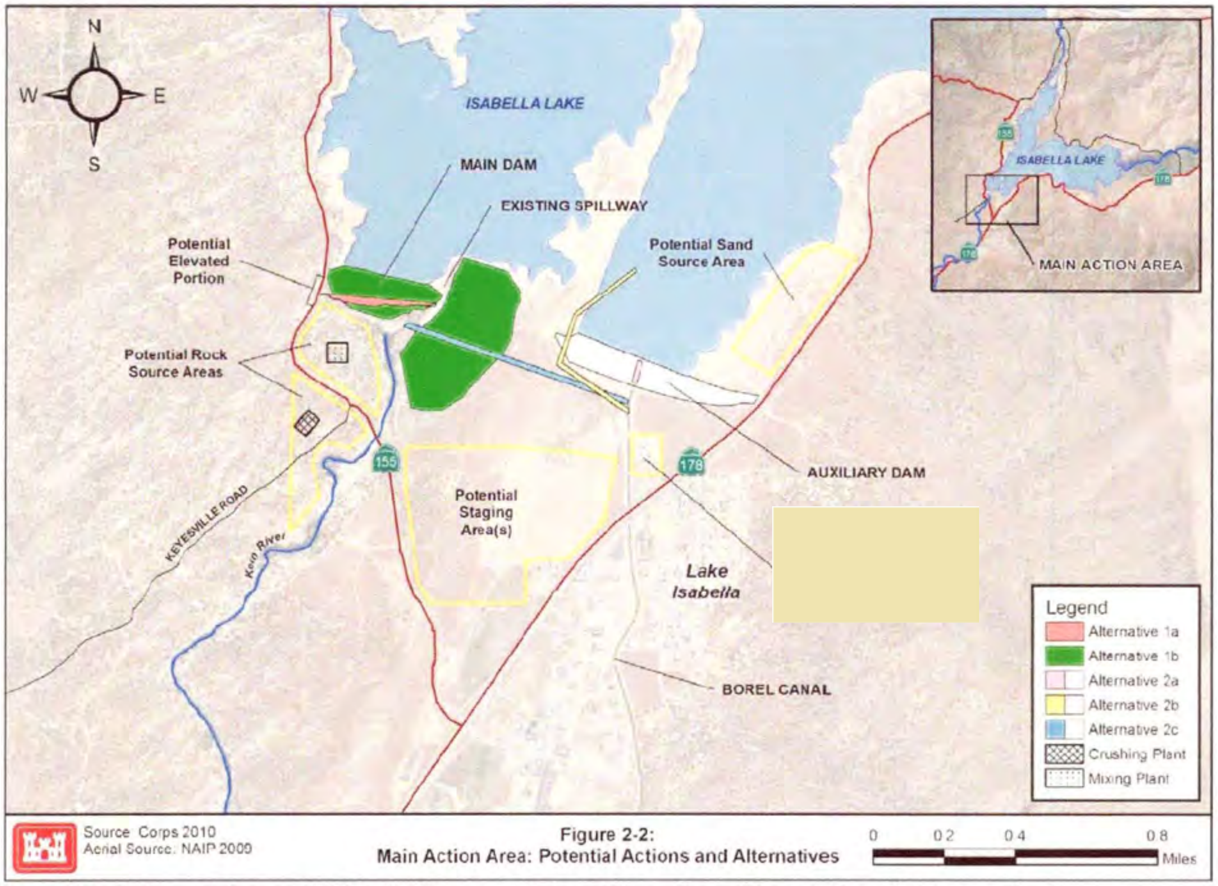

Figure 2: Map of Potential Main Dam and Auxiliary Dam/Borel Canal Alternatives

Auxiliary Dam and Borel Canal Alternatives

The Corps is considering three alternatives for remediating the Auxiliary Dam seismic and seepage deficiencies, all of which share the common element of remediating the deficiencies in place at the Dam's present location. The three alternatives differ in the approach to remediating the Borel Canal. The primary measures involved in the Auxiliary Dam remediation include constructing a rockfill buttress on the downstream toe and slope of the Dam, installing a filter drain and foundation treatment, and upgrading other associated structures as needed (refer to Figure 2).

Alternative 2a- Auxiliary Dam Remediation and Borel Canal Remediation-in-Place
Auxiliary Dam deficiencies would be remediated by retrofitting the existing Borel Canal tower and conduit on their present alignment through the Auxiliary Dam. Remediation would also include treating the foundation on the both upstream and downstream sides of the Dam to stabilize the conduit, constructing a welded steel jacket to enclose the conduit, reinforcing the tower structure, extending the conduit downstream, and installing a filter system.

Alternative 2b- Auxiliary Dam Remediation and Borel Canal Relocation through the Right Abutment
Under this alternative the Auxiliary Dam would be remediated by sealing and abandoning the Borel Canal conduit through the Auxiliary Dam, removing the tower, constructing a new Borel

Canal tower and conduit on a new alignment through the right abutment of the Auxiliary Dam, and reconnecting to the Borel Canal just downstream of the Auxiliary Dam.

Alternative 2c- Auxiliary Dam Remediation and Borel Canal Relocation to Main Dam Outlet with Tunnel Connection

Under this alternative, the Auxiliary Dam would be remediated by sealing and abandoning the existing canal conduit through the Auxiliary Dam, removing the tower, and constructing a piped connection from the Main Dam outlet through a 12-foot diameter tunnel to the Borel Canal just downstream of the Auxiliary Dam.

Spillway Alternatives

The inadequate hydrologic capacity of the Spillway would be remediated by widening the Spillway by cutting into the hill to the east where the USFS compound is located and rejoining the grade of the Kern River floodway downstream of the power generating plant. The variations differ mainly as to width (i.e., amount of excavation required to the east), the depth of excavation, how flow is managed through the Spillway (spillway type), and if the existing Spillway is integrated into the cross-section of the new Spillway. The five alternatives are:

1) An auxiliary labyrinth spillway parallel to the current spillway.
2) An auxiliary side-channel spillway parallel to the existing spillway.
3) A gated spillway in place of the existing spillway.
4) A labyrinth spillway in place of the existing spillway.
5) A side-channel spillway in place of the existing spillway.

All of these alternatives can be altered to various degrees depending on whether the Corps aims to pass a 25, 100, 200, or 500 year flood. Depending on the scale of the flood the spillway is designed to pass, the channel will be deepened and widened accordingly A dam raise of 1 to 10 feet may be required to accommodate a more unlikely event (500 year flood).

Support Actions Common to All Action Alternatives

Four major support actions are common to all alternatives being evaluated:

- developing at least two large open areas just to the south of the Main and Auxiliary Dams to temporarily store and stage equipment and materials;
- providing temporary electric power lines into the project sites;
- maintaining a construction pool elevation of a maximum of 2,530 feet during each of the four construction seasons (April through October); and,
- considering the use of preliminary material borrow locations identified at the Auxiliary Dam Campground, Main Dam Campground, Engineers Point, adjacent to the existing spillway, and the marina on the south side of the lake.

BIOLOGICAL RESOURCES

The north and south forks of Kern River flow through the project area, are impounded by Lake Isabella Dam, and are then released out of the main dam in one downstream channel. The project area contains valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub, riparian woodland, wetland, open water, and barren/ruderal cover-types, as well as developed areas. The proposed project area includes all Corps and USFS lands surrounding the reservoir and dams, including portions of the North and South Fork Kern River delta regions next to Lake Isabella, a reach of the lower Kern River immediately downstream of the main dam, and a portion of Hot Spring Valley immediately downstream of the auxiliary dam. Included in this area are private lands adjacent to Lake Isabella and the Kern River, and lands owned by the Bureau of Land Management, the California Department of Fish and Game, and Audubon California.

Vegetation

Lake Isabella hosts a great diversity of plant communities. This diversity is largely due to the convergence of four geographic regions: Sierra Nevada, Great Central Valley, Southwestern California, and Mojave Desert, with each providing unique physiographic and biologic characteristics (Hickman 1993). General plant communities in or near the project area are classified according to Sawyer et al. (2009) and include valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, and open water (Figure 3).

Valley Grasslands

The valley grassland cover-type is dominated by red brome grass, Mediterranean grass, and Arabian schismus, along with other nonnative species growing in the herbaceous layer (Sawyer et al. 2009). Other species that are common include California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle. Emergent shrubs may be present at low cover. Herbs in this stand are usually less than 2.5 feet tall, and cover is intermittent to continuous (Sawyer et al. 2009).

The Valley grassland cover type is restricted to a small ridgeline between and downstream of the Main and Auxiliary Dams (refer to Figure 3). This area has been highly disturbed in the past by human activities, including cattle ranching and off-road vehicle use.

Oak Woodland

The oak woodland cover-type is dominated in the tree canopy by interior live oak, California buckeye, Pacific madrone, tan oak, gray pine, canyon live oak, blue oak, or California black oak (Sawyer et al. 2009). Tree canopy of the oak woodland area is usually less than 65 feet high and forms either intermittent or continuous cover in canyons or basins, or in open areas, a savanna-like canopy (Sawyer et al. 2009). The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover-type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained and is common throughout the Sierra Nevada foothills (Sawyer et al. 2009).

Oak woodland in the proposed project area is restricted to a thin patchy band on either side of the lower Kern River, downstream of the Main Dam and is abundant in one of the proposed borrow areas west of Highway 155 (Figure 3). In the first area, clusters of interior live oaks grow,

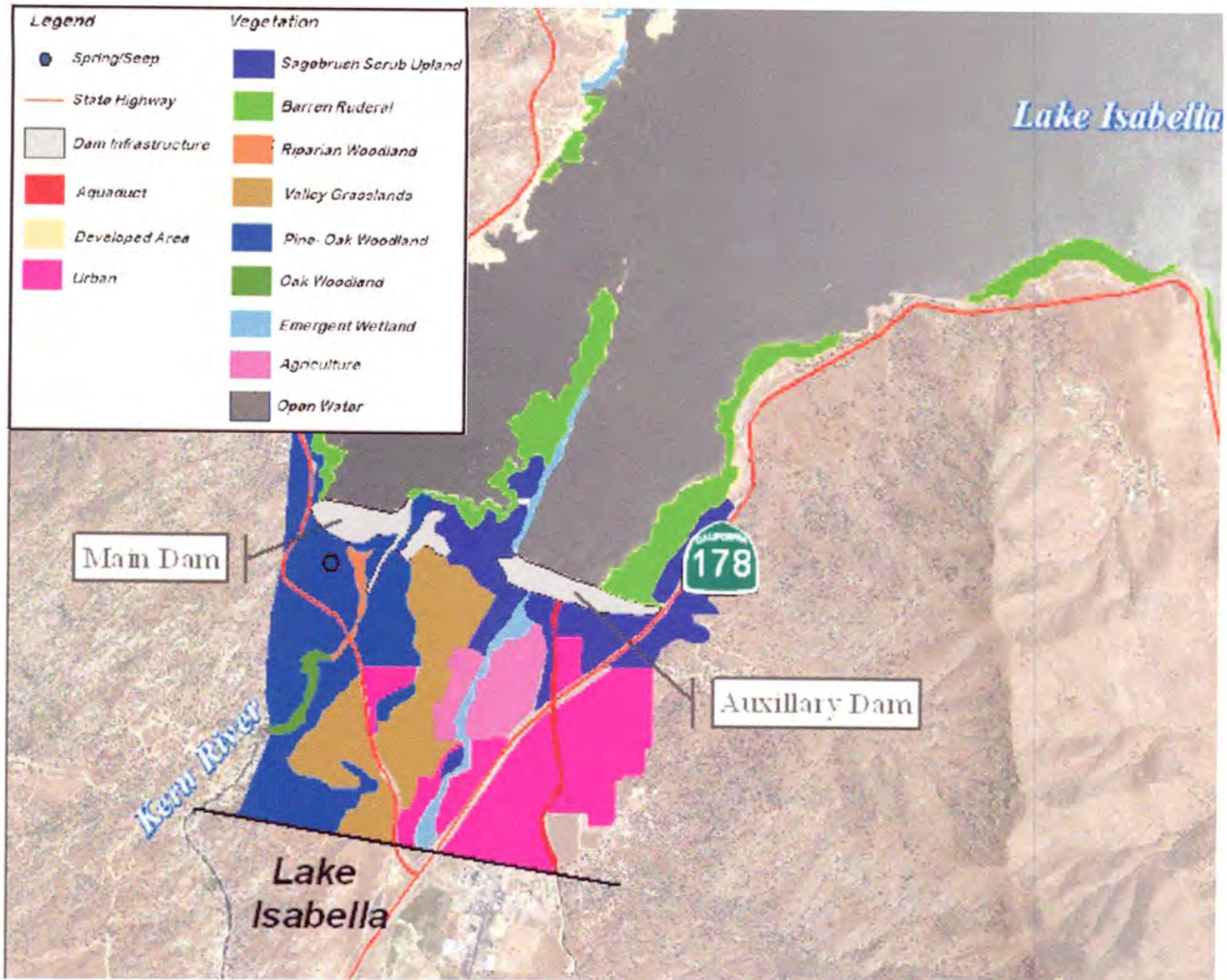

Figure 3: Vegetative Cover-Types in the Project Area

primarily with gray pine, immediately above the ordinary high-water elevation of the lower Kern River. Buffered stream flows due to modulation by the Main and Auxiliary Dams (Pope et al. 2004), and the presence of well-drained soils and steep stream banks that abruptly transition to upland conditions all likely contribute to this cover-type becoming established so near the streambed. In the proposed borrow site, oak woodland is in an open area mixed with sagebrush-scrub and valley grassland vegetation.

Pine-Oak Woodland

The pine-oak woodland cover-type is dominated by gray pine with interior live oak, blue oak, canyon live oak, California buckeye, western juniper, and Coulter pine (Sawyer et al. 2009). Tree canopy is typically less than 65 feet high and is open to intermittent (Sawyer et al. 2009). Shrubs are common or infrequent and include a mix of such species as rubber rabbitbrush, black mustard, California buckwheat, Russian thistle, Mormon tea, California scrub oak, yerba santa, flatspine bur ragweed, chaparral yucca, and common mullen. The herbaceous layer is sparse or grassy and hosts species such as Italian rye grass, foxtail chess, and common fiddleneck. This cover-type is present on streamside terraces, valleys, slopes, and ridges where soils are shallow, often stony, infertile, moderately to excessively drained, and at elevations between 990 and

6,990 feet (Sawyer et al. 2009). This cover-type commonly occupies rough foothill slopes intermixed with stands of chaparral (Allen-Diaz et al. 2007; Sawyer 2007).

Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the main dam, in the Main Dam Campground. This patch has been partially altered by the establishment of the campground and the water discharge facility for the main dam. Construction of dam infrastructure, access roads, campsites, parking areas, and a small constructed reservoir have all diminished the extent of native habitat in this area. Human disturbance has allowed for the introduction and establishment of various invasive plant species. Planting of ornamental species, mainly Aleppo pine, has also reduced the quality of native habitat.

Sagebrush-Scrub Upland

The sagebrush-scrub upland cover-type is dominated by rubber rabbitbrush with other species, including big sagebrush, yellow rabbitbrush, Mormon tea, California buckwheat, western juniper, and antelope bitterbrush as well as emergent junipers or pine at low cover (Sawyer et al. 2009). The shrub canopy is typically less than 10 feet high and is open to continuous (Sawyer et al. 2009). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as several species of bromes, California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle (Sawyer and Keeler-Wolf 1995). This cover-type is found in all topographic settings, especially in disturbed settings. Soils are well-drained sand and gravel at elevations ranging between 0 and 10,500 feet (Sawyer et al. 2009). Locally, stands are usually associated with broad intermittent watercourses, road cuts, and other clearings.

As with the pine-oak woodland cover-type, sagebrush-scrub upland dominates much of the upland area surrounding Lake Isabella. However, in the proposed project area, it is found only in patches between the main and auxiliary dams and in upland areas next to the auxiliary dam (refer to Figure 3). These areas are frequently disturbed by vehicles and machinery.

Riparian Woodland

The riparian woodland cover-type is dominated by Goodding's willow, Fremont cottonwood, and red willow. Also common in some areas are boxelder, California buckeye, incense cedar, western sycamore, Oregon ash, black walnut, white alder, arroyo willow, shining willow, Pacific willow, narrowleaf willow, yellow willow, and black elderberry (Sawyer et al. 2009). Tree canopy height is often greater than 100 feet and is open to continuous. Common shrubs include mule-fat, coyote brush, and redosier dogwood, which form an open to continuous layer (Sawyer et al. 2009). The herbaceous layer is variable and is often dominated by primary colonizers, such as rough cocklebur, stinging nettle, goosegrass, common rush, common knotweed, common plantain, and cress. The riparian woodland cover-type is usually present along terraces or large rivers, canyons, and rocky floodplains of small intermittent streams, seeps, and springs. Specific species composition is most likely determined by frequency and severity of disturbance by inundation (Sawyer et al. 2009).

The riparian woodland cover-type is common in the proposed project area along the North and South Fork of the Kern River and is distributed across recent floodplains and in areas subject to inundation. The broad floodplain along the South Fork Kern River region gently slopes up from Lake Isabella, causing it to be frequently inundated and creating conditions ideal for the riparian woodland cover-type. As a result, extensive stands are found throughout the riparian zone of the South Fork Wildlife Area, one of the most extensive riparian woodlands remaining in California (USFS 2010). The North Fork Kern River, although physically constrained by its location in a relatively incised floodplain in a narrow canyon, hosts linear distributions of the cover-type as well. Periodic inundation, particularly in the South Fork Wildlife Area, is thought to be necessary for the regeneration of Gooddings's willow and long-term maintenance of the riparian forest in general. These characteristics function to maintain diverse species composition and forest structure essential for federally listed species, such as southwestern willow flycatcher and least Bell's vireo (Jones & Stokes 2003, 2004, 2006, 2008; Whitfield and Henneman 2009).

Emergent Wetland

The emergent wetland cover-type is found throughout the proposed project area in the North and South Fork Kern River delta areas, on gently sloping lake shorelines with available soil moisture, in natural springs, and in areas of seepage downstream of the dam. Herbaceous vegetation in these areas is primarily non-native and is mainly composed of rough cocklebur, goosegrass, common rush, stinging nettle, common knotweed, common plantain, and various cress species and are also present in these areas. Also present, though less prevalent in these areas, are other emergent marsh species such as Baltic rush, red willow, and western dock with patches of tamarisk and giant cane.

In the proposed project area the emergent wetland cover-type is found along the shore line of Engineers Point which is a potential borrow site and in an area downstream of Lake Isabella Auxiliary Dam that is thought to be fed by a seep in the dam, which may be in the new dam footprint or used as a staging area.

Open Water

Open water habitat is present within the project area at Lake Isabella which averages about 11,000 surface acres when the dam is fully operational and is one of the largest reservoirs in California (USFS 2010). It is fringed mostly by sagebrush-scrub upland and, near the confluences with the North and South Forks of the Kern River, riparian woodland vegetation communities.

Wildlife

Lake Isabella and much of the Kern River are located in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the proposed project area and support extensive areas of riparian, open water, and wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub upland. Urban and rural lands also surround Lake Isabella. This diversity of habitats attracts a variety of wildlife species, including many residents and abundant migrants.

The extensive riparian areas found in the deltas of the North and South Fork Kern Rivers are the most substantial habitat for wildlife found in the proposed project area. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands. In particular, the South Fork Wildlife Area has been identified as one of the largest intact patches of riparian habitat remaining in California. It is estimated that over 300 species of birds use this area, with most being neotropical migrants that nest and forage during summer and overwinter in

Central and South America (Audubon 2010). Common birds include passerines, such as warblers, kinglets, chickadees, thrushes, jays, hummingbirds, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. In addition, other common birds are woodpeckers, flycatchers, water birds, waders, and various raptors, such as owls, buteos, and smaller accipiters (Audubon 2010). Other wildlife common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley gartersnake (Audubon 2010). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

Various waterbirds are also present in association with Lake Isabella. Species that utilize the lake include migratory and resident waterfowl, American coot, grebes, cormorants, gulls, and waders (Audubon 2010).

Although limited upland areas fall within the proposed project area, this generalized habitat is ubiquitous in the area surrounding Lake Isabella. Most wildlife species in upland areas are native and adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (Audubon 2010). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats.

Fish

The open water of Lake Isabella hosts a variety of aquatic species, although many are nonnative. A mixture of native and introduced fish species inhabit Lake Isabella and the Kern River and could occur in the proposed project area. Native species are Sacramento pikeminnow, Sacramento sucker, hardhead, and Kern River rainbow trout (SCE 1991). A variety of species have been introduced into the area to provide both food and sport fish. These are hatchery-reared rainbow trout, brown trout, carp, smallmouth bass, largemouth bass, white crappie, black crappie, bluegill, white catfish, channel catfish, and brown bullhead (SCE 1991). Threadfin shad were also introduced into Lake Isabella as a forage fish (Audubon 2010).

Endangered Species

Appendix A contains a list of federally listed species which may be found in the project area. Based on a search of the project area using the California Department of Fish and Game's California Natural Diversity Data Base of the project area there are several State and Federally listed species which could occur within or around the project area. The Corps will need to determine the possible effects of the proposed project on listed species and consult with the appropriate resource agency.

DISCUSSION

Service Mitigation Policy

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy as published in the Federal Register (46:15; January 23, 1981).

The Mitigation Policy provides Service personnel with guidance in making recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. However, the Mitigation Policy does not apply to threatened and endangered species, Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities, or Service recommendations related to the enhancement of fish and wildlife resources.

In applying the Mitigation Policy during an impact assessment, the Service first identifies each specific habitat or cover-type that may be impacted by the project. Evaluation species[1] which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several criteria, as follows: (1) species known to be sensitive to specific land- and water-use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with Important Resource Problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Fish and Wildlife Service. Based on the relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1) to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value." To achieve this goal, any unavoidable losses 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 those lost. The planning goal of Resource Category 3 is "no net loss of habitat while minimizing loss of in-kind value." To achieve this goal any unavoidable losses will be replaced in-kind or if it is not desirable or possible out-of-kind mitigation would be allowed. The planning goal of Resource

1 Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a HEP application, if one is conducted.

Category 4 is "minimize loss of habitat value." To achieve this goal the Service will recommend ways to rectify, reduce, or minimize loss of habitat value.

In addition to mitigation planning goals based on habitat values, Region 8 of the Service, which includes California, has a mitigation planning goal of no net loss of acreage and value for wetland habitat. This goal is applied in all impact analyses.

In recommending mitigation for adverse impacts to fish and wildlife habitat, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimization, rectification of measures, measures to reduce or eliminate impacts over time, and compensation.

Seven fish and/or wildlife habitats were identified in the project area which had potential for impacts from the project: valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, and open water. The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 1.

Table 1. Resource categories, evaluation species, and mitigation planning goal for the habitats possibly impacted by the proposed Lake Isabella Dam Safety Modification Project Kern County, California.

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Valley Grassland	Raptor Guild	3	No net loss of habitat while minimizing loss of in-kind value.
Oak Woodland	Breeding Birds	2	No net loss of in-kind habitat value or acreage.
Pine-Oak Woodland	Raptor Guild	2	No net loss of in-kind habitat value or acreage.
Sagebrush-scrub upland	Breeding Birds	3	No net loss of habitat while minimizing loss of in-kind value.
Riparian Woodland	Migratory Birds	2	No net loss of in-kind habitat value or acreage.
Emergent Wetland	Amphibian Species	2	No net loss of in-kind habitat value or acreage.
Open Water	Sport Fish	4	Minimize loss of habitat value

The evaluation species for the valley grassland cover-type is the raptor guild which utilizes these areas for foraging. These species were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Valley grassland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species as well, which are an important food source for many raptors. This cover-type is limited to a small ridgeline between and downstream of the Main and Auxiliary Dams in areas which were impacted during construction of the dams.

Therefore, the Service designates the valley grassland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

Evaluation species chosen for the oak woodland cover-type are breeding birds. This species was selected because of: (a) their ecological roles (prey, predator, scavenger, etc.), (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and, (c) their importance for nonconsumptive human uses (i.e., bird watching) , and, (d) this habitat provides required nesting, foraging, and cover habitat for many breeding bird species. This cover-type is restricted in one location in the proposed project area to a thin patchy band on either side of the lower Kern River, but is abundant in the hills downstream of the dam in one of the proposed borrow areas. Because of its high value to the evaluation species, the Service designates the oak woodland cover-type in the area potentially impacted by the project as Resource Category 2. Our associated mitigation planning goal is for "no net loss of in-kind habitat value or acreage."

The evaluation species chosen for the pine-oak woodland cover-type is breeding birds. This species was selected because of: (a) their ecological roles (prey, predator, scavenger, etc.), (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and, (c) their importance for nonconsumptive human uses (i.e., bird watching) , and, (d) this habitat provides required nesting, foraging, and cover habitat for many breeding bird species. Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the Main dam, in the Main Dam Campground in close proximity to the Kern River. Consequently, the pine-oak woodland areas within the project area have specific value in providing perch and nesting sites for birds in close proximity to valuable foraging. Therefore, the Service designates the pine-oak woodland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species for the sagebrush-scrub upland cover-type is the raptor guild which utilizes these areas for foraging. This species was selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Sagebrush-scrub upland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species which are an important food source for many raptors. Although sagebrush-scrub upland dominates much of the area surrounding Lake Isabella, in the proposed project area, it is found only in patches between the Main and Auxiliary dams and in upland areas next to the Auxiliary Dam, both of which were impacted during dam construction. Therefore, the Service designates the sagebrush-scrub upland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the riparian woodland cover-type are neo-tropical birds. Neo-tropical birds were selected because of: (a) their ecological roles (prey, predator, scavenger, etc.), (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and, (c) their importance for nonconsumptive human uses (i.e., bird watching) , and, (d) this habitat provides required nesting, foraging, and cover habitat for many migratory bird species. In general, riparian woodland habitat is valuable for a multitude of wildlife species, which include birds, mammals, reptiles, and amphibians. In the project area this cover-type is only located in a small area downstream of the Main Dam. Therefore, the Service designates the riparian woodland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the emergent wetland cover-type are amphibian species. Amphibian species were selected because: (a) this habitat provides cover, forage, and breeding for the species, (b) they have an important role as prey in the food chain for birds, fish, reptiles, and mammals, and (c) amphibian species are very sensitive to changes in the environment and are therefore good indicators of environmental health. In general, emergent wetland habitat is valuable for a multitude of wildlife species, which include birds, mammals, reptiles, and amphibians. In the project area this cover-type is only located in a small area downstream of the Auxiliary Dam located near the new dam footprint. Due to it high value and relative scarcity, the Service designates the emergent wetland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the open water cover-type are freshwater sport fish. The open water habitat is comprised of Lake Isabella. These species were chosen because of their consumptive and recreational value to humans and their importance as a prey item for many species of raptors and wading birds. This area has been highly impacted by recreational activities and contains mostly hatchery reared sport fish. Therefore, the Service designates the open water cover-type as Resource Category 4. Our associated mitigation planning goal for these areas is "minimized loss of in-kind value."

All action alternatives would require the lowering of the water level of Lake Isabella to a construction pool of 2,530 feet which could result in potential effects to the fish and wildlife species inhabiting the area. The lowering of the pool has, in the past, resulted in an increase in water temperature leading to harmful bacteria and algal blooms. These blooms could grow unchecked, deoxygenating the water and causing mass fish mortality as well as negative impacts to species feeding on the fish and drinking the water. Lake Isabella provides habitat for numerous species of birds, amphibians, and insects, as well as food and water resources for mammals and reptiles, all which could be negatively impacted by a harmful algal bloom.

The upstream habitat (delta areas), particularly on the South Fork of the Kern River, are highly valuable to numerous species including the federally endangered Southwestern willow flycatcher and the yellow-billed cuckoo a candidate species for listing under the Endangered Species Act. Due to the importance of these upstream areas, the Service suggests the Corps focus design on alternatives which minimize to the extent possible the duration of inundation of the South Fork delta area and other upstream habitat to reduce adverse impacts to highly productive wildlife habitat.

Based on our initial review, the proposed project would result in the permanent loss of habitat acreage and value for species inhabiting valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, and open water habitat. Temporal losses of habitat value would occur for species utilizing valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, and open water habitat in proximity to both the Main and Auxiliary Dams at the proposed construction and staging areas. Wildlife species utilizing these areas would be displaced during construction activities and there would be a temporal loss of habitat values.

For planning purposes, the Service suggests that all permanent losses of habitat during construction of the proposed project be mitigated at a 5 to 1 ratio for the Resource Category 2 cover-type. For Resource Category 3 and 4 cover-types a 2 to 1 ratio for mitigation will be required. There will be temporal impacts as well which can be minimized by reseeding all disturbed land areas at the completion of construction. Refined compensation acreage for permanent loss of habitat can be developed through application of Habitat Evaluation Procedures (HEP). In order to proceed with applying HEP to the project, additional information is needed which is included in the recommendations below. In the interim the Service is beginning the preliminary step to complete a HEP such as forming an inter-agency team and selecting models and sampling procedures.

RECOMMENDATIONS

The Service preliminary recommendations for planning purposes are that the Corps:

1) Provide the Service with the acreage of each cover-type that would be permanently impacted, temporarily impacted, or created in each alternative.

2) Provide the Service with construction details, schedule, staging areas, and a list of the equipment being used when a construction strategy has been determined.

3) Avoid impacts to migratory birds nesting in trees along the access routes, haul routes, staging areas, and adjacent to the proposed construction areas by conducting pre-construction surveys for active nests. These surveys and results should be factored into the proposed project schedule.

4) Avoid potential future impacts by ensuring all fill material is free of contaminants.

5) Minimize temporary impacts in disturbed areas by replanting/reseeding with appropriate native plant species. Revegetated areas should be monitored for 5 years or until they have been determined to be fully established.

6) Focus on spillway alternatives which decrease/minimize the duration and depth of inundation of upstream delta habitat on the North and South Forks of the Kern River.

7) Use the following compensation ratios for permanent impacts for planning purposes until a HEP is completed. Compensate for all impacts to all cover-types categorized as Resource Category 2 at a ratio of 5:1. All impacts to Resource Category 3 cover-types should be compensated at a 4:1 ratio. All Resource Category 4 cover-types should be compensated at a 2:1 ratio.

8) Coordinate with the Service, the U.S. Forest Service, and the California Department of Fish and Game to develop a mitigation strategy for habitat (acreage and value) lost during the

proposed project.

9) Consult with the Service under the Endangered Species Act if any federally listed species are affected by the proposed project.

10) Contact the California Department of Fish and Game regarding possible effects of the proposed project on State listed species.

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Appendix A:

Federal Endangered and Threatened Species that Occur in or may be Affected by the project.

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 110418044628

Database Last Updated: April 29, 2010

Quad Lists

Listed Species

Amphibians

Rana draytonii

California red-legged frog (T)

Birds

Gymnogyps californianus

California condor (E)

Quads Containing Listed, Proposed or Candidate Species:

TYLERHORSE CANYON (187B)

County Lists

Kern County

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta longiantenna

Critical habitat, longhorn fairy shrimp (X)

longhorn fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Euproserpinus euterpe

Kern primrose sphinx moth (T)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Thamnophis gigas
giant garter snake (T)

Birds

Charadrius alexandrinus nivosus
western snowy plover (T)

Empidonax traillii extimus
Critical habitat, southwestern willow flycatcher (X)
southwestern willow flycatcher (E)

Gymnogyps californianus
California condor (E)
Critical habitat, California condor (X)

Vireo bellii pusillus
Least Bell's vireo (E)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides nitratoides
Tipton kangaroo rat (E)

Ovis canadensis californiana
Sierra Nevada (=California) bighorn sheep (E)

Sorex ornatus relictus
Buena Vista Lake shrew (E)
Critical habitat, Buena Vista Lake shrew (X)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Caulanthus californicus
California jewelflower (E)

Eremalche kernensis
Kern mallow (E)

Monolopia congdonii (=Lembertia congdonii)
San Joaquin woolly-threads (E)

Opuntia treleasei
Bakersfield cactus (E)

Pseudobahia peirsonii
San Joaquin adobe sunburst (T)

Sidalcea keckii
Critical habitat, Keck's checker-mallow (X)
Keck's checker-mallow (=checkerbloom) (E)

Proposed Species

Amphibians

Rana draytonii
Critical habitat, California red-legged frog (PX)

Candidate Species

Amphibians

Rana muscosa
mountain yellow-legged frog (C)

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Mammals

Martes pennanti
fisher (C)

Key:

(E) *Endangered* - Listed 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.
(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
(C) *Candidate* - Candidate to become a proposed species.
(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the 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.

- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

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, there will be a separate line for this on the species list. 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). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 17, 2011.

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:
81420-2011 CPA-0079

MAR 1 2012

Alicia E. Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95825-2922

Dear Ms. Kirchner:

The U.S. Army Corps of Engineers has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the Lake Isabella Dam Safety Modification Project. The proposed dam modifications would occur at Lake Isabella, in Kern County, California. The enclosed report constitutes the U.S. Fish and Wildlife Service's draft FWCA report for the proposed project.

If you have any questions regarding this report, please contact Tyler Willsey at (916) 414-6550.

Sincerely,

Daniel Welsh
Daniel Welsh
Assistant Field Supervisor

Enclosure

cc:
Mitchell Stewart, COE, Sacramento, CA
Marci Jackson, COE, Sacramento, CA
Regional Manager, CDFG, Fresno, CA
Central Valley Flood Protection Board, Sacramento, CA

FISH AND WILDLIFE COORDINATION ACT REPORT
LAKE ISABELLA DAM SAFETY MODIFICATION PROJECT
March 2012

This is the Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act report on the effects of the proposed Lake Isabella Dam Safety Modification (Lake Isabella DSM) Project 40 miles northeast of Bakersfield, California. This report has been prepared under the authority of, and in accordance with, the provisions of the Fish and Wildlife Coordination Act (48 stat. 401, as amended: 16 U.S.C. 661 et seq.).

BACKGROUND

Lake Isabella Dam was placed into operation in 1953, but is currently unable to hold the amount of water for which it was authorized due to an interim risk reduction measure (IRRM) reducing the lake elevation from the authorized gross pool of 2605.5 feet to 2585.5 feet. Investigations and analysis of the Auxiliary and Main Dam deficiencies were culminated with the release of the October 2009 report entitled "Potential Failure Mode Assessment - Isabella Main and Auxiliary Dams." Based on current engineering knowledge, U.S. Army Corps of Engineers (Corps) determined that the Lake Isabella Main Dam, Spillway, and Auxiliary Dam have a high risk of failure due to significant seismic, seepage, and hydrologic issues. The project likely has the highest annualized life loss risk of any dam in the Corps' nationwide inventory, and has considerable public and congressional interest. The Corps has determined remediation of the dam's safety deficiencies is necessary.

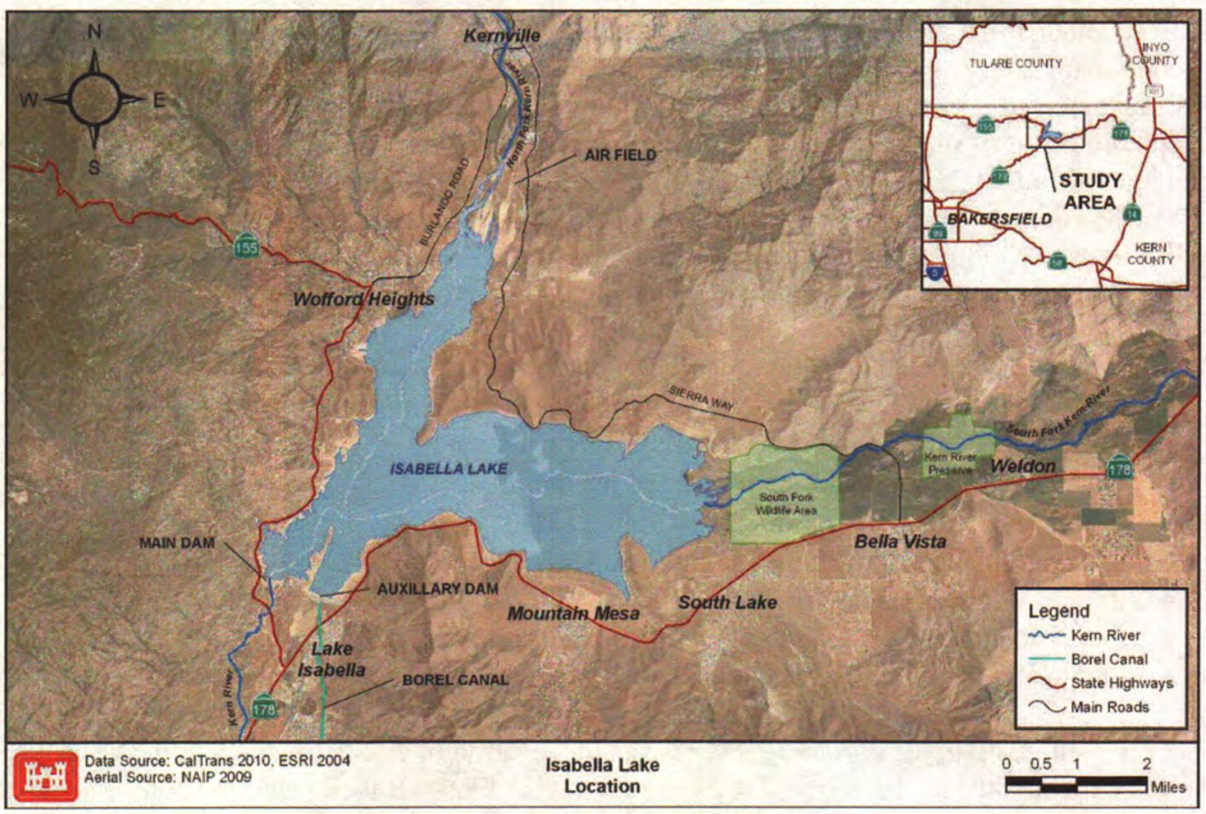

Figure 1: Map of the Lake Isabella Area

PROJECT DESCRIPTION

Lake Isabella is located between the towns of Kernville and Lake Isabella in Kern County, California northeast of Bakersfield. The remediation options being investigated by the Corps are listed below:

ALTERNATIVES EVALUATED

No Action Alternative

Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Lake Isabella Main Dam, Spillway, or Auxiliary Dam. Lake Isabella Dam would continue to be operated in accordance with the established Water Control Plan and Flood Control Diagram. In accordance with Draft Engineering Regulations, the lake capacity (gross pool elevation) would be returned to, and the dam would be operated at, the pre-Interim Risk Reduction Measures (IRRM) elevation of 2,605.5 feet. However, under the No Action Alternative, the Corps believes one or both dams would be almost certain to fail under normal operations in the near-term without intervention. The potential environmental, economic, and human consequences of a dam failure would be extremely high.

Making the IRRM Permanent

A seepage study conducted in 2005-2006 by the Corps found that the Auxiliary Dam was being subjected to higher foundation pressures than originally believed from earlier studies, and the study concluded that the pressures in the foundation had reached levels that could lead to potential dam safety concerns. Therefore, an emergency deviation from the water control plan was implemented on April 27, 2006, to reduce the foundation pressures and provide an acceptable factor of safety. The deviation consisted of reducing the previous lake capacity (gross pool level) from 2,609.26 feet (NAVD88) to a restricted elevation not to exceed 2,589.26 feet (NAVD88) during the flood-control off-season, from April through September of each year, as an IRRM until a more permanent solution could be implemented. This restricted elevation reduced the maximum storage capacity of the lake by 37 percent.

In addition to the restricted elevation, the IRRM included the following measures, still in effect:

- New inundation map and evacuation plan for the downstream affected area;
- Additional dam safety training to applicable personnel;
- Increased inspection and monitoring of the dams;
- Installation and operation of early warning sirens;
- Installation and use of remote-control cameras;
- Improved communications;
- Increased emergency response equipment and supplies; and
- Frequent and ongoing communication with the public.

Under this alternative, the current IRRM restricted elevation of 2,589.26 feet or some variant would be maintained as the permanent gross pool level of Lake Isabella, and the other measures listed above would be continued for the foreseeable future. The gross pool elevations of Lake Isabella recorded between 1955 and 2006 indicate that on average the lake elevation reaches or is higher than the restricted level about 1 out of 3 years. With the IRRM made permanent, the same operational conditions in effect since 2006, dam operation would control the level of Lake Isabella so as not to exceed the restricted level in any year.

Alternative Base Plan

Under this alternative, only deficiencies that would likely result in catastrophic failure (potentially life-threatening) of the dams during a large seismic or extreme storm event would be remediated against. This alternative represents the minimal risk management plan that would still provide an adequate level of safety for the project. All remediation measures under this alternative would be completed to modern construction and design standards. The remediation measures planned for each structure under this Alternative Base Plan are described in the following paragraphs.

Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the Probable Maximum Flood (PMF)). Under the Alternative Base Plan the Main Dam would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

- Constructing a filter and drain near the crest of the dam to help protect from potential settlement cracking during a seismic event.
- Retaining the existing bifurcated outlet structure and the privately owned power generating station downstream of the Main Dam.
- Constructing a 4-foot crest raise, and replacing the core near the crest, to be able to safely pass an extreme flood event without overtopping.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the filter and drain near the crest of the Main Dam would come from two proposed "borrow" sources. One source would be the Auxiliary Dam Recreation Area which is on-site, and, if needed, another off-site source would be the South Fork Kern River delta just downstream of the South Fork Wildlife Area. The concrete needed for Main Dam remediation measures would be supplied by a ready-mix plant located in the South Lake area along Hwy 178.

Existing Spillway

Included in this alternative would be remediation of the deficiencies identified for the existing spillway. The remediations include: (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of rock anchors along the right wall to increase seismic stability; and (c) construction of a 4-foot high retaining wall added to the crest along the right wall (closest to the Main Dam) to protect against potential erosion of the Main Dam during high outflows. The concrete needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along Hwy 178.

Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass extreme storm events (such as the PMF). Therefore, this alternative includes the construction of a new "Emergency Spillway" that will be located about 100 feet east of the existing spillway. The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of the dams.

This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2,620.76 feet (11.5 feet higher than existing spillway) for outflows associated with storm events greater than a 1-in-1000-year frequency. Outflows associated with more frequent storm events would be handled by the existing spillway. The new spillway would have a labyrinth type weir with four v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel.

It is anticipated that excavated materials from the proposed Emergency Spillway channel would be used as the main borrow material source for construction of the modification features for the Alternative Base Plan. The excavated materials would be crushed and stockpiled at a temporary crushing plant located in a construction staging area adjacent to Engineers Point in the vicinity of Launch 19. The materials (various sized rocks) produced in the crushing operation would be stockpiled on-site in this staging area and delivered to the appropriate construction areas as needed. The concrete needed to construct the baffles and apron of the Labyrinth Weir would be supplied from the ready-mix plant located in the South Lake area along Hwy 178.

Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose a high risk of potential failure of the dam. Under the Alternative Base Plan, the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities:

- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.
- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with treated soil to reduce the potential for liquefaction during a seismic event.
- Constructing a 4-foot crest raise to be able to safely pass an extreme storm event without overtopping.

- Constructing a rock fill berm on the upstream side, to increase seismic stability of the dam.

The majority of the rock materials needed to complete the downstream buttress and upstream berm on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam would come from one or both of the proposed borrow sources: the Auxiliary Dam Recreation Area and/or the South Fork Kern River delta area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on Hwy 178.

Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam. The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal which has the first water rights to the flows out of the North Fork Kern River. Since the early 1900s, the canal has been supplying water via the canal to the Southern California Edison power plant approximately 6 miles downstream of the Auxiliary Dam. The SCE has an agreement with the Corps to receive the first 605 cubic feet per second of the North Fork Kern River flows into Lake Isabella through the Borel Canal.

Under the Alternative Base Plan the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement 12- foot diameter Borel Canal conduit would be constructed through the right abutment of the Auxiliary Dam. The new tunnel would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal (Figure 2).

The rock materials needed to complete the new tunnel, portals, and connections would come from the excavation of the tunnel and proposed Emergency Spillway. The concrete needed for the upstream portal, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix plant on Hwy 178.

Also with this alternative, a temporary rock-fill coffer dam would be required upstream of the Auxiliary Dam in the area where the right abutment joins Engineers Point. This temporary coffer dam would be required in order to sufficiently dewater the area needed for construction of the upstream portal of the new tunnel. The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. After the construction of the upstream portal and tie-in to the existing canal in the reservoir is complete, the temporary coffer dam would be removed and the materials would be used to construct the proposed upstream berm on the Auxiliary Dam.

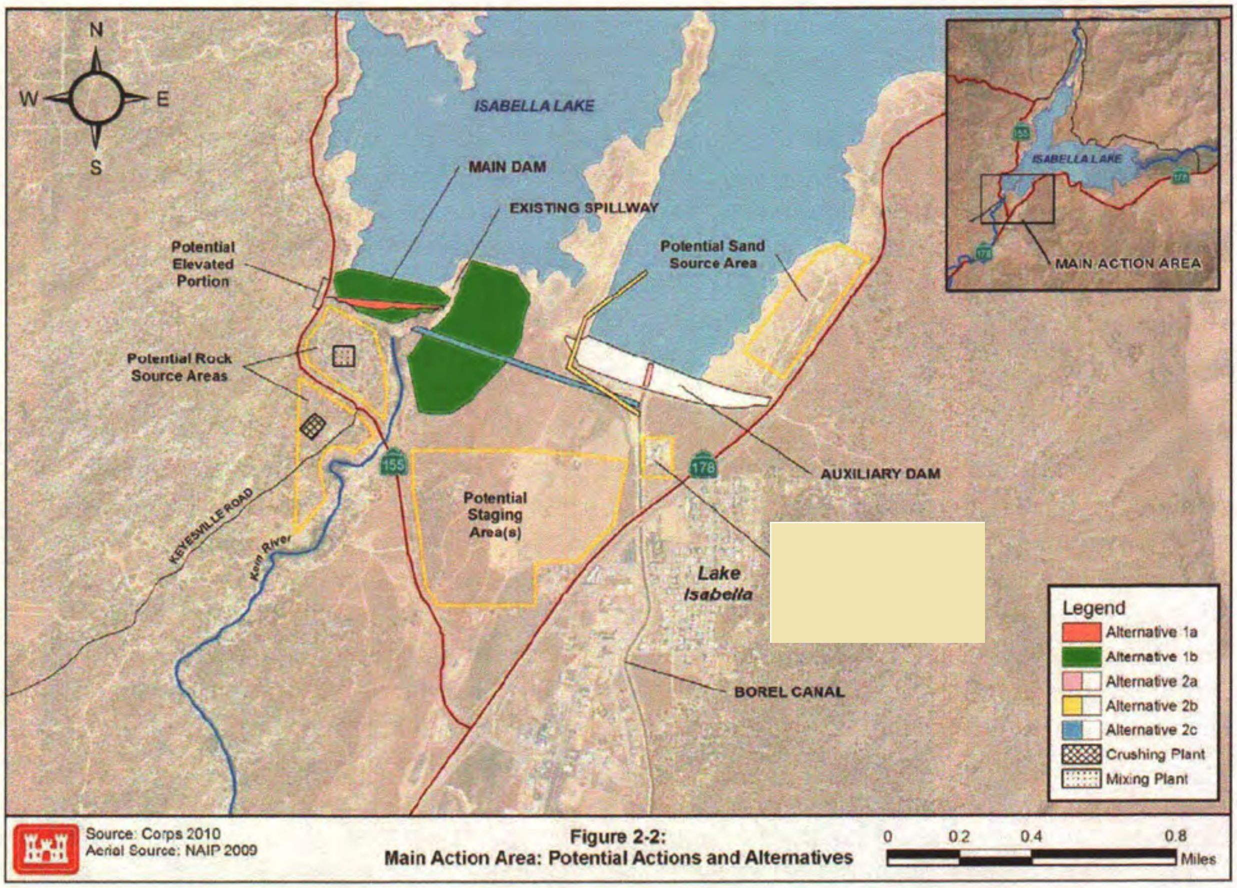

Figure 2: Map of Potential Main Dam and Auxiliary Dam/Borel Canal Alternatives

Alternative Plan 1

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Constructing a full-height filter and drain (rather than a filter only near crest as is described under the Alternative Base Plan) on the downstream slope of the dam to further protect the structure from potential settlement cracking and seepage during and following a seismic event.
- Constructing a toe filter/drain system to capture and collect seepage.
- Constructing a Roller-Compacted Concrete (RCC) Overlay on the center portion of the Main Dam, to provide an additional emergency spillway to control any overtopping of the dam from a very large and extremely rare storm event (such as the PMF). The RCC overlay would be constructed over the full-height filter and drain on the downstream face of the dam.

The 800-foot wide RCC Overlay would be constructed from the toe up in 2-foot sections (or rises), and would likely incorporate a 10-foot high fuseplug near the top of the Main Dam. The concrete would be placed using a concrete pump with a concrete mixture of fine and coarse aggregates and water from on-site sources (e.g., the two sand borrow areas, Emergency Spillway excavation, and lake), with cement and fly ash from sources near Barstow, California. The needed concrete would be prepared in a temporary (and portable) on-site Batch Plant set up in the Emergency Spillway excavation area. The approximate quantity of RCC concrete required would be 125,000 cubic yards.

Alternative Plan 2

Under this alternative, all of the deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures for the Auxiliary Dam. These additional remediation measures for the Auxiliary Dam would include the following:

- Adding a larger downstream buttress to the dam (top width of 100 feet, instead of 80 feet as under Alternative Base Plan and Alternative Plan 1), and a more extensive filter and drain system than was proposed for the Alternative Base Plan and Alternative Plan 1, to improve fault rupture, seismic stability, and seepage control.
- Providing a complete in-situ treatment of the deeper alluvial soil foundation (instead of only shallow treatment as under Alternative Base Plan and Alternative Plan 1) under the downstream slope with a bentonite and concrete slurry to further insure stability of the dam during a seismic event.

The additional rock materials needed to complete the larger downstream buttress on the Auxiliary Dam would come from the excavation of the Emergency Spillway. The sand material required to construct the larger filter on the downstream slope of the Auxiliary Dam would come from the two borrow sources: Auxiliary Dam Recreation Area and South Fork Kern River delta area. The concrete and bentonite needed for the additional Auxiliary Dam remediation measures such as the deep in situ soil treatment would be supplied from the ready-mix plant on Hwy 178, and from a plant in the Barstow area, respectively.

Alternative Plan 3

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Adding a steel lining to the Main Dam Control Tower to better withstand an extreme seismic loading.
- Adding concrete fill to the downstream side of the Main Dam Exit Portal Structure to increase seismic stability.

Also under this alternative, instead of relocating the Borel Canal conduit through the right abutment of the Auxiliary Dam (as is the case for the Alternative Base Plan and Alternative Plans 1 and 2), a new Borel Canal conduit would be constructed to connect from a new trifurcated structure (currently bifurcated) at the Main Dam outlet works via a 10-foot diameter tunnel passing under the existing and proposed spillways, and connecting to the existing Borel Canal alignment downstream of the Auxiliary Dam (Figure 2). The existing Borel Canal conduit through the Auxiliary Dam would be deactivated, sealed and abandoned. Also, the existing Borel Canal upstream of the Auxiliary Dam would no longer be needed for water delivery.

The rock materials needed to complete the new tunnel-conduit and connections from the Main Dam outlet would come from the tunnel excavation and/or the excavation of the Emergency Spillway. The concrete needed for the trifurcated structure at the Main Dam Outlet, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix concrete plant on Hwy 178.

BIOLOGICAL RESOURCES

The North and South Forks of the Kern River flow through the project area, are impounded by Lake Isabella Dam, and are then released out of the Main Dam in one downstream channel. The project area contains valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub, riparian woodland, wetland, open water, and barren/ruderal cover-types, as well as developed areas. The proposed project area includes all Corps and United States Forest Service lands surrounding the reservoir and dams, including portions of the North and South Fork Kern River delta regions next to Lake Isabella, a reach of the lower Kern River immediately downstream of the Main Dam, and a portion of Hot Spring Valley immediately downstream of the Auxiliary Dam. Included in this area are private lands adjacent to Lake Isabella and the Kern River, and lands owned by the Bureau of Land Management, the California Department of Fish and Game, and Audubon California.

Vegetation

Lake Isabella hosts a great diversity of plant communities. This diversity is largely due to the convergence of four geographic regions: Sierra Nevada Mountains, Great Central Valley, Southwestern California, and Mojave Desert, with each providing unique physiographic and biologic characteristics (Hickman 1993). General plant communities in or near the project area are classified according to Sawyer et al. (2009) and include valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, agricultural lands, and open water (Figure 3).

Valley Grasslands

The valley grassland cover-type is dominated by red brome grass, Mediterranean grass, and Arabian schismus, along with other nonnative species growing in the herbaceous layer (Sawyer et al. 2009). Other species that are common include California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle. Emergent shrubs may be present at low cover. Herbs in this stand are usually less than 2.5 feet tall, and cover is intermittent to continuous (Sawyer et al. 2009).

The valley grassland cover-type is restricted to a small ridgeline between and downstream of the Main and Auxiliary Dams (refer to Figure 3). This area has been highly disturbed in the past by human activities, including cattle ranching and off-road vehicle use.

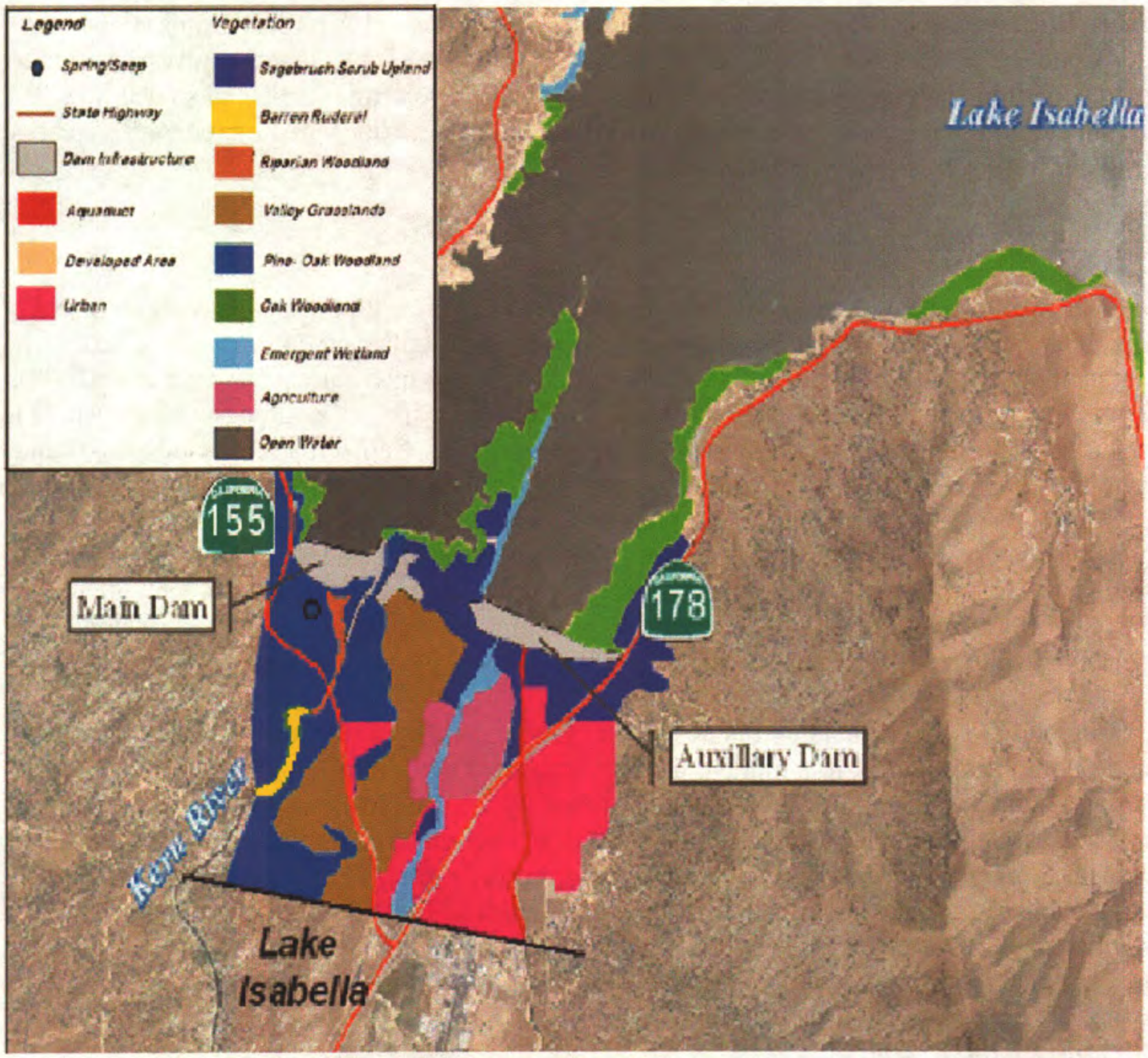

Figure 3: Vegetative Cover-Types in the Project Area

Oak Woodland

The oak woodland cover-type is dominated in the tree canopy by interior live oak, California buckeye, Pacific madrone, tan oak, gray pine, canyon live oak, blue oak, or California black oak (Sawyer et al. 2009). Tree canopy of the oak woodland area is usually less than 65 feet high and forms either intermittent or continuous cover in canyons or basins, or in open areas, a savanna-like canopy (Sawyer et al. 2009). The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover-type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained and is common throughout the Sierra Nevada foothills (Sawyer et al. 2009).

Oak woodland in the proposed project area is restricted to a thin patchy band on either side of the lower Kern River, downstream of the Main Dam and is abundant in one of the proposed borrow areas west of Highway 155 (Figure 3). In the first area, clusters of interior live oaks grow, primarily with gray pine, immediately above the ordinary high-water elevation of the lower Kern

River. Buffered stream flows due to modulation by the Main and Auxiliary Dams (Pope et al. 2004), and the presence of well-drained soils and steep stream banks that abruptly transition to upland conditions all likely contribute to this cover-type becoming established so near the streambed. In the proposed borrow site, oak woodland is in an open area mixed with sagebrush-scrub and valley grassland vegetation.

Pine-Oak Woodland

The pine-oak woodland cover-type is dominated by gray pine with interior live oak, blue oak, canyon live oak, California buckeye, western juniper, and Coulter pine (Sawyer et al. 2009). Tree canopy is typically less than 65 feet high and is open to intermittent (Sawyer et al. 2009). Shrubs are common or infrequent and include a mix of such species as rubber rabbitbrush, black mustard, California buckwheat, Russian thistle, Mormon tea, California scrub oak, yerba santa, flatspine bur ragweed, chaparral yucca, and common mullen. The herbaceous layer is sparse or grassy and hosts species such as Italian rye grass, foxtail chess, and common fiddleneck. This cover-type is present on streamside terraces, valleys, slopes, and ridges where soils are shallow, often stony, infertile, moderately to excessively drained, and at elevations between 990 and 6,990 feet (Sawyer et al. 2009). This cover-type commonly occupies rough foothill slopes intermixed with stands of chaparral (Allen-Diaz et al. 2007; Sawyer 2007).

Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the Main Dam, in the Main Dam Campground. This patch has been partially altered by the establishment of the campground and the water discharge facility for the Main Dam. Construction of dam infrastructure, access roads, campsites, parking areas, and a small constructed reservoir have all diminished the extent of native habitat in this area. Human disturbance has allowed for the introduction and establishment of various invasive plant species. Planting of ornamental species, mainly Aleppo pine, has also reduced the quality of native habitat.

Sagebrush-Scrub Upland

The sagebrush-scrub upland cover-type is dominated by rubber rabbitbrush with other species, including big sagebrush, yellow rabbitbrush, Mormon tea, California buckwheat, western juniper, and antelope bitterbrush as well as emergent junipers or pine at low cover (Sawyer et al. 2009). The shrub canopy is typically less than 10 feet high and is open to continuous (Sawyer et al. 2009). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as several species of bromes, California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle (Sawyer and Keeler-Wolf 1995). This cover-type is found in all topographic settings, especially in disturbed settings. Soils are well-drained sand and gravel at elevations ranging between 0 and 10,500 feet (Sawyer et al. 2009). Locally, stands are usually associated with broad intermittent watercourses, road cuts, and other clearings.

As with the pine-oak woodland cover-type, sagebrush-scrub upland dominates much of the upland area surrounding Lake Isabella. However, in the proposed project area, it is found only in patches between the Main and Auxiliary Dams and in upland areas next to the Auxiliary Dam (refer to Figure 3). These areas are frequently disturbed by vehicles and machinery.

Riparian Woodland

The riparian woodland cover-type is dominated by Goodding's willow, Fremont cottonwood, and red willow. Also common in some areas are boxelder, California buckeye, incense cedar, western sycamore, Oregon ash, black walnut, white alder, arroyo willow, shining willow, Pacific willow, narrowleaf willow, yellow willow, and black elderberry (Sawyer et al. 2009). Tree canopy height is often greater than 100 feet and is open to continuous. Common shrubs include mule-fat, coyote brush, and redosier dogwood, which form an open to continuous layer (Sawyer et al. 2009). The herbaceous layer is variable and is often dominated by primary colonizers, such as rough cocklebur, stinging nettle, goosegrass, common rush, common knotweed, common plantain, and cress. The riparian woodland cover-type is usually present along terraces or large rivers, canyons, and rocky floodplains of small intermittent streams, seeps, and springs. Specific species composition is most likely determined by frequency and severity of disturbance by inundation (Sawyer et al. 2009).

The riparian woodland cover-type is common in the proposed project area along the North and South Fork of the Kern River and is distributed across recent floodplains and in areas subject to inundation. The broad floodplain along the South Fork Kern River region gently slopes up from Lake Isabella, causing it to be frequently inundated and creating conditions ideal for the riparian woodland cover-type. As a result, extensive stands are found throughout the riparian zone of the South Fork Wildlife Area, one of the most extensive riparian woodlands remaining in California (USFS 2010). The North Fork Kern River, although physically constrained by its location in a relatively incised floodplain in a narrow canyon, hosts linear distributions of the cover-type as well. Periodic inundation, particularly in the South Fork Wildlife Area, is thought to be necessary for the regeneration of Goodding's willow and long-term maintenance of the riparian forest in general. These characteristics function to maintain diverse species composition and forest structure essential for federally listed species, such as southwestern willow flycatcher and least Bell's vireo (Jones & Stokes 2003, 2004, 2006, 2008; Whitfield and Henneman 2009).

Emergent Wetland

The emergent wetland cover-type is found throughout the proposed project area in the North and South Fork Kern River delta areas, on gently sloping lake shorelines with available soil moisture, in natural springs, and in areas of seepage downstream of the dam. Herbaceous vegetation in these areas is primarily non-native and is mainly composed of rough cocklebur, goosegrass, common rush, stinging nettle, common knotweed, common plantain, and various cress species and are also present in these areas. Also present, though less prevalent in these areas, are other emergent marsh species such as Baltic rush, red willow, and western dock with patches of tamarisk and giant cane.

In the proposed project area the emergent wetland cover-type is found along the shore line of Engineers Point which is a potential borrow site and in an area downstream of Lake Isabella Auxiliary Dam that is thought to be fed by a spring or seep in the dam, which may be in the new dam footprint or used as a staging area.

Agricultural Lands

Agricultural lands are present downstream of the proposed project area and are characterized by planted crops and actively grazed lands. Little to no native vegetation is present on these sites although they are located adjacent to the emergent wetland areas. Plant species present in this area are unknown because the area occurs on private land and has not been surveyed, but from a distance appear to be predominantly nonnative grasses, with no shrub or tree cover.

Open Water

Open water habitat is present within the project area at Lake Isabella which averages about 11,000 surface acres when the dam is fully operational and is one of the largest reservoirs in California (USFS 2010). It is fringed mostly by sagebrush-scrub upland and, near the confluences with the North and South Forks of the Kern River, riparian woodland vegetation communities.

Wildlife

Lake Isabella and much of the Kern River are located in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the proposed project area and support extensive areas of riparian, open water, and wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub upland. Urban and rural lands also surround Lake Isabella. This diversity of habitats attracts a variety of wildlife species, including many residents and abundant migrants.

The extensive riparian areas found in the deltas of the North and South Fork Kern Rivers are the most substantial habitat for wildlife found in the proposed project area. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands. In particular, the South Fork Wildlife Area has been identified as one of the largest intact patches of riparian habitat remaining in California. It is estimated that over 300 species of birds use this area, with most being neotropical migrants that nest and forage during summer and overwinter in Central and South America (Audubon 2010). Common birds include passerines, such as warblers, kinglets, chickadees, thrushes, jays, hummingbirds, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. In addition, other common birds are woodpeckers, flycatchers, water birds, waders, and various raptors, such as owls, buteos, and smaller accipiters (Audubon 2010). Other wildlife common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley gartersnake (Audubon 2010). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

Various waterbirds are also present in association with Lake Isabella. Species that utilize the lake include migratory and resident waterfowl, American coot, grebes, cormorants, gulls, and waders (Audubon 2010).

Although limited upland areas fall within the proposed project area, this generalized habitat is ubiquitous in the area surrounding Lake Isabella. Most wildlife species in upland areas are native and adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (Audubon 2010). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats.

Fish

The open water of Lake Isabella hosts a variety of aquatic species, although many are nonnative. A mixture of native and introduced fish species inhabit Lake Isabella and the Kern River and could occur in the proposed project area. Native species are Sacramento pikeminnow, Sacramento sucker, hardhead, and Kern River rainbow trout (SCE 1991). A variety of species have been introduced into the area to provide both food and sport fish. These are hatchery-reared rainbow trout, brown trout, carp, smallmouth bass, largemouth bass, white crappie, black crappie, bluegill, white catfish, channel catfish, and brown bullhead (SCE 1991). Threadfin shad were also introduced into Lake Isabella as a forage fish (Audubon 2010).

Endangered Species

Appendix A contains a list of federally listed species which may be found in the project area. Based on a search of the project area using the California Department of Fish and Game's California Natural Diversity Data Base of the project area there are several State and Federally listed species which could occur within or around the project area. The Corps will need to determine the possible effects of the proposed project on listed species and consult with the appropriate resource agency.

FUTURE WITHOUT THE PROJECT

Vegetation- No significant change in woody or herbaceous vegetation is expected on the lands within the project areas. Vegetation around the dam is expected to be maintained as it is currently. Habitat types are expected to mature slightly over the life of the project (50 years) providing some improvement for species utilizing areas around the dams.

Wildlife- Since only minimal changes are expected in vegetation, wildlife populations in the study area are expected to persist as they are currently, with normal year-to-year fluctuations of individual species.

Fish- Future conditions are expected to remain the same for fish species. As with current conditions, populations would fluctuate, depending on the level of the lake variations in water temperature, rainfall, contaminants, and natural population cycles.

FUTURE WITH PROJECT

Vegetation- Construction of the project would result in the permanent loss of 47.26 acres of sagebrush-scrub upland, 19.83 acres of pine-oak woodland, 6.96 acres of emergent wetland, 7.43 acres of agricultural lands, and 2.70 acres of valley grasslands. These losses will be attributed to the increased footprint of the dam and its accompanying structures as well as the staging and haul routes necessary to complete construction.

Wildlife- The proposed construction activities would have permanent and temporary impacts on wildlife abundance in the immediate area of construction. The loss of pine-oak woodland, emergent wetland, and sagebrush-scrub upland will permanently reduce the utility of the habitats for some wildlife species.

Fish- The construction of the dam requires the lowering of the lake's water level of around 30 feet. This would likely cause the water temperature to rise in the lake increasing the likelihood of harmful algal blooms which could result in massive fish kills.

DISCUSSION

Service Mitigation Policy

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy as published in the Federal Register (46:15; January 23, 1981).

The Mitigation Policy provides Service personnel with guidance in making recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. However, the Mitigation Policy does not apply to threatened and endangered species, Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities, or Service recommendations related to the enhancement of fish and wildlife resources.

In applying the Mitigation Policy during an impact assessment, the Service first identifies each specific habitat or cover-type that may be impacted by the project. Evaluation species[1] which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several criteria, as follows: (1) species known to be sensitive to specific land- and water-use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with Important Resource Problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Fish and Wildlife Service. Based on the

1 Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a HEP application, if one is conducted.

relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1) to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value." To achieve this goal, any unavoidable losses 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 those lost. The planning goal of Resource Category 3 is "no net loss of habitat while minimizing loss of in-kind value." To achieve this goal any unavoidable losses will be replaced in-kind or if it is not desirable or possible out-of-kind mitigation would be allowed. The planning goal of Resource Category 4 is "minimize loss of habitat value." To achieve this goal the Service will recommend ways to rectify, reduce, or minimize loss of habitat value.

In addition to mitigation planning goals based on habitat values, Region 8 of the Service, which includes California, has a mitigation planning goal of no net loss of acreage and value for wetland habitat. This goal is applied in all impact analyses.

In recommending mitigation for adverse impacts to fish and wildlife habitat, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimization, rectifying, reducing or eliminating impacts over time, and compensation.

Six fish and/or wildlife habitats were identified in the project area which had potential for impacts from the project: valley grassland, pine-oak woodland, sagebrush-scrub upland, emergent wetland, open water, and agricultural lands. The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 1.

The evaluation species for the valley grassland cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Valley grassland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species as well, which are an important food source for many raptors. This cover-type is limited to a small ridgeline between and downstream of the Main and Auxiliary Dams in areas which were impacted during construction of the dams. Therefore, the Service designates the valley grassland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Valley Grassland	Raptor Guild	3	No net loss of habitat while minimizing loss of in-kind value.
Pine-Oak Woodland	Raptor Guild	2	No net loss of in-kind habitat value or acreage.
Sagebrush-Scrub upland	Breeding Birds	3	No net loss of habitat while minimizing loss of in-kind value.
Emergent Wetland	Amphibian Species	2	No net loss of in-kind habitat value or acreage.
Open Water	Sport Fish	4	Minimize loss of habitat value
Agricultural Lands	Raptor Guild	4	Minimize loss of habitat value

Table 1. Resource categories, evaluation species, and mitigation planning goals for the habitats possibly impacted by the proposed Lake Isabella Dam Safety Modification Project Kern County, California.

The evaluation species chosen for the pine-oak woodland cover-type is breeding birds. Breeding birds were selected because of: (a) their ecological roles (prey, predator, scavenger, etc.), (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and, (c) their importance for nonconsumptive human uses (i.e., bird watching) , and, (d) this habitat provides required nesting, foraging, and cover habitat for many breeding bird species. Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the Main Dam, in the Main Dam Campground in close proximity to the Kern River. Consequently, the pine-oak woodland areas within the project area have specific value in providing perch and nesting sites for birds in close proximity to valuable foraging. Therefore, the Service designates the pine-oak woodland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species for the sagebrush-scrub upland cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Sagebrush-scrub upland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species which are an important food source for many raptors. Although sagebrush-scrub upland dominates much of the area surrounding Lake Isabella, in the proposed project area, it is found only in patches between the Main and Auxiliary Dams and in upland areas next to the Auxiliary Dam, both of which were impacted during dam construction. Therefore, the Service designates the sagebrush-scrub upland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the emergent wetland cover-type are amphibian species. Amphibians were selected because: (a) this habitat provides cover, forage, and breeding for amphibians, (b) amphibians have an important role as prey in the food chain for birds, fish, reptiles, and mammals, and (c) amphibians are very sensitive to changes in the environment and are therefore good indicators of environmental health. In general, emergent wetland habitat is valuable for a multitude of wildlife species, which include birds, mammals, reptiles, and amphibians. In the project area this cover-type is only located in a small area downstream of the Auxiliary Dam located near the new dam footprint. Due to it high value and relative scarcity, the Service designates the emergent wetland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the open water cover-type are freshwater sport fish. The open water habitat is comprised of Lake Isabella. These species were chosen because of their consumptive and recreational value to humans and their importance as a prey item for many species of raptors and wading birds. This area has been highly impacted by recreational activities and contains mostly hatchery reared sport fish. Therefore, the Service designates the open water cover-type as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of in-kind value."

The evaluation species for the agricultural lands cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Agricultural land provides forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species as well, which are an important food source for many raptors. This cover-type is limited to a small area downstream of the Auxiliary Dam adjacent the emergent wetland areas and have been highly impacted by years of active farming and grazing. Therefore, the Service designates the agricultural lands cover-type in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of in-kind value."

All action alternatives would require the lowering of the water level of Lake Isabella to a construction pool of 2,530 feet which could result in potential effects to the fish and wildlife species inhabiting the area. The lowering of the pool has, in the past, resulted in an increase in water temperature leading to harmful bacteria and algal blooms. These blooms could grow unchecked, deoxygenating the water and causing mass fish mortality as well as negative impacts to species feeding on the fish and drinking the water. Lake Isabella provides habitat for numerous species of birds, amphibians, and insects, as well as food and water resources for mammals and reptiles, all which could be negatively impacted by a harmful algal bloom.

The upstream habitat (delta areas), particularly on the South Fork Kern River, are highly valuable to numerous species including the federally endangered southwestern willow flycatcher and the yellow-billed cuckoo a candidate species for listing under the Endangered Species Act. Due to the importance of these upstream areas, the Service suggests the Corps focus design on alternatives which minimize to the extent possible the duration of inundation of the South Fork delta area and other upstream habitat, as well as minimize the amount of borrow taken from this area to reduce adverse impacts to highly productive wildlife habitat.

Based on our initial review, the proposed project would result in the permanent loss of habitat acreage and value for species inhabiting valley grassland, pine-oak woodland, sagebrush-scrub upland, agricultural lands, and emergent wetland. Temporary losses of habitat value would occur for species utilizing valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, agricultural lands, emergent wetland, and open water habitat in proximity to both the Main and Auxiliary Dams at the proposed construction and staging areas. Wildlife species utilizing these areas would be displaced during construction activities and there would be a tempororary loss of habitat values.

The Service completed an application of HEP for the project (Appendix B) and the compensation needs for the project are summarized in Table 2. The compensation area would be located at the Sprague Ranch conservation area following the completion of the project. HEP was not utilized for the open water, valley grasslands, or agricultural cover-types because these areas were only temporarily impacted and/or provided little utility to wildlife species. The seeding of these areas with native grasses following the completion of construction would minimize project impacts on the valley grassland and agricultural cover-types and the re-establishment of the gross pool at Lake Isabella would restore the open water habitat.

Cover-Type (All sites)	Area Affected (acres)	AAHUs Without Project	AAHUs With Project	Net Change in AAHUs	Compensation Ratio	Compensation Acres Needed
Sagebrush-Scrub Upland	47.26	0.03	-0.33	-0.36	1.00 : 1.46	69.00 ac
Emergent Wetland	6.96	0.02	-0.75	-0.77	1.00 : 1.00	6.96 ac
Pine-Oak Woodland	19.83	0.11	-0.39	-0.50	1.00 : 1.35	26.77 ac
Agriculture	7.43	N/A	N/A	N/A	Re-seed	0.00 ac
Valley Grasslands	2.70	N/A	N/A	N/A	Re-seed	0.00 ac
Total						**102.73 ac**

Table 2. Net change in Average Annual Habitat Units (AAHUs) and compensation need for the habitats affected by the Lake Isabella DSM Project, Alternative 3.

RECOMMENDATIONS

The Service recommendations for the project are that the Corps:

1) Provide the Service with any changes to the acreage of each cover-type that would be permanently impacted, temporarily impacted, or created in each alternative as planning progresses.

2) Avoid impacts to migratory birds nesting in trees along the access routes, haul routes, staging areas, and adjacent to the proposed construction areas by conducting pre-construction surveys for active nests. These surveys and results should be factored into the proposed project schedule.

3) Avoid potential future impacts by ensuring all fill material is free of contaminants.

4) Minimize temporary impacts in all disturbed areas by replanting/reseeding with appropriate native plant species. Revegetated areas should be monitored for 5 years or until they have been determined to be fully established.

5) Focus on spillway alternatives which decrease/minimize the duration and depth of inundation of upstream delta habitat on the North and South Forks Kern River.

6) Use the following compensation acreages for permanent impacts to the three habitat types calculated in the HEP. Compensate for impacts to the sagebrush scrub upland cover-type by creating 69.00 acres sage-brush scrub. Compensate for impacts to the emergent wetland cover-type by creating 6.96 acres of emergent wetlands. Compensate for impacts to the pine-oak woodland cover-type by creating 26.77 acres of pine-oak woodland.

7) Coordinate with the Service, the U.S. Forest Service, and the California Department of Fish and Game to develop a strategy for habitat development at the mitigation site.

8) Consult with the Service under the Endangered Species Act if any federally listed species are affected by the proposed project.

9) Contact the California Department of Fish and Game regarding possible effects of the proposed project on State listed species.

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Appendix A:

Federal Endangered and Threatened Species that may occur in or may be affected by the project.

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120228104103

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Fish

- Hypomesus transpacificus
  - delta smelt (T)

Amphibians

- Rana draytonii
  - California red-legged frog (T)

Birds

- Empidonax traillii extimus
  - southwestern willow flycatcher (E)
- Gymnogyps californianus
  - California condor (E)
- Vireo bellii pusillus
  - Least Bell's vireo (E)

Candidate Species

Birds

- Coccyzus americanus occidentalis
  - Western yellow-billed cuckoo (C)

Mammals

- Martes pennanti
    - fisher (C)

Quads Containing Listed, Proposed or Candidate Species:

LAKE ISABELLA NORTH (260B)

LAKE ISABELLA SOUTH (260C)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed 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.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the 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.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.

- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are

likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

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, there will be a separate line for this on the species list. 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). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 28, 2012.

APPENDIX D

HABITAT EVALUATION PROCEDURES REPORT

Appendix B:

Habitat Evaluation Procedures

Lake Isabella Dam Safety Modifications

February 2012

Prepared by:
Sacramento Fish and Wildlife Office
2800 Cottage Way, Rm W-2605
Sacramento, California 95825

INTRODUCTION

This application of Habitat Evaluation Procedures (HEP) is intended to quantify the anticipated impacts and benefits to fish and wildlife resources that would occur with the proposed Lake Isabella Dam Safety Modification (Lake Isabella DSM) Project in Kern County, California.

PROJECT DESCRIPTION

The Lake Isabella DSM Project consists of implementing the Preferred Risk Management Plan (Proposed Action) to remediate seismic, seepage, and hydrologic deficiencies at the Main Dam, Spillway, and Auxiliary Dam (Corps 2011). Implementing the proposed action is a large and complex project that involves altering the Lake Isabella Dams and Spillway, constructing new structures and facilities, and performing numerous associated support actions over a multi-year construction period. The U.S. Army Corps of Engineers (Corps) has developed six alternatives for remediating safety concerns at both the Main and Auxiliary Dams at Lake Isabella:

- **No Action Alternative**—Do nothing and operate the reservoir up to the authorized gross pool elevation of 2,609.26 feet (NAVD88).
- **Make the Interim Risk Management Measure (IRRM) Permanent**—No new actions, but make the current restricted pool elevation of 2,589.26 feet (NAVD88) permanent.
- **Alternative Base Plan**—Remediate those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not remediated, would likely result in catastrophic (potentially life-threatening) failure of the dams from an occurrence of a large seismic or extreme storm event.
- **Alternative Plan 1**—Remediate the deficiencies covered in the Base Plan Alternative, plus additional deficiencies identified for the Main Dam.
- **Alternative Plan 2**— Remediate the deficiencies covered in Alternative Plan 1, plus additional deficiencies identified for the Auxiliary Dam.
- **Alternative Plan 3**—Remediate the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam, ensuring that both dams achieve the best rating regarding dam safety.

All dam modification alternatives involve varying levels and combinations of increasing dam size, installing toe drains, modification of the existing spillway, construction of a new emergency spillway, and realignment of the Borel Canal. For a complete description of the alternatives and measures proposed for the Lake Isabella DSM project, see the attached Draft Fish and Wildlife Coordination Act report.

HEP OVERVIEW

HEP is a methodology developed by the Fish and Wildlife Service (Service) and other State and Federal resource agencies which can be used to document the quality and quantity of available habitat for selected fish and wildlife species. HEP provides information for two general types of habitat comparisons: (1) the relative value of different areas at the same point in time; and

(2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of the proposed or anticipated land-use and or water-use changes on habitat can be quantified. Similarly, any compensation needs (in terms of acreage) for the project can also be quantified, provided a mitigation strategy has been developed for a specific mitigation site.

A HEP application is based on the assumption that the value of a habitat for a selected species or the value of a community can be described in a model which produces a Habitat Suitability Index (HSI). This HSI value (from 0.0 to 1.0) is multiplied by the area of available habitat to obtain Habitat Units (HUs). The HU and Average Annual Habitat Units (AAHUs) over the life of the project are then used in the comparison described above.

The reliability of a HEP application and the significance of HUs are directly dependent on the ability of the user to assign a well-defined and accurate HSI to the selected evaluation elements or communities. In addition, a user must be able to measure the areas of each distinct habitat being utilized by fish and wildlife species within the project area. Both the HSIs and the habitat acreages must also be reasonably estimable at various future points in time. The HEP Team comprised of Corps and Service staff determined that the HEP criteria could be met, or at least reasonably approximated, for the Lake Isabella DSM Project alternatives. Thus HEP was considered an appropriate analytical tool to assess impacts of the proposed project.

GENERAL HEP ASSUMPTIONS

Some general assumptions are necessary to use HEP and HSI Models in the impact assessment.

<u>Use of HEP</u>:

- HEP is the preferred method to evaluate the impacts of the proposed project on fish and/or wildlife resources.
- HEP is a suitable methodology for quantifying project-induced impacts on fish and wildlife habitats.
- Quality and quantity of fish and wildlife habitat can generally be numerically described using the indices derived from the HSI models and associated habitat units.
- HEP assessment is applicable to the habitat types being evaluated.

<u>Use of HSI Models</u>

- HSI models are hypotheses based on available data.
- HSI models are conceptual models and may not measure all ecological factors that affect the quality of a given cover-type for the evaluation species (e.g. vulnerability to predation). In some cases, the HEP Team may make assumptions and incorporate them into the analysis to account for loss of those factors not reflected by the model.
- A peer reviewed "blue book" model must be used to evaluate each habitat type. Supplemental "non-blue book" models may be used for additional information.

METHODOLOGY

Habitat Workshop 3.0, a windows based HEP program, was used in this application, which was conducted in September 2011. The study design was developed jointly by Service (Tyler Willsey and Harry Kahler) and Corps (Mitchell Stewart) staff. Participants in the data collection portion of the HEP included the same agency representatives listed above.

Sites impacted by the project and for mitigation were identified by Corps staff with guidance from the Service. Habitat mapping of the project site was delineated in August 2010 by Mike Ericsson of Ericsson Mapping. General plant communities in or near the project area were classified as valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, open water, and agriculture. The acreage of habitat types potentially impacted by the project are summarized in Table 1.

LOCATION (SITE)	COVER-TYPE (HOLLAND HABITAT TYPE)	ACREAGE
Main Dam	Pine-Oak Woodland	3.66
	Total	**3.66**
Auxiliary Dam	Sagebrush Scrub Upland	13.83
	Emergent Wetland	0.34
	Total	**14.17**
Spillway	Sagebrush Scrub Upland	4.09
	Pine-Oak Woodland	3.96
	Valley Grasslands	0.75
	Total	**8.80**
Borel Canal	Sagebrush Scrub Upland	0.70
	Pine-Oak Woodland	0.64
	Emergent Wetland	0.59
	Agriculture	0.33
	Valley Grassland	1.50
	Total	**3.76**
Staging Areas/ Haul Routes	Sagebrush Scrub Upland	28.64
	Pine-Oak Woodland	11.57
	Emergent Wetland	6.03
	Agriculture	7.10
	Valley Grasslands	0.45
	Total	**53.79**
HABITAT TOTAL	Sagebrush Scrub Upland	47.26
	Pine-Oak Woodland	19.83
	Emergent Wetland	6.96
	Agriculture	7.43
	Valley Grasslands	2.70
PROJECT TOTAL		**84.18**

Table 1. Summary of existing habitat types and their approximate acreages in the project area

The purpose of using HEP is to provide a quantitative basis for identifying the habitat values which would be degraded, destroyed, and/or created by the construction of the proposed project. Barren ruderal, valley grassland, and agricultural habitats were not modeled because these areas disturbed by project activities are to be re-seeded after construction is complete. Therefore, the focus of this HEP is on three habitat types that would be lost due to Lake Isabella DSM Project activities: emergent wetland, pine-oak woodland, and sagebrush-scrub upland.

Emergent Wetland

The marsh wren (Gutzwiller and Anderson 1987) and Pacific Tree Frog HSI (Anonymous 1978) Models were selected for use in the emergent wetland habitat. Marsh wrens require dense stands of emergent herbaceous vegetation, typically cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) for nesting and cover. They prefer emergent vegetation in relatively deeper water, > 15 centimeters deep is considered optimum. Pacific tree frogs require dense cover in permanent to semi permanent water with the availability of insect prey. They prefer areas in close proximity to a permanent water source. Together these models account for the aquatic, herbaceous understory, and overstory components of the wetland area.

Pine-Oak Woodland

The Downy Woodpecker (Schroeder 1982) and California Ground Squirrel HSI (Anonymous 1980) Models were selected for use in the project's pine-oak woodland habitat. The downy woodpecker was selected because it forages and nests in oak and pinyon-juniper woodlands. Optimal nesting habitat for the Downy woodpecker is provided in natural cavities or self created holes 2 to 15 meters off the ground, in stands with moderate to high canopy closure. The California ground squirrel was selected to quantify the herbaceous and scrub understory found in the pine-oak woodland areas. The California ground squirrel is found predominantly in open or rocky areas and feeds on seeds, nuts, and legumes. It prefers habitat in open areas in close proximity to water.

Sagebrush Scrub Upland

The Ferruginous Hawk (Jasikoff 1982) HSI Model was selected for use in the project's sagebrush-scrub upland habitat. The ferruginous hawk was selected because it forages in the scrubland areas for small mammals which are common in the project area. The species commonly winters in the project area.

HEP Analyses

When using HEP, it is necessary to determine HSI values for each evaluation species at selected target years for both with-project and without-project scenarios. Proposed compensation areas must be treated similarly (with-management is substituted for with-project conditions). The capacity of each sample site to meet the needs of the evaluation elements within the project impact and compensation areas was determined by the HEP team through measurement of specific habitat variables. Baseline values for each of the model variables can be obtained by field sampling, map interpretation, and by reviewing historic records and reports. Table 2 lists the variables in each model and indicates how data was collected.

HSI MODEL	HSI VARIABLE	HOW OBTAINED
Ferruginous Hawk	V1- Average height of herbaceous shrub Canopy V2- Percent herbaceous shrub canopy V3- Topographic diversity V4- Distance to tree or shrub greater than 1 meter (3 ft) tall	Field measurement Field measurement Field measurement Field measurement
Downy Woodpecker	V1- Basal area V2- Number of snags	Field measurement Field measurement
Marsh wren	V1- Growth form of emergent hydrophytes V2- Percent canopy cover of emergent herbaceous vegetation V3- Mean water depth V4- Percent canopy cover of woody vegetation	Field measurement Field measurement Field measurement Field measurement
California Ground Squirrel	V1- Abundance and availability of suitable food V2- Distance to water V3- Presence of cover V4- Interspersion of open area with promontories	Field measurement Field measurement Field measurement Field measurement
Pacific Tree Frog	V1- Water permanence V2- Stream gradient V3- Food cover availability V4- Water cover relationship	Field measurement Field measurement Field measurement Field measurement

Table 2. Summary of Habitat Suitability Index Models, variables, and how values were obtained.

At the completion of data collection, an HSI value was calculated for each evaluation element. A higher numerical rating is indicative of a higher suitability for the evaluated element. The HSI measurements of the same habitat in an impact area were averaged. The HSI, when multiplied by the area of the habitat, yields HUs, a measure of the quality and quantity of the habitat. The equations to calculate HSIs are contained within each model (HEP Appendix A).

Because it is not possible to calculate habitat quality and quantity for future years, future HSI values were projected. This was accomplished by increasing or decreasing specific baseline Suitability Index values for each evaluation species based on the HEP Team's best professional judgment of probable future conditions. The assumptions used to derive future HSI and acreage values for with- and without-project conditions on the impact and mitigation area(s) are contained in HEP Appendix A. A mitigation site for the project was identified in the Sprague Ranch Conservation area (Figure 1).

Given these assumptions, long-term losses and gains in HUs can be estimated for each future scenario over the life of the project, and then expressed as AAHU gains or losses. Basic HEP outputs, expressed in the Habitat Workshop 3.0 Software Package are displayed in Table 3.

In order to make the comparison of future with- and without-project conditions for each alternative described above, it was necessary to first develop the future without-project scenario for the habitat impacted within the proposed project area. This required several key assumptions that existing land uses and maintenance activities would not change in the future without the project. Given these conditions, a future without-project scenario was developed which included: (1) no change in the existing habitat acreages, (2) sagebrush scrub upland, pine-oak woodland, and emergent wetland habitat would continue to develop, and (3) the existing hydrology would be maintained in the study area. Similarly, a compensation site was selected which was assumed to currently be primarily non-native grassland and future scenarios with- and without the project were developed.

Figure 1. The Sprague Ranch Conservation area mitigation site.

RESULTS AND DISCUSSION

Table 3 shows the net change in AAHUs and compensation need for each cover-type affected by the Lake Isabella DSM Project. Agricultural fields, barren ruderal, and valley grassland were not modeled or analyzed, yet should be re-seeded with native grasses at the conclusion of the project.

Cover-Type (All sites)	Area Affected (acres)	AAHUs Without Project	AAHUs With Project	Net Change in AAHUs	Compensation Ratio	Compensation Acres Needed
Sagebrush-Scrub Upland	47.26	0.03	-0.33	-0.36	1.00 : 1.46	69.00 ac
Emergent Wetland	6.96	0.02	-0.75	-0.77	1.00 : 1.00	6.96 ac
Pine-Oak Woodland	19.83	0.11	-0.39	-0.50	1.00 : 1.35	26.77 ac
Agriculture	7.43	N/A	N/A	N/A	Re-seed	0.00 ac
Valley Grasslands	2.70	N/A	N/A	N/A	Re-seed	0.00 ac
Total						**102.73 ac**

Table 3. Net change in Average Annual Habitat Units (AAHUs) and compensation need for the habitats affected by the Lake Isabella DSM Project, Alternative 3.

Sagebrush-Scrub Upland

The dam remediation activities at both the Main and Auxiliary Dams would result in the loss of 47.26 acres of sagebrush-scrub upland habitats in the impacted areas. Using the Ferruginous Hawk HSI model it was determined that these impact could be mitigated by developing 69.00 acres of sagebrush scrub upland habitat.

Emergent Wetland

The remediation of the seepage and the placement of materials and equipment at staging area A-2 in the Auxiliary Dam area would destroy 6.96 acres of emergent wetlands downstream. The Service's mitigation policy for wetland habitat types is to recommend that no net loss of habitat value or acreage results from project activities. Therefore, 6.96 acres of emergent wetland habitat are needed to compensate for the impacts to emergent wetlands due to the project.

Pine-Oak Woodland

The Main Dam remediation actions and the construction of the Auxiliary Spillway would result in the loss of 19.83 acres of pine-oak woodland habitat in the project area. Using the California Ground Squirrel and Downy Woodpecker HSI Models it was determined that 26.77 acres of pine-oak woodland habitat are needed to compensate for this impact.

All mitigation would occur at the Sprague Ranch conservation area mitigation site located on the South Fork of the Kern River upstream of Lake Isabella near the town of Weldon, California.

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HEP APPENDIX A

DATA ANALYSIS ASSUMPTIONS

DATA ANALYSIS/ASSUMPTIONS
LAKE ISABELLA DAM SAFETY MODIFICATION
KERN COUNTY, CALIFORNIA

EMERGENT WETLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY0-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 2)	SI = 0.50
	V2- Percent canopy cover emergent herbaceous vegetation (88.4%)	SI = 1.00
	V3- Mean water depth (7.37 cm)	SI = 0.49
	V4- Percent canopy cover woody vegetation (4.6%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.49)^1/3*0.95= 0.51

Pacific Treefrog

TY0- Baseline (measured*)	
V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) / 2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY1-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 4)	SI = 0
	V2- Percent canopy cover emergent herbaceous vegetation (0.0%)	SI = 0
	V3- Mean water depth (0.0 in)	SI = 0
	V4- Percent canopy cover woody vegetation (0.0 %)	SI = 0

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.0*0.0*0.0)^1/3*0.0= 0.0

Pacific Treefrog

TY1- Baseline (measured*)	
V1- Water Permanence (Intermittent)	SI= 0.00
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00%)	SI= 0.00
V4- Distance to Water body (300 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.00+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.000

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY50-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 4)	SI = 0
	V2- Percent canopy cover emergent herbaceous vegetation (0.0%)	SI = 0
	V3- Mean water depth (0.0 in)	SI = 0
	V4- Percent canopy cover woody vegetation (0.0 %)	SI = 0

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.0*0.0*0.0)^1/3*0.0= 0.0

Pacific Treefrog

Pacific Treefrog

TY50 -	Baseline (measured*)	
	V1- Water Permanence (Intermittent)	SI= 0.00
	V2- Food/ Cover Availability (0.00 %)	SI= 0.00
	V3- Percent Stream Gradient (0.00%)	SI= 0.00
	V4- Distance to Water body (300 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.00+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.000

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative1 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY0-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 2)	SI = 0.50
	V2- Percent canopy cover emergent herbaceous vegetation (88.4%)	SI = 1.00
	V3- Mean water depth (2.9 in)	SI = 0.49
	V4- Percent canopy cover woody vegetation (4.6%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.49)^1/3*0.95= 0.51

Pacific Treefrog

TY0-	Baseline (measured*)	
	V1- Water Permanence (Permanent)	SI= 1.00
	V2- Food/ Cover Availability (100.0 %)	SI= 1.00
	V3- Percent Stream Gradient (0.66 %)	SI= 1.00
	V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative1 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (95.0 %)	SI = 1.00
V3- Mean water depth (2.0 in)	SI = 0.34
V4- Percent canopy cover woody vegetation (7.0 %)	SI = 0.93

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.34)^1/3*0.93= 0.58

Pacific Treefrog

TY25- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative1 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 6.96 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY50- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (97.0 %)	SI = 1.00
V3- Mean water depth (2.0 in)	SI = 0.34
V4- Percent canopy cover woody vegetation (12.0 %)	SI = 0.88

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.34)^1/3*0.88= 0.57

Pacific Treefrog

TY50- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 1 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY0-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 1)	SI = 0.00
	V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
	V3- Mean water depth (10.0 in)	SI = 0.00
	V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY0- Baseline (measured*)	
V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (00.0 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 1 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY1- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 1.00
V2- Percent canopy cover emergent herbaceous vegetation (25.0%)	SI = 0.05
V3- Mean water depth (10.0 in)	SI = 1.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.97

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*0.05*1.00)^1/3*0.97= 0.36

Pacific Treefrog

TY1- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (25.0 %)	SI= 0.50
V3- Percent Stream Gradient (1.00 %)	SI= 1.00
V4- Distance to Water body (0.00ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 0.50)^1/2 +1.00)) /2) * 1.00 = 0.78

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 1 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 1.00
V2- Percent canopy cover emergent herbaceous vegetation (70.0%)	SI = 0.70
V3- Mean water depth (10.0 in)	SI = 1.00
V4- Percent canopy cover woody vegetation (5.0%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*0.70*1.00)^1/3*0.95= 0.84

Pacific Treefrog

TY25- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (60.0 %)	SI= 1.00
V3- Percent Stream Gradient (1.00 %)	SI= 1.00
V4- Distance to Water body (0.00 ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * 1.00 = 1.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 1 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY50-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 1)	SI = 1.00
	V2- Percent canopy cover emergent herbaceous vegetation (82.0%)	SI = 1.00
	V3- Mean water depth (10.0 in)	SI = 1.00
	V4- Percent canopy cover woody vegetation (8.0%)	SI = 0.92

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*1.00*1.00)^1/3*0.92= 0.92

Pacific Treefrog

TY50-	Baseline (measured*)	
	V1- Water Permanence (Permanent)	SI= 1.00
	V2- Food/ Cover Availability (76.0 %)	SI= 1.00
	V3- Percent Stream Gradient (1.00 %)	SI= 1.00
	V4- Distance to Water body (1.00ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * 1.00 = 1.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY0- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (0.00 inch)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY0- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)	
V1- Emergent hydrophytes (Category 4)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (0.00 inch)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY25- Baseline (measured*)	
V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY50-	Baseline (measured*)	
	V1- Emergent hydrophytes (Category 4)	SI = 0.00
	V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
	V3- Mean water depth (0.00 inch)	SI = 0.00
	V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY50-	Baseline (measured*)	
	V1- Water Permanence (Intermittent)	SI= 0.70
	V2- Food/ Cover Availability (0.00 %)	SI= 0.00
	V3- Percent Stream Gradient (0.00 %)	SI= 0.00
	V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Mitigate at 1:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.66
V2- Distance to Water (free water available)	SI = 0.95
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.82
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.93

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.66 + 0.95 + 0.82 + 0.93) / 4 = 0.84

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY1- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.66
V2- Distance to Water (free water available)	SI = 0.95
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.82
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.93

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.66 + 0.95 + 0.82 + 0.93) / 4 = 0.84

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY1- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.85
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.74
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.76

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.85 + 1.00 + 0.74 + 0.76) / 4 = 0.84

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (80.00 sq ft)	SI = 1.00
V2- Number of Snags (2)	SI = 0.40

HSI = Lowest life requisite value = 0.40

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.80
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.90

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.80+ 1.00 + 0.80 + 0.90) / 4 = 0.88

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (80.00 sq ft)	SI = 1.00
V2- Number of Snags (3)	SI = 0.60

HSI = Lowest life requisite value = 0.60

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.80
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.90

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.80+ 1.00 + 0.80 + 0.90) / 4 = 0.88

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative #1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.20
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.20

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.20+ 1.00 + 0.30 + 0.20) / 4 = 0.43

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative #1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY1-	Baseline (measured)	
	V1- Basal Area of trees per acre (25.00 sq ft)	SI = 0.57
	V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.50
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.70
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.70

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.50+ 1.00 + 0.70 + 0.70) / 4 = 0.73

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative #1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (40.00 sq ft)	SI = 0.90
V2- Number of Snags (4)	SI = 0.80

HSI = Lowest life requisite value = 0.80

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.70
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.75

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.70+ 1.00 + 0.80 + 0.75) / 4 = 0.81

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative #1 – Future With the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (60.00 sq ft)	SI = 1.00
V2- Number of Snags (5)	SI = 1.00

HSI = Lowest life requisite value = 1.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.90
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.90
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.80

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.90+ 1.00 + 0.90 + 0.80) / 4 = 0.90

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.20
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.20

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.20+ 1.00 + 0.30 + 0.20) / 4 = 0.43

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.30
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.30

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.30+ 1.00 + 0.30 + 0.30) / 4 = 0.48

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak Woodland habitat area is 19.83 acres for Alternative 1.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.30
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.30

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.30+ 1.00 + 0.30 + 0.30) / 4 = 0.48

Compensate at 1:1.35 ratio.

* The habitat values were measured at Year 0.

SAGEBRUSH-SCRUB SCRUBLAND
Project Area
Alternative 1 – Future With the Project

ASSUME:

1. Existing sagebrush-scrub cover type is 47.26 acres.
2. Sagebrush-scrub habitat will be covered by the new dam footprint, staging areas, and haul routes and lost permanently for the entire life of the project.
3. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
4. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}

for values where

48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY1-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00
TY25-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00
TY50-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00

Compensate at 1:1.46 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Existing sagebrush-scrub cover type is 47.26 acres.
2. Sagebrush-scrub habitat will remain relatively the same with modest improvement over the life of the project.
3. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
4. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY1-	Estimated	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY25-	Estimated	HSI=0.72
	V1- Summer height of herbaceous and shrub layer (21 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00
TY50-	Estimated	HSI=0.78
	V1- Summer height of herbaceous and shrub layer (22 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (48.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00

Compensate at 1:1.46 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Compensation Area
Alternativel – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing no sagebrush-scrub upland habitat.
2. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
3. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 1.00
TY1-	Estimated	HSI=0.90
	V1- Summer height of herbaceous and shrub layer (16 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (90.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.0
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00
TY25-	Estimated	HSI=0.94
	V1- Summer height of herbaceous and shrub layer (18 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (90.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (94%)	SI = 1.00
TY50-	Estimated	HSI=0.96
	V1- Summer height of herbaceous and shrub layer (18 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (91.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (96%)	SI = 1.00

Compensate at 1:1.46 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing no sagebrush-scrub upland habitat.
2. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
3. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY1-	Estimated	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY25-	Estimated	HSI=0.27
	V1- Summer height of herbaceous and shrub layer (10 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY50-	Estimated	HSI=0.29
	V1- Summer height of herbaceous and shrub layer (11 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53

Compensate at 1:1.46 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

HEP APPENDIX C

HABITAT SUITABILITY INDEX MODELS

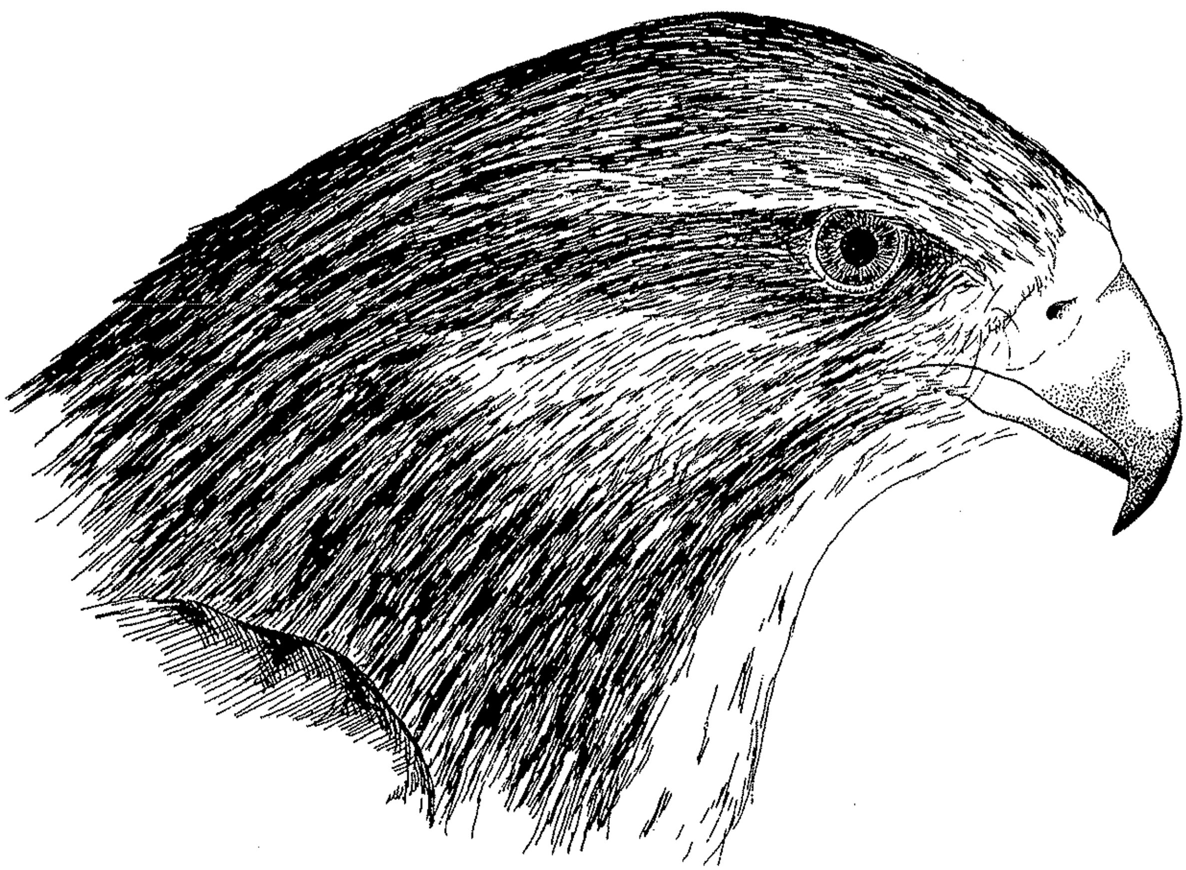
HEP APPENDIX B

HABITAT SUITABILITY INDEX MODELS

Biological Services Program

FWS/OBS-82/10.10
FEBRUARY 1982

HABITAT SUITABILITY INDEX MODELS: FERRUGINOUS HAWK



Fish and Wildlife Service

U.S. Department of the Interior

FWS/OBS-82/10.10
February 1982

HABITAT SUITABILITY INDEX MODELS: FERRUGINOUS HAWK

by

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that follow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

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FERRUGINOUS HAWK (*Buteo regalis*)

HABITAT USE INFORMATION

General

The ferruginous hawk inhabits grasslands, shrublands, and steppe-deserts of the Western United States. It is a common nester in Colorado, Idaho, Montana, Utah, and Wyoming (Call 1978). Populations in the more Northern States tend to be migratory, spending the winter in New Mexico, Colorado, Kansas, Texas, and Oklahoma (Call 1979).

Ferruginous hawks thrive in areas that favor the production of rabbits (Lagomorpha), prairie dogs (*Cynomys* spp.), or ground squirrels (*Citellus* spp. and *Spermophilus* spp.) (Call 1979), provided that suitable nesting sites are available. Foraging habitat consists of nonforested, nonmountainous areas, such as desert shrub and grassland communities. Nesting habitat consists of communities with isolated trees, woodland edges, buttes, cliffs, and/or grassland with some relief.

Food

Analysis of prey items collected from nests in many studies indicate that jackrabbits (*Lepus* spp.) often constitute the most important prey item, based on biomass (Weston 1969; Platt 1971; Smith and Murphy 1973; Howard 1975; Howard and Wolfe 1976; Woffinden and Murphy 1977; Thurow et al. 1980). In some of these studies, analysis of prey items was based not only on prey biomass but also on percent frequency of occurrence. For instance, the northern pocket gopher (*Thomomys talpoides*) was the most frequent prey item in Howard's study (1975) conducted in northern Utah and southern Idaho, whereas the Ord's kangaroo rat (*Dipodomys ordii*) was most frequent in the studies conducted in Utah by Weston (1969) and Woffinden and Murphy (1977). In some studies, prey species other than jackrabbits were most important, based on biomass. Thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*) comprised 41% of the prey biomass in Colorado (Olendorff 1973). In South Dakota, the Richardson's ground squirrel (*Spermophilus richardsonii*) comprised 68% of the total prey biomass (Lokemoen and Duebbert 1976). In all of the study areas listed above, however, jackrabbits remained an important, if not the most important, prey item. Other known prey items include desert cottontails (*Sylvilagus audubonii*), antelope squirrels (*Ammospermophilus* spp.), deer mice (*Peromyscus maniculatus*), and passerine birds (Weston 1969).

Significant fluctuations in raptor densities may be an indication of the abundance and diversity of prey species (Howard and Wolfe 1976). This predator-prey relationship seems to exist in certain ferruginous hawk populations. A decline in ferruginous hawk numbers in Utah was directly correlated with a drop in the jackrabbit population (Woffinden and Murphy 1977; Smith et al. 1981). Ferruginous hawk fledgling success and nesting densities in southern Idaho and northern Utah were closely correlated with the cyclic black-tailed jackrabbit (*Lepus californicus*) population (Thurow et al. 1980).

Fluctuations of small mammal populations often are caused by intrinsic factors that have little relationship to habitat suitability (Odum 1971). Although manipulation of these cyclic populations is not normally possible, range management practices that result in ranges in good condition that will support abundant and diverse prey may provide suitable food alternatives to predators, such as the ferruginous hawk, during periods of jackrabbit decline (Call 1979). The nesting success of some populations of ferruginous hawks in Utah, where jackrabbit numbers declined dramatically, was attributed to the presence of a broad prey base (Woffinden and Murphy 1977). Ground squirrels were the major prey for immature ferruginous hawks in southern Idaho and northern Utah during midsummer when jackrabbit availability became limiting (Thurow et al. 1980).

Land management practices that dramatically alter the density and structure of native vegetation can adversely affect jackrabbit and alternate prey populations, resulting in a reduction of breeding ferruginous hawks. For example, conversion of extensive tracts of brushland and native vegetation to either agriculture or monotypic fields of grass is particularly disruptive to the production of both jackrabbits and cottontails because they survive best in mixtures of brush and grassland types (Call 1979). It is also disruptive to ground squirrels and other rodents (Murphy 1978). However, moderate amounts of rangeland and agricultural land support colonization by pocket gophers and ground squirrels, which may provide alternate prey species for the ferruginous hawk.

Areas providing an interspersion of tall cover and open spaces are preferred by jackrabbits (Taylor and Lay 1944; Lechleitner 1958). Jackrabbits are normally associated with areas that have shrubs at least 0.6 m (2 ft) tall (Orr 1940) and use this shrub cover for hiding and resting (Bear and Hansen 1966). Black-tailed jackrabbits fed primarily on grasses during spring and summer in Idaho, whereas in fall the diet was comprised primarily of forbs and shrubs (Fagerstone et al. 1981).

Ferruginous hawks usually hunt by flying low over open fields, seldom rising more than a few feet above the ground (Weston 1969). They normally hunted in sagebrush-grassland areas in Utah (Smith and Murphy 1973). Habitat use by foraging raptors is sometimes, but not always, a function of prey density. Studies have shown that raptors often forage over areas where cover conditions make prey more vulnerable (Craighead and Craighead 1956; Wakeley 1978). Thus, an area supporting many concealed prey individuals may be less important to raptors than an area supporting a few vulnerable individuals. Although overgrazed areas temporarily may provide vulnerable prey, it is unlikely that such areas will support an adequate prey base for a long period of time (Call 1979).

<u>Water</u>

Water does not appear to be limiting to the ferruginous hawk (Bartholomew and Cade 1963). Most water is supplied by the metabolic process of digesting food.

Cover

Cover for concealment does not appear to be limiting to the ferruginous hawk. On the plains of Colorado, ferruginous hawks used fence posts, telephone poles, and dead trees as perch sites (Marion and Ryder 1975).

Reproduction

The ferruginous hawk is a versatile nester, using isolated trees, cliffs, buttes and cutbanks, manmade structures, ground locations, and trees in the juniper-sagebrush ecotone. Of 71 nests on the plains of Colorado, 69% were in trees, 11.3% on erosional remnants, 5.6% on the ground, 5.6% on cliffs, 5.6% on creek banks, and 2.9% on manmade structures (Olendorff 1973). Most ferruginous hawk nesting studies indicate a preference for tree nests (Olendorff 1973; Powers et al. 1973; Smith and Murphy 1973; Howard 1975; Lokemoen and Duebbert 1976; Thurow et al. 1980). Despite the abundance of potential ground nest sites (Call 1979), the ferruginous hawk is vulnerable to tree removal management practices (Platt 1971; Howard 1975; Woffinden 1975; Murphy 1978; Call 1979). Peripheral trees should be left throughout the treatment area during tree removal and chaining operations to provide nest sites (Howard and Wolfe 1976). Tree nests provide protection from ground predators (Fitzner et al. 1977) and shade for nestlings (Tomback and Murphy 1981).

Ground nests in southern Idaho and northern Utah were constructed in areas of rangeland where no suitable nest trees were available (Thurow et al. 1980). They were usually located near a small hill. Typical nest locations of ferruginous hawks in pristine North Dakota prairies were on the ground, usually on hilltops (Rolfe 1896 cited by Lokemoen and Duebbert 1976). Knolls were preferred nesting sites in Utah and were heavily utilized (Smith and Murphy 1973). Ground nests in South Dakota were always located in prairies with tall herbaceous cover or prairies that were in a lightly grazed condition (Lokemoen and Duebbert 1976).

Ferruginous hawks accept both modified and completely artificial nest structures (Call 1979). Use of manmade structures for nesting appears to occur most often when natural nesting substrates are scarce or unavailable, such as in deserts, grasslands, and areas with few shrubs or trees.

Juniper (*Juniperus* spp.) is most commonly used for tree nesting, but pine (*Pinus* spp.), willow (*Salix* spp.) (Williams and Matteson 1947), cottonwoods (*Populus* spp.) (Olendorff 1973), and sagebrush (Smith and Murphy 1973) have been used. The nest may be located as high as 12 m (40 ft) from the ground (Call 1978), but is usually 2 to 3 m (6 to 10 ft) from the ground (Weston 1969). Steep-sided canyons and pinyon-juniper woodland interiors were usually avoided as nesting areas in Utah, probably due to the low abundance of lagomorphs (Smith and Murphy 1973). Tree nests were located in cropland in South Dakota, but were always close to undisturbed prairie (Lokemoen and Duebbert 1976). Olendorff (1973) contends that cultivation is detrimental to ferruginous hawk nesting populations.

Interspersion

The juniper-sagebrush ecotone is commonly used habitat by the ferruginous hawk in the semi-arid Western United States (Powers et al. 1973; Smith and Murphy 1973; Thurow et al. 1980). Wooded foothills interspersed with valleys and large desert expanses provide optimal nesting sites because of the combination of human inaccessibility, remoteness, and ease of surveillance of the surrounding area (Smith and Murphy 1973). While most nests were constructed in junipers and the perimeters of the valley foothills, home ranges extended into the desert, the principal hunting area of the ferruginous hawk.

Ferruginous hawks generally nest within a short distance of their food supply (Smith and Murphy 1973). Average territory size of ferruginous hawks is 2.6 to 7.7 km^2 (1 to 3 mi^2), with a diameter of 1.6 to 4 km (1 to 2.5 mi) (Call 1978). Hunting forays of nine adults on the Utah-Idaho border were usually less than 0.8 km (0.5 mi) from the nest site, but extended up to 1.9 km (1.2 mi) (Howard and Wolfe 1976). Home range diameters averaged from 3.2 to 3.4 km (2 to 2.1 mi), with minimum and maximum diameters of 2.4 km (1.5 mi) and 4.2 km (2.6 mi), respectively.

Special Considerations

The ferruginous hawk is sensitive to human disturbance and, consequently, is prone to nest desertion (Olendorff and Stoddart 1974; Fyfe and Olendorff 1976; Woffinden and Murphy 1977). Human disturbance and habitat alteration are the two factors considered most responsible for the decline of the ferruginous hawk throughout its range (Thurow et al. 1980).

Due to their sensitivity to human disturbance, ferruginous hawks rarely nest near well traveled roads or extensive cultivation (Weston and Ellis 1968; Olendorff 1973). They avoid pure grassland areas with no trees. The problem of damage to isolated trees by animals seeking shade and rubbing posts can be alleviated by erecting artificial nest structures and protecting trees by constructing fenced enclosures.

Vegetation management for ferruginous hawks should emphasize maximizing the amount of edge and interspersion (Howard and Wolfe 1976). Where crested wheatgrass plantings are planned, a minimum of 20% of the area should be left in scattered islands of shrubby vegetation.

The ferruginous hawk has been on the Blue List of declining birds for the last 10 years (Tate 1981). The presence of the ferruginous hawk on this list has been attributed to its intolerance of disturbances during the breeding season and habitat loss through overgrazing and conversion of feeding areas to agricultural use.

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for the area encompassing the principal breeding range of the species. This area, which is north of Arizona and New Mexico, is semi-arid land classified by Bailey (1978) as the dry domain.

Season. This model will produce HSI values based upon breeding habitat needs for the ferruginous hawk.

Cover types. The ferruginous hawk, like most raptors, is opportunistic and utilizes several cover types. Some cover types are more suitable than others, but all of the following are utilized to some degree: Grassland (G); Pasture and Hayland (P/H); Forbland (F); Cropland (C); Desertic Woodland (DeW); Desertic Shrubland (DeS); Desertic Herbland (DeH); Evergreen Shrubland (ES); Deciduous Shrubland (DS); Evergreen Shrub Savanna (ESS); Deciduous Shrub Savanna (DSS) (U.S. Fish and Wildlife Service 1981).

Mountainous areas and the interior of forested areas are not used by the ferruginous hawk. Although forested areas are not considered as a useable cover type, ferruginous hawks will nest in trees and large shrubs along the edge of forests and wooded areas that are adjacent to "open" areas.

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous suitable habitat that is required before an area will be occupied by a particular species. This information was not found in the literature for the ferruginous hawk. If local information is available to define the minimum habitat area, and less than this amount of area is available, the HSI for the species will be zero.

Verification level. This model was critiqued by Joseph R. Murphy, Ph.D., Brigham Young University, and Richard P. Howard, U.S. Fish and Wildlife Service. Murphy concluded that this model is as reasonable as can be expected, given the fact that field tests have not been completed (Murphy, pers. comm). Howard concluded that this model accurately reflects the biological realities of the ferruginous hawk, contains reasonable assumptions, and displays a mathematical index which is flexible enough to subtract or add variables for more precise adjustments (Howard, pers. comm). Comments from both reviewers have been incorporated into the current model.

Model Description

Overview. The HSI model for the ferruginous hawk considers the quality of the life requisites in each cover type and interspersion of life requisites when the habitat is composed of two or more cover types. Figure 1 illustrates how the HSI is related to cover types, life requisites, and specific habitat variables. Food and reproduction needs of the ferruginous hawk are considered in this model. It is assumed that water and cover resources will never be more limiting than food and reproduction.

In the following life requisite sections, the rationale for developing the model is presented. Specifically, these sections cover the following: (1) identification of variables used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationships between variables.

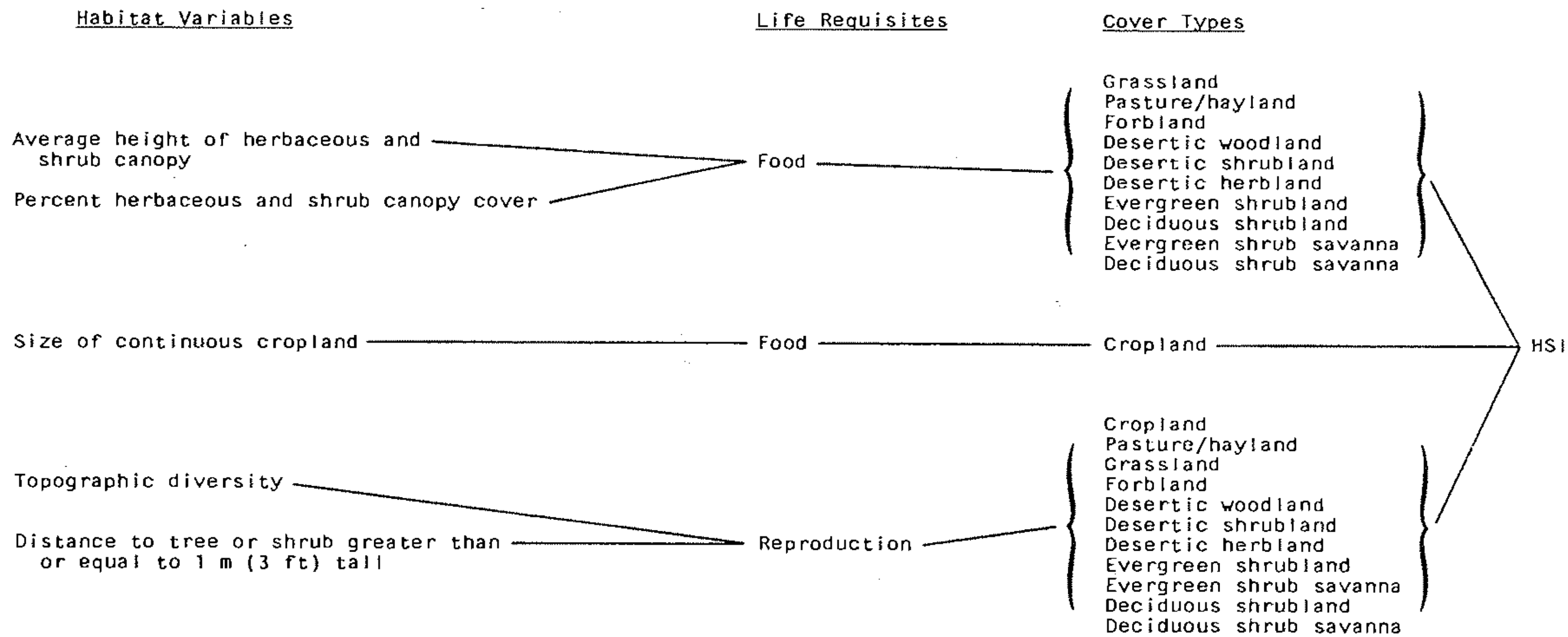


Figure 1. Relationships of habitat variables, life requisites, and cover types in the ferruginous hawk model.

Food component. Food suitability for the ferruginous hawk is related to the availability of suitable prey. This relationship is based on the premise that optimum conditions for prey do not necessarily reflect optimum conditions for the predator. For this reason, coupled with the fact that the ferruginous hawk hunts several prey species, a general approach to modeling food suitability for this raptor is presented. Food suitability in all cover types other than cropland is determined by assessing both the abundance and accessibility of prey, as determined by the height and density of the vegetation.

The abundance of major prey species is assumed to be related to the volume and structure of both herbaceous and shrub vegetation. The accessibility of prey is related to the level of concealment provided for prey by the vegetation and the degree of access by the hawk to all huntable areas. Food suitability for the ferruginous hawk is optimum when the vegetation occurs at a mix of heights and densities which optimizes prey abundance and minimizes hunting interference.

It is also assumed that very dense, tall vegetation will provide abundant prey, but very poor accessibility for the ferruginous hawk. Vegetation that is low and very dense will provide lower levels of prey abundance but increased accessibility. For this model, it is assumed that optimum vegetation heights occur when the average height of herbaceous and shrub vegetation is between 15 and 60 cm (6 and 24 in). It is further assumed that suitability will decrease as average vegetation heights approach both 0 and 120 cm (0 and 48 in).

Optimum food suitabilities are assumed to occur at different combinations of average vegetative heights and densities (Fig. 2). Habitats with average vegetative heights of 15 cm (6 in) will provide optimum food when vegetative densities approach 100% canopy cover. Habitats with vegetation heights increasing to 60 cm (24 in) will provide optimum food at successively lower densities, down to an average canopy closure of 60%. Vegetative densities less than 60% canopy closure will always be less than optimum.

A major assumption of this model is that the average vegetative height and density conditions in a particular habitat actually reflect a mix of individual heights and densities, and not a uniform, homogeneous condition. Optimum prey abundance and accessibility are assumed to occur in this mixed, or more structurally diverse, conditon. The average condition is more readily measured or estimated in the field, and hence is the variable included in this model.

Food suitability in cropland cover types is related to the size of each contiguous unit of cropland. Prey species often use croplands as a food source, provided that adequate cover is nearby. It is assumed that prey abundance will decrease as the cropland size increases, due to the decreasing amount of nearby cover in larger cropland fields. Small croplands [less than 16 ha (40 ac)] are assumed to provide the best conditions, while croplands larger than 128 ha (316 ac) are assumed to be of very low suitabilities. Due to the frequency of disturbance and cultivation, croplands in the best condition are assumed to be only half as valuable as noncroplands in the best condition.

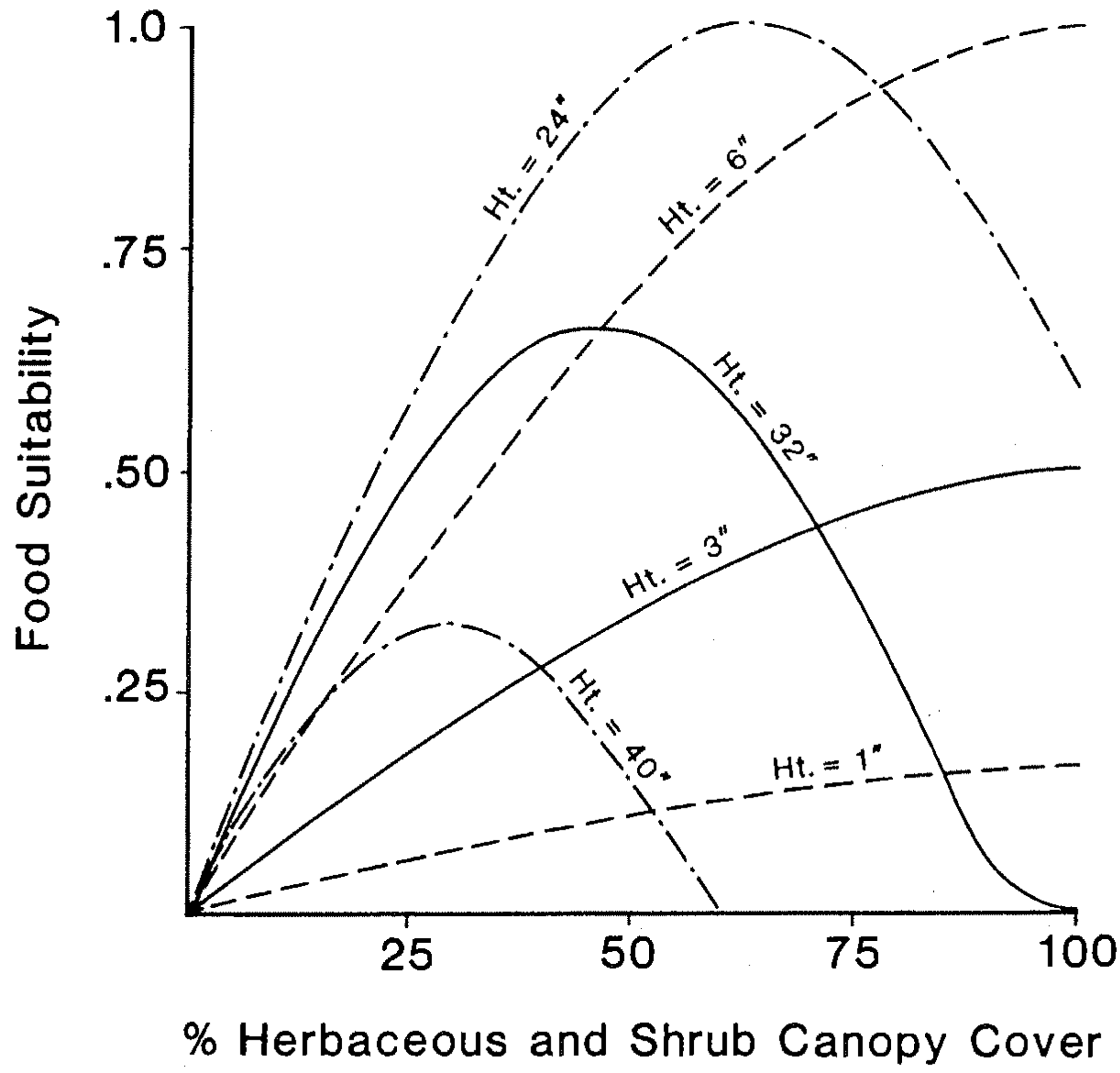


Figure 2. The relationship of percent of vegetative canopy cover and vegetative height, to food suitability for the ferruginous hawk. Individual curves show the change in suitability for the particular height class indicated on the curve.

Reproduction component. Reproductive suitability for the ferruginous hawk is related to the availability of nesting sites. It is assumed that the availability of suitable nest sites can be adequately assessed by measuring the suitability of potential ground nesting sites and the abundance of trees and large shrubs.

The availability of trees or large shrubs is considered to be the most important factor for nesting. It is assumed that the presence of a tree or large shrub within a distance of 1.6 km (1.0 mi) of random sample points will provide optimum nesting conditions, whereas the lack of shrubs or trees within 4.8 km (3.0 mi) will not contribute any value to reproductive requirements. Shrubs $\geq$ 1 m (3.3 ft) in height are considered large enough to support the large bulky nest of the ferruginous hawk.

Suitability of ground nests is assumed to be related to topography. Ferruginous hawks appear to favor elevated sites for nesting, be it ground, cliff, or tree nests. Ground nests described in the literature were usually associated with rolling terrain, where nests could be situated on hills, knolls, or rims. Areas that are flat, with no breaks in topography to provide ground nest sites, will not be suitable unless trees or shrubs are present. Mountainous areas with slopes exceeding 25% are assumed to be unsuitable for ferruginous hawks regardless of the presence of trees or shrubs. Areas with rolling terrain provide optimum ground nest sites, however, it is assumed that the best ground nest sites will only provide one-half the suitability of the best conditions for tree or shrub nests.

Overall reproductive value is assumed to be equal to the combined suitabilities of the variables for topography, and shrubs and trees.

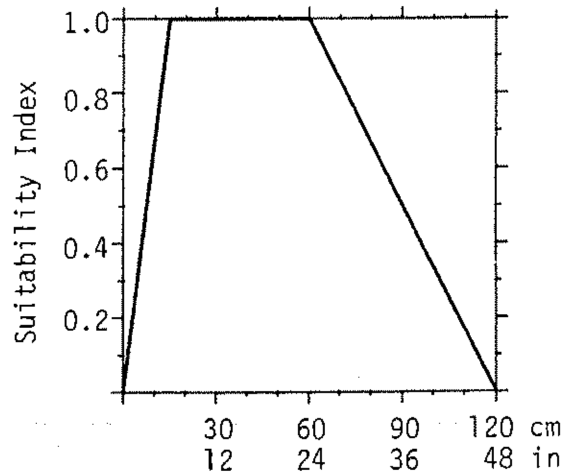
Special habitat component. Ferruginous hawks are highly sensitive to human disturbance during the nesting season. Habitat alteration due to agricultural development and direct human disturbance are the two factors believed to be most responsible for the decline of the ferruginous hawk throughout its range. It is difficult to accurately quantify the effects of human disturbance. Habitat evaluations for the ferruginous hawk should take into account the nature, length, location, and season of any human disturbances. Overall habitat quality values will be lower in areas where significant human disturbances are likely to occur.

Interspersion component. It is assumed that the best habitat for the ferruginous hawk contains high quality food over 75% of the habitat. This estimate is based on data that indicate that ferruginous hawks generally hunt over large portions of their home range. High quality food is not required over 100% of the area because the effective hunting range is usually smaller than the home range, i.e., hunting activities are concentrated in areas where prey capture rates are highest.

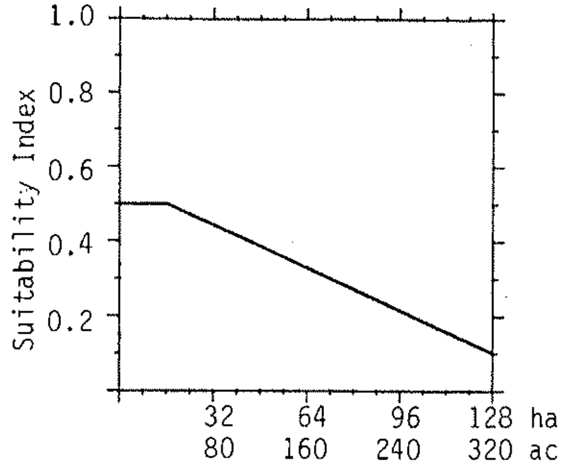
Interspersion of nesting sites is addressed in the variable for distance to a tree or shrub and subjectively considered in the topographic variable. Low reproduction values will thus indicate a poor interspersion of nest sites and indicate that effectively less of the habitat is useable by the ferruginous hawk.

Model Relationships

Suitability Index (SI) graphs for habitat variables. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

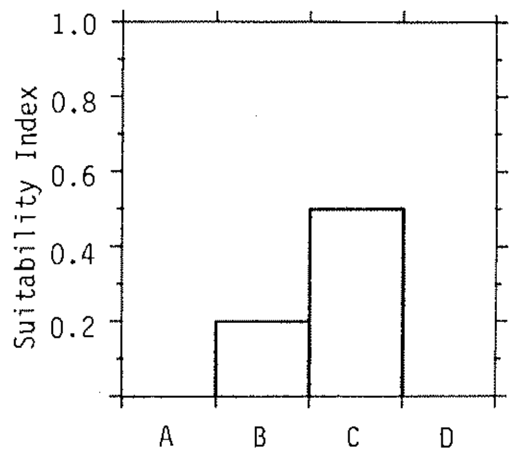
Cover type	Variable		
G,P/H,F,DeW, DeS,DeH, ES,DS, ESS,DSS	(V_1)	Average height of herbaceous and shrub canopy (summer).	
G,P/H,F,DeW, DeS,DeH, ES,DS, ESS,DSS	(V_2)	Percent herbaceous and shrub canopy cover.	Note: No SI graph is needed. The actual percent of cover should be incorporated into the proper equation in Figure 3.

C (V_3) Size of continuous cropland.

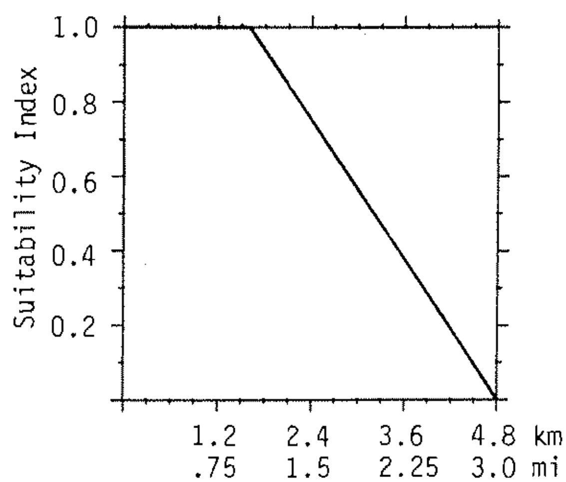


C,P/H,G, F,DeW,DeS, OeH,ES,DS, ESS,DSS (V_4) Topographic diversity.

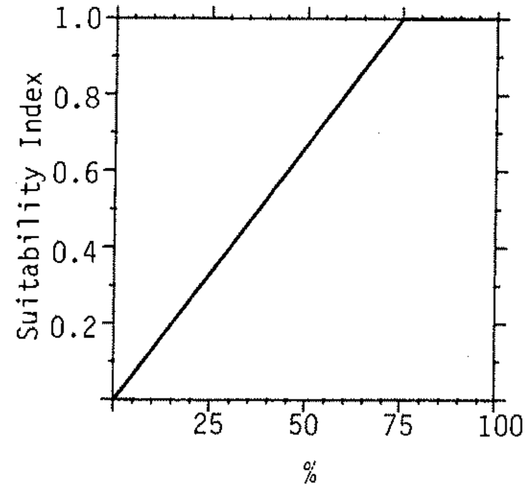
A) Flat terrain, no hills or breaks in topography
B) Generally flat terrain, with scattered hills or breaks in topography
C) Rolling terrain with frequent breaks in topography
D) Mountainous terrain, > 25% slope



C,P/H,G, F,DeW,DeS, DeH,ES,DS, ESS,DSS (V_5) Distance to tree or shrub ≥ 1 m (3.3 ft) tall.



Suitability Index (SI) graphs for interspersion variables. This section contains curves used in computing the overall life requisite value for food.

Cover type	Variable		
C,P/H,G, F,DeW,DeS, DeH,ES,DS, ESS,DSS	(V_6)	Percent area in equivalent optimum food.	

Equations. In order to determine life requisite values for the ferruginous hawk, the SI values for appropriate variables must be combined through the use of equations. A discussion and explanation of the assumed relationships between variables was included under Model Description, and the specific equations in this model were chosen to mimic these perceived biological relationships as closely as possible. The suggested equations for obtaining life requisite values are presented in Figure 3.

HSI determination. Determination of an HSI for a multicover type user involves consideration of both habitat variables and interspersion variables. Several steps and calculations are necessary in order to properly determine an HSI score. They are as follows:

1. Compute the food and reproduction values for each cover type by collecting field data for each variable by cover type and entering this data into the proper suitability index curve. The resulting index values are used in the appropriate life requisite equations.

Life requisite	Cover types	Equation
Food	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS,DSS	Food = V_1 x SIN $\frac{360 \times (P1xCC\%)}{400 \times [P1-(HT-P2)]}$ for values of $\frac{P1xCC\%}{P1-(HT-P2)} \leq 200$ Food = 0.0 for values of $\frac{P1xCC\%}{P1-(HT-P2)} > 200$ Where: V_1 = SI value from graph for V_1 CC% = % herbaceous and shrub canopy cover HT = Average height of herbaceous and shrub vegetation P1 = Height of vegetation above which food value is zero for any value of canopy closure [= 120 cm (48 in) for this model, SI of 0.0 on graph for V_1]. P2 = Height of vegetation at which optimum food values occur at 100% canopy cover [= 15 cm(6 in) for this model, SI of 1.0 on graph for V_1].
Food	C	V_3
Reproduction	C,P/H,G,F, DeW,DeS,DeH, ES,DS,ESS,DSS	min (1, V_4 + V_5) Note: See Special Habitat Component discussion on p. 9 for effects of human disturbance.

Figure 3. Equations to determine life requisite values by cover type for the ferruginous hawk.

2. Determine the relative area (%) of each cover type within the study area as follows:

$$\text{Relative area (\%) for cover type A} = \frac{\text{Area of cover type A}}{\text{Total area of all cover types used by the species}} \times 100$$

Be certain that you consider only those cover types used by the species in determining this percentage.

3. Determine the percent of the area in the equivalent of optimum food by multiplying the food value for each cover type by the relative area (%) of that cover type. Sum these values, and enter this percent into the food composition suitability graph (V_6) to obtain an overall food index.

4. Multiply the reproduction value in each cover type by the relative area (%) of that cover type and sum these values to obtain an overall reproduction index. This index value accounts for the interspersion of nest sites. A low reproduction value will indicate poor interspersion of nest sites and will mean that effectively less of the total habitat is useable by the ferruginous hawk.

5. The HSI is determined by multiplying the food index by the reproduction index. This will take into account the quality, quantity, and distribution of the food and reproduction life requisites.

Application of the Model

If it is desirable to decrease the cost and amount of time necessary to apply this model, it is recommended that the reproductive value be estimated or assumed to be not limiting. This recommendation is based on the following two reasons. First, it is assumed that reproductive value is easier and more accurately estimated using subjective methods than is food value. The variables used to measure food value are more indirect than those used to measure reproductive value, which reflects the tangible nature of nest site characteristics and the difficulties involved with measuring prey abundance and prey accessibility. Second, it is assumed that food will usually be more limiting than reproduction because the ferruginous hawk is such a versatile nester.

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 4.

Variable (definition)		Cover types	Suggested technique
(V_1)	Average height of herbaceous and shrub canopy (summer) (the average height from the ground surface to the dominant height stratum of the vegetative canopy).	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS, DSS	Line intercept and graduated rod
(V_2)	Percent herbaceous and shrub canopy cover (the percent of the ground surface that is shaded by a vertical projection of herbaceous and shrub vegetation).	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS, DSS	Line intercept and Daubenmire plot
(V_3)	Size of continuous cropland (the average size of each contiguous block of cropland)	C	Aerial photograph and dot grid
(V_4)	Topographic diversity (the most prevalent and characteristic topographic feature present).	C,P/H,G,F,DeW, DeS,DeH,ES,DS, ESS,DSS	Ocular estimate or aerial photograph
(V_5)	Distance to tree or shrub ≥ 1 m (3.3 ft) tall (the distance from random points to the nearest tree or shrub, including the edge of shrub or forested cover types).	C,P/H,G,F,DeW, DeS,DeH,ES,DS, ESS,DSS	Aerial photograph, dot grid

Figure 4. Definitions of variables and suggested measurement techniques.

SOURCES OF OTHER MODELS

No other habitat models for the ferruginous hawk were located.

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Habitat preferences and species characteristics of the ferruginous hawk (Buteo regalis) are described in this publication. It is one of a series of Habitat Suitability Index (HSI) models and was developed through an analysis of available scientific data on the species-habitat requirements of the ferruginous hawk. Habitat use information is presented in a review of the literature, followed by the development of a HSI model. The model is presented in three formats: graphic, word and mathematical. Suitability index graphs quantify the species-habitat relationship. These data are then synthesized into a model which is designed to provide information for use in impact assessment and habitat management activities.

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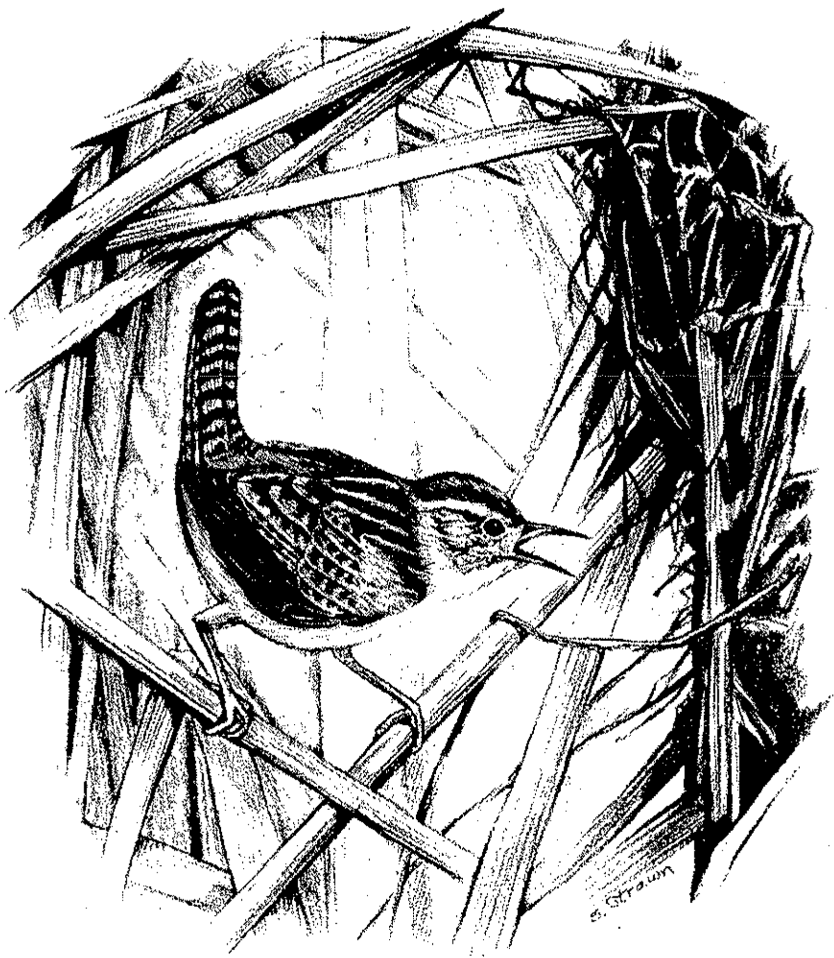

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HABITAT SUITABILITY INDEX MODELS: MARSH WREN

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PREFACE

This document is part of the Habitat Suitability Index (HSI) model series [Biological Report 82(10)], which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. This information provides the foundation for the HSI model and may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model section documents the habitat model and includes information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The HSI Model section includes information about the geographic range and seasonal application of the model, its current verification status, and a list of the model variables with recommended measurement techniques for each variable.

The model is a formalized synthesis of biological and habitat information published in the scientific literature and may include unpublished information reflecting the opinions of identified experts. Habitat information about wildlife species frequently is represented by scattered data sets collected during different seasons and years and from different sites throughout the range of a species. The model presents this broad data base in a formal, logical, and simplified manner. The assumptions necessary for organizing and synthesizing the species-habitat information into the model are discussed. The model should be regarded as a hypothesis of species-habitat relationships and not as a statement of proven cause and effect relationships. The model may have merit in planning wildlife habitat research studies about a species, as well as in providing an estimate of the relative suitability of habitat for that species. User feedback concerning model improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning are encouraged. Please send suggestions to:

Resource Evaluation and Modeling Group
National Ecology Center
U.S. Fish and Wildlife Service
2627 Redwing Road
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MARSH WREN (_Cistothorus palustris_)

HABITAT USE INFORMATION

General

The marsh wren (_Cistothorus palustris_) is a locally abundant breeding bird in freshwater and saltwater marshes throughout much of the United States and southern Canada (Bent 1948; Robbins et al. 1966). Marsh wrens winter in Mexico and on the gulf coast as far east as western Florida. In some maritime and southern climates, where marshes do not freeze over, marsh wrens are year-round residents (Bent 1948; Verner 1965; American Ornithologists' Union 1983).

Food

Insects and spiders are taken by marsh wrens from marsh vegetation, the marsh floor, and by flycatching. Insect orders commonly taken include Coleoptera, Diptera, Hemiptera, and Odonata. Carabidae and Dytiscidae dominate within Coleoptera, whereas Tipulidae composes most of the Diptera in marsh wren diets (Bent 1948; Kale 1964).

Food items brought to young depend on the age of the nestlings. Mosquitoes (Culicidae) and their larvae, midges (Chironomidae), larval tipulids, and other delicate stages of various insects are fed first. Later, as the nestlings mature, larger forms, such as ground beetles, diving beetles, long-horned beetles (Coleoptera), caterpillars (Lepidoptera), and sawflies (Hymenoptera), are brought to the young (Welter 1935).

Water

Marsh wrens living in salt marshes are apparently able to get sufficient dietary water from succulent insects and spiders (Kale 1967). We found no discussion in the literature of dietary water needs or water procurement techniques for marsh wrens breeding in freshwater environments. Marsh wrens bathe in saltwater and freshwater, but they apparently only drink freshwater (Kale 1967). Water also protects nests from predation and supports an important food source (arthropods) (Verner and Engelsen 1970).

Cover

Cover needs of the marsh wren are assumed to be the same as reproduction habitat needs and are discussed in the following section.

Reproduction

Marsh wrens typically nest in cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), or sedges (*Carex* spp.). Other plants frequently present in nesting habitats include horsetails (*Equisetum* spp.), bluejoint reedgrass (*Calamagrostis canadensis*), reed canarygrass (*Phalaris arundinacae*), cordgrasses (*Spartina* spp.), annual wildrice (*Zizania aquatica*), spirea (*Spiraea* spp.), needle rush (*Juncus roemerianus*), and American mangrove (*Rhizophora mangle*) (Welter 1935; Bent 1948; Kale 1965; Verner 1965; Clapp and Abbott 1966).

This species typically nests in marshes where water depths range from several centimeters to 61 to 91 cm (Bent 1948). Marsh wrens usually do not nest in areas without some standing water (Verner and Engelsen 1970). In intertidal areas, however, nests are built in marshes where standing water may be present only during high tides or during periods of spring tides (H.W. Kale, Florida Audubon Society, Maitland, FL; letter dated August 11, 1985). Further, marshes that dry out by mid to late summer have been used successfully by nesting marsh wrens (Verner 1965), but permanent water through the breeding season is generally required to supply a dependable food source and security from predation (Verner and Engelsen 1970). Marsh wrens construct various layers of their nests with water-soaked vegetation that they obtain from the marsh (Welter 1935; Verner 1965).

Nests are normally anchored at least 38.1 cm above the ground; the average above-ground height for 21 nests measured in early June was 83.8 cm (Bent 1948). Occasionally, nests are placed in mangrove (*Rhizophora* spp.) trees 1.52 to 2.74 m above the ground (Bent 1948). Verner (1965) found mean nest heights varying from 76.2 to 92.7 cm above the marsh floor in cattails and bulrushes. Kale (1965) recorded nest heights, from early to late in the breeding season, that ranged from 0.5 m to 2.0 m above the marsh bed. Nests are typically placed 30 to 91 cm above standing water or high tide (Bent 1948). Nest height tends to increase with plant growth (Verner 1965); second nests generally yield higher mean heights than do first nests.

Bigamous and monogamous males nested in cattails much more frequently than if they had simply used cattails in proportion to their availability; male marsh wrens without mates did not exhibit this preference for cattails (Verner and Engelsen 1970). Verner (1964) reported a positive trend between the fraction of a male's territory covered by emergent vegetation (including floating portions of vegetation without standing water between roots and nests) and that male's pairing success. On the average, about 83.2% of the area of bachelor male territories at four marshes was covered by emergent vegetation (cattails and bulrushes); overall average percentages for these four marshes for monogamous and bigamous males were 85.1% and 87.8%. Verner (1964) suggested that this trend reflects the ability of female marsh wrens to recognize the amount of available feeding habitat in a male's territory. He thus implied that the proportion of a male's territory covered by emergent plants is a criterion used by female marsh wrens for mate selection. Marsh wrens tend to use denser areas of cattails because their nests require several stems for attachment (Burger 1985).

Interspersion and Movements

Marshes <0.40 ha are usually not used by breeding marsh wrens (Bent 1948), although Verner (J. Verner, Pacific Southwest Forest and Range Experiment Station, Forestry Sciences Lab, Fresno, CA; letter dated July 16, 1985) found nests in 0.04-ha patches of emergent, lakeside vegetation that were as much as 60 m from similar patches. Welter (1935) described a monogamous male territory that was 0.12 to 0.14 ha in a preferred cattail-sedge association; in a less preferred bluejoint-reedgrass-dominated wetland, a monogamous male held a 0.28 ha territory. Welter (1935) also noted that the territory of a bigamous male was almost twice that held by a monogamous male in the same vegetation type.

Verner (1964) found bachelor, monogamous, and bigamous marsh wrens holding territories that were, on the average, 0.08 ha, 0.13 ha, and 0.17 ha. Verner (1964) also noted one trigamous male with a territory that was 0.02 ha. Verner and Engelsen (1970) reported mean territory sizes for bachelor, monogamous, and bigamous marsh wrens of 0.05 ha, 0.06 ha, and 0.07 ha. There was no significant difference between these latter three means, nor was there a significant correlation between pairing success of males and their territory sizes, presumably because territory size was so variable. Indeed, among five Washington sites, mean territory size for all males ranged from 0.05 to 0.17 ha (Verner 1965). Kale (1965) reported mean territory size (for all males collectively) to range from 0.01 to 0.02 ha during four breeding seasons at nine study sites in Georgia.

Verner (1971) determined that the average dispersal distance between successive territory centers of 13 adult male marsh wrens during 2 consecutive years was approximately 386 m (range = 0 - 3353 m). Of these 13 males, five used the same territory in both years, and one set up a territory on a different lake during the second year. Ten yearling male marsh wrens established their first breeding territories at a mean distance of 1,951 m (range = 180 - 4090 m) from their natal lake. These mean dispersal distances for yearling versus adult males were significantly different ($0.01 > P > 0.001$) (Verner 1971).

Special Considerations

Marsh wren nestlings are occasionally consumed by common grackles (*Quiscalus quiscula*) (Welter 1935). Clapp and Abbott (1966) found a pilot black snake (*Elaphe obsoleta obsoleta*) that had preyed on marsh wren eggs. Rice rats (*Oryzomys palustris*), raccoons (*Procyon lotor*), and mink (*Mustella vison*) are important predators of marsh wren eggs and young in Georgia (Kale 1965). Yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) physically attack adult marsh wrens on the breeding grounds during territorial conflict (Burt 1970, cited in Picman 1980). Adult marsh wrens of both sexes destroy the eggs of other marsh wrens, presumably as a result of the evolution of intraspecific nest destruction, or perhaps because it decreases intraspecific competition for resources within a marsh (Picman 1977). Red-winged blackbirds (*Agelaius phoeniceus*) aggressively suppress the singing activities of marsh wrens and may, therefore, reduce marsh wren reproductive success. Nesting success in marsh wrens improves with increased distance between marsh wren breeding nests and the nearest red-winged blackbird nest (Picman 1982). Thus, the density of predators, breeding marsh wrens, and red-winged and yellow-headed blackbirds in a marsh may significantly influence its suitability as marsh wren breeding habitat.

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for application throughout the breeding range of the marsh wren (Figure 1).

Season. This model was developed to evaluate breeding season habitat for the marsh wren.

Cover type. This model was developed to assess habitat suitability in permanently and semipermanently flooded estuarine, riverine, lacustrine, and palustrine wetlands that can be classed as emergent or scrub-shrub (Cowardin et al. 1979).

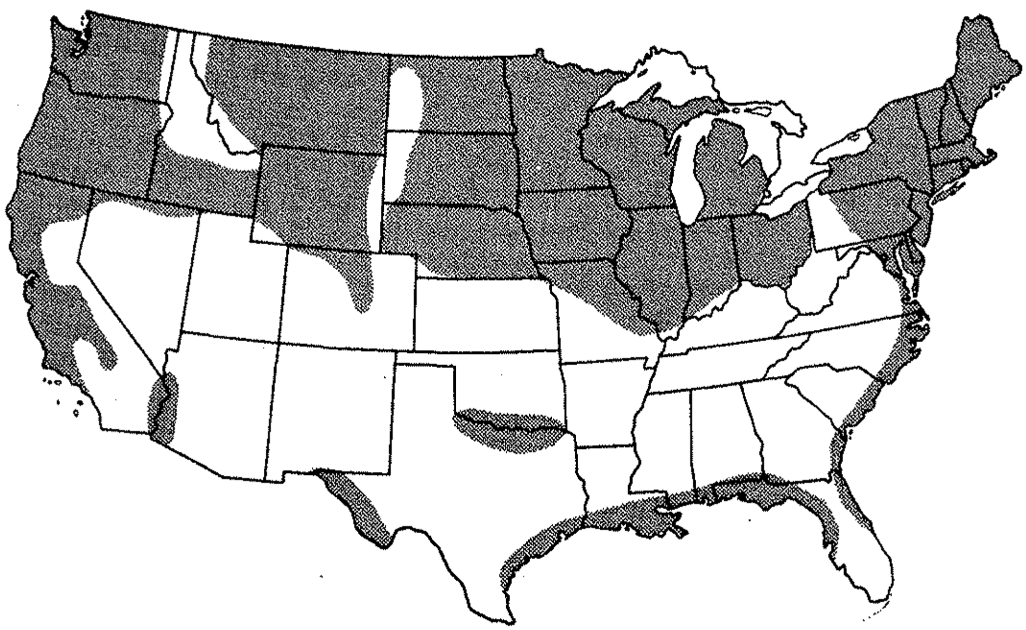

Figure 1. Approximate area of marsh wren model applicability. Range estimates were adapted from several sources (including Kale, unpubl. and Verner, unpubl.) that combine both breeding and year-round observations.

Minimum habitat area. Minimum habitat area is defined as the mininum amount of contiguous habitat that is necessary before an area will be used by a species. Marsh wrens do not usually nest in marshes that are <0.40 ha. Accordingly, it is assumed that if less than this amount of wetland (open water plus emergent vegetation) is present, the HSI is 0.

Verification level. Considerable interesting work has been conducted with marsh wrens in the areas of reproductive strategy (Verner 1964), and interspecific competition between it and other marsh-dwelling passerines (Picman 1983; Leonard and Picman 1986); however, information linking the species to habitat suitability is limited. For example, Verner and Engelsen (1970) were unable to exhibit statistically significant relationships between various measures of vegetation coverage within wren territories and pairing success of bachelor, monogamous, or bigamous males. Where marsh wrens occur with red-winged blackbirds and yellow-headed blackbirds, redwings tend to use the drier, shallower locations, yellowheads the deeper areas bordering open water, and marsh wrens the areas in between (Weller and Spatcher 1965; Burger 1985). Measures of habitat use under these conditions apparently reflect active spatial segregation among the three species, as wrens expand their territories into areas previously occupied by redwings or yellowheads after the blackbirds leave the marshes in late summer (Leonard and Picman 1986). How these relationships relate to habitat suitability is unknown.

The standard of comparison for this model focuses on male territories in wetlands as reported in the literature and interpreted by the authors. The potential of a permanently or semipermanently flooded wetland to support territorial males and, we assume, nesting marsh wrens is described; the model should be useful for baseline assessments and habitat management. The model is a set of hypotheses describing our interpretations of suitable marsh wren habitat conditions; however, it is not intended to serve as a predictor of numbers of wrens occupying a given wetland at any particular time. The model is intended to rate the suitability of potential nesting areas as would an expert thoroughly familiar with the reproductive requirements of marsh wrens; however, we have not evaluated the model's performance under actual field conditions.

Comments and suggestions from H.W. Kale, II, and J. Verner on an earlier draft of the marsh wren model were used to formulate the present model. Modifications suggested by these individuals have been incorporated into the model where possible. Use of the reviewers' names, however, does not necessarily imply that they concur with each section of the model, or the model in its entirety.

Model Description

Overview. Cover and reproduction requirements of the marsh wren are combined into a single habitat component because these needs are assumed to be supplied by the same habitat features. It is assumed that if the cover and reproduction needs are satisfied, adequate amounts of food and water will also be available.

In the sections that follow, we document the logic and assumptions used to relate marsh wren habitat information to the variables and equations used in this model. Specifically, we identify variables used in the model, define and justify suitability levels for each variable, and describe the assumed relationships between variables.

Cover/reproduction component. It is assumed that the cover and nesting requirements for marsh wrens can be supplied by herbaceous wetlands that support hydrophytes, such as cattails, bulrushes, cordgrasses, sedges, and other species, and that contain standing water. Marsh wrens tend to avoid areas of abundant woody vegetation, thus high tree or shrub densities are assumed to lower the value of a wetland for nesting marsh wrens. Verner (unpubl.) found marsh wrens nesting in a stand of *Spiraea aquatica* in Washington; isolated trees and shrubs did not preclude habitat use. Instead, woody vegetation was used for singing and feeding sites.

Early accounts describing the nest sites of marsh wrens identify a wide variety of emergent species used as nest support (Bent 1948). A common characteristic of nest-support vegetation is several erect and closely spaced stalks or limbs that together provide the strength and height to support a bulky nest (approximately 12.5 x 17.5 cm) at least several centimeters above the water surface. Cattails and cordgrasses appear to provide a growth form commonly acceptable to nest-building marsh wrens; bulrushes are also important, especially during drier years (Verner and Engelsen 1970). Aquatic emergents exhibiting a growth form similar to cattails, cordgrass, or bulrush are assumed to provide ideal conditions for nest building and the general cover requirements for marsh wrens (SIV1, Figure 2). Species such as bluejoint reedgrass, reed canarygrass, and sedges are also used by marsh wrens, but are assumed to provide lower suitability because of their different structure, or shorter stature and assumed lower stem strength, than that exhibited by cattails and similar species. Emergent species with growth forms differing significantly from those described above [e.g., buttonbush (*Cephalanthus occidentalis*) and mangrove (*Rhizophora* spp.)], but that are occasionally used to support nests, are assumed to have very low suitability. The assignment of a suitability index to emergent vegetation not specifically identified above will require some judgement by the user.

Although Verner and Engelsen (1970) were unable to exhibit statistical relationships between cover and pairing status, we feel that some consideration of relative availability of emergent vegetation for breeding marsh wrens is required to characterize cover/reproduction suitability. Most studies indicate or imply that marsh wrens use areas supporting relatively dense emergent vegetation for territories and nesting. The lowest mean percent coverage of emergent vegetation recorded for territorial males in Washington was 50% for bachelors using "blue" marsh (Verner 1964:257). Coverage of emergent vegetation in other territories in other marshes ranged from 57% to 100%. A diagram of marsh wren territories provided by Leonard and Picman (1986:136) also indicates the use of areas with extensive vegetation coverage, at least while yellow-headed blackbirds were present.

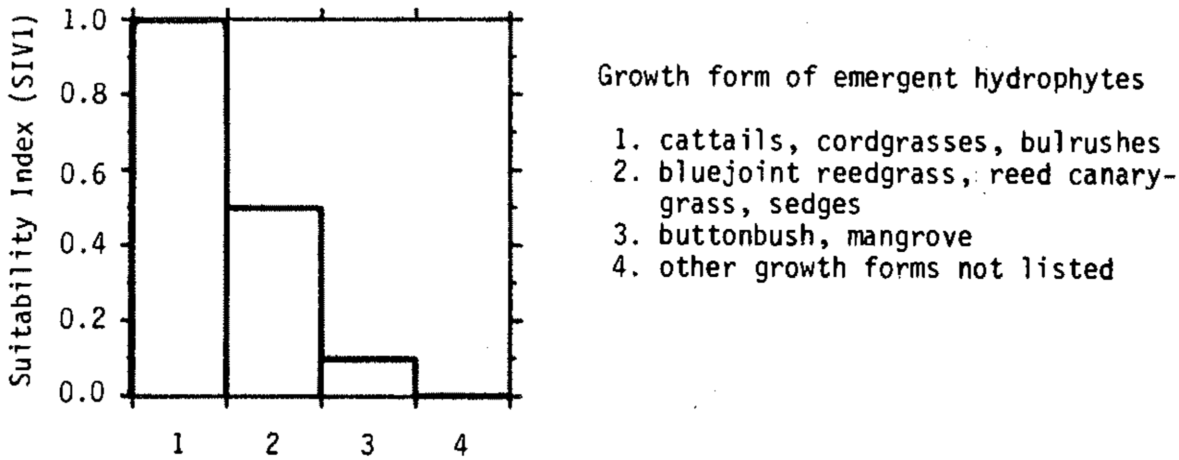

Figure 2. The assumed relationship between the growth form of emergent hydrophytes and the suitability of a wetland as cover/reproduction habitat for marsh wrens.

We present the above information as increasing suitability with increasing percent canopy cover of emergent herbaceous vegetation (SIV2, Figure 3). Fifty percent canopy cover is assigned a value of 0.1, and optimum conditions are reached at 80%. These values are somewhat arbitrary, as use may equal availability after some coverage threshold is reached, especially in wetlands also used by red-winged or yellow-headed blackbirds. The ultimate determination of nesting suitability may depend on female assessments of food resources within the territory, which are based on as yet unknown characteristics (Verner and Engelsen 1970).

Wetlands without standing water usually are not used for nesting by marsh wrens, although intertidal coastal marshes and other marshes that periodically lack standing water are acceptable (Verner 1965; Kale, unpubl.). Information relating water depths to cover/reproduction suitability was not located; however, we have assumed a linear increase in suitability as mean depth increases (SIV3, Figure 4). Optimum conditions are assumed to occur at a minimum mean depth of 15 cm. The upper depth limit for standing water is unknown, and the graph for SIV3 indicates no limit. In reality, as water increases in depth, some threshold will be reached at which growth of emergent herbaceous vegetation will be affected, and the suitability of the wetland as represented by SIV1 and SIV2 will decrease.

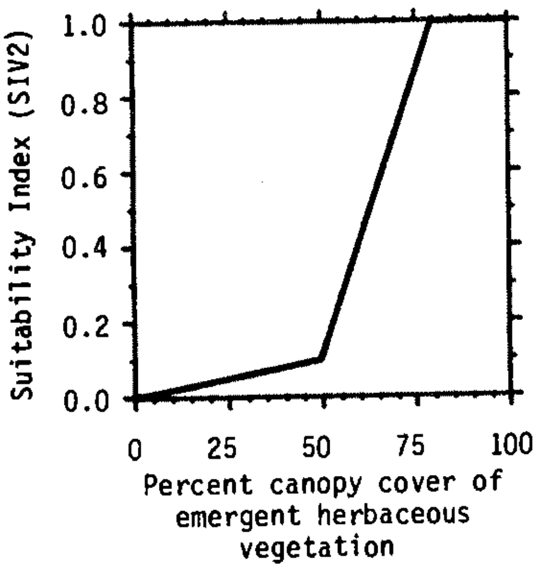

Figure 3. The assumed relationship between percent canopy cover of emergent herbaceous vegetation and cover/reproduction suitability of a wetland for marsh wrens.

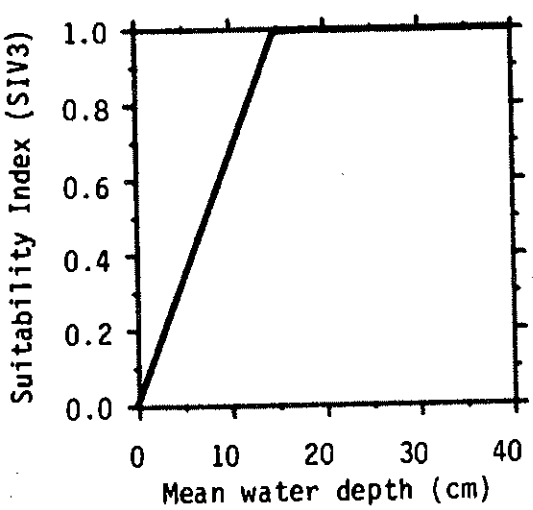

Figure 4. The assumed relationship between mean water depth and cover/reproduction suitability of a wetland for marsh wrens.

The effect of woody vegetation on marsh wren habitat suitability is unclear. Bent (1948) cites several early studies from the eastern United States that document nesting in woody vegetation; however, the relative importance of this activity in the overall nesting effort of the populations under study is unknown. More recent studies emphasize emergent herbaceous vegetation as nesting substrate. Therefore, for the purposes of this model, woody vegetation is assumed to lower the suitability of wetlands for nesting marsh wrens. Forested wetlands with >30% coverage of trees >6 m in height (U.S. Fish and Wildlife Service 1981) are considered unsuitable. Shrub-dominated wetlands (>30% coverage of woody plants <6 m tall) may have some value for nesting marsh wrens, but the value of both herbaceous and deciduous-shrub wetlands are assumed to decrease with increasing canopy closure of woody vegetation (SIV4, Figure 5). Wetlands supporting trees with <30% canopy coverage should be evaluated as either emergent or scrub-shrub wetlands.

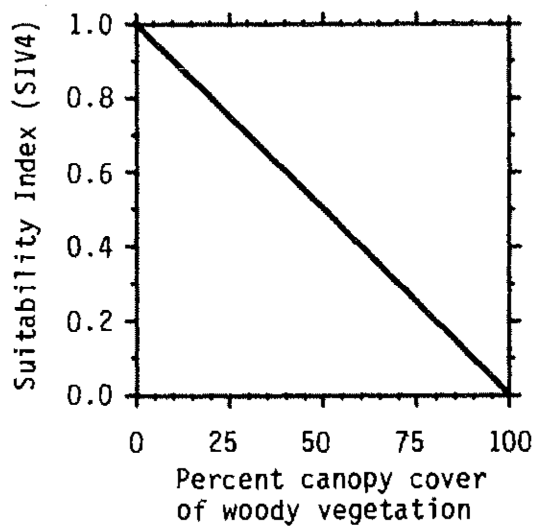

Figure 5. The assumed relationship between percent canopy cover of woody vegetation and cover/reproduction suitability of a wetland for marsh wrens.

HSI determination. We have assumed that habitat suitability, in terms of cover/reproduction for the marsh wren, is a reflection of the characteristics of individual permanently or semipermanently flooded estuarine, riverine, lacustrine, or palustrine wetlands classed as emergent or scrub-shrub (Cowardin et al. 1979). Criteria characterizing the growth form of emergent vegetation (SIV1), the percent canopy cover of emergent herbaceous vegetation (SIV2), mean water depth (SIV3), and the percent canopy cover of woody vegetation (SIV4) can be used to assess suitability. Suitability among the first three variables is compensatory, i.e., a low value for one index can be compensated for by a high value in one of the other indices. A zero value for any of the three variables, however, indicates a wetland that is unsuitable in terms of cover/reproduction requirements for marsh wrens. The relationship between woody vegetation and habitat suitability is unclear, but we have assumed a negative affect on overall cover/reproduction suitability as the percent canopy cover of woody vegetation increases. Thus, SIV4 is used to lower the value of a wetland supporting woody vegetation. These relationships are described by equation 1.

$$HSI = (SIV1 \times SIV2 \times SIV3)^{1/3} \times SIV4 \qquad (1)$$

Application of the Model

Summary of model variables. Four habitat variables are used in this model to characterize the suitability of a wetland for supplying cover and reproductive needs of marsh wrens. Relationships among these variables, the cover and reproduction component, and the HSI value are summarized in Figure 6. During application of this model, variables should be defined and measured as discussed in Figure 7.

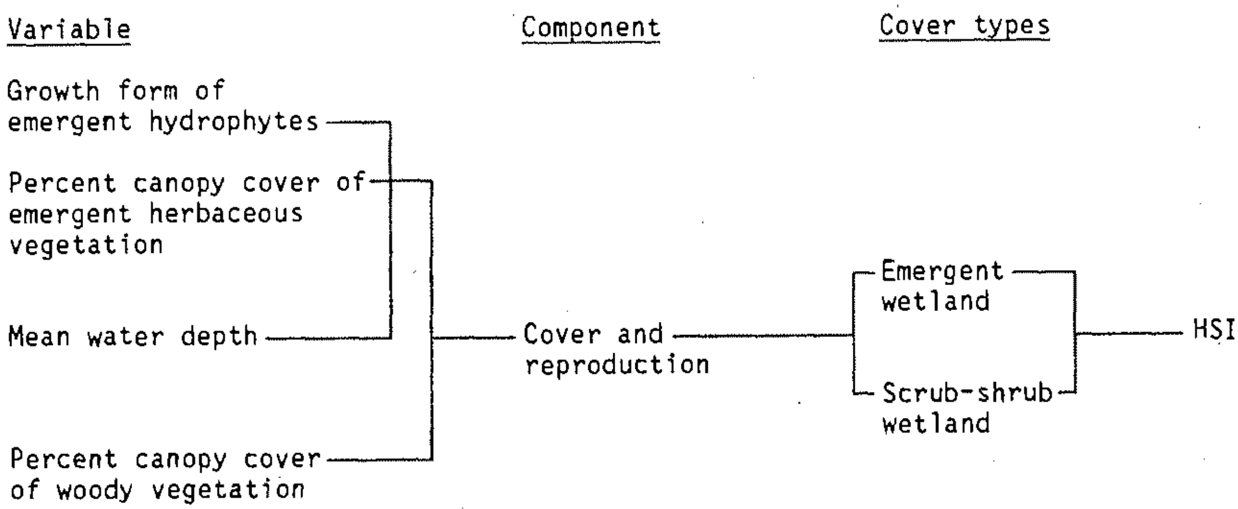

Figure 6. Relationship among habitat variables, component, cover types, and HSI for the marsh wren.

Variable (definition)	Cover type	Recommended technique
Growth form of emergent hydrophytes.	Emergent and scrub-shrub wetlands	Aerial photos, on-site inspection
Percent canopy cover of emergent herbaceous vegetation (the percent of the water surface shaded by a vertical projection of the canopies of emergent herbaceous vegetation, both persistent and nonpersistent).	Emergent and scrub-shrub wetlands	Line intercept
Mean water depth (cm).	Emergent and scrub-shrub wetlands	Graduated rod
Percent canopy cover of woody vegetation (the percent of the ground surface that is shaded by a vertical projection of the canopies of all woody vegetation).	Emergent and scrub-shrub wetlands	Line intercept

Figure 7. Definition of variables, applicable cover types, and recommended measurement techniques (Hays et al. 1981) for the marsh wren model.

Model assumptions. This model was developed to assess the habitat suitability of wetlands for supplying the cover and reproductive needs of marsh wrens. The model is not intended to produce outputs that reflect actual population densities at any particular time, but rather it attempts to estimate the potential of a site to supply the habitat requirements as defined above, regardless of nonhabitat variables influencing populations. Model variables and relationships are based on information obtained from studies disjunct in time and space. As such, the model is a collection of hypotheses and should not be interpreted as statements of proven cause and effect. Users should refine the model as necessary to better represent localized conditions.

Three basic assumptions characterize the model. First, we assume that the growth form of herbaceous hydrophytes and percent canopy cover of emergent herbaceous vegetation in a wetland are dominant factors determining habitat suitability for marsh wrens. Second, we assume that any depth of water $\geq$15 cm, if present during the breeding season, indicates optimum conditions. Wetlands lacking such conditions would be unsuitable by definition of this variable. No information was located that could be used to relate various degrees of water permanence throughout the breeding season with relative suitability. Third, we assume that changes in suitability of marsh wren habitat follow a direct linear response to changes in woody vegetation canopy cover, although the influences of woody vegetation are difficult to interpret from the literature.

SOURCES OF OTHER MODELS

No other habitat models for the marsh wren were found.

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A review and synthesis of existing information were used to develop a Habitat Suitabiltiy Index (HSI) model for the marsh wren (Cistothorus palustris). The model consolidates habitat use information into a framework appropriate for field application, and is scaled to produce an index between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). HSI models are designed to be used with Habitat Evaluation Procedures previously developed by U.S. Fish and Wildlife Service.

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APRIL 1983

HABITAT SUITABILITY INDEX MODELS: DOWNY WOODPECKER

Fish and Wildlife Service

U.S. Department of the Interisr

This model is designed to be used by the Division of Ecological Services in conjunction with tbe Habitat Evaluation Procedures.

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April 1983

HABITAT SUITABILITY INDEX MODELS: DOWNY WOODPECKER

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that ioilow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

Habitat Evaluation Procedures Group
Western Energy and Land Use Team
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2627 Redwing Road
Ft. Collins, CO 80526

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DOWNY WOODPECKER (Picoides pubescens)

HABITAT USE INFORMATION

General

Downy woodpeckers (Picoides pubescens) inhabit nearly all of North America where trees are found (Bent 1939). They are rare or absent in arid desert habitats and most common in open woodlands.

Food

The downy woodpecker is primarily an insectivore; 76% of the diet is animal foods, and the remainder is vegetable food (Beal 1911). Beetles, ants, and caterpillars are the major animal foods, and vegetable foods include fruits, seeds, and mast. Downy woodpeckers feed by digging into the bark with the bill, by gleaning along the bark surface, and, infrequently, by flycatching (Jackson 1970).

Downy woodpeckers in Illinois foraged more in the lower height zones of trees than. in the tree canopies and foraged more often on live limbs than on dead limbs (Williams 1975). Similarly, downy woodpeckers in Virginia foraged primarily on live wood in pole age and mature forests (Conner 1980). Downy woodpeckers in New York spent 60% of their foraging time in elms (Ulmus spp.) (Kisiel 1972). They foraged most frequently on twigs 2.5 cm (1 inch) or less in diameter, and drilling was the foraging technique used most often. Downy woodpeckers are not strong excavators and do not excavate deeply to reach concentrated food sources, such as carpenter ants (Camponotus spp.) (Conner 1981).

Downy woodpeckers in Virginia foraged in the breeding season in habitats with a mean basal area of 11.3 m^2/ha (49.2 ft^2/acre). Habitats used for foraging during the postbreeding and winter seasons had significantly higher mean basal areas of 21.4 m^2/ha (93.2 ft^2/acre) and 17.2 m^2/ha (74.9 ft^2/acre), respectively. Downy woodpeckers in New Hampshire fed heavily in stands of paper birch (Betula papyrifera) that were infected with a coccid (Xylococchus betulae) (Kilham 1970). The most attractive birches for foraging were those that were crooked or leaning, contained broken branches in their crown, and had defects, such as cankers, old wounds, broken branch stubs, and sapsucker drill holes. Downy woodpeckers invaded an area in Colorado in high numbers during the winter months in response to a severe outbreak of the pine bark beetle (Dendroctonus ponderosae) (Crockett and Hansley 1978). This outbreak of beetles had not resulted in increased breeding densities of the woodpeckers at the time of the study.

Downy woodpeckers foraged more on tree surfaces during summer than in winter (Conner 1979). They increased the amount of time spent in subcambial excavation in winter months, probably in response to the seasonal availability and location of insect prey. Downy woodpeckers appear to broaden all aspects of their foraging behavior in the winter in order to find adequate amounts of food (Conner 1981).

Downy woodpeckers in Ontario extracted gall fly (Eurosta solidaginis) larvae from goldenrod (Solidago canadensis) galls growing near forest edges (Schlichter 1978). Corn stubble fields supported small winter populations of downy woodpeckers in Illinois (Graber et al. 1977).

Water

Information on the water requirements of the downy woodpecker was not located in the literature.

Cover

The cover requirements of the downy woodpecker are similar to their reproductive requirements, which are discussed in the following section.

Reproduction

The downy woodpecker is a primary cavity nester that prefers soft snags for nest sites (Evans and Conner 1979). These woodpeckers nest in both coniferous and deciduons forest stands in the Northwest. Nests in Virginia were common in both edge situations and in dense forests far from openings (Conner and Adkisson 1977). Downy woodpeckers in Oregon occur primarily in deciduous stands of aspen (Populus tremuloides) or riparian cottonwood (Populus spp.) (Thomas et al. 1979). The highest nesting and winter densities in Illinois were in virgin or old lowland forests (Graber et al. 1977).

Downy woodpeckers in Virginia preferred to nest in areas with high stem density, but with lower basal area and lower canopy heights than areas used by the other woodpeckers studied (Conner and Adkisson 1977). They preferred sparsely stocked forests commonly found along ridges (Conner et al. 1975). Preferred nest stands had an average basal area of 10.1 m^2/ha (44 ft^2/acre), 361.8 stems greater than 4 cm (1.6 inches) diameter/ha (894/acre), and canopy heights of 16.3 m (53.5 ft) (Conner and Adkisson 1976). Downy woodpeckers in Tennessee were frequently seen feeding in the understory and apparently selected habitats with an abundance of understory vegetation (Anderson and Shugart 1974).

Downy woodpeckers excavate their own cavity in a branch or stub 2.4 to 15.3 m (8 to 50 ft) above ground, generally in dead or dying wood (Bent 1939). There was a positive correlation between downy woodpecker densities and the number of dead trees in Illinois (Graber et al. 1977). Downy woodpeckers rarely excavate in oaks (Quercus spp.) or hickories (Carya spp.) with living cambium present at the nest site (Conner 1978). They apparently require both sap rot, to soften the outer part of trees, and heart rot, to soften the interior, when hardwoods, and possibly pines, are used for nesting. Downy woodpeckers in Virginia nested mainly in dead snags with advanced stages of fungal heart rot (Conner and Adkisson 1976).

Downy woodpeckers "search image" of an optimal nest site is a live tree with a broken off dead top (Kilham 1974). Suitable nest trees are in short supply in most areas and appear to be a limiting factor in New Hampshire. Downies in Montana appeared to prefer small trees, possibly to avoid the difficulty of excavating through the thick sapwood of large trees (McClelland et al. 1979). The average dbh of nest trees (n = 3) in Montana was 25 cm (10 inches). All 11 nests in an Ontario study were in dead aspen, and the average dbh of four of these nest trees was 26.2 cm (10.3 inches) (Lawrence 1966). Fourteen of 19 nest trees in Virginia were dead, the average dbh of nest trees was 31.8 cm (12.4 inches), and nest trees averaged 8.3 m (27.2 ft) in height (Conner et al. 1975).

Thomas et al. (1979) estimated that downy woodpeckers in Oregon require 7.4 snags, 15.2 cm (6 inches) or more dbh, per ha (3 snags/acre). This estimate is based on a territory size of 4 ha (10 acres), a need for two cavities per year per pair, and the presence of 1 useable snag with a cavity for each 16 snags without a cavity. Evans and Conner (1979) estimated that downies in the Northeast require 9.9 snags, 15 to 25 cm (6 to 10 inches) dbh, per ha (4 snags/acre). Their estimate is based on a territory size of 4 ha (10 acres), a need for four cavity trees per year per pair, and a need for 10 snags for each cavity tree used in order to account for unuseable snags, a reserve of snags, feeding habitat, and a supply of snags for secondary users. Conner (pers. comm.) recommended 12.4 snags/ha (5 snags/acre) for optimal downy woodpecker habitat.

Interspersion

Downy woodpeckers occupy different size territories at different times of the year (Kilham 1974). Fall and winter territories consist of small, defined areas with favorable food supplies and the area near roost holes. Breeding season territories consist of an area as large as 10 to 15 ha (24.7 to 37.1 acres) used to search out nest stubs, and a smaller area around the nest stub itself. Breeding territories of downies in Illinois ranged from 0.5 to 1.2 ha (1.3 to 3.1 acres) (Calef 1953 cited by Graber et al. 1977). Male and female downy woodpeckers retain about the same breeding season territory from year to year, while their larger overall range has more flexible borders (Lawrence 1966).

Downy woodpeckers occupy all portions of their North American breeding range during the winter (Plaza 1978). There is, however, a slight, local southward migration in many areas.

Special Considerations

Conner and Crawford (1974) reported that logging debris in regenerating stands' (1-year old) following clear cutting were heavily used by downy woodpeckers as foraging substrate. Timber harvest operations that leave snags and trees with heart rot standing during regeneration cuts and subsequent thinnings will help maintain maximum densities of downy woodpeckers (Conner et al. 1975). Foraging habitat for the downy woodpecker in Virginia would probably be provided by timber rotations of 60 to S0 years (Conner 1980).

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for the entire range of the downy woodpecker.

Season. This model was developed to evaluate the year-round habitat needs of the downy woodpecker.

Cover types. This model was developed to evaluate habitat in Deciduous Forest (DF), Evergreen Forest (EF), Deciduous Forested Wetland (DFW), and Evergreen Forested Wetland (EFW) areas (terminology follows that of U.S. Fish and wildlife Service 1981).

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous habitat that is required before a species will live and reproduce in an area. Specific information on minimum habitat areas for downy woodpeckers was not found in the literature. However, based on reported territory and range sizes, it is assumed that a minimum of 4 ha (10 acres) of potentially useable habitat must exist or the HSI will equal zero.

Verification level. Previous drafts of this model were reviewed by Richard Conner and Lawrence Kilham and their comments were incorporated into the current draft (Conner, pers. comm.; Kilham, pers. comm.).

Model Description

Overview. This model considers the ability of the habitat to meet the food and reproductive needs of the downy woodpecker as an indication of overall habitat suitability. Cover needs are assumed to be met by food and reproductive requirements and water is assumed not to be limiting. The food component of this model assesses food quality through measurements of vegetative conditions. The reproductive component of this model assesses the abundance of suitable snags. The relationship between habitat variables, life requisites, cover types, and the HSI for the downy woodpecker is illustrated in Figure 1.

Habitat variable	Life requisite	Cover types	
Basal area	Food	Deciduous forest Evergreen forest Deciduous forested wetland Evergreen forested wetland	HSI
Number of snags > 15 cm dbh/0.4 ha (> 6 inches dbh/1.0 acre)	Reproduction		

Figure 1. Relationships of habitat variables, life requisites, and cover types in the downy woodpecker model.

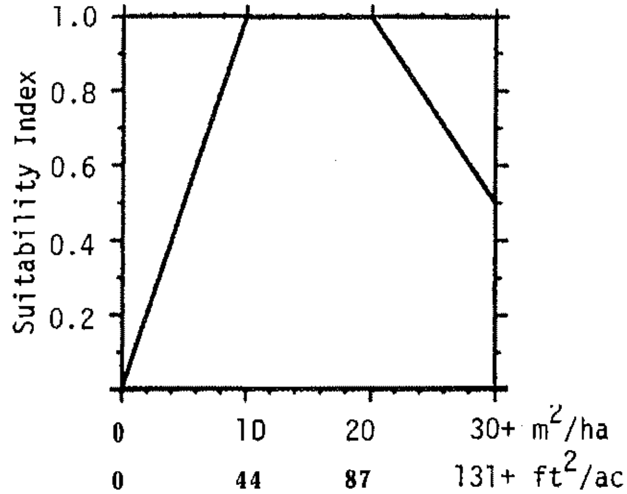
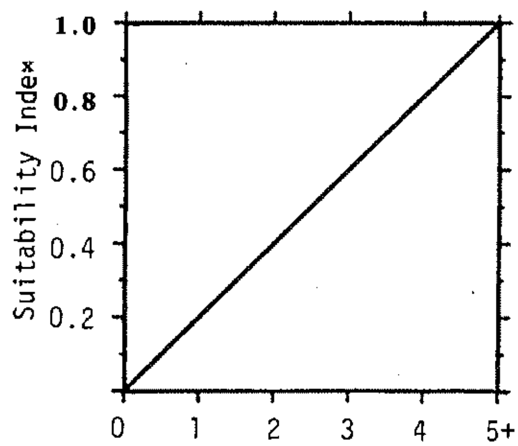
The following sections provide a written documentation of the logic and assumptions used to interpret the habitat information for the downy woodpecker in order to explain the variables and equations that are used in the HSI model. Specifically, these sections cover the following: (1) identification of variables used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationship between variables.

Food component. Food for the downy woodpecker consists of insects found on trees in forested habitats. Downy woodpeckers occupy a wide variety of forested habitats from virgin bottomlands to sparsely stocked stands along ridges. The highest downy woodpecker densities were most often reported in the more open stands with lower basal areas, but it is assumed that all forested habitats have some food value for downies. Optimal conditions are assumed to occur in stands with basal areas between 10 and 20 m^2/ha (43.6 and 37.2 ft^2/acre), and suitabilities will decrease to zero as basal area approaches zero. Stands with basal areas greater than 30 m^2/ha (130.8 ft^2/acre) are assumed to have moderate value for downy woodpeckers.

Reproduction component. Downy woodpeckers nest in cavities in either totally or partially dead small trees. They require snags greater than -15 cm (6 inches) dbh for nest sites. Optimal habitats are assumed to contain 5 or more snags greater than 15 cm dbh/0.4 ha (6 inches dbh/1.0 acre), and habitats without such snags have no suitability.

Model Relationships

Suitability Index (SI) graphs for habitat variables. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

Cover type	Variable		Suitability graph
EF, DF, EFW, DFW	V_1	Basal area.	
EF, DF, EFW, DFW	V_2	Number of snags > 15 cm dbh/0.4 ha (> 6 inches dbh/ 1.0 acre).	

Life requisite values. The life requisite values for the downy woodpecker are presented below.

Life requisite	Cover type	Life requisite value
Food	EF,DF,EFW,DFW	V_1
Reproduction	EF,DF,EFW,DFW	V_2

HSI determination. The HSI for the downy woodpecker is equal to the lowest life requisite value.

Application of the Model

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 2.

Variable (definition)		Cover types	Suggested technique
V_1	Basal area [the area of exposed stems of woody vegetation if cut horizontally at 1.4 m (4.5 ft) height, in m^2/ha ($ft^2/acre$)].	EF,DF,EFW,DFW	Bitterlich method
V_2	Number of snags > 15 cm (6 inches) dbh/0.4 ha (1.0 acre) [the number of standing dead trees or partly dead trees, greater than 15 cm (6 inches) diameter at breast height (1.4 m/4.5 ft), that are at least 1.8 m (6 ft) tall. Trees in which at least 50% of the branches have fallen, or are present but no longer bear foliage, are to be considered snags].	EF,DF,EFW,DFW	Quadrat

Figure 2. Definitions of variables and suggested measurement tecnniques.

SOURCES OF OTHER MODELS

Conner and Adkisson (1976) have developed a discriminant function model for the downy woodpecker that can be used to separate habitats that possibly provide nesting habitat from those that do not provide nesting habitat. The model assesses basal area, number of stems, and canopy height of trees.

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16. Abstract (Limit: 200 words)

A review and synthesis of existing information was used to develop a habitat model for the downy woodpecker (Picoides pubescens). The model is scaled to produce an index of habitat suitability between 0 (unsuitable habitat) and 1 (optimally suitable habitat) for areas of the continental United States. Habitat suitability indexes are designed for use with Habitat Evaluation Procedures previously developed by the U.S. Fish and Wildlife Service.

17. Document Analysis a. Descriptors

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b. Identifiers/Open-Ended Terms

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Picoides pubescens
Habitat Suitability Indexes (HSI)

c. COSATI Field/Group

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DRAFT HABITAT SUITABILITY INDEX MODEL
PACIFIC TREE FROG (*Hyla regilla*)

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

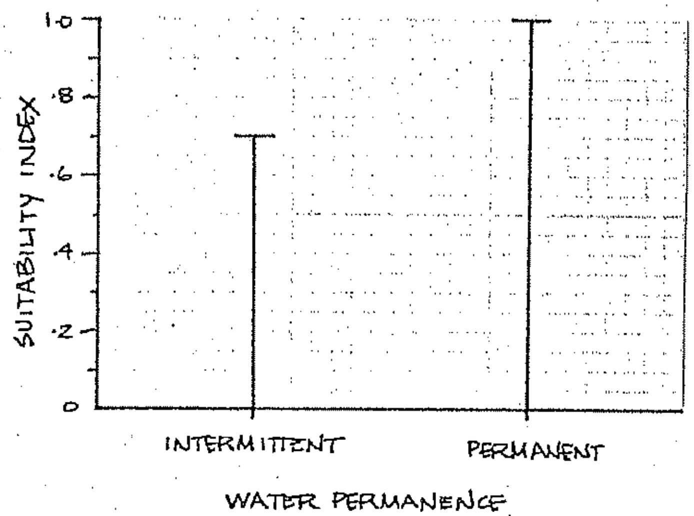
September 1984

VARIABLE	COVER TYPES	SUGGESTED TECHNIQUE
(V_1) Water permanence - Number of months that water is present in an average year.	S	Rainfall charts, ocular estimate.
(V_2) Stream gradient	S	USFS data
(V_3) Food/cover availability - percent cover of rock crevices, ground debri, rank vegetation.	H,O	Point intercept - step point.
(V_4) Water/cover relationship - distance in yards between cover and nearest water body.	H,O,S	Range finder, measuring tape

Cover Type	Life Requisite	Habitat Variable
Stream (S)	Reproduction	Water permanence (V_1)
		Stream gradient (V_2)
	Interspersion	Water/cover relationship (V
Oak Woodland (O)	Food/cover	Food/cover availability (V_3
	Interspersion	Water/cover relationship (V
Conifer - Hardwood Forest (H)	Food/cover	Food/cover availability (V_3
	Interspersion	Water/cover relationship (V

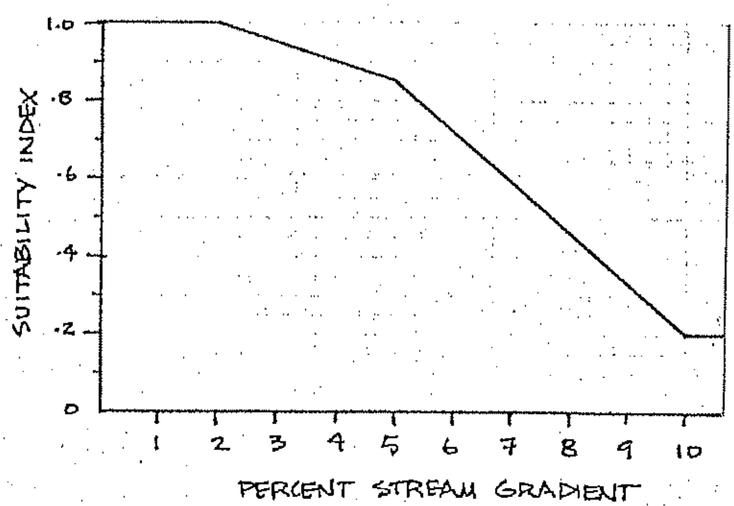
Variable 1. Water permanence - number of months that standing water is present in an average year.

Assumes: 1) Water present six months of the year or longer is optimum for development of young (Stebbins, 1951).



Variable 2. Stream gradient

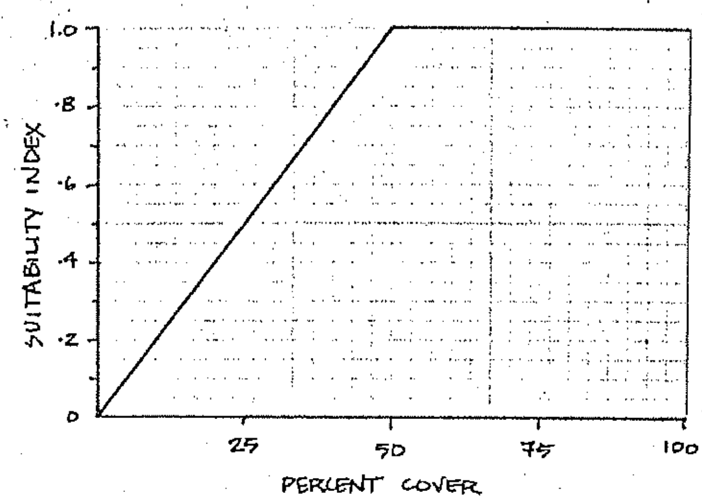
Assumes: 1) Quiet water optimum for tree frog reproduction (Storm, 1948).



Variable 3. Food/cover availability - percent cover of rock crevices, ground debris, rank vegetation, etc.

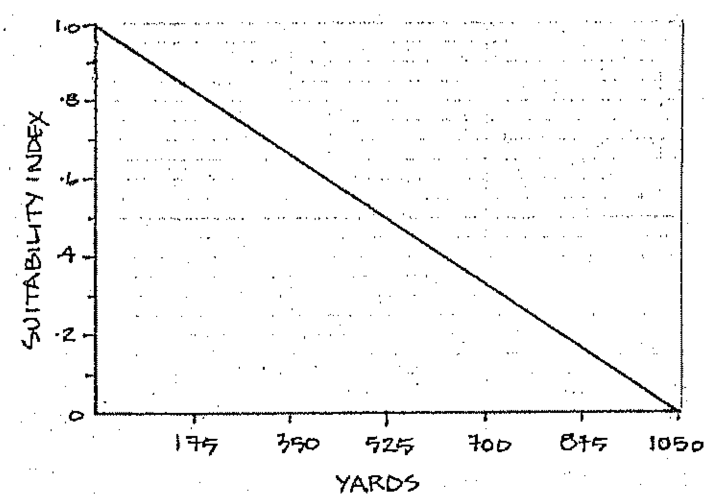
Assumes: 1) Tree frogs require ground debris, crevices, etc. for food and cover in upland habitats (Stebbins, 1951; Brattstrom and Warren, 1955).

2) 50% or greater cover is optimum.



Variable 4. Water/cover relationship - distance in yards between cover and nearest water body.

Assumes: 1) Habitat equal to or less than 1,000 yards from reproductive water body is optimum (derived from Jameson, 1957).



A81

Equations Used to Calculate Suitability Indices

a) Equation for reproduction component.

Cover Type	Equation
S	$(V_1 \times V_2)^{1/2}$

b) Equation for food/cover component.

Cover Type	Equation
O,H	V_3

C) Equation for interspersion component.

Cover Type	Equation
S,O,H	V_4

HSI Determination:

The HSI value equals the life requisite value calculated for each cover type multiplied by the interspersion value.

A8

Assumptions Used in Applying the Pacific Tree Frog Model

V_1 - Water permanance

It was assumed that permanent streams had an SI value of 1.0 and intermittent streams a value of 0.7. Lengths and widths of stream habitat for the tree frog provided by a USFS fisheries biologist was then used to calculate a weighted SI value for the study area.

V_3 - Food/cover availability

It was assumed that cover for the tree frog was not limiting in the study area; SI 1.0.

V_4 - Water/cover relationship

The distance between cover and the nearest body of water suitable for reproduction was assumed not to be limiting in the study area for the tree frog; SI = 1.0.

It was assumed that the reservoir was not suitable habitat due to the fluctuating water levels of the lake.

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14.0 CALIFORNIA GROUND SQUIRREL

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General

The California ground squirrel (Spermophilus beecheyi), sometimes referred to as the beechey ground squirrel, is common throughout much of Ecoregion 2610. Its range extends south from south-central Washington to northern Baja California, through western Oregon and California (Burt and Grossenheider 1964; Ingles 1965; MacClintock 1970; Orr 1971).

This ground squirrel occupies a variety of open habitats in the Central Valley. It can be found in most agricultural land, grassland, plains, small meadows, open rocky places, and on slopes with scattered trees; it avoids areas with dense stands of brush, trees, tall grasses, or herbaceous annual vegetation.

Food Requirements

The diet of the California ground squirrel varies seasonally and includes green herbage, seeds, nuts, bulbs, acorns, agricultural row crops, orchard crops, grains and pasture (Martin et al. 1961). On the San Joaquin Experimental Range, Schitoskey and Woodmansee (1978) found nonlegume forbs to be the most prevalent forage plants in the ground squirrel's annual diet. Over a fifteen month sampling period, the percent composition of dietary elements are as follows:

Nonlegume Forbs	46.4%	Grasses	16.0%
Legumes	19.0%	Miscellaneous	1.5%
Woody Vegetation	17.1%		

Within the San Joaquin Experimental Range, Filaree (Erodium spp.) is the most important nonlegume forb (Fitch 1948; Schitoskey and Woodmansee 1978); comprising 50.2 percent of the nonlegume forbs used and 23.3 percent of the annual diet (Schitoskey and Woodmansee 1978). Filaree forms the bulk of the diet, on the Experimental Range, through winter and spring (Fitch 1948). For detailed diet and seasonal shifts, the reader is referred to: Evans and Holdenried (1943); Fitch (1948); Schitoskey and Woodmansee (1978).

Although only a small proportion of the diet, California ground squirrels have been observed to occasionally seek animal food (Fitch 1948). Linsdale (1946) and Fitch (1948) both report active predation upon grasshoppers and small birds caught in squirrel traps. Linsdale described a tendency of ground squirrels to colonize near chicken enclosures and frequently raid both chicken feed and eggs. Fitch (1948) additionally reports the following predatory observations: eggs of gopher snakes, quail, killdeer and mourning doves; young cottontails removed from their nests; pocket gophers; kangaroo rats; and other ground squirrels killed by accident, poison, or disease.

Many authors agree that the California ground squirrel's habitat has greatly expanded with the introduction of agriculture to Ecoregion 2610. Some of the new food items added to this squirrel's diet are as follows: grain (all types); fruits and nuts including almonds, apples, apricots, peaches, pistachios, prunes, oranges, tomatoes and walnuts; seedlings of certain vegetables and field crops such as sugar beets and cotton; bark of young orchard trees (Clark 1975). Tomich (1962) reports an agricultural setting, in the Sacramento Valley, in which the California ground squirrel thrives as: typically large farms of barley, grain hay, milo maize, tomatoes, sugar beets and dry beans; irrigated pasture, stubble, and grassland grazed by sheep and beef cattle; fallow land and field borders of weedy annual vegetation. Additionally, permanent burrow systems develop in uncultivated fenceline margins providing "...a choice of crops on either side of a fence, as well as of a variety of wild annual weeds along the fenceline or fallow land" (Tomich 1962, p. 215).

Winter hibernation is common to most ground squirrels; the frequency and timing of which varies according to geographical variations of environmental conditions (Linsdale 1946; Fitch 1948). Fat storage and food caches enables ground squirrels to remain below the surface through most, if not all, of the wet and cold season. Therefore, food requirements for winter are actually more closely related to food availability in the fall.

Water Requirements

Of the literature reviewed, very little addressed the issue of moisture requirements or acquisition by the California ground squirrel. However, from studies of grassland populations in southern California, it is believed that the moderate minimum water requirement of 1.2 percent body weight per day is satisfied by a seasonal shift of diet (Baudinette 1974). Fitch (1948, p. 541) suggests that "...the succelence available in tarweed [Madia spp.] may be a vital factor in providing them with the necessary amount of moisture," in the dry season.

Estivation (summer dormancy), on stored body fat, occurs in many California ground squirrels. There is a greater tendency for adults, particularly females, to estivate than for young squirrels (Evans and Holdenried 1943; Fitch 1948). This relieves water stress in estivating individuals and reduces intraspecific competition for water sources (i.e., succulent vegetation) among the nondormant segment of the population.

Besides the introduction of new succelent food items into the ground squirrels diet, agriculture provides free water by summer irrigation of even the driest parts of the Central Valley. According to Grinnell and Dixon (1918, in Linsdale 1946) ground squirrels will travel up to a quarter of a mile for water where surface water is available; however, populations still thrive where it is not. Linsdale (1946) further reports observations of free water sources used by ground squirrels as follows: streams and creeks; fog, dew and rain water condensed on broad leaf vegetation; and watering troughs.

Cover Requirements

In Ecoregion 2610, California ground squirrels occupy a variety of habitats, principally characterized as open areas. These include: agricultural pasture and grain fields (Tomich 1962; Burt and Grossenheider 1964; Orr 1971; Clark 1975), orchards (Ingles 1965; Clark 1975), and field crops (Clark 1975); slopes, with scattered trees, and rocky places (Burt and Grossenheider 1964;

MacClintock 1970; Clark 1975); plains and small meadows (MacClintock 1970); open grassland (Evans and Holdenriod 1943); suitable open areas in riparian forest (Roberts et al. 1977).

Surface cover requirements of these ground squirrels appear to be not what vegetation is present, but more or less what vegetation is not present. Escape, reproduction, resting, shelter, and foraging cover is provided almost exclusively by extensive communal burrow systems, with many entrances and simple, singular emergency burrows. Almost all activities are carried on within 137.2 m (150 yds) from the burrow complex (Evans and Holdenried 1943; Fitch 1948; MacClintock 1970; Clark 1975) thus permitting quick access to one of the system's entrances or to an outlying emergency borrow. Therefore, surface cover preferences seem to be for open areas with conspicuously short vegetation; which extends the visibility range for predator detection. California ground squirrels avoid tall, dense vegetation such as heavy brush or dense stands of trees (Evans and Holdenried 1943; Burt and Grossenheider 1964; Clark 1975) and even dense stands of tall grasses and herbaceous annual vegetation (Evans and Holdenried 1943; Linsdale 1946; Tomich 1962).

Owings et al. (1977) observed that California ground squirrels often use promontories (logs, mounds, stones, etc.) when assuming alert postures. In another study, Owings and Borchert (1975) found a partial correlation ($r=0.62$) between promontory and burrow location; which probably offset visual obstruction by the tall grasses present in the area. According to Linsdale (1946), large boulders, mounds, trees, stumps, and fence posts serve ground squirrels as basking and lookout areas. Rocky outcrops and trees also served to anchor and protect burrow systems.

Agricultural land use and grazing have greatly increased suitable habitat for California ground squirrels by reducing excess cover and introducing new food items (Linsdale 1946; Orr 1971). Grazing, in particular, improves ground squirrel habitat by reducing excessive growth (Evans and Holdenried 1943; Linsdale 1946). Tomich (1962) found a large colony in an area of sparse, low cover. However, vegetation of barley and mustard grew to heights between five and seven feet the following year and all but eliminated ground squirrels in that area. Tomich further suggested that excessive rainfall is the most adverse environmental factor affecting these squirrels. Dry years provide adequate seed production and reduces cover which, with the addition of squirrel and cattle grazing, maintains open ground.

Interspersion Requirements

No specific interspersion requirements could be found in the literature. Limited interspersion appears to be tolerated by ground squirrels, so long as the physiognomy of the land is relatively open. Interspersion of scattered trees, bushes and/or inanimate objects (boulders, stumps, fence posts, etc.) may actually be perferred for use as basking and/or lookout perches; particularly where grasses and forbs are several feet tall.

Reproductive Requirements

In Ecoregion 2610, the ground squirrel primarily breeds during the first half of the year (Clark 1975). In northern California, the breeding season runs from February through April (Evans and Holdenried 1943).

No specific requirements were found in the literature.

Special Habitat Requirements

No special habitat requirements were found in the literature.

Special Considerations

Many authors report on the agricultural pest status of the California ground squirrel. All of the crop types listed in the "food requirements" section above are damaged to some extent by ground squirrels.

This common ground squirrel is associated with several human diseases. On this subject, Clark (1975) summarizes:

Ground squirrels are frequently named as causal agents in human cases of sylvatic (bubonic) plague in California. Circumstantial evidence points to ground squirrels as the host to plague-infected fleas in over half the reported human plague cases in California in the last 40 years. Ground squirrels are not the "reservoir" hosts of the disease; apparently wild mice (and their fleas) are the reservoir hosts from which the disease periodically spreads to other rodents. Records of the incidence of plague in wild mouse and squirrel populations show some areas of the state to be "high risk" areas, while the disease is rare in other areas. Ground squirrels are themselves susceptible to plague, and insecticides have been used as a preventive measure in some recreation areas to kill the fleas, with the result that both human and squirrel populations were protected from the disease. Ground squirrels are also associated with the spread of Rocky Mountain spotted fever, rat bite fever, tularemia, Chagas' disease, adiospiromycosis and encephalomycarditis.

It has long been felt that ground squirrel foraging is in direct competition with cattle grazing on rangeland (Fitch 1948; Clark 1975). However, a recent controversy has emerged on this subject. Schitoskey and Woodmansee (1978) studied the California ground squirrel's diet and energy requirements, at the San Joaquin Experimental Range (where previous cattle-squirrel relationships have been studied) and concluded that 1) the diets of cattle and ground squirrels were generally dissimilar and 2) ground squirrel consumption of the net above ground plant production was only a small amount. Further research is apparently needed to develop a final conclusion.

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GUIDELINES FOR DETERMINING HABITAT SUITABILITY INDEX (HSI)

Species: California Ground Squirrel (Spermophilus beecheyi; Formerly Beechey Ground Squirrel)

Cover Types: Grassland; Agricultural Field and Row Crops; Deciduous Treeland (Orchards)

Ecoregion: 2610 - The Central Valley of California

HABITAT RELATIONSHIPS

Range Size

Almost all activities take place within 137.2 m (150 yds.) from the ground squirrel's burrow system; or about 5.9 ha (14.3 ac.) in extent. However, some movements to 1,097 m (1,200 yds) have been detected (Evans and Holdenried 1943). The home range may be permanently maintained or shifted to a new area, depending upon annual shifts in environmental conditions. Young of the year have the greatest tendency to establish adult ranges in new territory; always in areas of lower squirrel density.

Optimum Habitat Composition

Linsdale (1946; p. 450) concluded that a favored living place for ground squirrels, in the grassland community of the Hastings Natural History Reservation (Monterey County), has "...scattered trees, scattered bushes, sparse low grass, dry, loose soil, an area which slopes toward the sun, moderate sunshine, dryness, few carnivores, moderate heat, moderate humidity, light wind, protective obstacles, light, burrows, and other squirrels." Tomich (1962) reports on agricultural setting, in the Sacramento Valley, in which the California ground squirrel thrives as: typically large farms of barley, grain hay, milo maize, tomatoes, sugar beets and dry beans; irrigated pasture, stubble, and grassland grazed by sheep and beef cattle; fallow land and field borders of weedy annual vegetation.

Life Requisite Values

Food - Related to the abundance, availability and diversity of green herbage, seeds, nuts, bulbs, acorns and many agricultural row crops, orchard crops, grains and pasture. [V_1]

Water - The absence of free water is not limiting to California ground squirrels as feeding patterns are shifted towards greater succulence during dry parts of the year and adult squirrels estivate ("summer sleep") in their borrows, thus escaping the dry conditions. However, where free water is available, ground squirrels will exceed their normal home range to drink. [V_2]

Cover - Related primarily to the physiognomy of the sample site and the presence of burrows. Prefered sample sites include an open character with sparse, low vegetation of grasses and weedy annual forbs. Due to summer estivation and winter hibernation, above ground activity of squirrels may be difficult to detect during some months; particularly August-September and December-January, respectively. Hence, the presence of burrows indicate present use of the area by these squirrels. Even abandoned burrows may be recolonized as environmental conditions change; either on the sample site or in adjacent areas (i.e., dispersement of young-of-the-year). [V_3]

Interspersion - Habitat interspersion, or the lack thereof, is not limiting to the California ground squirrel, so long as the "open" character of the area is maintained. However, ground squirrels prefer a pseudointerspersion of scattered inanimate objects (e.g., fence posts, stumps, mounds, rocks, etc.), bushes, and trees for use as basking and "lookout" promontories. [V_4]

Mechanism to Determine the Habitat Suitability Index (HSI)

The HSI equals the mean of the above Life Requisite Values.

$$HSI\ (\leq 1.0) = \underline{\qquad\qquad\qquad}$$

HABITAT EVALUATION CRITERIA

Food - Related to the abundance, availability, and diversity of green herbage, seeds, nuts, bulbs, and agricultural row crops, orchard crops, grains, and pasture. In natural areas, nonlegume herbs form the bulk of the ground squirrels diet, particularly tarweed (*Madia* spp.) and filaree (*Erodium* spp.). Acorns, when present, form an important winter food as they are cached during fall months. During sample site inspections, optimal diversity is difficult to assess because it includes seasonal changes in the annual vegetation. However, the optimum includes dominance by nonlegume forbs followed by equal abundance of grasses, legumes and in some areas, woody vegetation.

Food Value is a function of:

[V_1] The abundance, availability, and diversity of suitable food types within 137.2 m (150 yds.) from the sample site.

(a) Suitable food types abundant, readily available, and diverse with nonlegume forbs dominant; within 137.2 m (150 yds.) from sample site . . . . (0.8 - 1.0 rating)

(b) Suitable food types scattered, less abundant (medium density), less available (concentrated from 68.6 - 137.2 m or 75 - 150 yds.), or less diverse (nonlegume forbs less than dominant) . . . . (0.4 - 0.7 rating)

(c) Suitable food types
scarce, not available
within 137.2 m (150 yds)
or of monotypic diversity . . . . (0.0 - 3.0 rating)

Food Value [V_1] = ____________________

Water - Related to the availability of free water. Since the lack of free water is not limiting to ground squirrels, low ratings do not apply. However, the presence of free water does improve the habitat suitability of the area and increases the HSI of the sample site.

Water Value is a function of:

[V_2] The availability of free water within 402 m (0.25 mi) from the sample site.

(a) Free water available
within 137.2 m (150 yds) . . . . (0.8 - 1.0 rating)

(b) Free water available
between 137.2 m (150 yds)
and 402 m (0.25 mi) . . . . (0.6 - 0.7 rating)

(c) Free water not available
within 402 m (0.25 mi) . . . . DO NOT USE AS A
LIFE REQUISITE VALUE IN THE HSI FORMULA BELOW.

Water Value [V_2] = ____________________

Cover - Related not to what vegetation is present, but more or less to what vegetation is not present; i.e., the "open" character of the land. California ground squirrels prefer surface cover which is "open" with conspicuously short vegetation which extends the visibility range for predator detection. Also related to the presence of burrows, active or abandoned, which provides for the rearing of young, hibernation and estivation, food caches, escape cover, and shelter from the elements.

Cover Value is a function of:

[V_3] The presence of burrows and the "openness" of the area within 137.2 m (150 yds) from the sample site.

(a) Grasses and forbs less than 0.3 m (1 ft.) tall, scattered (low density), and burrows abundant . . . . (0.8 - 1.0 rating)

(b) Grasses and forbs between 0.3 - 0.6 m (1-2 ft.) tall, of medium density, runways present, and/or burrows present but scattered . . . . (0.4 - 0.7 rating)

3 (c) Grasses and forbs taller than 0.6 m (2 ft.), dense, lacking runways, and/or burrows scarce or unavailable . . . . . (0.0 - 0.3 rating)

Cover Value [V_3] = ________________

Interspersion - Related to the absence of interspersion between grassland, agricultural land, open rangeland, or any other open areas with dense shrubs and trees. Ground squirrels prefer open areas with scattered trees, bushes, or inanimate objects (e.g., fence posts, stumps, mounds, rocks, etc.) for use as basking and "lookout" promontories.

Interspersion Value is a function of:

[V_4] The "open" character of the area within 137.2 m (150 yds) from the sample site and the presence of promontories.

(a) Sample site conspicuously open with well scattered, equally spaced promontories . . . . (0.8 - 1.0 rating)

(b) Sample site conspicuously open with scattered inanimate promontories and small, moderately dense clumps of trees or bushes . . . . (0.5 - 0.7 rating)

(c) Sample site moderately open with moderate interspersion of trees and shrubs . . . . (0.3 - 0.4 rating)

(d) Sample site partially open with open grassy areas well interspersed with dense stands of trees and shrubs or area predominantly trees and shrubs . . . . (0.0 - 0.2 rating)

Interspersion Value [V_4] = ______________

Habitat Suitability Index (HSI) Determination

For sample sites with free water available within 402 m (0.25 mi):

$$HSI\ (\leq 1.0) = [V_1 + V_2 + V_3 + V_4] \div 4$$

HSI = ______________________

For sample sites without free water available within 402 m (0.25 mi):

$$HSI\ (\leq 1.0) = [V_1 + V_3 + V_4] \div 3$$

HSI = __________________

Other Considerations

In addition to those inventory characteristics identified as being important for the California ground squirrel, there may still be other pertinent evaluation criteria obvious only at an on-site inspection. All criteria identified as being unique to a specific site must be incorporated (and documented) into the appropriate life requisite category as each situation dictates and considered when determining the HSI.

If any criteria listed are not applicable in a particular situation, do not use in determining the life requisite value or the HSI.

APPENDIX E

ENDANGERED SPECIES ACT – SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

January 11, 2012

Document Number: 120111031623

Toni Pennington, PhD
Tetra Tech, Inc.
1020 SW Taylor St., Suite 530
Portland, OR 97202

Subject: Species List for Lake Isabella DSM Project

Dear: Ms. Pennington

We are sending this official species list in response to your January 11, 2012 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 10, 2012.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found here.

Endangered Species Division

TAKE PRIDE® IN AMERICA

These buttons will not appear on your list.

Revise Selection

Print this page

Print species list before going on to letter.

Make Official Letter

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120111031623

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Branchinecta lynchi
  - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)
- Euproserpinus euterpe
  - Kern primrose sphinx moth (T)

Fish

- Hypomesus transpacificus
  - delta smelt (T)

Amphibians

- Rana draytonii
  - California red-legged frog (T)

Reptiles

- Gambelia (=Crotaphytus) sila

- blunt-nosed leopard lizard (E)

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Empidonax traillii extimus
  - Critical habitat, southwestern willow flycatcher (X)
  - southwestern willow flycatcher (E)

- Gymnogyps californianus
  - California condor (E)

- Vireo bellii pusillus
  - Least Bell's vireo (E)

Mammals

- Dipodomys ingens
  - giant kangaroo rat (E)

- Dipodomys nitratoides nitratoides
  - Tipton kangaroo rat (E)

- Ovis canadensis californiana
  - Sierra Nevada (=California) bighorn sheep (E)

- Sorex ornatus relictus
  - Buena Vista Lake shrew (E)

- Vulpes macrotis mutica
  - San Joaquin kit fox (E)

Plants

- Caulanthus californicus
  - California jewelflower (E)

- Monolopia congdonii (=Lembertia congdonii)
  - San Joaquin woolly-threads (E)

- Opuntia treleasei
  - Bakersfield cactus (E)

- Pseudobahia peirsonii
  - San Joaquin adobe sunburst (T)

Candidate Species

Birds

- Coccyzus americanus occidentalis

    - Western yellow-billed cuckoo (C)

Mammals

- Martes pennanti
    - fisher (C)

Quads Containing Listed, Proposed or Candidate Species:

BRECKENRIDGE MTN (238A)

MT. ADELAIDE (238B)

RIO BRAVO RANCH (239A)

OIL CENTER (239B)

STEVENS (240C)

TUPMAN (241D)

WALKER PASS (259A)

ONYX (259B)

CANE CANYON (259C)

WELDON (260A)

LAKE ISABELLA NORTH (260B)

LAKE ISABELLA SOUTH (260C)

WOOLSTALF CREEK (260D)

ALTA SIERRA (261A)

GLENNVILLE (261B)

DEMOCRAT HOT SPRINGS (261C)

County Lists

Listed Species

Invertebrates

- Branchinecta conservatio
    - Conservancy fairy shrimp (E)

- Branchinecta longiantenna
  - Critical habitat, longhorn fairy shrimp (X)
  - longhorn fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Euproserpinus euterpe
  - Kern primrose sphinx moth (T)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)
  - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
  - California red-legged frog (T)
  - Critical habitat, California red-legged frog (X)

Reptiles

- Gambelia (=Crotaphytus) sila
  - blunt-nosed leopard lizard (E)

- Thamnophis gigas
  - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
  - western snowy plover (T)

- Empidonax traillii extimus
  - Critical habitat, southwestern willow flycatcher (X)
  - southwestern willow flycatcher (E)

- Gymnogyps californianus
  - California condor (E)

- Critical habitat, California condor (X)

- Vireo bellii pusillus
  - Least Bell's vireo (E)

Mammals

- Dipodomys ingens
  - giant kangaroo rat (E)

- Dipodomys nitratoides nitratoides
  - Tipton kangaroo rat (E)

- Ovis canadensis californiana
  - Sierra Nevada (=California) bighorn sheep (E)

- Sorex ornatus relictus
  - Buena Vista Lake shrew (E)
  - Critical habitat, Buena Vista Lake shrew (X)

- Vulpes macrotis mutica
  - San Joaquin kit fox (E)

Plants

- Caulanthus californicus
  - California jewelflower (E)

- Eremalche kernensis
  - Kern mallow (E)

- Monolopia congdonii (=Lembertia congdonii)
  - San Joaquin woolly-threads (E)

- Opuntia treleasei
  - Bakersfield cactus (E)

- Pseudobahia peirsonii
  - San Joaquin adobe sunburst (T)

- Sidalcea keckii

    - Critical habitat, Keck's checker-mallow (X)
    - Keck's checker-mallow (=checkerbloom) (E)

Proposed Species

Amphibians

- Rana draytonii
    - Critical habitat, California red-legged frog (PX)

Candidate Species

Amphibians

- Rana muscosa
    - mountain yellow-legged frog (C)

Birds

- Coccyzus americanus occidentalis
    - Western yellow-billed cuckoo (C)

Mammals

- Martes pennanti
    - fisher (C)

Key:

- (E) Endangered - Listed 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.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the 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.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

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, there will be a separate line for this on the species list. 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). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 10, 2012.

APPENDIX F

CULTURAL RESOURCE CONSULTATION

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Tina Terrell, Forest Supervisor
Sequoia National Forest
1839 South Newcomb Street
Porterville, California 93257

Dear Ms. Terrell:

The U.S. Army Corps of Engineers, Sacramento District (Corps), is requesting that you participate in consultation as a signatory to the programmatic agreement (PA) that we are preparing for the Isabella Lake Dam Safety Assurance Program Project (IDSAP). We anticipate engaging in a number of actions that have the potential to adversely affect historic properties. The draft PA outlines our procedures for managing cultural resources in compliance with Section 106 of the National Historic Preservation Act, NAGPRA, and Forest regulations. Mr. Dirk Charley, your Tribal Relations Program Manager, provided our project archeologist with a list of Tribal Contacts. They will be invited to participate in consultation as concurring parties.

Currently we have seismic investigation projects planned at Brush Creek, Rincon Springs, Durrwood Creek and the toe of the Auxiliary Dam that will require Section 106 compliance. These however, will be handled separately from the PA because we anticipate that execution of the PA may take at least a year to complete.

We are sending you a copy of the draft PA to review. Following receipt of your comments, we will send the revised version to the Advisory Council on Historic Preservation, the State Historic Preservation Officer, and the identified Native American Tribes.

Please distribute this Draft PA to your technical staff for review and recommendations. We would appreciate your comments within 45 days of receipt of this letter. Thank you for engaging in this process. We are looking forward to a beneficial long term relationship with you and the Sequoia National Forest Staff as the IDP will be a lengthy, multi-year project. If you have any questions regarding the Draft PA, please contact Mr. Richard Perry, Archeologist at (916) 557-5218, or by email at richard.m.perry@usace.army.mil. Questions involving the project in general maybe addressed to Ms. Veronica Petrovsky at (196) 557-7245, or be email at veronica.v.petrovsky@usace,army.mil.

Sincerely,

E. Scott Clark

Francis C. Piccola
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Monty Bengochia, Tribal Chairman
Bishop Paiute Tribe
50 Tu Su Lane
Bishop, California. 93514

APR 08 2009

Dear Mr. Bengochia:

The Sacramento District, U.S. Army Corps of Engineers (COE) is writing to inform you of our proposed trenching activities in the Sequoia National Forest (SNF) to determine the potential for seismic activity that may have an effect on overall stability of Lake Isabella Dam. The seismic investigations are part of the preliminary investigation the COE is conducting to determine the potential for failure of Lake Isabella Dam. Lake Isabella Dam has been identified as one of eight dams nationwide that have a high potential for failure based on outdated engineering, and geotechnical data. The dam already has noticeable seepage on the backside of the dam near Barlow Drive in the town of Lake Isabella. The seepage is consistent with a known fault line that runs between the main and auxiliary dams. We are proposing to excavate backhoe trenches at three separate locations within the Kernville Ranger District boundaries. The trenches will be approximately 30 meters long by three meters deep.

After the COE geologist selected the three locations for the trenches, contract archeologist from URS Corporation surveyed each area for archeology sites. The site locations are shown on enclosure 1. At two of the locations, existing archeology sites were found and the site forms updated. The URS archeologists recorded one new site at Corral Creek. In order to insure that the three sites would not be affected by the trenching project, the project geologist selected trench locations away from the sites. Additionally, URS archeologists hand augured the trench locations to insure that there was not the presence of buried cultural deposits. The result of the investigations, and the site records are in the enclosed report (enclosure 2).

In order to insure that the proposed seismic trenching project is in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended, the COE submitted the results of the URS study to the SNF, Kernville Range District Archeologist, Mr. Dennis Daugherty. Mr. Daugherty reviewed the document and concluded that it was a high quality document that encompassed all aspects of the project. The approved report was transmitted to the acting SNF Archeologist, Ms. Karen Miller who approved the proposed project as meeting an exemption from further consultation pursuant to Stipulation VII,A.1: No heritage resources recorded within the Area of Potential Effects (enclosure 3). In addition to our project being cleared for cultural resources, our consultant, URS, will have an onsite archeological monitor. The monitor will be the same individual who recorded the sites and hand augured the proposed trench locations.

The trenching is scheduled to commence in mid-April 2009. We apologize for the very short time frame of notification. We just recently received our clearance from the SNF and have to act quickly on obtaining the seismic information. However, we are in the process of developing a programmatic agreement for the Lake Isabella Dam Safety Assurance Program Project. You will be invited to be a concurring party to the agreement. Additionally, we will be discussing developing separate burial agreements with the three Federally Recognized Tribes for the potential for future archeology field work on the SNF for out project.

If you have any questions or comments regarding the seismic trenching project, please contact Mr. Richard Perry, Archaeologist, at (916) 557-5218, or by email at richard.m.perry@usace.army.mil. If you have questions about the Project in general please contact, Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email at veronica.v.petrovsky@usace.army.mil.

Sincerely,

Francis C. Piccola
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

APR 08 2009

Mr. Clarence Atwell, Tribal Chairman
Santa Rosa Tachi Yokut Rancheria
16835 Alkali Drive
Lemoore, California. 93245

Dear Mr. Atwell:

The Sacramento District, U.S. Army Corps of Engineers (COE) is writing to inform you of our proposed trenching activities in the Sequoia National Forest (SNF) to determine the potential for seismic activity that may have an effect on overall stability of Lake Isabella Dam. The seismic investigations are part of the preliminary investigation the COE is conducting to determine the potential for failure of Lake Isabella Dam. Lake Isabella Dam has been identified as one of eight dams nationwide that have a high potential for failure based on outdated engineering, and geotechnical data. The dam already has noticeable seepage on the backside of the dam near Barlow Drive in the town of Lake Isabella. The seepage is consistent with a known fault line that runs between the main and auxiliary dams. We are proposing to excavate backhoe trenches at three separate locations within the Kernville Ranger District boundaries. The trenches will be approximately 30 meters long by three meters deep.

After the COE geologist selected the three locations for the trenches, contract archeologist from URS Corporation surveyed each area for archeology sites. The site locations are shown on enclosure 1. At two of the locations, existing archeology sites were found and the site forms updated. The URS archeologists recorded one new site at Corral Creek. In order to insure that the three sites would not be affected by the trenching project, the project geologist selected trench locations away from the sites. Additionally, URS archeologists hand augured the trench locations to insure that there was not the presence of buried cultural deposits. The result of the investigations, and the site records are in the enclosed report (enclosure 2).

In order to insure that the proposed seismic trenching project is in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended, the COE submitted the results of the URS study to the SNF, Kernville Range District Archeologist, Mr. Dennis Daugherty. Mr. Daugherty reviewed the document and concluded that it was a high quality document that encompassed all aspects of the project. The approved report was transmitted to the acting SNF Archeologist, Ms. Karen Miller who approved the proposed project as meeting an exemption from further consultation pursuant to Stipulation VII,A.1: No heritage resources recorded within the Area of Potential Effects (enclosure 3). In addition to our project being cleared for cultural resources, our consultant, URS, will have an onsite archeological monitor. The monitor will be the same individual who recorded the sites and hand augured the proposed trench locations.

The trenching is scheduled to commence in mid-April 2009. We apologize for the very short time frame of notification. We just recently received our clearance from the SNF and have to act quickly on obtaining the seismic information. However, we are in the process of developing a programmatic agreement for the Lake Isabella Dam Safety Assurance Program Project. You will be invited to be a concurring party to the agreement. Additionally, we will be discussing developing separate burial agreements with the three Federally Recognized Tribes for the potential for future archeology field work on the SNF for out project.

If you have any questions or comments regarding the seismic trenching project, please contact Mr. Richard Perry, Archaeologist, at (916) 557-5218, or by email at richard.m.perry@usace.army.mil. If you have questions about the Project in general please contact, Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email at veronica.v.petrovsky@usace.army.mil.

Sincerely,

E. Scott Clark

Francis C. Piccola
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO ATTENTION OF

Environmental Resources Branch

APR 08 2009

Mr. Neil Peyron, Tribal Chairman
Tule River Reservation
340 N. Reservation Road
Porterville California. 93257

Dear Mr. Peyron:

The Sacramento District, U.S. Army Corps of Engineers (COE) is writing to inform you of our proposed trenching activities in the Sequoia National Forest (SNF) to determine the potential for seismic activity that may have an effect on overall stability of Lake Isabella Dam. The seismic investigations are part of the preliminary investigation the COE is conducting to determine the potential for failure of Lake Isabella Dam. Lake Isabella Dam has been identified as one of eight dams nationwide that have a high potential for failure based on outdated engineering, and geotechnical data. The dam already has noticeable seepage on the backside of the dam near Barlow Drive in the town of Lake Isabella. The seepage is consistent with a known fault line that runs between the main and auxiliary dams. We are proposing to excavate backhoe trenches at three separate locations within the Kernville Ranger District boundaries. The trenches will be approximately 30 meters long by three meters deep.

After the COE geologist selected the three locations for the trenches, contract archeologist from URS Corporation surveyed each area for archeology sites. The site locations are shown on enclosure 1. At two of the locations, existing archeology sites were found and the site forms updated. The URS archeologists recorded one new site at Corral Creek. In order to insure that the three sites would not be affected by the trenching project, the project geologist selected trench locations away from the sites. Additionally, URS archeologists hand augured the trench locations to insure that there was not the presence of buried cultural deposits. The result of the investigations, and the site records are in the enclosed report (enclosure 2).

In order to insure that the proposed seismic trenching project is in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended, the COE submitted the results of the URS study to the SNF, Kernville Range District Archeologist, Mr. Dennis Daugherty. Mr. Daugherty reviewed the document and concluded that it was a high quality document that encompassed all aspects of the project. The approved report was transmitted to the acting SNF Archeologist, Ms. Karen Miller who approved the proposed project as meeting an exemption from further consultation pursuant to Stipulation VII,A.1: No heritage resources recorded within the Area of Potential Effects (enclosure 3). In addition to our project being cleared for cultural resources, our consultant, URS, will have an onsite archeological monitor. The monitor will be the same individual who recorded the sites and hand augured the proposed trench locations.

The trenching is scheduled to commence in mid-April 2009. We apologize for the very short time frame of notification. We just recently received our clearance from the SNF and have to act quickly on obtaining the seismic information. However, we are in the process of developing a programmatic agreement for the Lake Isabella Dam Safety Assurance Program Project. You will be invited to be a concurring party to the agreement. Additionally, we will be discussing developing separate burial agreements with the three Federally Recognized Tribes for the potential for future archeology field work on the SNF for out project.

If you have any questions or comments regarding the seismic trenching project, please contact Mr. Richard Perry, Archaeologist, at (916) 557-5218, or by email at richard.m.perry@usace.army.mil. If you have questions about the Project in general please contact, Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email at veronica.v.petrovsky@usace.army.mil.

Sincerely,

E. Scott Uller

for Francis C. Piccola
Chief, Planning Division

Enclosures

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
SACRAMENTO, CA 94296-0001
(916) 653-6624 Fax: (916) 653-9824
calshpo@ohp.parks.ca.gov
www.ohp.parks.ca.gov

July 15, 2009 In Reply Refer To: COE080801C

Francis C. Piccola
Chief, Planning Division
Department of the Army
U.S. Army Engineer District, Sacramento
1325 J Street
Sacramento, California 95814-2922

Re: Continued Consultation Lake Isabella Dam Safety Assurance Program, Kern County, California

Dear Mr. Piccola:

Thank you for continuing consultation with my office regarding the Lake Isabella Dam Safety Assurance Program. The U.S. Army Corps of Engineers (COE), Sacramento District, is seeking my concurrence on their determination of effects that the subject undertaking will have on historic properties pursuant to 36 CFR Part 800 (as amended 8-05-04) regulations implementing Section 106 of the National Historic Preservation Act (NHPA). The COE is currently investigating courses of action for Section 106 consultation regarding future components of this undertaking designed to address the seismic and hydrologic deficiencies of the Lake Isabella Dams (2), which have been identified as high hazard dams. In addition to your letter of June 24, 2009 (and attachments), additional information regarding this project was provided by the COE at a meeting between William Soule and Cheryl Foster-Curley of my staff and Sannie Osborn and Richard Perry of your staff on June 29, 2009. Based on this meeting and my review of your letter, I have the following comments:

1) The COE needs to provide a project description, even if it is largely based on conjecture, and define an Area of Potential Effects (APE) pursuant to 36 CFR Part 800.4(a)(1). Both the project description and the APE can be revised and/or amended as necessary later in the consultation. These areas need to be addressed if this undertaking is going to proceed with a programmatic agreement (PA) as proposed by the COE.

2) Please keep me apprised of your progress in securing consultation from the appropriate Native American tribes, organizations, and individuals.

3) Before consulting further with me regarding the proposed PA, please continue to refine this document in consultation with the United State Forest Service, Sequoia National Forest, so that I can be assured that both agencies are reasonably satisfied with the initial draft document.

4) Please notify the Advisory Council on Historic Preservation of this undertaking (include documentation), inform them that it is likely to have an adverse effect, and invite them to participate in the consultation and the PA pursuant to 36 CFR Part 800.6.

5) Regarding your reference to an environmental impact statement on the first page of your letter; my office does not, as a general policy, comment on National Environmental Policy Act (NEPA) documents unless they are specifically written to meet Section 106 regulations.

6) In the absence of a project description and the determination of an Area of Potential Effects by the COE, I cannot at this time comment on any historic property identification efforts completed to date, or proposed in the future, for the Lake Isabella Dam Safety Assurance Program.

Thank you for seeking my comments and for considering historic properties in planning your project. If you require further information, please contact William Soule, Associate State Archeologist, at phone 916-654-4614 or email wsoule@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

United States Department of Agriculture | Forest Service | Sequoia National Forest Giant Sequoia National Monument | Kern River Ranger District Lake Isabella Office P.O. Box 3810 Lake Isabella, CA 93240 (760) 379-5646 www.fs.fed.us/r5/sequoia/ | Kernville Office P.O. Box 9 Kernville, CA 93238 (760) 376-3781

File Code: 2360
Date:

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
California Department of Parks and Recreation
P.O. Box 942896
Sacramento , CA 94296-0001

Dear Mr. Donaldson

Please find enclosed the National Register of Historic Places (NRHP) evaluation report entitled ***Historic Resource Evaluation Report for the Lake Isabella Forest Service Administrative Complex Near Lake Isabella, Kern County, California.*** The report was prepared by architectural historian Douglas W. Dodd in December, 2009. A portion of the Administrative Complex, an elevated water storage tank, was previously evaluated by Dr. Dodd in Januay, 2009 (*Historic Resource Evaluation Report for the Lake Isabella Water System Project, Lake Isabella, Kern County, California*: *Report R2009051354035*). The water tower was found ineligible for listing in the National Register of Historic Places. Subsequent consultation between the Sequoia National Forest and the Office of Historic Preservation yielded an agreement that the water tower should be re-evaluated in the broader context of the administrative complex. The Sequoia National Forest undertook to complete the evaluation regarding the administrative compound and seeks to initiate consultation with your office under 36 CFR 800, implementing regulations of the National Historic Preservation Act, for the purpose of requesting concurrence with the determination findings of the enclosed report.

The Lake Isabella Forest Service Administrative Complex originally served as the U.S. Army Corps of Engineers' Isabella Project Headquarters. The compound is comprised of four areas: the administration building, the overlook area, the service yard, and the elevated water tank. For the purposes of the current evaluation, the period of significance was determined to be from 1948 (the year dam construction began) to 1960 (the fifty year requirement for NRHP eligibility). The complex consists of fifteen (15) building and structures. The elevated water tank and seven wood frame structures were constructed by the U.S. Army Corps of Engineers between 1948 and 1955. An additional six metal buildings were erected by the Corps between 1960 and 1991. Under Forest Service Administration, a wooden storage shed, a metal helitack training tower, a pump house were constructed on the site, and additions or major alterations were made to three of the Corps-era buildings. The compound is landscaped with pine trees and a grass lawn near the administrative building. The remaining undeveloped areas are dominated by native vegetation.

The overall Administrative Complex has been significantly altered over the years and currently represents a utilitarian facility for forest administrative functions. The core buildings (administration building, garage/fire office, car garage/mechanic shop/engine bay, and wood shop) have been substantially altered and no longer retain their original appearance. Alterations to these facilities include structural additions, interior remodeling, and new doors and windows. The complex's overall appearance has significantly changed due to new construction including a new wing to the administration building (2002-2003); a new storage shed (1990); a welding shop addition to the car garage/mechanic shop/engine bay (2003); a new oil and grease shed, a new paint storage shed and electrical supply shed (1974); a new recreation storage building (1981); a new plumbing shed and janitorial supply shed (1969); an electrical shed and pump house (2009); and the helitack training tower (1990s). Of the 15 existing structures, a total of 8 buildings (53%) were built after 1960 and are each less than 50 years in age. Of the remaining 7 buildings that are more than 50 year old, it is determined that five (5) of the structures no longer retain key character-defining elements that would have contributed to conveying the appearance of the facility during the period of historical significance.

The compound is situated at Engineer Point between the Isabella Main Dam and the Isabella Auxiliary Dam and served as the Corps headquarters for dam construction. Although the compound is contextually associated with the Isabella Dam construction, these components have only recently reached the 50 year benchmark for NRHP eligibility and they currently remain under the Corp of Engineer's jurisdiction. The facilities have yet to be evaluated for NRHP eligibility. Given the contextual relation between the dams and the administrative compound, it is expected that if the dams are evaluated themselves, the Administrative Complex would not be a contributing element due to the severity of the compound's loss of integrity.

The USDA Forest Service, Sequoia National Forest proposed a water line improvement project for the water system serving the Lake Isabella compound. Proposed activities include demolition of miscellaneous existing features and underground utilities, including the possible demolition and disposal of the existing elevated steel water tank and tower. Project activities also consist of construction a new 30-000-gallon water storage tank, pump house (with duplex pressure pumps, pressure tanks, piping, controls, and electrical service), security fence installation, and a new submersible pump with controls in the existing well. Aside from the elevated steel water tank and tower removal, the majority of proposed activities were reviewed and cleared under the terms of the *Programmatic Agreement Among the U.S.D.A. Forest Service, Pacific Southwest Region, California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Management of Forest Service Administrative Buildings in California* (Admin Building PA). The elevated steel water tank and tower demolition and disposal are contingent pending the review and concurrence regarding the current evaluation. The Sequoia National Forest conducted the current evaluation for the NRHP under section 106 of the National Historic Preservation act of 1966 (16 USC 470) and procedures of the Advisory Council on Historic Preservation (36 CFR 800).

The Forest Service concurs with the finding of Douglas W. Dodd that the features and structures associated with the Lake Isabella Forest Service Administrative Complex are not eligible for the NRHP. We agree that neither the entire complex not its individual building and structures appear to be eligible for inclusion in the National Register of Historic Places.

The Sequoia National Forest requests concurrence with the determination findings of the enclosed report. If you have any questions or need any additional information regarding the recommendations outlined in this letter, please contact Kern River Ranger District Archaeologist, Dennis Dougherty, at (760) 376-3781 (ext. 635) or by email at ddougherty@fs.fed.us; or Forest Archaeologist, Karen Miller, at (559) 784-1500 (ext. 1132) or by email at kmiller@fs.fed.us.

Sincerely,

Tina J. Terrell
Forest Supervisor

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
SACRAMENTO, CA 94296-0001
(916) 653-6624 Fax: (916) 653-9824
calshpo@ohp.parks.ca.gov
www.ohp.parks.ca.gov

March 20, 2010

Reply in Reference To: USFS100210A

Tina J. Terrell
Forest Supervisor
Sequoia National Forest
1839 South Newcomb Street
Porterville, CA 93257-9353

Re: Section 106 Consultation for Determination of Eligibility of Lake Isabella Forest Service Administrative Complex, Kern County

Dear Ms. Terrell:

Thank you for initiating consultation regarding the United States Forest Service (USFS) efforts to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f), as amended, and its implementing regulation found at 36 CFR Part 800.

The USFS is requesting my concurrence with their determination that the Lake Isabella Forest Service Administrative Complex is ineligible for listing as a district in the National Register of Historic Places (NRHP) and furthermore, that no buildings within the Lake Isabella Forest Service Administrative Complex are individually eligible for NRHP listing. The complex consists of 15 buildings and structures and the USFS has determined that the complex's period of significance is from 1948 to1960. The USFS contends that due to significant alterations to the complex's original layout and structures in conjunction with the construction of new buildings at the complex, the site's overall integrity has been compromised.

Of the 15 buildings evaluated for this determination, eight are less than 50 years of age. Of the remaining seven, only two, the Overlook Public Restrooms and Small Engine Shed have been determined to have retained their integrity but do not appear to be individually eligible for the NRHP. The other five consist of the Administrative building, Garage/Fire Office, Mechanic Shop and Engine Bay, Wood Shop and an elevated Water Tank. These five structures have been subject to structural modifications and do not convey the facility's appearance during its period of significance.

In addition to you letter, you have submitted the following document that contains photographs, maps delineating the project's location and Area of Potential Effects (APE), historic context and DPR forms for all of the subject resources:

- *Historic Resource Evaluation Report for the Lake Isabella Forest Service Administrative Complex, Near Lake Isabella, Kern County, California (*Dodd: December 2009)

After reviewing the submitted documentation, I have no objection to your determination that the Lake Isabella Forest Service Administrative Complex is ineligible for listing as a historic district in the NRHP and that none of the buildings located at the complex are individually eligible for NRHP listing.

Thank you for seeking my comments and considering historic properties as part of your project planning. If you have any questions or concerns, please contact Ed Carroll of my staff at (916) 653-9010 or at email at ecarroll@ca.parks.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 12 2010

Mr. Ruben Barrios Sr., Chairman
Tachi Yokut Tribe
P.O. Box 8
Lemoore, California 93245

Dear Mr. Barrios:

The U.S. Army Corps of Engineers (Corps), Sacramento District, requests your participation as a concurring party in the development of a Programmatic Agreement (PA) for the Lake Isabella Dam Safety Assurance Program project at Lake Isabella Dam in Kern County. We are also inviting the Tule River Indian Reservation and the Bishop Paiute Tribe to participate in the PA for the project.

On May 4, 2009, we sent a letter to your predecessor Mr. Clarence Atwell, informing him of the proposed project and our efforts to identify cultural resources that may be affected by the project (enclosure 1). In our letter, we also requested any information regarding areas of traditional cultural or spiritual interest to your Tribe in the Lake Isabella area. To date, we have not received a response to our letter.

Since the proposed project may adversely cultural resources eligible for listing in the National Register of Historic Places, we have developed a PA to consider the potential effects and ways to mitigate these effects. The PA has been reviewed and accepted by the Sequoia National Forest and the Bureau of Land Management. We are now requesting that you and the other two Federally recognized Tribes review the draft PA and determine if you wish to participate in its development and implementation as a concurring party, and submit any comments or suggestions that you may have (enclosure 2).

The Isabella Dam system is composed of two dams: the main dam and the auxiliary dam directly east of the main dam. The area of potential effects (APE) for the initial dam safety study is shown on enclosure 3. The APE boundary follows the shoreline since the pool elevation would be lowered for reconstruction of the auxiliary dam. Lowering the pool may expose submerged archeology sites. As the project develops and the final alternative is approved, the APE will very likely need to be modified.

Please contact us if you are interested in participating with the Corps in the development and implementation of the PA for the Lake Isabella Dam Safety Assurance Program project. Also, please let us know if your Tribe has any areas of traditional cultural interest in the Lake Isabella area. We would appreciate a reply within 45 days of your receipt of this letter. If you have any questions or comments, please contact Mr. Richard Perry, Archeologist, at

(916) 557-5218, or email: richard.m.perry@usace.army.mil. Government-to-Government consultation questions may be referred to our Tribal liaison Mr. Mark Gilfillan at (970) 243-1199, x18, or email: mark.a.gilfillan@usace.army.mil. Project-specific questions may be directed to Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email: veronica.v.petrovsky@usace,army.mil.

Sincerely,

E. Scott Clark

Alicia E. Kirchner
Chief, Planning Division

Enclosures

Copy furnished w/ enclosures:
Mr. Lalo Franco, Cultural Resources Program Manager, Santa Rosa Rancheria - Tachi Yokut Tribe, P.O. Box 8, Lemoore, California 93245

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 12 2010

Mr. Ryan Garfield, Chairman
Tule River Indian Reservation
PO Box 589
Porterville, California 93258

Dear Mr. Garfield:

The U.S. Army Corps of Engineers (Corps), Sacramento District, requests your participation as a concurring party in the development of a Programmatic Agreement (PA) for the Isabella Lake Dam Safety Modification Program project at Isabella Lake Dam in Kern County. We are also inviting the Bishop Paiute Tribe and the Santa Rosa Tachi Yokuts to participate in the PA for the project.

On May 4, 2009, we sent a letter to Mr. Neil Peyron, informing him of the proposed project and our efforts to identify cultural resources that may be affected by the project (enclosure 1). In our letter, we also requested any information regarding areas of traditional cultural or spiritual interest to your Tribe in the Lake Isabella area. To date, we have not received a response to our letter. Mr. Richard Perry, Archeologist, will also contact Ms. Kerri Vera, your Tribal Environmental Director, to inform her of the project. She will also be provided with a copy of the May 2009 letter.

Since the proposed project may adversely affect cultural resources eligible for listing in the National Register of Historic Places, we have developed a PA to consider the potential effects and ways to mitigate these effects. The PA has been reviewed and accepted by the Sequoia National Forest and the Bureau of Land Management. We are now requesting that you and the other two Federally recognized Tribes review the draft PA and determine if you wish to participate in its development and implementation as a concurring party, and submit any comments or suggestions that you may have (enclosure 2).

The Isabella Lake Dam system is composed of two dams: the main dam and the auxiliary dam directly east of the main dam. The area of potential effects (APE) for the initial dam safety study is shown on enclosure 3. The APE boundary follows the shoreline since the pool elevation may be lowered for remediation of the auxiliary dam. Lowering the pool may expose submerged archeology sites. As the project develops and the final alternative is approved, the APE will very likely need to be modified.

Please contact us if you are interested in participating with the Corps in the development and implementation of the PA for the Isabella Lake Dam Safety Assurance Program project. Also, please let us know if your Tribe has any areas of traditional cultural interest in the

Isabella Lake area. We would appreciate a reply within 45 days of your receipt of this letter. If you have any questions or comments, please contact Mr. Richard Perry, Archeologist, at (916) 557-5218, or email: richard.m.perry@usace.army.mil. Government-to-Government consultation questions may be referred to our Tribal liaison Mr. Mark Gilfillan at (970) 243-1199, x18, or email: mark.a.gilfillan@usace.army.mil. Project-specific questions may be directed to Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email: veronica.v.petrovsky@usace,army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

Copy furnished w/ enclosures:
Ms. Kerri Vera, Environmental Director/Archeological Resources, Tule River Indian Reservation, P.O. Box 589, Porterville, California 93258

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

MAY 12 2010

Mr. William Vega, Chairman
Bishop Paiute Tribe
50 Tu Su Lane
Bishop, California 93514

Dear Mr. Vega:

The U.S. Army Corps of Engineers (Corps), Sacramento District, requests your participation as a concurring party in the development of a Programmatic Agreement (PA) for the Isabella Lake Dam Safety Modification Program project at Isabella Lake Dam in Kern County. We are also inviting the Tule River Indian Reservation and the Santa Rosa Tachi Yokuts to participate in the PA for the project.

On May 4, 2009, we sent a letter to Mr. Tilford Denver, informing him of the proposed project and our efforts to identify cultural resources that may be affected by the project (enclosure 1). In our letter, we also requested any information regarding areas of traditional cultural or spiritual interest to your Tribe in the Isabella Lake area. To date, we have not received a response to our letter. Mr. Richard Perry, Archeologist, also called Ms. Theresa Stone, your Tribal Historic Preservation Officer, on April 28, 2010 to inform her of the project. She expressed great interest in being included as a concurring party.

Since the proposed project may adversely affect cultural resources eligible for listing in the National Register of Historic Places, we have developed a PA to consider the potential effects and ways to mitigate these effects. The PA has been reviewed and accepted by the Sequoia National Forest and the Bureau of Land Management. We are now requesting that you and the other two Federally recognized Tribes review the draft PA and determine if you wish to participate in its development and implementation as a concurring party, and submit any comments or suggestions that you may have (enclosure 2).

The Isabella Dam system is composed of two dams: the main dam and the auxiliary dam directly east of the main dam. The area of potential effects (APE) for the initial dam safety study is shown on enclosure 3. The APE boundary follows the shoreline since the pool elevation may be lowered for remediation of the auxiliary dam. Lowering the pool may expose submerged archeology sites. As the project develops and the final alternative is approved, the APE will very likely need to be modified.

Please contact us if you are interested in participating with the Corps in the development and implementation of the PA for the Isabella Lake Dam Safety Assurance Program project. Also, please let us know if your Tribe has any areas of traditional cultural interest in the

Isabella Lake area. We would appreciate a reply within 45 days of your receipt of this letter. If you have any questions or comments, please contact Mr. Richard Perry, Archeologist, at (916) 557-5218, or email: richard.m.perry@usace.army.mil. Government-to-Government consultation questions may be referred to our Tribal liaison Mr. Mark Gilfillan at (970) 243-1199, x18, or email: mark.a.gilfillan@usace.army.mil. Project-specific questions may be directed to Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email: veronica.v.petrovsky@usace,army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

Copy furnished w/ enclosures:
Ms. Theresa Stone, Tribal Historic Preservation Officer, Bishop Paiute Tribe Bishop, 50 Tu Su Lane, Bishop, California 93514

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

AUG 11 2010

Mr. Reid Nelson
Office of Federal Agency Programs
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue NW, Suite 803
Old Post Office Building
Washington, DC 20004

Dear Mr. Nelson:

The U.S. Army Corps of Engineers, Sacramento District (Corps) is writing the Advisory Council on Historic Preservation (ACHP) pursuant to 36 CFR 800.6(a)(1)(i)(C), to inform you of the proposed Lake Isabella Dam Safety Modification Project (Project), and to request your participation in developing a draft programmatic agreement (DPA) for resolution of potential adverse effects that may occur as a result of project construction (enclosure 1). Construction is expected to begin in 2013 with a completion date of 2017. These dates may be modified as we refine our alternatives analysis. The Project has the potential for very extensive earth moving operations.

The Isabella Dam system is comprised of two dams: the Main Dam and the Auxiliary Dam (located southeast of the Main Dam). The Lake Isabella Dams have the potential for failure from three sources: seepage under the Auxiliary Dam, seismic activity, and hydrologic issues at both dams and the spillway. An active earthquake fault has been identified on an area known as Engineer Point; a peninsula that separates the Main Dam from the Auxiliary Dam. The Main and Auxiliary Dams are typical Corps-designed earthen filled dams that were completed in 1954.

The Project is part of the Corps-wide Dam Safety Modification Program to update and repair aging dams that are in danger of failure. Isabella Dam is classified as a Dam Safety Action Class 1, on the scale of dams with the highest risk to public safety. We have been investigating the potential issues in order to determine a course of action. Our geotechnical investigations included extensive boring and trenching to determine the stability of the dams. The source of the seepage has been identified as the ingress and egress points on the Auxiliary Dam where the Borel Canal is located. The Borel Canal is the source of water for the Borel Hydroelectric Plant downstream in the Kern River Canyon.

The dams are north of the town of Lake Isabella, approximately 60-70 miles northeast of the city of Bakersfield in Kern County, California. Isabella Lake is located approximately one mile below the confluence of the North and South Forks of the Kern River. As a reservoir, the lake provides flood control, irrigation for downriver interests, recreational tourism benefits to the Kern River Valley communities, and hydroelectric power is generated by the Main Dam Power Plant, and the Borel Hydroelectric Plant for Southern California Edison. Isabella Lake is located on property formerly owned and managed by the Corps, but is now owned by the U.S. Forest Service (FS). Recreation facilities and lands associated with the reservoir are managed by the FS specifically by Sequoia National Forest (SQF). The Corps regulates the Isabella dams and reservoir and developed the water control plan for flood control within the Kern River Watershed. The Kern River Water Master directs releases for purposes other than flood control.

Since we do not have a recommended project alternative identified at this time, we have not yet defined the area of potential effects (APE). The study area is on the Lake Isabella North and South 7.5 Minute U.S.G.S. topographic quadrangle sheets updated in 1994. The enclosed map is a composite of the two quadrangles showing property ownership of the dams and surrounding areas (Enclosure 2). The study area includes the Lake Isabella Dams, which are on Corps owned property, and the Lake and shoreline. The surrounding areas include potential borrow sites for the future proposed dam replacement alternatives. When the DPA is sent to SHPO, we will submit our determination identifying the study area as the APE. In 2009 the Corps and the SQF met with SHPO to inform them of the proposed project.

We have been working with Mr. Dirk Charley, the SQF Tribal Program Coordinator who provided us with a list of Native Americans that may be interested in the project. We sent letters to 14 individuals, representing both Federally-recognized and non-recognized Tribes to weigh their potential interest. Mr. Charley also provided us with a list of three Federally-recognized Tribes for consultation who may have ancestral ties to the area. Letters with copies of the DPA were sent to the three Tribal Chairmen and their respective cultural resources coordinators. The Tribal coordinators were called two to three times each as well. Two Tribes were sent additional copies of the letters and DPA via email at their request. The initial letters with the DPA were sent almost three months ago. Thus far, no response has been received from any of the three Tribes. As part of our public involvement requirement under the National Environmental Policy Act we are planning to give presentations on the Project to the Tribal community.

We have completed a records and literature of the lake and adjacent properties. A contract was awarded to Basin Research Associates, Inc. to confirm all site locations and review and update all site record forms as necessary for all sites in the study area. They are also preparing an interactive map of the study area that includes files of the sites record forms, survey reports, and a set of new photographs of each site. The DPA has recently been reviewed by the SQF and Bureau of Land Management archeologists, and there comments have been addressed.

The DPA is being developed pursuant to 36 CFR 800.6(a)(1)(i)(C), and 36 CFR 800.14(b)(1)(ii) *When effects on historic properties cannot be fully determined prior to approval of an undertaking.* Please review the request for participation and the DPA. We understand that according to 36 CFR 800.6(a)(1)(C)(iii) you are allowed 15 days with which to reply with our request. If you have any questions or comments, please contact Mr. Richard Perry, Archeologist, at (916) 557-5218, or by email at richard.m.perry@usace.army.mil. Please contact Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245 or by email at veronica.v.petrovsky@usace.army.mil with any project specific questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

Milford Wayne Donaldson
Chairman

Susan S. Barnes
Vice Chairman

John M. Fowler
Executive Director

Preserving America's Heritage

September 3, 2010

Lt. Gen. Robert L. Van Antwerp
Chief of Engineers and Commanding General
U.S. Army Corps of Engineers
441 G. Street, NW
Washington, DC 20314-1000

REF: Lake Isabella Dam Safety Modification Project, Kern County, California

Dear Lt. General Van Antwerp:

We have received documentation from the Sacramento District of the Corps of Engineers about the referenced project, including its invitation to participate in development of a Programmatic Agreement (PA) to guide consideration of historic properties as it updates and repairs Lake Isabella's Main Dam and Auxiliary Dam. Both dams have been classified as Dam Safety Action Class I, with a high risk to public safety should they fail.

In considering the Criteria for Council Involvement in Reviewing Individual Section 106 Cases (Appendix A to our regulations, 36 CFR Part 800) we believe the criteria are met for our participation in this undertaking. The project will involve important questions of policy or interpretation, as the project's potential effects to historic properties will not be determined prior to approval of the undertaking , and thus the PA may alter the way the Corps meets its responsibilities under Section 106 of the National Historic Preservation Act for the project. Accordingly, the Advisory Council on Historic Preservation will participate in consultation to help ensure historic properties are fully considered in this important dam safety modification project.

Section 800.6(a)(1)(iii) of our regulations requires that we notify you, as the Commander of the Corps of Engineers, of our decision to participate in consultation. By copy of this letter we are also notifying Ms. Alicia E. Kirchner, Chief of the Planning Division of the Sacramento District, of this decision.

Our participation in this consultation will be handled by Dr. Tom McCulloch who can be reached at 202-606-8554 or at tmcculloch@achp.gov. We look forward to working with the Corps of Engineers on this undertaking.

Sincerely,

John M. Fowler
John M. Fowler
Executive Director

ADVISORY COUNCIL ON HISTORIC PRESERVATION

1100 Pennsylvania Avenue NW, Suite 803 • Washington, DC 20004
Phone: 202-606-8503 • Fax: 202-606-8647 • achp@achp.gov • www.achp.gov

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF
Environmental Resources Branch

MAY 17 2011

Milford Wayne Donaldson
State Historic Preservation Officer
California Department of Parks and Recreation
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

In accordance with Section 106 of the National Historic Preservation Act and its implementing regulation 36 CFR part 800, we are writing in regard to a programmatic agreement (PA), pursuant to 36 CFR 800.14(b), that we have prepared for the Isabella Lake Dam Safety Modification Study Project (Project) that we are planning at Isabella Lake, Kern County, California. Additionally, we are writing pursuant to 36 CFR 800.4(a)(1) to inform you of our determination of the area of potential effects (APE). The U.S. Army Corps of Engineers (Corps) has been in consultation with your office on three prior occasions for small related projects during our data gathering phase of the Project. In a letter dated June 24, 2009 we provided you with a description of planned efforts and the purpose for our proposed project (enclosure 1). We met in your office with Bill Soule and Sequoia National Forest (SQF) personnel on June 29, 2009 to further discuss the project. During this meeting Mr. Soule delayed any further review pending identification of the APE. Your file number for the Project is COE0801C.

We have identified an APE for the Isabella Lake study. The APE is based on the gross pool elevation. Our studies show that the Main and Auxiliary Dams would require some level of remediation because they have a high risk of failure due to significant seismic, seepage, and hydrologic issues. We are developing remediation measures that will address these issues. The APE is on the Lake Isabella North, T 27 S, and R 32 E, and Lake Isabella South, T 26 S, and R 33 E. Both maps had minor revisions made to them in 1994. The third topographic map, the Weldon quadrangle, T 26 S, and R 33 E, was also revised in 1994. We recently located an old real estate map that showed flowage easements on the south fork of the Kern River between the eastern edge of Isabella Lake and Sierra Way on the Weldon quadrangle. The flowage easements have been added to the APE accordingly. The enclosed map is a composite of the three quadrangles showing the gross pool elevation, the two dams, areas that may be affected by construction, and two potential borrow sites on Bureau of Land Management property that are not contiguous with the lake (enclosure 2).

We have consulted with the Advisory Council on Historic Preservation (ACHP), the Bureau of Land Management, Bakersfield Office (BLM), the SQF and the Bishop Paiute Tribe, the Tule River Indian Tribe, and the Santa Rosa Tachi Yokut Rancheria. The ACHP agreed to participate in a letter dated September 3, 2010 (enclosure 3). The PA reflects the inclusion of comments that were provided by Ms. Karen Miller, Forest Archeology with the SQF, and, Ms. Kimberly Cuevas, formerly with the BLM in Bakersfield. The PA has been reviewed and accepted by Ms. Cuevas's replacement at the BLM, Ms. Tamara Whitley. After we receive your comments on the PA we will forward the amended version to the ACHP for their review.

We wrote the three federally recognized tribes by mail on May 12, 2010, and followed up with telephone calls (enclosures 4-6). Our project archeologist, Mr. Richard Perry spoke directly with Mr. Lalo Franco from the Santa Rosa Tachi Yokut Rancheria, Ms Kerri Vera with the Tule River Indian Reservation, and Ms. Teresa Stone with the Bishop Paiute Tribe. Ms. Stone asked to have the PA sent to her private email address as well. Ultimately, none of the three tribes expressed any interest in the project or the PA.

The Corps requests your concurrence with our identification of the APE, and any comments on our draft PA. A copy of the draft PA is enclosed for your review (enclosure 7). Our Office of Counsel has also reviewed it. If you have any questions concerning this project, please contact Mr. Richard M. Perry, Archeologist, at (916) 557-5218 or e-mail at richard.m.perry@usace.army.mil. If you have any general project questions please contact Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or email at veronica.v.petrovsky@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

NOV 30 2011

Ms. Donna Miranda Begay
Tribal Chairwoman
Tübatulabel Tribe
12600 Mountain Mesa Road, Suite #B
Lake Isabella, California 93240

Dear Ms. Begay:

As was promised in my email dated September 30, 2011, we are replying to a letter dated September 27, 2011 (enclosure 1) that you sent U.S. Army Corps of Engineers, Sacramento District (Corps) regarding the Dam Safety Modification (DSM) Project at Isabella Lake Dam. The Corps is very interested with including you in our activities as we move towards remediation of the seismic and seepage problems at Isabella Lake Dam. In view of that we would like to address the four concerns you communicated in your letter.

(1) We have a draft programmatic agreement (PA) that has been circulating for review approximately two years now. Currently, we are awaiting comments from the State Historic Preservation Officer (SHPO). Originally, our project archeologist, Mr. Richard Perry, and the Sequoia National Forest (SQF) Heritage Program Manager, Ms. Karen Miller, discussed whether to keep the Tribal interests with the PA limited to federally recognized Tribes, or include the non-federally recognized Tübatulabel Tribe. We agreed to limit the tribal involvement to federally recognized tribes since the entire project is on federal property and there is the potential for issues that may necessitate the application of the Native American Graces Repatriation Act (NAGPRA). Isabella Lake Dam is on Corps owned property, but the borrow material will be extracted from SQF owned property. We had, perhaps mistakenly, assumed that the Tule River Indian Tribe was keeping you informed of our project related activities at the dam.

Based on information regarding local federally recognized tribes that may potentially be interested in our project that was provided Mr. Dirk Charley, the SQF Tribal Program Manager, we invited the Tule River Indian Tribe, Santa Rosa Tachi Yokut Rancheria, and the Bishop Paiute tribe to be concurring parties to the PA. Copies of the draft PA, and supporting documentation were sent on May 12, 2011 to the three Tribal chairmen, with copies sent to their respective cultural resources program managers (CRPM), Ms. Kerri Vega, Mr. Lalo Franco, and Ms. Teresa Stone. There was no response from the three Tribal Chairs or their CRPMs. In spite of repeated attempts to elicit interest from the three CRPMs by repeated mailings, emails, and telephone calls, no responses were received. Because of your continued interest, and that fact the proposed project is on Tübatulabel Tribe ancestral land, we are inviting you to be a concurring party to the PA.

Earlier this year on June 7, 2011, you contacted the Corps' District Tribal Liaison, Mark Gilfillan; whereupon you requested a meeting of all parties to develop a plan of action (POA) to deal with human remains should they be encountered during implementation of this project. Your email was forwarded to me by Mr. Mark Gilfillan, Corps Tribal Liaison for the Sacramento District (enclosure 2). That topic was discussed at the SQF Tribal meeting hosted by Mr. Charley in Kernville on June 8, 2011 and at the meeting the development of a POA to deal with human remains was agreed to by Richard Perry, Ms. Miller, Mr. Charley, and Ms. Vera. Future discussion regarding this POA will also include the Tübatulabel Tribe, the Tule River Indian Tribe, Santa Rosa Tachi Yokuts, and the Bishop Paiutes, the SQF Heritage Program Manager, Ms. Miller, and possibly the U.S. Forest Service NAGPRA coordinator, Mr. Frank Wozniak. We will be arranging a meeting to discuss the development of the proposed POA in the near future.

(2) The local Corps of Engineers Office in Lake Isabella is strictly a field office whose sole function is running the Isabella Lake Dam operations. The Isabella Lake DSM Project and environmental managers are located in the District office in Sacramento. Representatives from Sacramento have attended two of Mr. Charley's Tribal meetings and have given presentations regarding the Isabella Lake Dam Safety Modification Project. Mr. Gilfillan, who is from our Grand Junction, Colorado office, gave a presentation regarding tribal coordination at Mr. Charley's Tribal Program meeting in Dunlap, California in March 2011. Corp Archeologist, Mr. Perry, and project Environmental Manager, Mr. Mitch Stewart discussed the environmental and cultural resources aspects of the project at the SQF Tribal meeting in June in Kernville.

(3) In 2009, we contracted with Basin Research Associates, Inc. to conduct a records and literature search for the entire lake and surrounding areas. We have all site records, some records were updated, and all sites that are still in existence were photographed in their current condition. We can assure you that our staff and the SQF archeologists that are working with the Corps always maintain a high level of confidentiality with regard to site locations. Site locations are never released to the public, and they are not available through the State Public Information Act or as a Freedom of Information Act request. Thank you for the recently provided map of ethnographic villages in the SQF area. They are quite helpful. I forwarded your email to the SQF archeologists that are working with us.

(4) With regard to your offer to provide Tribal monitors, they are welcome assuming that the safety officer on site permits them. However, legally, the Government cannot offer them compensation. They would have to there on their own time. All geotechnical investigation sites have been surveyed by SQF archeologists from the Kernville Ranger District, who are also monitoring the geotechnical drilling and trenching work.

We hope we have addressed the concerns that were voiced in your letter. As mentioned in an earlier paragraph we are inviting you to be concurring party to our PA. Please review the enclosed draft PA document (enclosure 3) and provide your comments, if any, within 45 calendar days from the post mark date. You may notice two subjects that are usually of interest to Native American Tribes that are not addressed in the draft PA: Native American Monitors and the application of NAGPRA. As I mentioned above the Federal Government cannot provide compensation for this activity. In reference to the application of NAGPRA, the Advisory Council on Historic Preservation explicitly requires the omission of NAGPRA from Section 106 documents, as Section 106 does not support NAGPRA. NAGPRA is a separate law from the National Historic Preservation Act, and it will be complied with if the necessity arises.

If you have any questions concerning this project, please contact Mr. Richard M. Perry, Archeologist, Planning Division at (916) 557-5218 or by e-mail at: richard.m.perry@usace.army.mil. If you have any general project questions please contact Ms. Veronica Petrovsky, Project Manager, at (916) 557-7245, or by email at: veronica.v.petrovsky@usace.army.mil.

Sincerely,

E. Scott Clark

for Alicia E. Kirchner
Chief, Planning Division

Enclosures

Copy furnished (w/o encl):
Ms. Karen Miller, Heritage Resources Manager, Sequoia National Forest, 1839 S. Newcomb
Porterville, California 93257