Appendix 1
Correspondence

Appendix 1a
Public Scoping letter, mailing list and responses

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA, NE
ALBUQUERQUE, NEW MEXICO 87109-3435
FAX (505) 342-3199

Reply to
Attention of:

18 September 2003

Dear Interested Party:

The U.S. Army Corps of Engineers, Albuquerque District, in cooperation with the New Mexico Energy, Minerals, and Natural Resources Department - State Parks Division, is studying the feasibility of restoring aquatic habitat within Bottomless Lakes State Park in Chaves County, New Mexico. The study area includes Lea Lake and its outlet channel which flows southwest to an undeveloped area of the park bordered on the south by Bureau of Land Management Overflow Wetlands (Figure 1). This study, the Aquatic Habitat Restoration Feasibility Study at Bottomless Lakes State Park, commenced in August 2003 and is expected to be completed by December 2004.

The goal of the study is to determine the extent of aquatic habitat degradation and develop alternatives to restore the aquatic habitat and associated ecosystem within the study area. Potential actions that may aid in meeting this goal are: 1) improving capacity and function of outlet channel and wetland; 2) removing nonnative vegetation and clearing dead vegetation in the outflow area; 3) creating educational and interpretive opportunities to foster public understanding of wetland and aquatic ecosystem importance and function; and 4) reshaping and resloping terrain in the outflow area.

As part of the planning process, the U.S. Army Corps of Engineers, Albuquerque District will prepare an environmental assessment to analyze potential impacts of the proposed actions in accordance with the National Environmental Policy Act (NEPA). We would like your comments on this study and the potential alternatives. You may use the attached form or send a letter by close of business on 17 October 2003. Please mail or fax comments as indicated on the comment form.

A public scoping information meeting is planned for 9 October 2004. The purpose of the meeting is to explain the study process and to obtain information and ideas from the public, organizations, and agencies for use in formulating alternatives to reach the stated goal. The scoping meeting will be held on the campus of Eastern New Mexico University in Roswell, New Mexico at the Campus Union Building from 6:30 PM to 8:30 PM. The meeting will begin with a 30-minute open house to be followed by a short presentation and then time for questions and comments. Figure 2 shows a map of the campus and directions to Campus Union Building.

If you would like to remain on the mailing list for this study, please indicate so on the attached form. If we do not receive a response from you, we will assume that you do not want to remain on the mailing list and will remove your name accordingly. If you have any questions regarding this study, please contact Lynette Giesen at (505) 342-3322. Thank you for your interest in this study.

Sincerely,

T. Terry Weeks

Terry Weeks, Project Manager
Civil Planning &
Project Management Branch

Enclosure

Figure 1. Aquatic habitat restoration feasibility study area at Lea Lake in Bottomless Lakes State Park near Roswell, Chaves County, New Mexico.

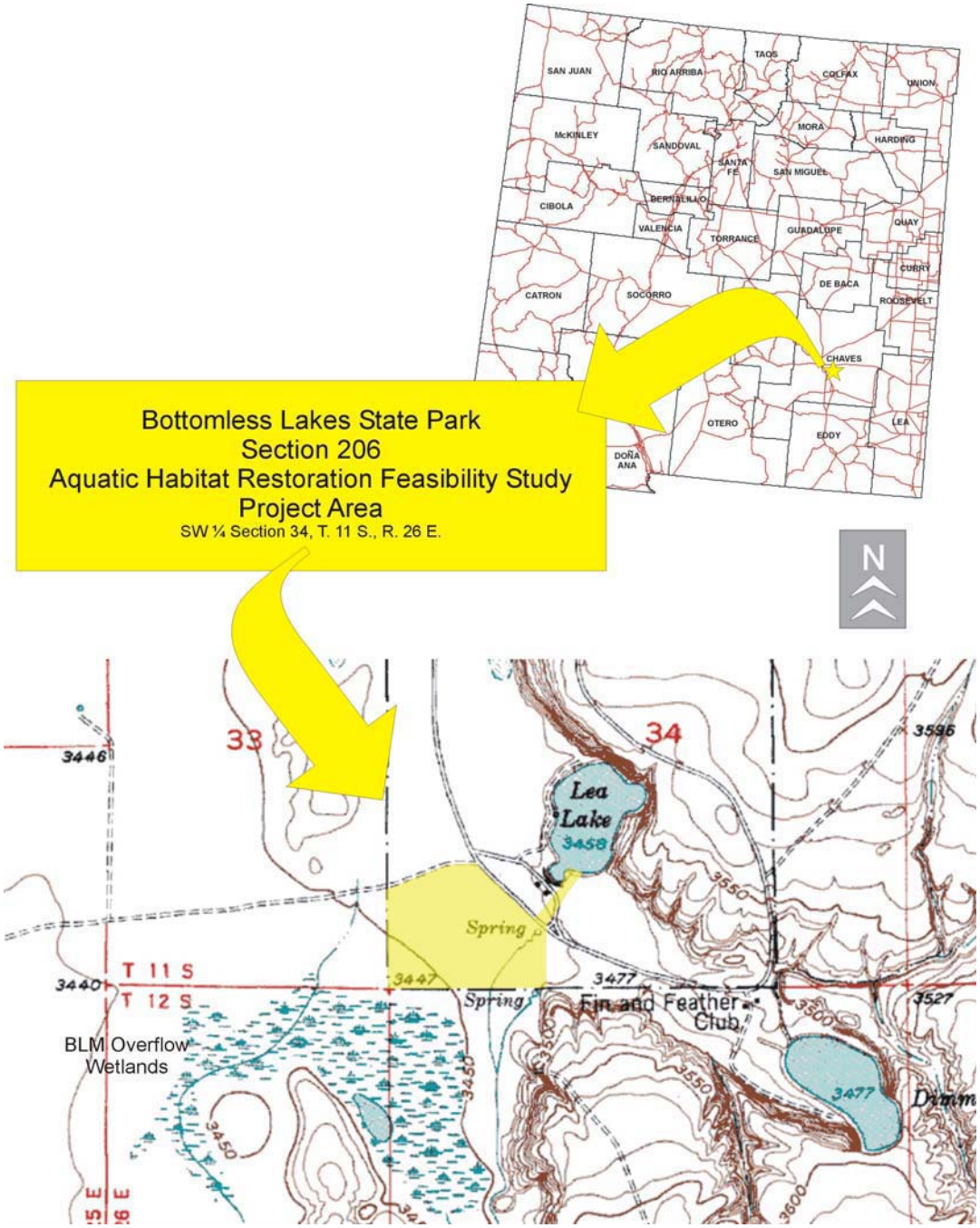
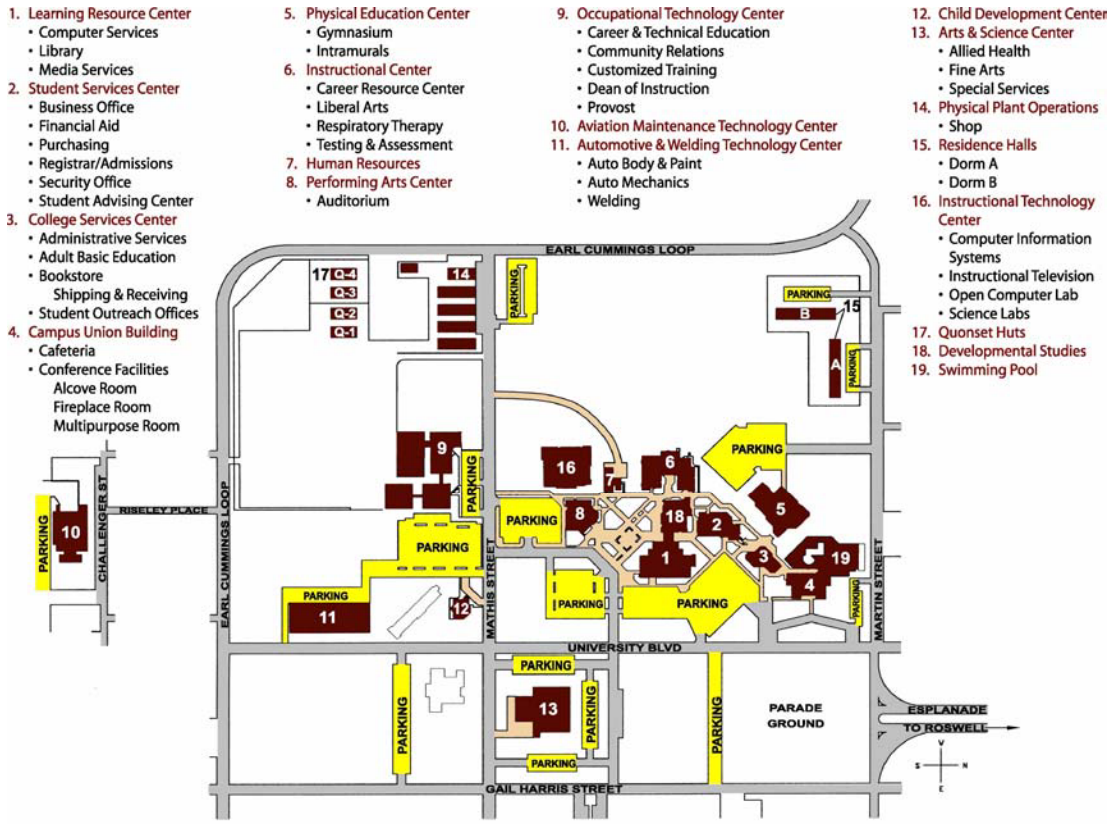


Figure 2. Map of Eastern New Mexico University Roswell campus. Campus Union Building is identified as #4 on map.



Directions to Eastern New Mexico University campus in Roswell, New Mexico

<u>If you enter Roswell on Highway 285/70 (North/South)</u>

You will enter on Main Street; remain on Main Street and go as far south as you can. You will then be at a point where you will either go right or left, turn right and then make a quick left; you will then be on University Boulevard; you will be in front of the Campus Union Building (CUB). The CUB is located at 48 University Boulevard.

<u>If you enter Roswell on Highway 70/380 (East/West)</u>

You will enter on Second Street; you will come to Main Street, turn south on to Main Street and go as far south as you can. You will then be at a point where you will either go right or left, turn right and then make a quick left; you will then be on University Boulevard; you will be in front of the Campus Union Building (CUB). The CUB is located at 48 University Boulevard.

Aquatic Habitat Restoration Feasibility Study
Bottomless Lakes State Park
Chaves County, New Mexico

Comment Form

Please make your comments specific to the proposal described in the attached letter.

1. What issues (for example, natural or cultural resources, social, or economic) are of concern to you in regards to the study?

_____

_____

_____

_____

2. Other comments about the study.

_____

_____

_____

_____

_____

Please attach additional sheets if desired.

☐ Please keep my name on the study mailing list.

☐ Please remove my name from the study mailing list.

Name: _____

Address: _____

City, State, Zip: _____

Please mail or fax your specific written comments **for receipt by close of business on 17 October 2003** to:

Terry Weeks, Project Manager
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Place NE
Albuquerque, NM 87109
Fax: (505) 342-3480

Bottomless Lakes State Park Aquatic Habitat Feasibility Study
Scoping Letter Mailing List
September 2003

Regulatory Branch
U.S. Army Corps of Engineers
4101 Jefferson Plaza NE
Albuquerque, NM 87109

U.S. Fish and Wildlife Service
Ecological Services Field Office
2105 Osuna Road, Northeast
Albuquerque, New Mexico 87113

Andrew Sandoval
New Mexico Department of Game & Fish
Conservation Services Division
P.O. Box 25112
Santa Fe, New Mexico 87504

Robert Sivinski
New Mexico Forestry and Resources Conservation Division
Energy, Minerals, and Natural Resources Department
P.O. Box 1948
Santa Fe, New Mexico 87113

Steven Patterson
Bottomless Lakes State Park
HC12, Box 1200
Roswell, NM 88201

Deputy State Historic Preservation Officer
New Mexico State Historic Preservation Bureau
228 East Palace Avenue, Room 101
Santa Fe, New Mexico 87503

Dan Baggao
Bureau of Land Management
2909 West 2nd Street
Roswell, NM 88201

Michael McGee
Bureau of Land Management
2909 West 2nd Street
Roswell, NM 88201

Rebecca King
Interstate Stream Commission
P.O. Box 25102
Santa Fe, NM 87504

Kenneth Fresquez
Office of the State Engineer
1900 West 2nd Street
Roswell, NM 88201

Craig Hipple
Office of the State Engineer
1900 West 2nd Street
Roswell, NM 88201

Kathryn Becker
New Mexico State Parks
P.O. Box 1147
Santa Fe, NM 87504

Manuel Ulibarri
Dexter National Fish Hatchery
U.S. Fish and Wildlife Service
P.O. Box 219
Dexter, NM 88203

Loney Ashcraft
Natural Resource Conservation Service
1011 S. Atkins
Roswell, NM 88201

Ken Butts
Bitter Lakes National Wildlife Refuge
4065 Bitter Lakes Road
Roswell, NM 88201

Malcom McCarty
Farm Services Agency
1011 S. Atkins
Roswell, NM 88203

James Duffy
Chaves County Extension Office
200 E. Chisum
Roswell, NM 88203

Earl Newborn
Friends of Bottomless Lakes
20 Mallard Drive
Roswell, NM 88201

Susan E. Berry
312 W. Broadway
Silver City, NM 88061

Anthony Bonanno
7 Avenida Vista Grande, Suite 330
Santa Fe, NM 87508

Richard Choi
403 N. Turner
Hobbs, NM 88240

Leslie Fernandez
1348 Dwyer Avenue
Raton, NM 87740

Larry Henderson
1302 South Country Club Circle
Carlsbad, NM 88220

Thora Padilla
P.O. Box 227
Mescalero, NM 88340

Lawrence Rael
8712 Rio Grande
Albuquerque, NM 87114

Paul Scott
P.O. Box 319
Elephant Butte, NM 87935

Orlando Sedillo
11930 Dusty Rose Road NE
Albuquerque, NM 87122

Alvin Warren
P.O. Box 913
Española, NM 87532

Herbert T. Yazhe
P.O. Box 2492
Gallup, NM 87305

GOVERNOR
Bill Richardson

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

One Wildlife Way
PO Box 25112
Santa Fe, NM 87504

Visit our website at www.gmfsh.state.nm.us
For basic information or to order free publications: 1-800-862-9310.

DIRECTOR AND SECRETARY
TO THE COMMISSION
Bruce C. Thompson

Tom Arvas, Chairman
Albuquerque, NM

Alfredo Montoya, Vice-Chairman
Alcalde, NM

David Henderson
Santa Fe, NM

Jennifer Atchley Montoya
Las Cruces, NM

Peter Pino
Zia Pueblo, NM

Guy Riordan
Albuquerque, NM

Leo Sims
Hobbs, NM

October 7, 2003

Terry Weeks, Project Manager
Civil Planning & Project Management Branch
Corps of Engineers
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

Re: Bottomless Lakes State Park Section 206 Aquatic habitat Restoration Feasibility Study near Roswell, Chaves County, New Mexico. NMGF No. 8939.

Dear Mr. Weeks:

In response to your letter dated September 18, 2003 regarding the above referenced project, the Department of Game and Fish (Department) does not anticipate significant detrimental impacts to wildlife or sensitive habitats.

The Department supports efforts to restore native habitats where those habitats have been compromised. We believe that a fifth action should be added in paragraph two that addresses alternatives for the actual restoration of native vegetation in the project area. To ensure proper establishment and survival of vegetation, we urge the inclusion of adequate ongoing fiscal support as well as long-term biological monitoring of the site.

Restoration of native habitats after exotic vegetation (especially salt cedar) removal in such projects has proven to be labor intensive and long-term. Proper site design and vegetation selection is extremely important in the success of these projects. Management and monitoring of affected soils, effects of resulting siltation, establishment and survival of replacement vegetation, and of wildlife use should be integral portions of this process.

The Department would appreciate being kept on the mailing list and informed during the decision making process and afterward about restoration and management decisions for this project.

Thank you for the opportunity to review and comment on your project. If you have any questions, I can be contacted at (505) 476-8114 or jaward@state.nm.us .

Sincerely,

Janell Ward

Janell Ward, Assistant Chief
Conservation Services Division

JW/mr

xc: Joy Nicholopolous, (New Mexico Ecological Services, USFWS)
Alexa Sandoval (SE Area Habitat Specialist, NMGF)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

October 8, 2003

Cons. # 2-22-03-I-728

Lt. Colonel Dana R. Hurst
U.S. Army Corps of Engineers
Albuquerque District
Attn: Terry Weeks, Project Manager
4101 Jefferson Plaza, NE
Albuquerque, New Mexico 87109

Dear Lt. Colonel Hurst:

Thank you for your September 18, 2003, letter requesting information on threatened or endangered species or important wildlife habitats that could be affected by the Aquatic Habitat Restoration Feasibility Study at Bottomless Lakes State Park, Chaves County, New Mexico. Potential actions to restore the aquatic habitat in Lea Lake include: 1) improving capacity and function of the outlet channel and wetland; 2) removing nonnative vegetation and clearing dead vegetation in the outlet area; 3) creating educational and interpretive opportunities to foster public understanding of wetland and aquatic ecosystem importance and func[illegible] 4) reshaping and resloping terrain in the outflow area. The U.S. Fish and Wildlife Service (Service) recommends implementing the alternative that provides the greatest protection for fish and wildlife resources with the least amount of mitigation, as well as the greatest flexibility to address fish and wildlife issues.

We have enclosed a current list of federally endangered, threatened, proposed, and candidate species, and species of concern that may be found in Chaves County, New Mexico.[1] Under the Endangered Species Act, as amended (Act), it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with us further. If your action area has suitable habitat for any of these species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts. Please keep in mind that the scope of federally listed species compliance also includes any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects.

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[1] Additional information about these species is available on the Internet at <http://nmrareplants.unm.edu>, <http://nmnhp.unm.edu/bisonm/bisonquery.php>, and <http://ifw2es.fws.gov/endangeredspecies>.

Candidates and species of concern have no legal protection under the Act and are included in this document for planning purposes only. We monitor the status of these species. If significant declines are detected, these species could potentially be listed as endangered or threatened. Therefore, actions that may contribute to their decline should be avoided. We recommend that candidates and species of concern be included in your surveys.

The Migratory Bird Treaty Act (MBTA) prohibits the taking of migratory birds, nests, and eggs, except as permitted by the U.S. Fish and Wildlife Service. To minimize the likelihood of adverse impacts to all birds protected under the MBTA, we recommend construction activities occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until nesting is complete.

We suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding fish, wildlife, and plants of State concern.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We look forward to reviewing and providing comments on the draft environmental assessment for this project when it becomes available. In future correspondence regarding this project, please refer to consultation # 2-22-03-I-728. If you have any questions about the information in this letter, please contact Dennis Coleman at the letterhead address or at (505) 346-2525, ext. 4716.

Sincerely,

Joy E. Nicholopoulos

Joy E. Nicholopoulos
State Supervisor

Enclosure

cc: (w/o enc.)
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

Rev. May 2003

FEDERAL ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE SPECIES AND SPECIES OF CONCERN IN NEW MEXICO

Consultation Number 2-22-03-I-728

October 9, 2003

Chaves County

ENDANGERED

- Black-footed ferret (*Mustela nigripes*) **
- Interior least tern (*Sterna antillarum*)
- Northern aplomado falcon (*Falco femoralis septentrionalis*)
- Pecos gambusia (*Gambusia nobilis*)
- Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri*)

PROPOSED ENDANGERED

- Koster's springsnail (*Juturnia kosteri*)
- Pecos assiminea snail (*Assiminea pecos*)
- Roswell pyrg (springsnail) (*Pyrgulopsis roswellensis*)
- Noel's amphipod (*Gammarus desperatus*)

THREATENED

- Bald eagle (*Haliaeetus leucocephalus*)
- Mexican spotted owl (*Strix occidentalis lucida*)
- Pecos bluntnose shiner (*Notropis simus pecosensis*) with critical habitat
- Pecos sunflower (*Helianthus paradoxus*)

PROPOSED THREATENED

- Mountain plover (*Charadrius montanus*)

CANDIDATE

- Black-tailed prairie dog (*Cynomys ludovicianus*)
- Lesser prairie chicken (*Tympanuchus pallidicinctus*)
- Sand dune lizard (*Sceloporus arenicolus*)
- Texas hornshell (mussel) (*Popenaias popei*)

SPECIES OF CONCERN

- Desert pocket gopher (*Geomys bursarius arenarius*)
- Pecos River muskrat (*Ondatra zibethicus ripensis*)
- Swift fox (*Vulpes velox*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Western red bat (*Lasiurus blossevillii*)
- American peregrine falcon (*Falco peregrinus anatum*)
- Arctic peregrine falcon (*Falco peregrinus tundrius*)
- Baird's sparrow (*Ammodramus bairdii*)
- Bell's vireo (*Vireo bellii*)

Black tern (*Chlidonias niger*)
Northern goshawk (*Accipiter gentilis*)
Western burrowing owl (*Athene cunicularia hypugea*)
Yellow-billed cuckoo (*Coccyzus americanus*)
Greenthroat darter (*Etheostoma lepidum*)
Headwater catfish (*Ictalurus lupus*)
Pecos pupfish (*Cyprinodon pecosensis)*
Rio Grande shiner (*Notropis jemezanus*)
Mescalero Sands tiger beetle (*Cicindela formosa rutilovirescens)*
Mescalero Sands June beetle (*Polyphylla mescalerensis*)
Wright's marsh thistle (*Cirsium wrightii*)

Index

Endangered	=	Any species which is in danger of extinction throughout all or a significant portion of its range.
Threatened	=	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate	=	Candidate Species (taxa for which the Service has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities).
Proposed	=	any species of fish, wildlife or plant that is proposed in the Federal Register to be listed under section 4 of the Act.
Species of Concern	=	Taxa for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. Species of Concern are included for planning purposes only.
**	=	Survey should be conducted if project involves impacts to prairie dog towns or complexes of 200-acres or more for the Gunnison's prairie dog (*Cynomys gunnisoni*) and/or 80-acres or more for any subspecies of Black-tailed prairie dog (*Cynomys ludovicianus*). A complex consists of two or more neighboring prairie dog towns within 4.3 miles (7 kilometers) of each other.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Roswell Field Office
2909 West Second Street
Roswell, New Mexico 88201

IN REPLY REFER TO:
6740 (0620)

OCT 14 2003

Department of the Army
Albuquerque District, Corp of Engineers
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

Dear Mr. Terry Weeks:

Thank you for allowing us to provide your office with our written comments concerning the Aquatic Habitat Restoration Feasibility Study at Bottomless Lakes State Park. As you know, the BLM Overflow Wetlands Area of Critical Environmental Concern (ACEC) exists because of the overflow waters from Lea Lake. Manipulation of terrain and flow of water may impact the extensive wetlands and the various aquatic, avifaunal and terrestrial wildlife and plant species that are dependent on this ecosystem. We had the opportunity to meet with personnel from Blue Earth Ecological Consultants, Inc. who are currently working on the proposed environmental assessment. At this meeting, we provided our concerns and recommendations to be considered in the study.

As per your letter dated September 18, 2003, we are providing you with some thoughts concerning the study, most of which fall under the category of natural resources. Without knowing how the potential actions would be conducted, it is difficult to identify specific impacts, recommend ideas for mitigation of impacts, or assist in the development of feasible alternatives. Therefore, our comments and questions at this stage are general and may lead to additional discussions in order to address potential impacts and alternatives. When we refer to wetlands in the following comments, we are also including those wildlife and plant species dependent on the wetlands that may be impacted.

The wetlands and channels occur on public, private and State Trust lands. Manipulation of water flows, increasing or decreasing, would have an impact on the wetlands. The magnitude of which would depend on many factors which lead to the following questions which may reflect public concerns and comments during the public scoping meeting:

<u>Improving the capacity and function of the outlet channel</u>

What is the current capacity of the existing channel and what increase in capacity is proposed?
What other functions would the outlet channel serve, if improved?
What extent would the outflow channel be modified?
What portion of the channel would be modified?
Would the channel leading to public land be incorporated in the design?
Would flows be diverted during re-construction of the channel?
Would water flow from Lea Lake be piped or would it remain in open ditches and culverts?
Would water flow from Lea Lake be controlled using valves and gates?
What time of year would the project be undertaken?
Would the current outflow points where surface water leaves the park onto BLM and private lands change?
Would the channel/ditch on public land need modification as well?
What impacts to wetland water quality could be expected from channel modification?

.emoving nonnative vegetation and clearing dead vegetation in the outflow area

What method of removal would be employed, by hand, mechanical, chemical, fire, or combinations?
What chemical may be used for control?
How would the removed vegetation be disposed of, burning, chipping?
Would additional removal or treatment be considered outside of the park boundary under the project?
Would existing fences be removed and replaced?

Creating educational and interpretive opportunities to foster public understanding of wetland and aquatic ecosystem importance and function

How can BLM's same goal for the Overflow Wetlands ACEC be incorporated into the study?
Is there potential to dovetail projects, such as a raised walkway, interpretive signs, etc.?

Reshaping and resloping terrain in the outflow area

What extent would reshaping and resloping be conducted?
Would modification of the outflow area affect current water flow patterns and quantity to the ACEC?
Would a shallow impoundment be incorporated in the design?
What impacts to water quality could be expected from reshaping and resloping the outflow area?

General Comments

The BLM is not adverse to receiving additional water on public land from the Bottomless Lakes State Park. There are four major outflow points that drain the wetlands into the Pecos River. The two northern outflows resulted in the increase of water beginning in the year 2000. One is located on State Trust land and the other on BLM land just north of a private land inholding. The State of New Mexico and private landowners may have concerns for potential increase in wetland surface area on their respective lands as it may impact access to and through the area, or may impact livestock grazing on the State Trust lands.

Water quantity and quality (potential changes in water chemistry) is of concern for the various aquatic species that inhabit the wetlands, and the various waterfowl and shorebirds that utilize the area as well. We have recent studies and surveys that are available for your review concerning fish and invertebrates.

The establishment of a base flow to sustain the ACEC may need to be determined as not to fall below a threshold for the viability of the wetlands. A starting point for a minimum flow may need to be determined.

Monitoring of the effects of the proposed project on wildlife species need to be incorporated in the study. These studies should not be limited to the Bottomless Lakes State Park as the activity may have an impact outside of the boundaries of the park. A separate section may be needed in the study to address threatened and endangered species populations and habitat.

The project should be conducted incrementally to carefully monitor the effects of improving the capacity and function of the outlet channel and reshaping and resloping terrain in the outflow area. A drastic change in outflow and water quality could have a detrimental impact to the wetlands. It is important that no nicks in the landscape occur resulting from erosion from excessive flows. A headcut originating from the Pecos River could works its way up an outflow channel and potentially dewater the wetlands.

Sincerely,

TR Kreager

T.R. Kreager
Assistant Field Office Manager - Resources

Aquatic Habitat Restoration Feasibility Study
Bottomless Lakes State Park
Chaves County, New Mexico

Comment Form

Please make your comments specific to the proposal described in the attached letter.

1. What issues (for example, natural or cultural resources, social, or economic) are of concern to you in regards to the study?

_____

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2. Other comments about the study.

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Please attach additional sheets if desired.

☒ Please keep my name on the study mailing list.

☐ Please remove my name from the study mailing list.

Name: _____

Address: _____

City, State, Zip: _____

Larry ~~& Signe~~ Henderson
1302 S. Country Club Circle
Carlsbad, N.M. 88220
(505) 887-7666

Please mail or fax your specific written comments **for receipt by close of business on 17 October 2003** to:

Terry Weeks, Project Manager
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Place NE
Albuquerque, NM 87109
Fax: (505) 342-3480

Aquatic Habitat Restoration Feasibility Study
Bottomless Lakes State Park
Chaves County, New Mexico

Comment Form

Please make your comments specific to the proposal described in the attached letter.

1. What issues (for example, natural or cultural resources, social, or economic) are of concern to you in regards to the study?

2. Other comments about the study.

Please attach additional sheets if desired.

☒ Please keep my name on the study mailing list.

☐ Please remove my name from the study mailing list.

Name: New Mexico State Land Office

Address: 310 Old Santa Fe Trail, PO Box 1148

City, State, Zip: Santa Fe, NM 87504-1148

Please mail or fax your specific written comments **for receipt by close of business on 17 October 2003** to:

Terry Weeks, Project Manager
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Place NE
Albuquerque, NM 87109
Fax: (505) 342-3480

Aquatic Habitat Restoration Feasibility Study
Bottomless Lakes State Park
Chaves County, New Mexico

Comment Form

Please make your comments specific to the proposal described in the attached letter.

1. What issues (for example, natural or cultural resources, social, or economic) are of concern to you in regards to the study?

2. Other comments about the study.

Please attach additional sheets if desired.

☒ Please keep my name on the study mailing list.

☐ Please remove my name from the study mailing list.

2003 SEP 22 AM 10: 00

Name: Fin & Feather Club Inc

Address: PO Box 1818

City, State, Zip: Roswell, NM 88202

Please mail or fax your specific written comments **for receipt by close of business on 17 October 2003** to:

Terry Weeks, Project Manager
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Place NE
Albuquerque, NM 87109
Fax: (505) 342-3480

Appendix 1b
Tribal Scoping letter and mailing list

Copy

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

January 25, 2006

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

Mr. Bobby Jay
Tribal Administrator
Apache Tribe of Oklahoma
Post Office Box 1220
Anadarko, Oklahoma 73005

Dear Mr. Jay:

The U.S. Army Corps of Engineers (Corps), Albuquerque District, at the request of Bottomless Lakes State Park, as managed by the State Parks Division of the New Mexico Energy, Minerals and Natural Resources Department, is planning a Section 206 Aquatic Habitat Restoration project at Bottomless Lakes State Park under the Water Resources Development Act of 1996 (Public Law 104-303), as amended. The project area is located within Bottomless Lakes State Park, approximately 16 miles southeast of Roswell, Chaves County, in southeastern New Mexico.

The proposed project would enlarge the existing drainage ditch/outlet channel that drains artesian water flows from Lea Lake to a 43-acre wetland. The project would remove the existing outlet-control weir and construct a new weir about 30 feet upstream of the existing weir, install larger culverts under State Highway 409, increase habitat diversity in the existing wetland by creating three open-water ponds by mechanical excavation (about 2.2 acres total), and remove the exotic, introduced tamarisk (salt cedar) from the wetland area. The proposed plan also calls for a 0.5-acre parking area and about 4,000 lineal feet of graveled hiking trail. Gravel for construction would come from a pre-approved commercial quarry.

An archaeological survey of the project area has been conducted by the University of New Mexico's Office of Contract Archeology. A copy of the survey report entitled **An Archeological Survey at Bottomless Lakes State Park; Chaves County, New Mexico** (OCA/UNM Report No. 185-827, New Mexico

Cultural Resources Information System No. 87023) is enclosed for your review. The report includes documentation regarding the area's cultural resources and area maps. The OCA survey resulted in the discovery of three archaeological sites and two isolated occurrences; all of which are historic. The sites include LA142877, a homestead patented in 1910; LA142878, two drainage ditch alignments, a main ditch and a lateral, that are thought to date to the 1930s; and LA142879, another drainage ditch also thought to date to the 1930s. The project will be confined to OCA's Survey Areas No. II (2) and V (5). The existing State Parks maintenance yard, OCA Survey Area No. I (1, will be used for staging purposes. As currently planned, OCA's Survey Areas No. III (3) and IV (4) are no longer a part of the project.

The Corps is seeking input for consideration during planning of the project. This letter is to solicit comments and concerns regarding the proposed project under the National Environmental Policy Act. Your input will be used in preparing the Draft Detailed Project Report/Environmental Assessment. At this time, no traditional cultural properties are known to occur within or adjacent to the proposed project area.

Written comments regarding the proposed project are being accepted through February 28, 2006. Please provide written comments regarding cultural resources to Gregory Everhart, Archaeologist, Environmental Resources Section, at the above address or to gregory.d.everhart@usace.army.mil . If you have any cultural resources questions or require additional cultural information, please contact Mr. Everhart at (505) 342-3352, or myself, at (505) 342-3281.

Sincerely,

Julie A. Hall
Chief, Environmental Resources
Section

Enclosure

Tribal Mailing List for 2006

For **Chaves** County projects

Apache Tribe of Oklahoma
Comanche Indian Tribe
Kiowa Tribe
Mescalero Apache Tribe
Ysleta del Sur Pueblo

Mr. Bobby Jay
Tribal Administrator
Apache Tribe of Oklahoma
Post Office Box 1220
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Chairman, Comanche Indian Tribe
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cf:
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Tribal Historic Preservation Officer
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Governor, Ysleta del Sur Pueblo
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Appendix 1c
Draft DPR-EA Public Comments

NEW MEXICO INTERSTATE STREAM COMMISSION

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August 31, 2006

Ms. Patricia Phillips
Project Manager
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, New Mexico 87109

Ms. Phillips:

First, the New Mexico Interstate Stream Commission (ISC) would like to congratulate you on a thorough investigation of the potential impacts of the project contained in the *Draft Detailed Project Report/Environmental Assessment for Bottomless Lakes State Park, Roswell, New Mexico* (DPR/EA). ISC appreciates the opportunity to comment on the proposed restoration of approximately 43 acres of wetland habitat at Bottomless Lakes State Park, Chaves County, New Mexico; by increasing the Lea Lake outlet channel capacity from 15 cfs to 25 cfs; removing all salt cedar from the approximately 43-acre project area; removing all solid waste debris from the project area; constructing three open water habitats totaling approximately 2.2 acres; planting supplemental wetland vegetation in solid waste debris removal areas and around the margins of open water habitats (approximately 7.32 acres); and constructing a 0.5-acre gravel parking lot, a 3,786-ft gravel loop trail, a 517-ft raised boardwalk trail, and four wildlife viewing blinds. While the ISC staff was unable to find any major problems with the document other than a few typographic errors and numerical discrepancies, and finds that, the proposed action may be of benefit to the citizens of New Mexico and the Pecos River Basin Ecosystem; the ISC does have some concerns.

General Comments:

The DPR/EA states that the largest potential effect on aquifer water levels in the project area would come from future pumping from ISC's augmentation well fields. This statement is without merit. In order to comply with the Pecos River Compact, NMSA 1978, § 72-15-19, Pecos River Settlement and U. S. Supreme Court's Pecos River Amended Decree, the state cannot allow the Pecos River to sustain new net surface or ground water depletions in the basin. The DPR/EA reports that a net savings from evapotranspiration (ET) will result through the implementation of the proposed action. While the science relating to the measurement of ET is evolving, the science is not precise. In the event that depletions occur due to this project then the responsible parties should acquire offset water with a permit from the New Mexico State Engineer.

In the exercises of its authority, the ISC is contributing to an attempt to return the Pecos River System to a hydrologic balance. The policy and priority of ISC is to purchase senior water rights that are active at the time of sale [NMSA 1978, § 72-1-2.4]. Therefore, when ISC adds water to the Pecos River, ISC is unlikely to exercise any previously dormant water rights. It is improbable that any future river augmentation by the ISC would have any effect on Lea Lake or the surrounding wetlands. While the DPR/EA asserts there is a

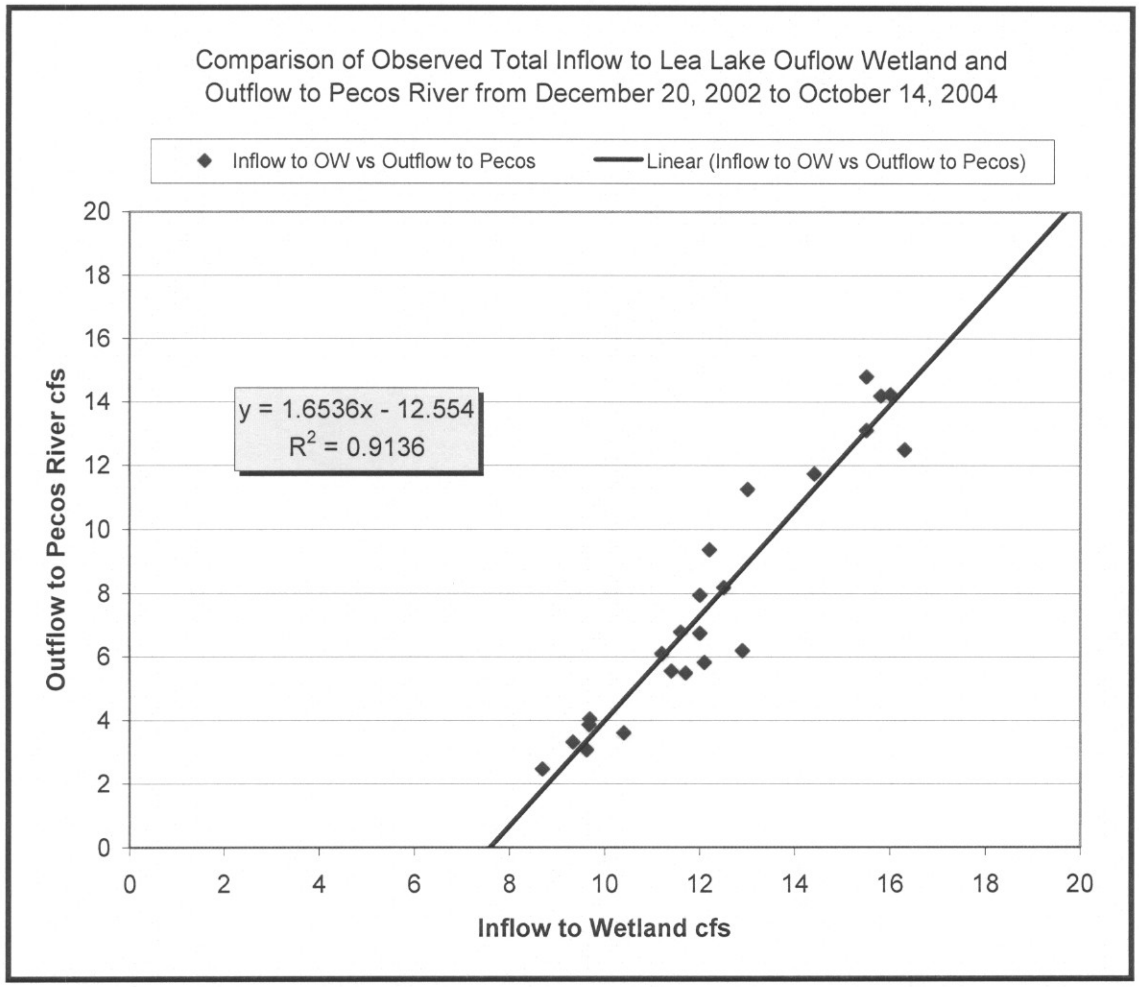
"significant relationship between Lea Lake outflows and the artesian aquifer levels (Technical Appendix H)",

the document does not explain that the ISC primary augmentation field is in Seven Rivers, New Mexico, approximately 75 river miles and 47 areal miles to the south of the proposed action site. Nor does it mention that the ISC's secondary augmentation field is also remotely located, at Lake Arthur, New Mexico approximately 40 river miles and 20 areal miles to the south.

The ISC will utilize the best hydrologic science, modeling and planning to implement any future river augmentation scheme and will not execute any such plan to the detriment of the citizens of New Mexico or Pecos River Ecosystem since it would be subject to an impairment analysis by the State Engineer. In fact, the intention of ISC is to restore the Pecos River artesian basin to a hydrologic balance.

While the DPR/EA addresses future monitoring of impacts to endangered species and outflow channel impacts, it does not address monitoring of impacts on the wetland water budget. The entire 715-acre wetland is considered in the DPR/EA water budget evaluation of this project (Technical Appendix H2). This approach should also be used in monitoring of future impacts of this project. While the best available science may have been used for the water budget report in 2003, without monitoring we cannot be certain of the positive or negative impacts on the water budget. Of utmost concern to ISC is clearly any increase or decrease to the outflow to the Pecos River. A helpful monitoring exercise would be to plot inflow to the wetland versus the outflow to the Pecos River.

See chart example below.



By documenting the water budget data before the project begins and continuing to monitor into the future, a record of project effects on the water budget could be established. For example, when inflow versus outflow data increases the slope toward an R^2 value of 1.0, additional flow to the Pecos River can be documented. As the data move closer to an R^2 value of 0.0 and the slope decreases, a reduction in flow to the Pecos River can be noted.

Specific Comments:

Section 2.9.1 Page 18 paragraph 2 states:

"The augmentation well field could potentially affect groundwater levels in the vicinity of the project area, depending on the location and depth of the wells. This, in turn, could influence outflow from Lea Lake."

The ISC augmentation well fields are not near the project area nor will Lea Lake likely be affected by them. The K-M fault lies between the project area and the ISC augmentation well fields and is considered a hydrologic impediment to conductivity between the two locations.

Section 3.1 Page 23 paragraph 5 states:

"The issue that has the largest potential for affecting aquifer water levels in the near future is planned purchase of around 12,000 acres of land and water rights by ISC, as mentioned above. If ISC simply retires the wells, water levels in the aquifer could rise. If any of the purchased water rights were previously dormant, and ISC activates those water rights in order to augment flows to the Pecos River, the additional pumping could possibly cause a lowering of aquifer levels."

Beginning in 1992, ISC began purchasing senior water rights of higher priority with confirmed historic use, in order to retire them from active use. The majority of the water rights purchased thus far were not dormant. The large distance between the augmentation fields and the project area preclude any likelihood of lowering aquifer levels.

Section 4.1.2.3 Page 28 paragraph 2 states:

"A correction or balancing term was applied to ensure that the water budget balanced on a monthly basis. Total inflow to the marsh (9,900 acre-feet) is nearly identical to total outflow (9,956 acre-feet) on an annual basis, excluding the balancing term."

The correction or balance term referred to above and used in Table 8 is 34 ac-ft. This value is an error term for an annual water budget. While 34 ac-ft is only 0.34% of "inflow to the marsh" and represents and insignificant error, the proposed savings of this project is predicted to be 4 ac-ft The savings projected is 12% of the error factor, which is 8.5 times the projected savings. Statistically, there is no significance or likelihood of this savings occurring. In fact, equally likely is an increase of a similar amount to ET.

Section 4.2 Table 2 (adapted from Table 5.13, Technical Appendix H2) :

Below Table 2 (aka. 5.13) there is an Excel summation and comparison of the table data that exposes an error of +/- 1 ac-ft in 16 totals. In cells where the total is highlighted in yellow, the value is correct. If the total is highlighted in light yellow, the value does not agree with the Wetland Inflow or Outflow total. If the font is red, the total does not balance with the intended matching total.

Table 2. Water budget for wetlands between Lea Lake and the Pecos River, including the study area (source: Technical Appendix H).

MONTH	WETLAND INFLOWS			WETLAND OUTFLOWS				
	INFLOW FROM LEA LAKE (acre-feet)	PRECIP. (acre-feet)	TOTAL INFLOW (acre-feet)	SURFACE-WATER EVAPORATION (acre-feet)	WETLAND EVAPO-TRANSPIRATION (acre-feet)	UNMEASURED OUTFLOW (acre-feet)	BALANCING TERM (acre-feet)	TOTAL OUTFLOW (acre-feet)
JAN	999	26	1024	31	38	157	-16	1024
FEB	875	25	900	46	46	73	-70	900
MAR	775	28	802	81	77	101	-90	802
APR	721	33	754	113	86	317	-206	754
MAY	769	77	845	133	149	-89	283	845
JUN	681	100	782	149	339	1	-51	782
JUL	635	111	746	140	364	64	-16	746
AUG	587	129	716	121	345	8	28	716
SEP	649	113	761	94	257	5	133	761
OCT	787	73	860	69	126	47	130	860
NOV	848	31	879	42	54	120	-141	879
DEC	885	34	919	29	45	202	-78	919

Table 5.13. Tabulated wetland water budget summary showing mean monthly volumes for all inputs and outputs.

	Wetland Inflows				Wetland Outflows						
Month	Inflow from Lea Lake (ac-ft)	Precipitation (ac-ft)	Total Input (ac-ft)		Surface-water Evaporation (ac-ft)	Wetland ET (ac-ft)	Unmeasured Outflow (ac-ft)	Surface Outflow to Pecos River (ac-ft)	Balancing Term (ac-ft)	Total Output (ac-ft)	
				Total Check							Total Check
Jan	999	26	1024	1025	31	38	157	814	-16	1024	1024
Feb	875	25	900	900	46	46	73	805	-70	900	900
Mar	775	28	802	803	81	77	101	633	-90	802	802
Apr	721	33	754	754	113	86	317	445	-206	754	755
May	769	77	845	846	133	149	-89	369	283	845	845
Jun	681	100	782	781	149	339	1	344	-51	782	782
Jul	635	111	746	746	140	364	64	194	-16	746	746
Aug	587	129	716	716	121	345	8	213	28	716	715
Sep	649	113	761	762	94	257	5	272	133	761	761
Oct	787	73	860	860	69	126	47	488	130	860	860
Nov	848	31	879	879	42	54	120	676	-14	879	878
Dec	885	34	919	919	29	45	202	721	-78	919	919

Section 6.2 Table 8 shows:

Table 8. Effects of the recommended plan on water yield from Lea Lake Marsh.

	Surface Water Evaporation (acre-feet)	Wetland Evapo-transpiration (acre-feet)	Groundwater Outflow (acre-feet)	Surface Outflow to Pecos River (acre-feet)	Balancing Term** (acre-feet)	Total Output (acre-feet)
Existing Condition	1,059	1,926	1,007	5,973	34	9,990
Recommended Plan*	1,070	1,911	1,007	5,973	34	9,984

* Refer to section 6.6 for details on vegetation changes resulting from the recommended plan
** Technical Appendix H

An Excel summation of the table data exposes an error of nine ac-ft in both totals.

	SW ET	Wet ET	GW OUT	SW OUT	Balance Term	TOTAL Output	Total Check
Existing Condition	1059	1926	1007	5973	34	9990	9999
Recommended Plan	1070	1911	1007	5973	34	9984	9995

Thank you for taking the time and attention to evaluate and respond to ISC's comments. We look forward to working with you in the future.

Sincerely,

Emile Sawyer

Emile Sawyer
Pecos Bureau - Engineer Specialist
New Mexico Interstate Stream Commission

cc: E. Lopez
B. Rao

Comments on the July 2006
Draft DPR and EA for Bottomless Lakes State Park, Roswell, NM
Tim Frey, Fishery Biologist, BLM

Section 6.5.2, page 70, column 1, paragraph 2 – This paragraph deals with the effects that an increase in flow will have on the plant communities of the study area. It states,

"Average water depth and hydroperiod in several of the wetland vegetation communities are expected to change with implementation of the recommended plan (Technical Appendix B). **Average depth of inundation would increase** from 7 to 18 inches in bulrush marsh, 2.4 to 12 inches in saltgrass marsh, 0.4 to 4 inches in saltgrass wet meadow, 1.2 to 8 inches in saltgrass-iodinebush marsh, and 0 to 1.2 inches in converted salt cedar thicket vegetation (Technical Appendix B). Hydroperiod would change in saltgrass marsh habitat from semi-permanently flooded to intermittently exposed and from seasonally flooded to semi-permanently flooded in saltgrass wet meadow. Also, hydroperiod in converted salt cedar thicket vegetation would change from saturated to semi-permanently flooded."

1. If the hydroperiodicity and inundation rate estimates are correct, then each of the communities listed will change. For example, if saltgrass wet meadow is inundated with water from a base of 0.4" to 4 inches and it's hydroperiod changes from "seasonally flooded to semi-permanently flooded", then one can surmise that it will convert to a different state, possibly even bulrush or cattail marsh. Two very important points must be addressed.
    a. With increased flow, one can surmise that the saltgrass wet meadow will disappear. This in turn will cause the elimination of habitat for the least shrew and thus the population of least shrew from the study area.
    b. This is in direct conflict with your statement on p. 75, col. 2, which states the "plan is consistent" with recommendations by Frey 2005, to "protect saltgrass wetland meadow system from … changes to hydrology" **YET** on page 70 the plan plainly states that there will be an order of magnitude change to the hydrology in this habitat type (e.g. 0.4 to 4 inches).

Time of work is scheduled for January 2007 – August 2007 (see p. 59). This leads to:

Discrepancies/contradictions in time of work and effects on Salt Cedar removal/herbicide treatment

1. page 34, col. 2, para. 2 states that herbicide is best done, "late in the growing season." It has been suggested that September is the optimal time to apply herbicide to tamarisk spp. and thus would be outside of the scheduled work time.
2. page 71, col.1, para. 1 states, "…in order to avoid destruction of active nests and mortality of young birds, salt cedar removal would be conducted" from September through March. This contradicts with schedule on page 59.

Discrepancies/contradictions in time of work and effects on listed species

If work occurs according to schedule on page 59 (i.e. Jan. 2007-Aug. 2007) then it will overlap with

1. spawning times of pupfish and tetras (may effect)
2. breeding season of least shrew (may effect)
3. growing season of Pecos sunflower (may effect)

Suggest that work is moved to August through March.

Need more specificity on plan to "replant" disturbed areas: (see p.59, col.2, para. 2)

1. what species will be planted
2. in what abundance will they be planted
3. where will they be planted
4. how will you minimize the change in the plant community composition of the current landscape and thereby minimize negative affects on listed species? (e.g. loss of saltgrass wet meadow affecting least shrew)

Suggest that sediment traps be installed in the temporary channel as well as the "new" channel prior to reconnect. These could include starw bales placed in the channel to trap sediment.

Where would the "temporary" diversion channel be located, how will it be dug and what effects would it have on the disturbed habitat types (i.e saltgrass wet meadow, saltgrass marsh, etc.) and associated species (e.g. least shrew)?

Clarificiation:

1. State in section 5.2.4 (p. 57) that, "a biologist will be present on site during project implementation…" and then state that a "qualified biologist would periodically monitor work…"
2. p.71, col. 1, para. 2 states "no herbicide **spraying** will be conducted." If this is true, how will follow up herbicide treatments be conducted?
3. What do the BLM fish barriers have to do with this proposal and the study area?

Page 4, Col. 1, line 31 – deleted "listed"

Page 4, Col. 2, line 20 – delete "of"

Comments on the July 2006
Draft DPR and EA for Bottomless Lakes State Park, Roswell, NM
Michael McGee, Hydrologist, Roswell Field Office BLM

Section 5.0 Description of Recommended Plan

The plan states that "Modification of the outlet channel would be conducted in dry conditions. This would be accomplished by dewatering the outlet channel and diverting outflow from Lea Lake around the work area and into Lea Lake." Provide a map the shows the location of this diversion channel and all new feeder channels or diversions.

Section 5.5.1 Water Quality and Wetlands

Provide a map which depicts the locations of the feeder channels and water diversion sites or channels. Provide a detailed description of the BMP's that will be used in conjunction with your Clean Water Act section 404 authorization from the USACE Albuquerque District and the section 401 water quality certification from the New Mexico Environment Department. I recommend the use of silt fences, hay bails, or sediment traps to control sediment. I recommend that silt fences be place around and between all surface stockpiles of loose dirt or dirt stockpiles.

Follow up spray treatment of the herbicide habitat will be required in the following years after the stump treatments are completed. You plan only states that cut stump treatments will be used with habitat.

State that you will notify the Authorized Officer of the RFO BLM immediately if an accidental spill occurs in the wetland that may impact public land.

Section 6.3 Water Quality 6.3.1 Suspended Sediments and Turbidity

Provide a detailed description of the BMP's that you will use that are described in your section 404 and 401 certification permit to control and decrease suspended sediment loads and turbidity.

GOVERNOR
Bill Richardson

DIRECTOR AND SECRETARY
TO THE COMMISSION
Bruce C. Thompson, Ph.D.

Tod Stevenson, Deputy Director

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DEPARTMENT OF GAME & FISH

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Silver City, NM

August 17, 2006

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AUG 23 2006

Ms. Karen Yori
Blue Earth Ecological Consultants, Inc.
1345 Pacheco St.,
Santa Fe, New Mexico 87505

Re: Draft Detailed Project Report and Environmental Assessment for the Bottomless Lakes State Park, Roswell, New Mexico
NMGF No. 10961

Dear Ms. Yori:

In response to the Notice of Availability of the Draft Detailed Project Report and Environmental Assessment (DPR/EA) for the Bottomless Lakes State Park, Roswell, New Mexico, the Department of Game and Fish (Department) has identified several issues we would like Blue Earth Ecological Consultants, Inc., the U.S. Fish and Wildlife Service (Service), US Army Corps of Engineers (Corps), and State Parks to be aware of. The Department supports restoration of wetland habitats down-gradient from Lea Lake. The Department encourages State Parks to work cooperatively with the Bureau of Land Management on restoration planning and implementation so that the park boundary does not act as an artificial barrier to comprehensive management of overflow or restoration of wetland habitats down-gradient of Lea Lake. Our comments are based in part on a field visit by staff to the project area on June 1, 2006.

The Draft DPR/EA, dated 24 July 2006, does not analyze the potential effects of global warming on aquifer recharge and discharge and the potential changes in outflows from Lea Lake. Future climate change will affect precipitation patterns, surface flow, groundwater recharge and discharge, surface water temperatures, aquatic habitats, and wetland vegetation. Anticipated changes related to water resources that are direct consequences of projected increases in temperature and possible decreases in precipitation include:

- greater evaporative loss from lakes and reservoirs;
- greater evaporative loss from soils and plants (evapotranspiration);
- less runoff and more soil drought for a given amount of precipitation; and
- reduced groundwater recharge.

Given these anticipated changes in climate, it is reasonable to expect outflows from Lea Lake to decrease in the future, although changes in groundwater recharge due to irrigation returns in the Roswell area may affect the quantity and timing of groundwater discharge in ways that moderates the effects of global warming on the hydroperiod of Lea Lake outflows. Restoration project planning should factor such likely changes into estimates of future Lea Lake outflows under Scenario 3, Technical Appendix H, which may well fall below historic levels, in order to design modifications to the outflow channel and wetland enhancement features that address reduced outflows. Given these anticipated changes, surface water yields into the Pecos River will almost certainly diminish.

Section 4.2.2.5 Supplement Wetland Vegetation - Management Measures M through T of the DPR/EA does not specifically indicate that woody wetland species would be planted, and only specifies that aquatic vascular plants would be planted. The Department is concerned that saltcedar removal be done in a manner that quickly replaces habitat currently provided by saltcedar. Rapid replacement of saltcedar with native shrubs such as willows will minimize the impacts of removal on wildlife that currently occupy saltcedar. One way to rapidly replace habitat currently provided by saltcedar is to plant poles or large container stock of native shrubs as soon as possible. Growth of native shrubs will depend on restoration of adequate hydrology to planting sites, primarily through raising the water table. Drainage of Lea Lake overflow away from the parking lot and campground should not preclude management of drainage downslope of NM-409 in a manner that saturates or raises the water table beneath areas currently mapped as upland vegetation community types.

The Department recommends that the Service and Corps be aware of recent published information on the use of saltcedar by wildlife (Shafroth et al. 2005). Bird use of saltcedar has been documented along the Pecos River (Hunter et al. 1988). The Pecos valley was "largely devoid of mature riparian vegetation before the appearance of salt cedar" (Hunter et al. 1988). The invasion of tamarisk species into the Pecos River valley has altered the habitat and use patterns of avian species. In the Pecos valley, "the number of breeding bird species currently using saltcedar would suggest that bird species expanded into and within the valley with the spread of saltcedar" (Hunter et al. 1988). Breeding bird surveys in the Pecos River Valley of New Mexico indicate that saltcedar provides habitat to numerous avian species including mourning dove, yellow-billed cuckoo, blue grosbeak, and painted bunting (Hildebrandt and Ohmart 1982). In the Pecos River valley, it is unlikely that any other woody species would replace saltcedar, thereby displacing numerous birds and decreasing the diversity of bird species in the area.

Within saltcedar areas occupied by yellow-billed cuckoos, specific treatments should be designed to help retain vegetative conditions for this bird by avoiding removal at breeding locations. In August 2004, the Department communicated with Roswell BLM regarding the appropriate size of leave areas for birds in saltcedar habitats along the Pecos River during saltcedar control activities. We indicated that information from Department contracted reports suggest a maximum density of one cuckoo pair per 6 hectares (in "prime" habitats in the Gila drainage), which would be roughly equivalent to a circular area with a 450 ft. radius. The surveys also found cuckoo occurrences along the Pecos River within suitable habitat within mature salt cedar stands and local cottonwood bosques. We suggested a minimum radius of 325-650 feet for areas to leave untreated during salt cedar control for the benefit of cuckoos and other birds. Treatments could occur in the fall or winter outside of the breeding season.

Thank you for the opportunity to comment on the Draft Detailed Project Report and Environmental Assessment for the Bottomless Lakes State Park, Roswell, New Mexico. If you have any questions please contact Randy Floyd at (505) 476-8091 or randy.floyd@state.nm.us .

Sincerely,

Lisa Kirkpatrick

Lisa Kirkpatrick, Chief
Conservation Services Division

LK/rf

xc: Brian Millsap, New Mexico Ecological Services Field Supervisor, USFWS
Roy Hayes, SE Area Operations Chief, NMGF
George Farmer, SE Area Operations Chief, NMGF
Steve Patterson, Superintendent, Bottomless Lakes State Park
Refuge Manager, Bitter Lake National Wildlife Refuge, Roswell

References

Hildebrandt, T. D. and R. D. Ohmart. 1982. Biological Resource Inventory (Vegetation and Wildlife), Pecos River Basin, New Mexico and Texas. Final Report to Bureau of Reclamation, Contract No. 9-07-57-V0567.

Hunter, W.C., R. D. Ohmart, and B. W. Anderson. 1988. Use of exotic Saltcedar (*Tamarisk chinensis*) by birds in arid riparian systems. The Condor 90:113-123.

Shafroth P.B., J.R. Cleverly, T.L. Dudley, J.P. Taylor, C. Van Riper III, E.P. Weeks, and J.N. Stuart. 2005. Control of *Tamarix* in the Western United States: Implications for Water Salvage, Wildlife Use, and Riparian Restoration. Environmental Management 35:231-246.

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HISTORIC PRESERVATION DIVISION

Draft Detailed Project Report/Environmental Assessment for the Bottomless Lakes State Park, Roswell, New Mexico Available for Review

The U.S. Army Corps of Engineers (Corps) has released a Detailed Project Report/Environmental Assessment (DPR/EA) for a proposal to restore approximately 43 acres of wetlands at Bottomless Lakes State Park (BLSP) in Chaves County, New Mexico. Bottomless Lakes State Park is located about 12 miles southeast of Roswell, New Mexico. The BLSP project is a Section 206 Aquatic Ecosystem Restoration project which proposes to 1) increase the Lea Lake outlet channel capacity from 15 cfs to 25 cfs; 2) remove all salt cedar from the project area; 3) remove all solid waste debris from the project area; 4) construct three open water habitats totaling approximately 2.2 acres; 5) plant supplemental wetland vegetation in solid waste debris removal areas and around the margins of open water habitats (approximately 7.32 acres); and 6) construct a 0.5-acre gravel parking lot, a 3,786-ft gravel loop trail, a 517-ft raised boardwalk trail, and four wildlife viewing blinds.

Public review of the Draft DPR/EA and FONSI will begin on 24 July 2006 and extend 30 days until 23 August 2006. A copy of the DPR/EA and FONSI are available at the Roswell Public Library located at 301 N. Pennsylvania, Roswell, New Mexico. The documents are also available on the Corps web site at http://www.spa.usace.army.mil (go to FONSI/Environmental Assessments). Hard copies may also be requested.

Comments on the DPR/EA must be submitted by close of business on 23 August 2006. Comments should be submitted to: Karen Yori, Blue Earth Ecological Consultants, Inc., 1345 Pacheco Street, Santa Fe, NM 87505, fax: (505) 983-2960, email: kyori@blueearthecological.com. For more information please contact Karen Yori at (505) 983-2687 ext.106 or by e-mail.

NO COMMENT
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Appendix 1d
Draft DPR-EA responses to public comments

RESPONSES TO PUBLIC COMMENTS ON THE BOTTOMLESS LAKES SECTION 206 PROJECT

ID	Comment	Response
ISC-01	**General Comments** The DPR/EA states that the largest potential effect on aquifer water levels in the project area would come from future pumping from ISC's augmentation well fields. This statement is without merit. In order to comply with the Pecos River Compact, NMSA 1978, § 72-15-19, Pecos River Settlement and U. S. Supreme Court's Pecos River Amended Decree, the state cannot allow the Pecos River to sustain new net surface or ground water depletions in the basin. The DPR/EA reports that a net savings from evapotranspiration (ET) will result through the implementation of the proposed action. While the science relating to the measurement of ET is evolving, the science is not precise. In the event that depletions occur due to this project then the responsible parties should acquire offset water with a permit from the New Mexico State Engineer. In the exercises of its authority, the ISC is contributing to an attempt to return the Pecos River System to a hydrologic balance. The policy and priority of ISC is to purchase senior water rights that are active at the time of sale [NMSA 1978, § 72-1-2.4]. Therefore, when ISC adds water to the Pecos River, ISC is unlikely to exercise any previously dormant water rights. It is improbable that any future river augmentation by the ISC would have any effect on Lea Lake or the surrounding wetlands. While the DPR/EA asserts there is a "significant relationship between Lea Lake outflows and the artesian aquifer levels (Technical Appendix H)", The document does not explain that the ISC primary augmentation field is in Seven Rivers, New Mexico, approximately 75 river miles and 47 aerial miles to the south of the proposed action site. Nor does it mention that the ISC's secondary augmentation field is also remotely located, at Lake Arthur, New Mexico approximately 40 river miles and 20 aerial miles to the south. The ISC will utilize the best hydrologic science, modeling and planning to implement any future river augmentation scheme and will not execute any such plan to the detriment of the citizens of New Mexico or Pecos River Ecosystem since it would be subject to an impairment analysis by the State Engineer. In fact, the intention of ISC is to restore the Pecos River artesian basin to a hydrologic balance. While the DPR/EA addresses future monitoring of impacts to endangered species and outflow channel impacts, it does not address monitoring of impacts on the	Detailed information regarding the location, quantity, depth, or future intended use of ISC's augmentation well fields could not be obtained. Therefore, the report simply described possible effects on the aquifer based on these unknown variables. If all wells purchased by the ISC to augment flows to the Pecos River are active at the time of purchase, as specified in the comments, then it is unlikely that ISC's augmentation program would lower aquifer levels. If wells are dormant at the time of purchase, the aquifer could be impacted if wells are later activated. The net impact is difficult to predict since localized depletions would occur near the wells, and some localized recharge would likely occur at the river. Direct monitoring of each component of the wetland budget would obviously assess the impact of the project, however, it is not feasible. Surface flows are the only component of the wetland budget that can realistically be measured. Flow surplus or depletions in the river cannot realistically be attributed to any particular component of the water budget, especially when considering changes in climate.

ID	Comment	Response
	wetland water budget. The entire 715-acre wetland is considered in the DPR/EA water budget evaluation of this project (Technical Appendix H2). This approach should also be used in monitoring of future impacts of this project. While the best available science may have been used for the water budget report in 2003, without monitoring we cannot be certain of the positive or negative impacts on the water budget. Of utmost concern to ISC is clearly any increase or decrease to the outflow to the Pecos River. A helpful monitoring exercise would be to plot inflow to the wetland versus the outflow to the Pecos River.	
ISC-02	Section 2.9.1 Page 18 paragraph 2 states: "The augmentation well field could potentially affect groundwater levels in the vicinity of the project area, depending on the location and depth of the wells. This, in turn, could influence outflow from Lea Lake." The ISC augmentation well fields are not near the project area nor will Lea Lake likely be affected by them. The K-M fault lies between the project area and the ISC augmentation well fields and is considered a hydrologic impediment to conductivity between the two locations.	As mentioned above, detailed information regarding the location, quantity, or future intended use of ISC's augmentation well fields could not be obtained. Increased distances between the augmentation fields and the project site are likely to reduce the impact to the aquifer that supplies Lea Lake outflows. However, the aquifer has been shown to extend well west of Roswell, where existing pumping practices do likely impact Lea Lake outflows.
ISC-03	Section 3.1 Page 23 paragraph 5 states: "The issue that has the largest potential for affecting aquifer water levels in the near future is planned purchase of around 12,000 acres of land and water rights by ISC, as mentioned above. If ISC simply retires the wells, water levels in the aquifer could rise. If any of the purchased water rights were previously dormant, and ISC activates those water rights in order to augment flows to the Pecos River, the additional pumping could possibly cause a lowering of aquifer levels." Beginning in 1992, ISC began purchasing senior water rights of higher priority with confirmed historic use, in order to retire them from active use. The majority of the water rights purchased thus far were not dormant. The large distance between the augmentation fields and the project area preclude any likelihood of lowering aquifer levels.	See responses above.
ISC-04	Section 4.1.2.3 Page 28 paragraph 2 states: "A correction or balancing term was applied to ensure that the water budget balanced on a monthly basis. Total inflow to the marsh (9,900 acre-feet) is nearly identical to total outflow (9,956 acre-feet) on an annual basis, excluding the	ISC has compared the proposed savings of the project of about 4 AF to the magnitude of the Balancing Term in the water budget. The purpose of the Balancing Term in the water budget is to account for additional unknown or unmeasurable inputs/outputs that effect the wetland area.

ID	Comment	Response
	balancing term." The correction or balance term referred to above and used in Table 8 is 34 ac-ft. This value is an error term for an annual water budget. While 34 ac-ft is only 0.34% of "inflow to the marsh" and represents and insignificant error, the proposed savings of this project is predicted to be 4 ac-ft The savings projected is 12% of the error factor, which is 8.5 times the projected savings. Statistically, there is no significance or likelihood of this savings occurring. In fact, equally likely is an increase of a similar amount to ET.	Regardless of what the Balancing Term is actually comprised of (Precip, ET, groundwater, etc.), it is independent of the potential savings that could be provided by the project. The savings is directly computed based on the proposed changes within the wetland (independent of the balancing term), and is the best estimate given the available data regardless of whether the Balancing Term is 0 AF or 34 AF.
ISC-05	Section 4.2 Table 2 (adapted from Table 5.13, Technical Appendix H2) : Below Table 2 (aka. 5.13) there is an Excel summation and comparison of the table data that exposes an error of +/- 1 ac-ft in 16 totals. In cells where the total is highlighted in yellow, the value is correct. If the total is highlighted in light yellow, the value does not agree with the Wetland Inflow or Outflow total. If the font is red, the total does not balance with the intended matching total.	The discrepancy is simply due to rounding in the excel spreadsheet. Our electronic spreadsheet balances exactly, but when the numbers were rounded to 1 cfs for the EA, it shows an error of +/- 1 cfs that doesn't actually exist.
ISC-06	Section 6.2 Table 8: An excel summation of the table data exposes an error of nine ac-ft in both totals.	Concur. The first column in Table 8 will be changed to read 1049 and 1060 rather than 1059 and 1070.
TF-01	Section 6.5.2, page 70, column 1, paragraph 2 – This paragraph deals with the effects that an increase in flow will have on the plant communities of the study area. It states, "Average water depth and hydroperiod in several of the wetland vegetation communities are expected to change with implementation of the recommended plan (Technical Appendix B). Average depth of inundation would increase from 7 to 18 inches in bulrush marsh, 2.4 to 12 inches in saltgrass marsh, 0.4 to 4 inches in saltgrass wet meadow, 1.2 to 8 inches in saltgrass-iodine bush marsh, and 0 to 1.2 inches in converted salt cedar thicket vegetation (Technical Appendix B). Hydroperiod would change in saltgrass marsh habitat from semi-permanently flooded to intermittently exposed and from seasonally flooded to semi-permanently flooded in saltgrass wet meadow. Also, hydroperiod in converted salt cedar thicket vegetation would change from saturated to semi-permanently flooded." 1. If the hydroperiodicity and inundation rate estimates are correct, then each of the communities listed will change. For example, if saltgrass wet meadow is inundated with water from a base of 0.4" to 4 inches and it's hydroperiod changes from "seasonally flooded to semi-permanently flooded", then one can surmise that it will convert to a different state, possibly even bulrush or cattail	The comment implies that the study area will be uniformly flooded and assumes that the referenced changes in hydroperiod and inundation depth would result in a shift in plant community type. This assumption is not supported by the empirical data collected in the project area on the relationship between plant communities and hydrologic conditions. The comment does not consider that there will be considerable spatial variation in hydrologic regime and hydroperiod within community types due to topography, as the study area is not a flat surface with a constant elevation. A change in average depth in bulrush marsh from 7 inches (existing) to 18 inches (with project) would not cause the dominant vegetation (chairmaker's bulrush) to be replaced by some other plant species. Bulrush marsh vegetation was observed in 18-inch deep water in areas adjacent to the park.

ID	Comment	Response
	marsh. Two very important points must be addressed. a. With increased flow, one can surmise that the saltgrass wet meadow will disappear. This in turn will cause the elimination of habitat for the least shrew and thus the population of least shrew from the study area. b. This is in direct conflict with your statement on p. 75, col. 2, which states the "plan is consistent" with recommendations by Frey 2005, to "protect saltgrass wetland meadow system from … changes to hydrology" **YET** on page 70 the plan plainly states that there will be an order of magnitude change to the hydrology in this habitat type (e.g. 0.4 to 4 inches).	The forecasted increase in average water depth in saltgrass wet meadow was based on consideration of the shallow depressions created by mechanical removal of salt cedar. It is expected that much of the saltgrass wet meadow area would remain without surface inundation or with very shallow, seasonal inundation. Regardless, increasing water depth from 0.4 to 4 inches and duration of inundation in saltgrass vegetation would be unlikely to cause replacement of saltgrass by some other plant species. The statement that "saltgrass wet meadow will disappear" from the study area is unfounded. Saltgrass was found in the project area in permanently inundated areas at water depths of up to at least six inches (*cf.* saltgrass marsh). The "saltgrass wetland meadow system" referenced by Frey (2005) does not correspond exclusively with the saltgrass wet meadow community described in the study, as is erroneously assumed in the comment. A careful reading of Frey (2005) and consideration of least shrew ecology indicates that the species does in fact occur in mesic habitats notably including marsh areas. Marshes, by definition, are wetlands with emergent vegetation and surface inundation. Frey (2005: 33) concluded that "Most localities and the highest relative abundances of *C. parva* were associated with native emergent wetland communities, especially inland saltgrass meadows and marshes dominated by cattail, sedges, rushes, bulrush, and various wetland grasses" and that "Habitat at capture sites in the Pecos River Valley tended to be associated with emergent marsh species and inland saltgrass …" Consequently, the conclusion in the comment that an increase in average water depth and duration of inundation (*i.e.*hydroperiod) in saltgrass wet meadow "will cause elimination of habitat for the least shrew and thus the population of least shrew from the study area" is

ID	Comment	Response
		not supported by information on the ecology of least shrew. Furthermore, the implication in the comment that least shrew is specifically associated with saltgrass wet meadow, as defined in the study, is not supported by available data on the species (*cf.* Frey, 2005).
TF-02	Time of work is scheduled for January 2007 – August 2007 (see p. 59). This leads to: Discrepancies/contradictions in time of work and effects on Salt Cedar removal/herbicide treatment 1. page 34, col. 2, para. 2 states that herbicide is best done, "late in the growing season." It has been suggested that September is the optimal time to apply herbicide to tamarisk spp. and thus would be outside of the scheduled work time. 2. page 71, col.1, para. 1 states, "…in order to avoid destruction of active nests and mortality of young birds, salt cedar removal would be conducted" from September through March. This contradicts with schedule on page 59.	Concur. Text will be edited to clarify schedule in Section 5.4. Time of work for salt cedar removal/treatment would be between September 1 and April 1 of any year. Therefore, treatment (including herbicide treatment) would take place between January – March 2007. Efficacy of herbicide (especially Habitat) is good year round. Other herbicides (such as Arsenal) have been shown to work best in September. The schedule on Section 5.4 has been clarified.
TF-03	Discrepancies/contradictions in time of work and effects on listed species If work occurs according to schedule on page 59 (i.e. Jan. 2007-Aug. 2007) then it will overlap with 1. spawning times of pupfish and tetras (may effect) 2. breeding season of least shrew (may effect) 3. growing season of Pecos sunflower (may effect) Suggest that work is moved to August through March.	Concur. The schedule on in Section 5.4 has been updated. Based on the current schedule and the schedule for work on salt cedar (discussed in TF-02), work could take place in September through March of any given year. Work within the areas where wildlife may occur (pupfish, tetras, least shrew, Pecos sunflower) would take place between September and March. The current schedule is that this work would occur between January – March 2007.
TF-04	Need more specificity on plan to "replant" disturbed areas: (see p.59, col.2, para. 2) 1. what species will be planted 2. in what abundance will they be planted 3. where will they be planted 4. how will you minimize the change in the plant community composition of the current landscape and thereby minimize negative affects on listed species? (e.g. loss of saltgrass wet meadow affecting least shrew)	1. Species planted will include those native to the area and adapted to the saline soil conditions including chairmaker's bulrush (*Schoenoplectus americanus*), saltgrass (*Distichlis spicata*), baccharis (*Baccharis salicifolia*), and other species that are available either as live material or seed. Section 4.2.2.5 has been updated. 2 & 3. Seeding rates and live material planting rates would be determined in the design based on the actual species used. 4. Only areas where the ground surface has been disturbed (open water habitats and debris removal areas)

ID	Comment	Response
		will be planted. Planting would be conducted by hand using live material or seed. Therefore, there would be no substantial disturbance of existing native vegetation from the planting work. As described in the DPR/EA in Section 6.5.1 and Table 9 existing saltgrass wet meadow habitat will not be lost and the amount of suitable habitat for least shrew will increase in the study area.
TF-05	Suggest that sediment traps be installed in the temporary channel as well as the "new" channel prior to reconnect. These could include straw bales placed in the channel to trap sediment. Where would the "temporary" diversion channel be located, how will it be dug and what effects would it have on the disturbed habitat types (i.e saltgrass wet meadow, saltgrass marsh, etc.) and associated species (e.g. least shrew)?	Best Management Practices' as described in Section 5.2 would be implemented during construction. A silt face will be placed around the channel during construction and sequencing of construction would occur in order to limit sediment inputs.
TF-06	Clarification: 1. State in section 5.2.4 (p. 57) that, "a biologist will be present on site during project implementation…" and then state that a "qualified biologist would periodically monitor work…" 2. p.71, col. 1, para. 2 states "no herbicide spraying will be conducted." If this is true, how will follow up herbicide treatments be conducted? 3. What do the BLM fish barriers have to do with this proposal and the study area?	1. Concur. Section 5.2.4 has been updated. 2. Concur. Section 6.5.3 has been updated to clarify that no *aerial* spraying would be conducted. Cut stumps will be treated with herbicide by hand application using a brush after cutting the tree. Follow-up treatment is described in section 5.3 and involves the same type of herbicide application. 3. The BLM fish barrier and its current state were discussed in the context of describing existing conditions for Pecos pupfish, regarding the continuing threat to the species from hybridization with sheepshead minnow and the security of the pupfish population inhabiting the BLM Overflow Wetlands and the study area.
TF-07	Page 4, Col. 1, line 31 – deleted "listed"	Concur.
TF-08	Page 4, Col. 2, line 20 – delete "of"	Concur.
MM-01	Section 5.0 Description of Recommended Plan The plan states that "Modification of the outlet channel would be conducted in dry conditions. This would be accomplished by dewatering the outlet channel and diverting outflow from Lea Lake around the work area and into Lea Lake." Provide a map the shows the location of this diversion channel and all new feeder channels or diversions.	The diversion channel will be developed during plans and specs or design phase. The Corps will coordinate with the State Park to determine the optimal placement of the diversion.
MM-02	**Section 5.5.1 Water Quality and Wetlands** Provide a map which depicts the locations of the feeder channels and water diversion sites or channels. Provide a detailed description of the BMP's that will be used in	After discussions with the Corps' Regulatory Branch, a 404 permit will not be required since we will not be 'discharging dredged or fill material' into the wetland. A

ID	Comment	Response
	conjunction with your Clean Water Act section 404 authorization from the USACE Albuquerque District and the section 401 water quality certification from the New Mexico Environment Department. I recommend the use of silt fences, hay bails, or sediment traps to control sediment. I recommend that silt fences be place around and between all surface stockpiles of loose dirt or dirt stockpiles.	Section 401 water quality certification will be obtained from NMED. Section 6 has been updated to reflect this.
MM-03	Follow up spray treatment of the herbicide habitat will be required in the following years after the stump treatments are completed. You plan only states that cut stump treatments will be used with habitat.	Concur. See response to TM-06, 2.
MM-04	State that you will notify the Authorized Officer of the RFO BLM immediately if an accidental spill occurs in the wetland that may impact public land.	Concur. The statement was added to Section 5.3, end of third paragraph.
MM-05	**Section 6.3 Water Quality 6.3.1 Suspended Sediments and Turbidity** Provide a detailed description of the BMP's that you will use that are described in your section 404 and 401 certification permit to control and decrease suspended sediment loads and turbidity.	Concur. See response to MM-02
GF-01	The Draft DPR/EA, dated 24 July 2006, does not analyze the potential effects of global warming on aquifer recharge and discharge and the potential changes in outflows from Lea Lake. Future climate change will affect precipitation patterns, surface flow, groundwater recharge and discharge, surface water temperatures, aquatic habitats, and wetland vegetation. Anticipated changes related to water resources that are direct consequences of projected increases in temperature and possible decreases in precipitation include: • greater evaporative loss from lakes and reservoirs; • greater evaporative loss from soils and plants (evapotranspiration); • less runoff and more soil drought for a given amount of precipitation; and • reduced groundwater recharge • Given these anticipated changes in climate, it is reasonable to expect outflows from Lea Lake to decrease in the future, although changes in groundwater recharge due to irrigation returns in the Roswell area may affect the quantity and timing of groundwater discharge in ways that moderates the effects of global warming on the hydroperiod of Lea Lake outflows. Restoration project planning should factor such likely changes into estimates of future Lea Lake outflows under Scenario 3, Technical Appendix H, which may well fall below historic levels, in order to design modifications to the outflow channel and wetland enhancement features that address reduced outflows. Given these anticipated changes, surface water yields into the Pecos River will almost certainly diminish.	The Corps is aware of potential changes to water resources in the future due to global warming. Analysis of this potential on projects of this size is unable to be completed at this time. Most global warming models are at a regional scale at minimum.
GF-02	Section 4.2.2.5 Supplement Wetland Vegetation - Management Measures M through T	Concur. Shrubs will be planted as described in Section

ID	Comment	Response
	of the DPR/EA does not specifically indicate that woody wetland species would be planted, and only specifies that aquatic vascular plants would be planted. The Department is concerned that saltcedar removal be done in a manner that quickly replaces habitat currently provided by saltcedar. Rapid replacement of saltcedar with native shrubs such as willows will minimize the impacts of removal on wildlife that currently occupy saltcedar. One way to rapidly replace habitat currently provided by saltcedar is to plant poles or large container stock of native shrubs as soon as possible. Growth of native shrubs will depend on restoration of adequate hydrology to planting sites, primarily through raising the water table. Drainage of Lea Lake overflow away from the parking lot and campground should not preclude management of drainage downslope of NM-409 in a manner that saturates or raises the water table beneath areas currently mapped as upland vegetation community types.	4.2.2.5. Also, see response to TM-04 above.
GF-03	The Department recommends that the Service and Corps be aware of recent published information on the use of saltcedar by wildlife (Shafroth et al. 2005). Bird use of saltcedar has been documented along the Pecos River (Hunter et al. 1988). The Pecos valley was "largely devoid of mature riparian vegetation before the appearance of salt cedar" (Hunter et al. 1988). The invasion of tamarisk species into the Pecos River valley has altered the habitat and use patterns of avian species. In the Pecos valley, "the number of breeding bird species currently using saltcedar would suggest that bud species expanded into and within the valley with the spread of saltcedar" (Hunter et al. 1988). Breeding bird surveys in the Pecos River Valley of New Mexico indicate that saltcedar provides habitat to numerous avian species including mourning dove, yellow-billed cuckoo, blue grosbeak, and painted bunting (Hildebrandt and Ohmart 198%. In the Pecos River valley, it is unlikely that any other woody species would replace saltcedar, thereby displacing numerous birds and decreasing the diversity of bird species in the area. Within saltcedar areas occupied by yellow-billed cuckoos, specific treatments should be designed to help retain vegetative conditions for this bud by avoiding removal at breeding locations. In August 2004, the Department communicated with Roswell BLM regarding the appropriate size of leave areas for buds in saltcedar habitats along the Pecos River during saltcedar control activities. We indicated that information from Department contracted reports suggest a maximum density of one cuckoo pair per 6 hectares (in "prime" habitats in the Gila drainage), which would be roughly equivalent to a circular area with a 450 ft. radius. The surveys also found cuckoo occurrences along the Pecos River within suitable habitat within mature salt cedar stands and local cottonwood bosques. We suggested a minimum radius of 325- 650 feet for areas to leave untreated during salt cedar control for the benefit of cuckoos and other birds. Treatments could occur in the fall or winter outside of the breeding season.	The Corps is aware of the value of salt cedar to wildlife, especially birds. The stands of salt cedar within the wetland are very small (less than the 325-650 feet radius discussed). The goal of the project is to increase and improve the wetland habitat. Though nesting in these small stands has not been monitored, no listed species (including cuckoo) have been noted to use these stands. Yellow-billed cuckoo suitable habitat is commonly considered to be contiguous riparian woodland stands of at least 4.9 acres (Halterman and Johnson, 2003), although the species rarely nests in patches smaller than 25 acres in size (Laymon, 2001: 335). Salt cedar stands in the park do not meet these criteria and generally consist of small clumps of trees or patches of seedlings and saplings. Nearby stands of woody riparian vegetation along the Pecos River and in the park outside of the study area cottonwood and native shrubs would provide habitat in lieu of these salt cedar stands. The overall wetland habitat (which will include areas of shrub plantings as discussed in Section 6.5.1) will also provide habitat for wildlife, especially birds. **Halterman**, M. and M. Johnson. 2003. *Draft Yellow-billed Cuckoo Natural History Summary and Survey Methodology.* Southern Sierra Research Station, University of Nevada - Reno, Weldon, California. **Laymon**, S. A. 2001. Cuckoos, roadrunners, and anis. Pages

ID	Comment	Response
		332-335 *in*: Elphick, C., J. B. Dunning, Jr., and D. A. Sibley (eds.). *The Sibley Guide to Bird Life and Behavior*. Alfred A. Knopf, New York.

ISC = New Mexico Interstate Stream Commission, Public Comment Letter dated August 31, 2006
TF = Tim Frey, Fishery Biologist with Roswell Field Office Bureau of Land Management, Public Comment
MM = Michael McGee, Hydrologist, Roswell Field Office Bureau of Land Management, Public Comment
GF = State of New Mexico Department of Game and Fish, Public Comment Letter dated August 17, 2006

Appendix 2
Fish and Wildlife Coordination Act Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
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Albuquerque, New Mexico 87113
Phone: (505) 346-2525; Fax: (505) 346-2542

November 8, 2006

Lt. Colonel Bruce Estok
(Attn: Ondrea Hummel)
U.S. Army Corps of Engineers
4101 Jefferson Plaza N.E.
Albuquerque, New Mexico 87109-3435

Re: Final Fish and Wildlife Coordination Act Report for the Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chavez County, New Mexico

Dear Lt. Colonel Estok:

Enclosed is the final Fish and Wildlife Coordination Act Report for the Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chavez County, New Mexico. The main purpose of the proposed project is to restore existing wetlands and improve the environmental quality and habitat for native plants and animals that use the Lea Lake Marsh in the Bottomless Lakes State Park. The Service supports the U.S. Army Corps of Engineers aquatic habitat restoration plan and we have included recommendations in the Coordination Act Report to avoid and/or mitigate potential environmental impacts from the preferred alternative.

This report has been prepared by the U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, under the authority of and in accordance with the requirements of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e).

If you have any questions, please contact Joel D. Lusk of my staff at the letterhead address or at (505) 346-2525 ext. 4709.

Sincerely,

Cynthia G. Abeyta

Cynthia G. Abeyta
Acting Field Supervisor

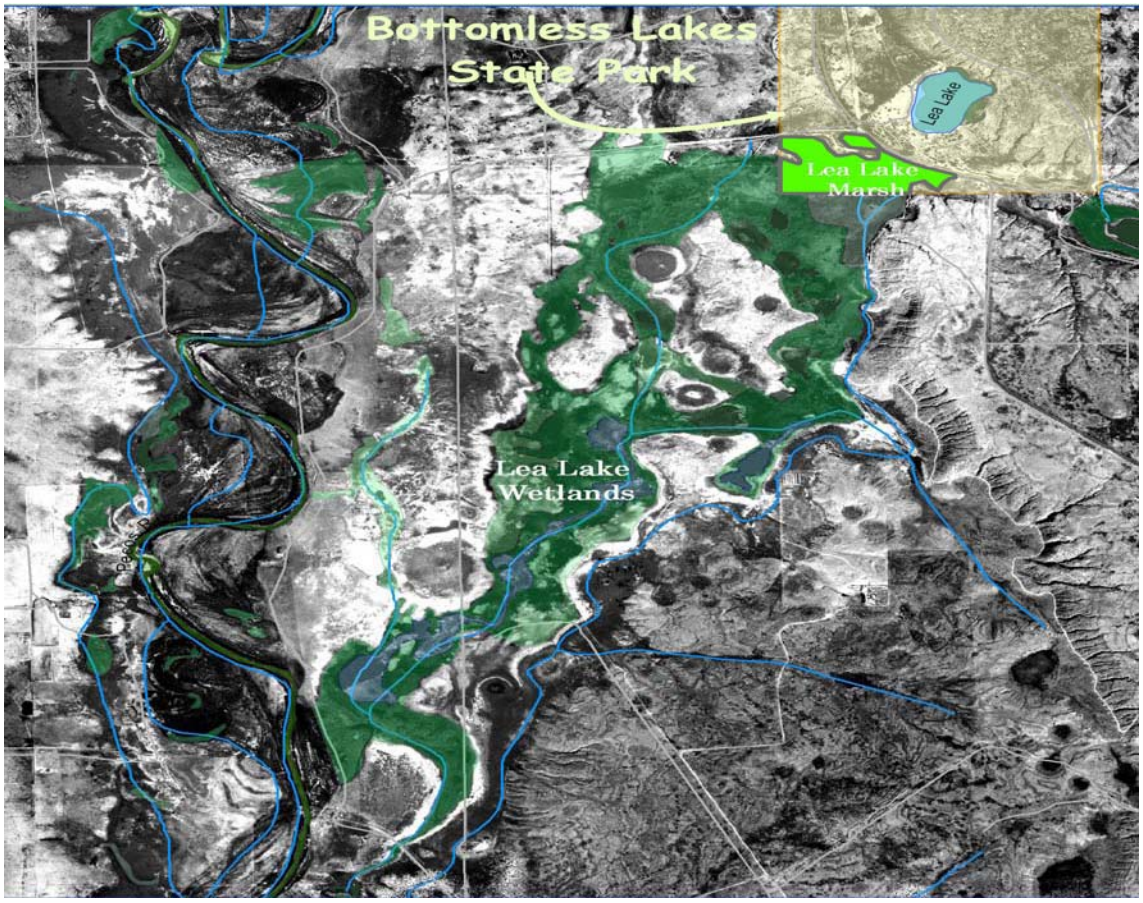
Enclosure

cc: (w/ encl)
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Assistant Regional Director, Fish and Wildlife Service, Region 2, Ecological Services, Albuquerque, New Mexico

Final Fish and Wildlife Coordination Act Report

for the

Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chavez County, New Mexico



U.S. DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

Prepared for the U.S. Army Corps of Engineers
By the U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113

November 2006

Final Fish and Wildlife Coordination Act Report

for the

Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chaves County, New Mexico

Submitted to:
U.S. Army Corps of Engineers
4101 Jefferson Plaza, NE
Albuquerque, New Mexico 87109-3435

Prepared by:
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November 8, 2006

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INTRODUCTION

The Bottomless Lakes State Park (Park) is located about 26 kilometers (km) (16 miles [mi]) southeast of Roswell in Chaves County, New Mexico. The Park was established on November 18, 1933 (State Parks Division 2001) and encompasses about 647 hectares (ha) (1,600 acres [ac]). The Park is situated at an elevation of 1,067 meters (m) (3,500 feet [ft]) along the east side of the Pecos River valley (Figure 1). The Park consists of eight lakes that are primarily fed by underground springs and that developed through the natural dissolution of the subsurface limestone in this area of karst topography (Mussetter Engineering, Inc. [MEI] 2003).

Lea Lake marsh is the portion of wetlands on the Park located in the southwest quarter of Section 34, Township 11 South, Range 26 East, New Mexico Principal Meridian (Figure 2). Latitude and longitude coordinates of the center of the Lea Lake marsh are 33° 18' 56" North and 104° 20' 2" West. The Universal Transverse Mercator coordinates for the Lea Lake marsh are 562,006 m Easting and 3,686,272 m Northing (Zone 13, North American Datum of 1983). The elevation of the Lea Lake marsh ranges from about 1,055 m (3,460 ft) above mean sea level at the beginning of the Lea Lake outflow channel to about 1,051 m (3,447 ft) above mean sea level at the western boundary of the Lea Lake marsh. The land surface slopes gradually from the Lea Lake marsh to the Pecos River Valley to the southwest.

Lea Lake is located near the Park's south boundary and has a surface area of about 6.1 ha (15 ac) (Figure 2). Unlike the other seven sinkhole lakes at the Park, Lea Lake has a substantial artesian outflow of surface water that flows through channels and by overland flow sustaining over 289 ha (715 ac) of wetlands between Lea Lake and the Pecos River (MEI 2003). Most of these wetlands (Figure 3) are on lands that are managed by the Bureau of Land Management (BLM) or are privately-owned. Approximately 13.8 ha (34 ac) of these wetlands sustained by Lea Lake outflow are located within the Park boundary south of New Mexico State Highway 409 (NM 409). Throughout this report "Lea Lake marsh" will be used exclusively for the Park portion of the Lea Lake wetlands. The term " Lea Lake Wetlands" will be used for the wetlands that stretch from the Lea Lake outflow to the Pecos River; including the 252 ha (681 ac) of wetlands on BLM land called the Overflow Wetlands.

The State Parks Division of the New Mexico Energy, Minerals and Natural Resources Department manages the Park. The mission of the Park is "[t]o provide a quality outdoor recreation experience to all visitors through the protection of the natural environment, preservation of historic resources, and educational programming." The primary goal is to provide protection of the natural environment and preservation of historical resources through ongoing evaluation and management practices (State Parks Division 2001).

Aquatic and wetland habitats are relatively rare in New Mexico, but they support a high diversity of native plants and wildlife. For example, over 55 percent of the vertebrate species that occur in the State rely wholly, or in part, on aquatic or wetland habitat for their survival (Blue Earth 2006a). Wetland and aquatic habitats are particularly critical in the

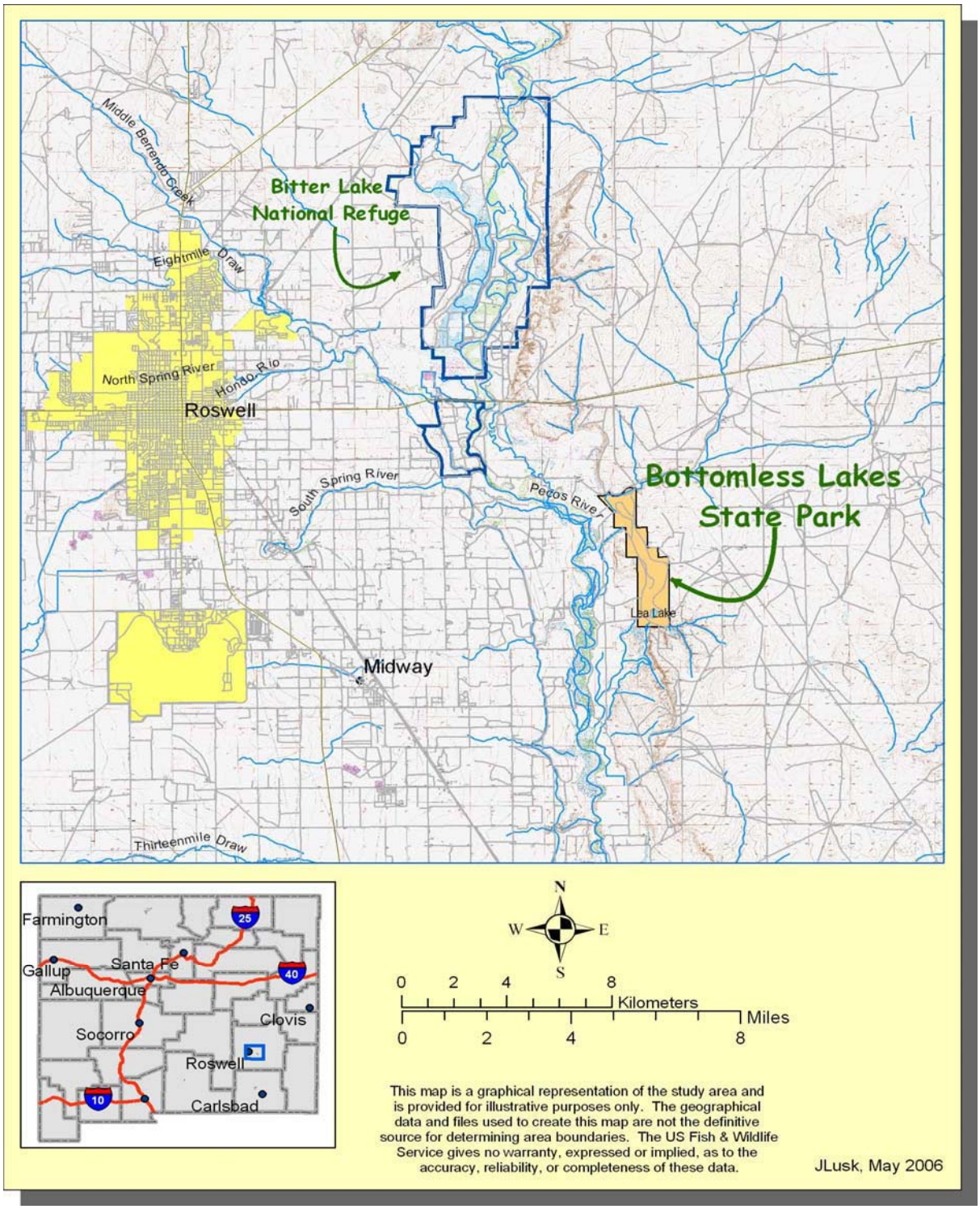

Figure 1. Location of Lea Lake on the Bottomless Lakes State Park and the Bitter Lake National Wildlife Refuge in the Pecos River valley near Roswell, New Mexico.

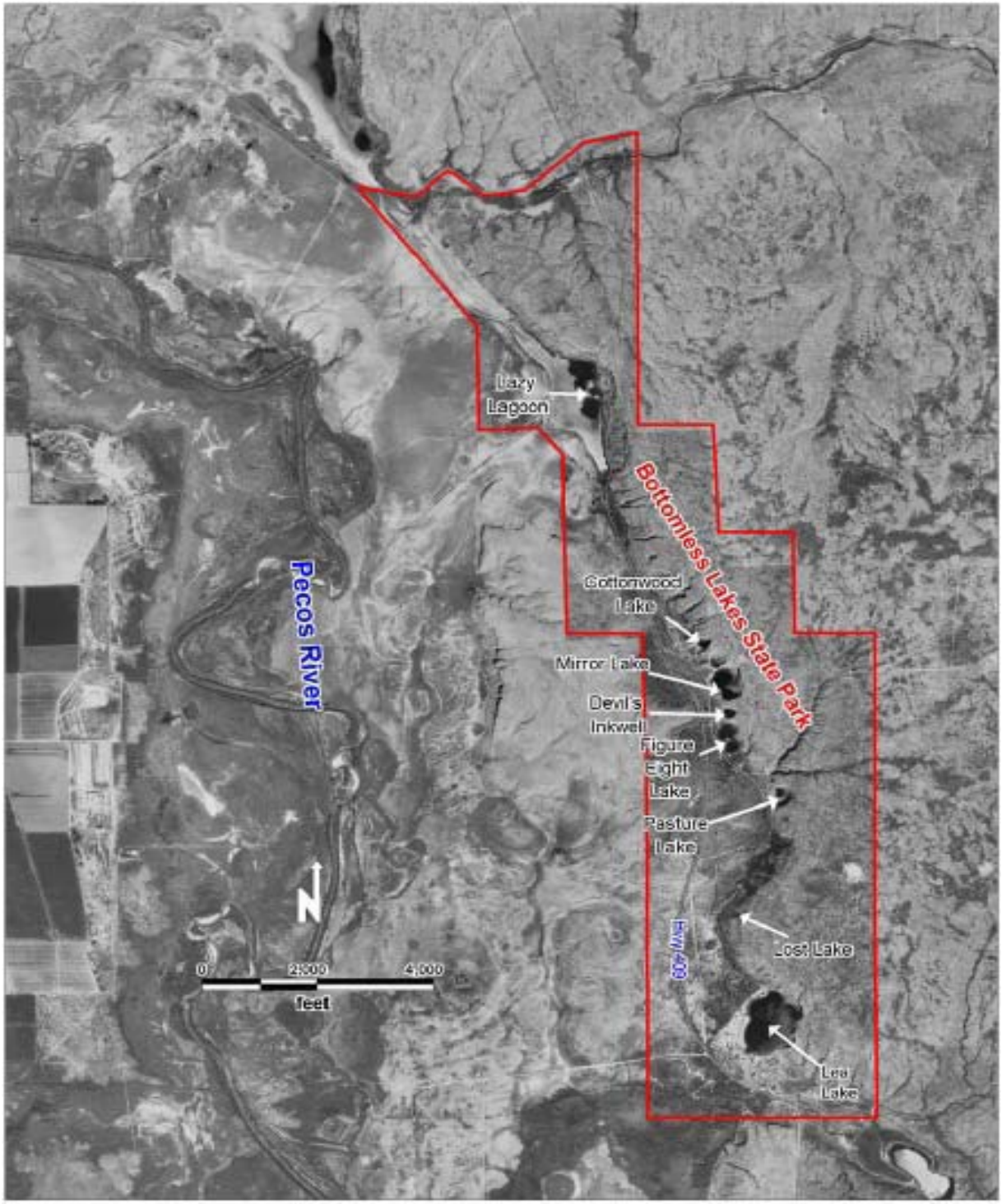

Figure 2. Aerial photograph showing the location of Lea Lake and other lakes on the Bottomless Lakes State Park. (Source: Mussetter Engineering, Inc., 2003).

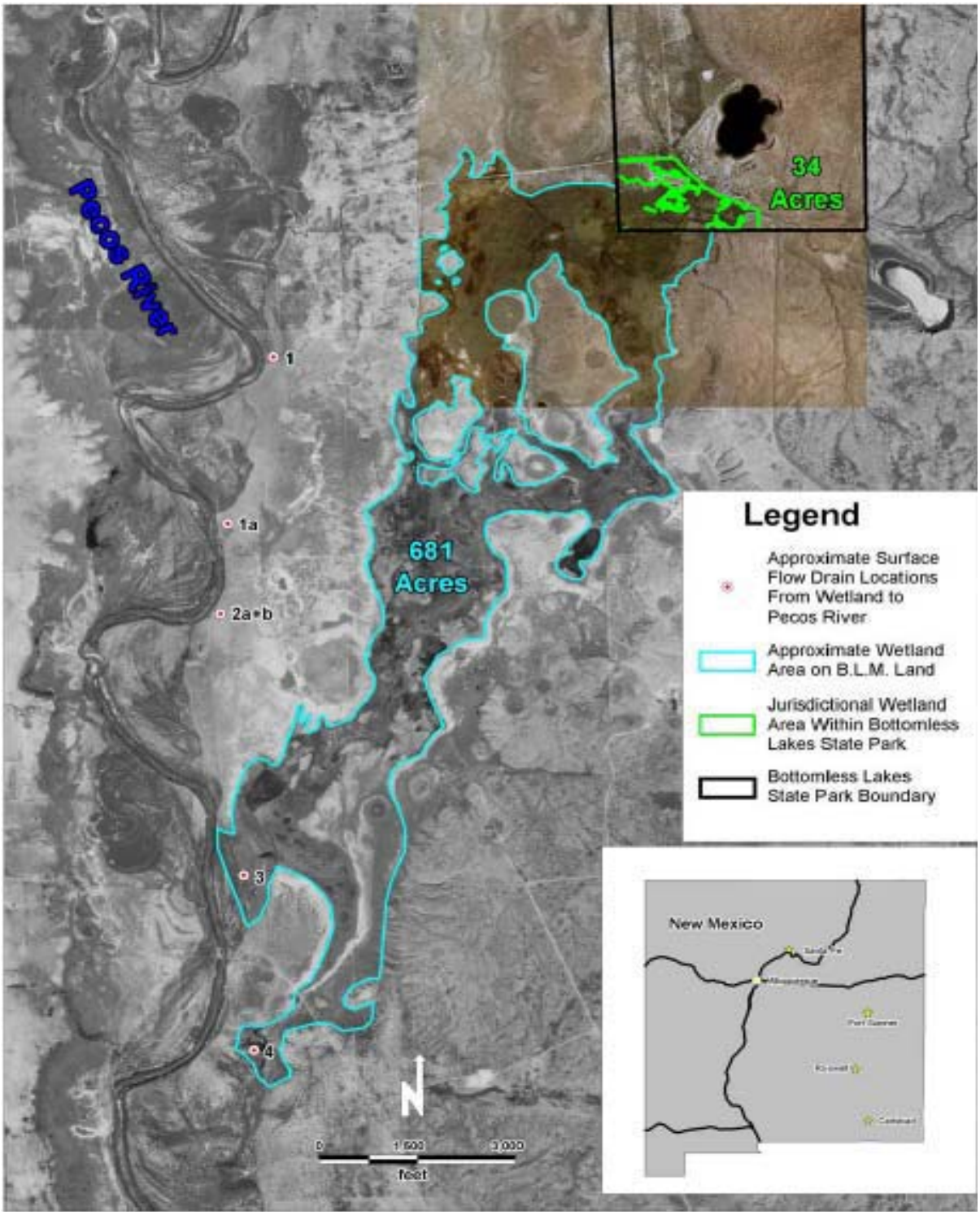

Figure 3. Map showing the approximate wetland boundaries of Lea Lake Wetlands on the Bottomless Lakes State Park and on BLM lands as well as six wetland drain locations to the Pecos River. (Source: Mussetter Engineering, Inc., 2003).

conservation, recovery and management of special-status species; over half of the listed species in the State are associated with wetland or aquatic habitats (New Mexico Department of Game and Fish [NMDGF] 2001). However, it is estimated that fully one-third of the wetlands that once existed in New Mexico have been lost (Dahl 1990). Many of the remaining wetlands have been degraded by invasion of nonnative plants and altered hydrology. Lea Lake marsh like other wetlands in New Mexico has also become degraded through invasion by nonnative salt cedar (*Tamarix chinensis*), by the placement of refuse and debris, and through altering of the wetland hydrology by ditching (Blue Earth 2006a).

Due to changes in the level of the artesian aquifer, the outflow from Lea Lake has increased since flow measurements began in 1976 (MEI 2003). In 2000, this increased discharge flooded the recreational facilities of the park and NM 409 resulting in temporary closure of these facilities (USACE 2006). In 2002, emergency work was conducted by the Park to increase flow capacity of an old ditch system downstream from NM 409 culvert crossing. The emergency work temporarily stopped the overflow and subsequent flooding, however, discharge from Lea Lake continued to overflow the outlet channel at times. In 2005, the Park and the New Mexico Department of Transportation dug a shallow trench from the southwest corner of Lea Lake west to the culvert crossing at NM 409 and buried a culvert to accommodate overflows from Lea Lake. Two new culverts were also placed under NM 409 to move flows into the earthen ditch along the south side of the gravel road leading to the BLM wetlands.

The Park and the US Army Corps of Engineers (USACE) want to redirect the overflows from Lea Lake through the degraded Lea Lake marsh to restore its wetland functions while protecting the developed recreation facilities and NM 409 from high water levels. The USACE has developed a draft feasibility study, Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chaves County, New Mexico (USACE 2006) to "identify, evaluate and recommend to decision makers an appropriate, coordinated, and practical solution to the identified water resources problems and opportunities" on the Park. It is also an objective of the USACE during water resources project planning to contribute to the national economic development consistent with protecting the Nation's environment (USACE 2000). The USACE supports the conservation of the Park's unique and ecologically important aquatic and wetland habitats. These habitats provide an exceptional resource for recreation, education, and scientific investigation. The Park's sinkholes and wetlands also play an important role in the surface water hydrology of the Pecos River.

The Fish and Wildlife Coordination Act (16 United States Code 661-667e, as amended) requires consultation with the U.S. Fish and Wildlife Service (Service) and the fish and wildlife agencies of affected States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. These consultation are undertaken for the purpose of "preventing loss of and damage to wildlife resources." This Fish and Wildlife Coordination Act Report (CAR) is prepared in order to address the proposed activities and any alternatives through the description of existing fish and wildlife

resources in the project area, identification of potential project impacts to fish and wildlife resources, and recommendations to avoid, minimize, and/or mitigate the potential adverse effects to fish and wildlife resources. The USACE, working with its contractors, other Federal and State agencies, and the Park, has conducted a thorough review of the alternatives, and identified a restoration plan that maximizes ecosystem restoration benefits while reducing impacts. The Service provides to the USACE this CAR on the Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chaves County, New Mexico.

PROJECT AREA ECOLOGICAL BACKGROUND AND DESCRIPTION

Geomorphology and Hydrology

Bottomless Lakes State Park is located within the lower Pecos River valley, which is largely covered with sediment deposited by flowing waters of the Pecos River (MEI 2003). However, the eastern side of the valley exposes carbonate and evaporite deposits of the Artesia Group of Permian Age. These rock formations, which include limestone, dolomite, gypsum, and anhydrite, are susceptible to solution by groundwater (MEI 2003). The lithologic character permits solution of the carbonates and evaporites, and along with the eastward dip of the valley that creates the Roswell Artesian Basin (Figure 4). Together with the fault that traverses the Park, they create unique conditions appropriate to the formation of the chain of lakes on the Park and associated wetlands (MEI 2003).

It was the uplift of the Sacramento Mountains to the west that has tilted the geologic formations down to the east, causing migration of the Pecos River channel to its current location east of Roswell (Land 2003) and formation of the Roswell Artesian Basin (Figure 4). This aquifer is between 76 and 137 m (250 and 450 ft) thick and is characterized by a significant amount of porosity due to the dissolution of the evaporites within the formation. The result is an aquifer that is represented by cavernous limestone, solution breccias, and solution-enlarged fractures (MEI 2003). Water infiltration into joints and other pathways enlarge passageways through the limestone by solution, which eventually creates a closed-surface depression. When a subsurface cavern enlarges, and the overlying rocks collapse, a natural sinkhole lake, often referred to as a “doline” and also a “cenote” or natural well, is formed. Solution at depth leads to “collapse doline” formations (Figure 5; Sweeting 1973) that are found on the Park as well as on the Bitter Lake National Wildlife Refuge to the east. According to Ritter (1978), sinkhole lakes tend to have greater depth-to-width ratios and sidewalls that are characteristically steep and rocky. The carbonate aquifer that is overlain by a leaky confining layer creates an artesian condition and therefore, water seeps from the ground into the Pecos River above the confining layer (Land 2003) particularly in the area of Lea Lake due to the various geologic faults, buckles and folds in this area (Kelley 1971).

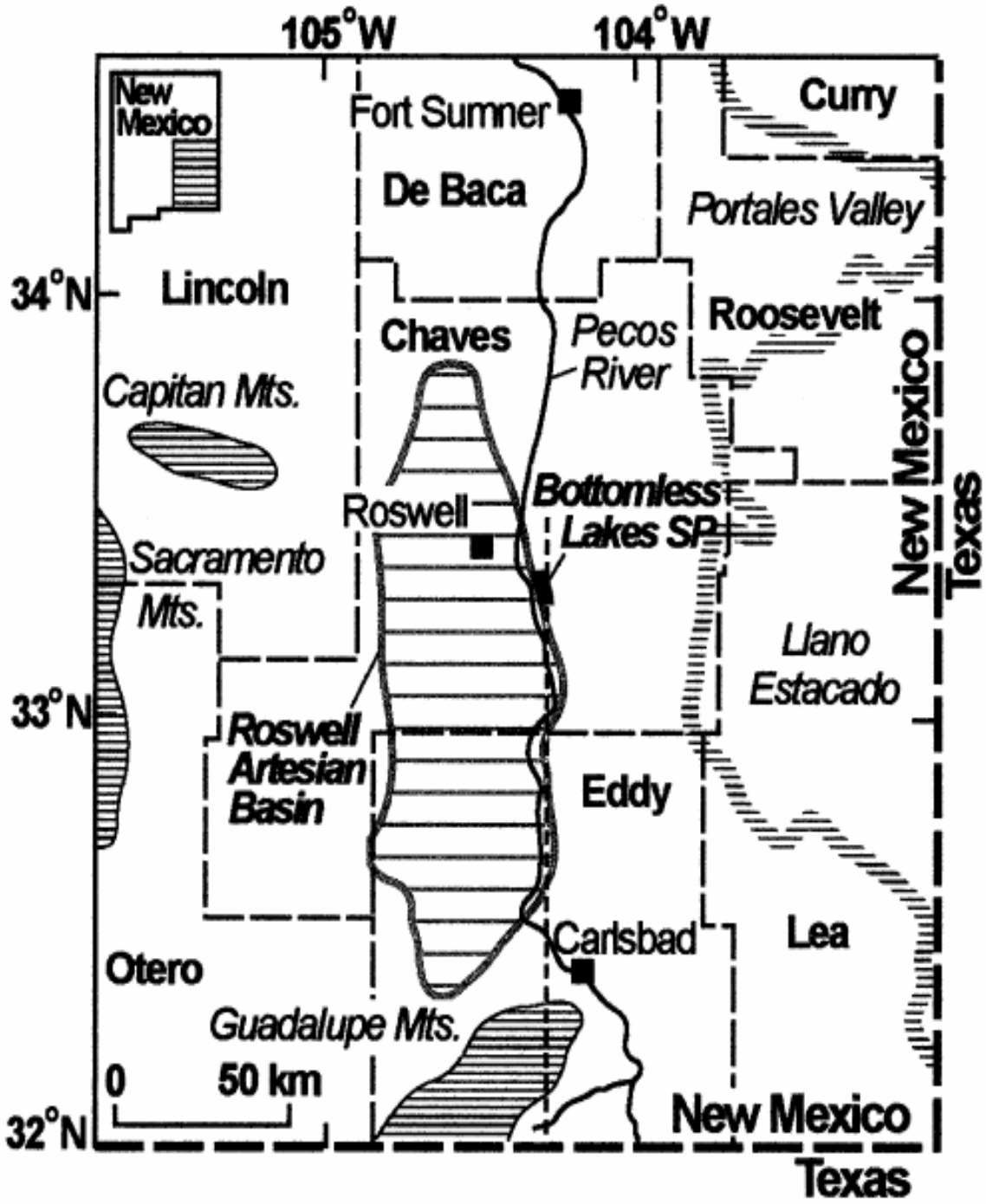

Figure 4. Map showing extent of Roswell Artesian basin.
(Source: Mussetter Engineering, Inc., 2003 citing Land 2003).

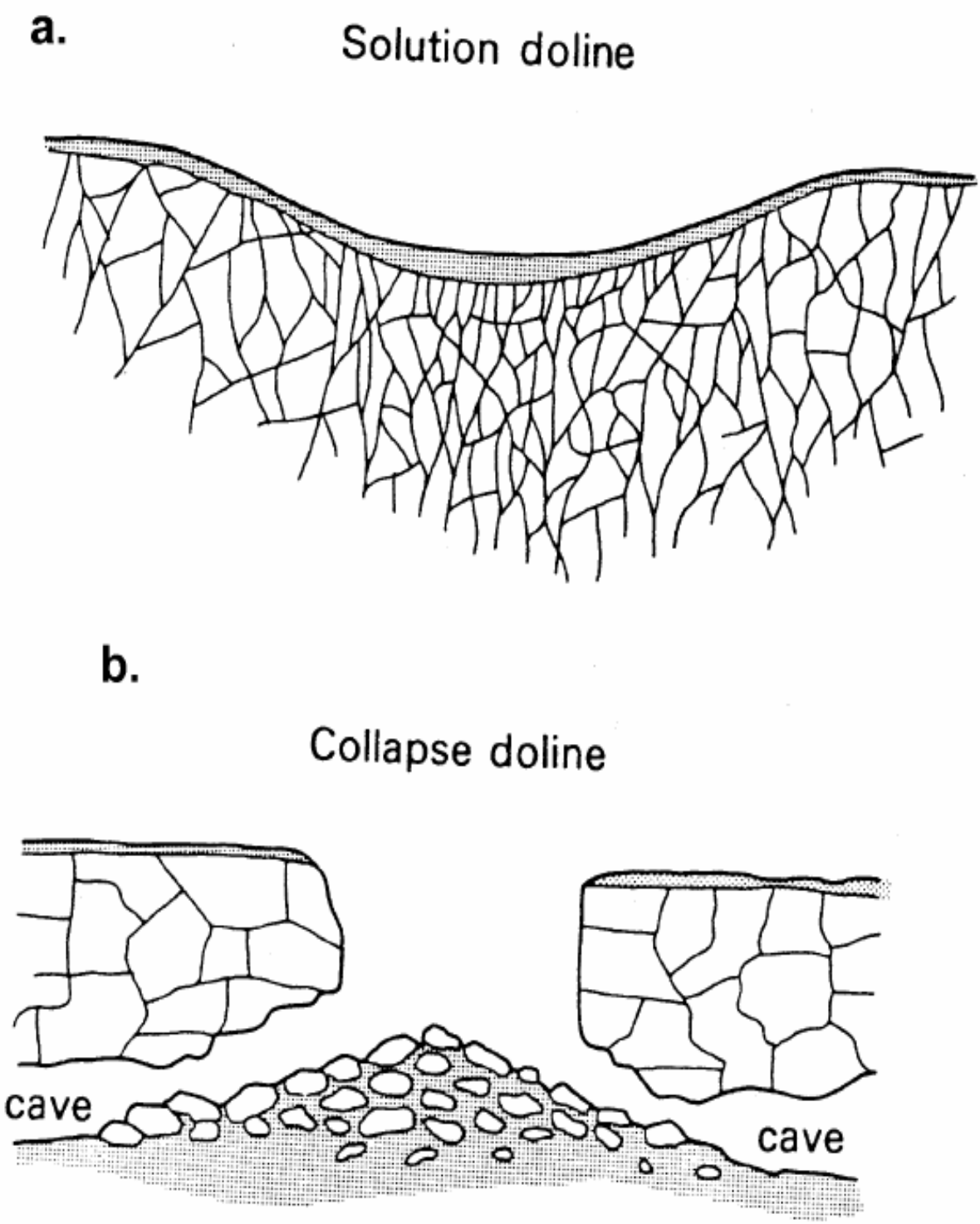

Figure 5. Types of doline (Source:Mussetter Engineering, Inc. 2003 citing Williams 1969).

Water levels and the resulting outflow from Lea Lake are primarily controlled by the hydraulic head in the artesian aquifer (MEI 2003). These surface-water outflows from Lea Lake travel through the outlet channel to a wetland area that is located starting about 213 m (700 ft) downstream (Figure 6). The majority of the flow remains canalized for an additional 304 m (1,000 ft) to the south boundary of the Park. Drainage patterns in the Lea Lake marsh downstream include two distinct channels, referred to as the South Wetlands Channel and the West Wetlands Channel (Figure 6). Water partially escapes these channels due to both seepage and overtopping of the primary flow paths which creates numerous locations with standing water. Additionally, there is shallow overland flow through inundated portions of the Lea Lake marsh.

The combination of overland and channel flow exit the approximately 13.7 ha (34 ac) jurisdictional wetlands of the Park onto private wetlands and wetlands managed by the BLM. The approximately 276 ha (681 ac) BLM portion of the Lea Lake wetlands extends from the Park to the Pecos River (Figure 3). Surface water continues to flow in a southwesterly direction across the BLM overflow wetlands to the Pecos River. Mussetter Engineering, Inc. (2003) identified six locations as points at which the surface water drains from the wetland into the Pecos River (Figure 3). Discharge measurements at these drains have been taken by the New Mexico Interstate Stream Commission (NMISC) approximately every two weeks since December 2002 indicate that flows crossing the wetland and entering the Pecos River also fluctuate seasonally. These data also indicate that in the winter months when the discharge from Lea Lake is highest, approximately 10 percent of the discharge is lost from the wetland through a combination of evapotranspiration, evaporation, and groundwater infiltration. During the summer approximately 70 percent of the surface flows from Lea Lake are consumed and purified by the wetland before reaching the Pecos River. Average annual discharge from Lea Lake into the Lea Lake wetlands during 2002 and 2003 was about 11,360,00 cubic meters (m^3) (over 3 billion gallons of saline water annually).

Factors that could potentially affect the hydraulic head in the aquifer include changes in land use, well-pumping rates, irrigation practices, retirement of water rights, and water restrictions (MEI 2003). Natural recharge of the artesian aquifer occurs by infiltration of precipitation and surface-water runoff that flows east from the Sacramento Mountains. Since the beginning of irrigation in the Pecos River Basin (more than 800 wells had been installed by 1975), both the seasonal and long-term variability in pumping rates have affected both the discharge and recharge of the aquifer (MEI 2003). The magnitude and temporal distribution of Lea Lake outflows are important to the function of the wetland area. Discharges in the Lea Lake outflow channel have been measured by the U.S. Geological Survey (USGS) on an approximately quarterly basis since February 18, 1976 (MEI 2003). Between the start of the program in 1976 and construction of the outlet channel in January 2002, Lea Lake outflows were piped underground from the lake boundary to a location on the downstream side of NM 409. After the flow crossed under Highway 409, it entered a small ditch that carried the discharge out into the downstream marsh (Figure 6).

Figure 6. Map of the Lea Lake Marsh on the Bottomless Lakes State Park and current alignment of the outlet and wetland channels (Source: USACE 2006).

The MEI (2003) reported the average Lea Lake outflow discharges measured since the completion of the new outlet channel in 2002 are about 0.4 cubic meters per second (m^3/s) (12.6 cubic feet per second [ft^3/s]) and ranged from 0.3 to 0.5 m^3/s (9.5 to 16.2 ft^3/s). Blue Earth (2006a) reported that about 57 percent of the inflow into the Lea Lake marsh, or 0.22 m^3/s (7.9 ft^3/s), exited the Park via the South and the West Channels; the remaining 43 percent flowed through the Lea Lake marsh via inundated areas.

Water Quality

Lea Lake is slightly saline, with a specific conductance ranging from about 9.95 to 12.7 µS/cm (NMDGF 1959; Davis and Joseph 1998; Blinn 2003). Blue Earth (2006a) reported the conductivity of surface waters in the marsh on 29 October 2003 as ranging from 10.4 to 10.7 µS/cm. Blinn (2003) reported the major cations in water samples included sodium (92 millimoles/liter [mmol/L]), potassium (0.4 mmol/L), calcium (22 mmol/L), and magnesium (7 mmol/L) and the anions chloride (106 mmol/L), sulfate (22 mmol/L) and carbonate (3 mmol/L).

The NMDGF (1959) reported the hydrogen ion concentration (pH) in Lea Lake ranged from a high of about pH 8.2 in the fall through early spring, to a low of about pH 6.4 in the middle of the summer. Brandenburg and Farrington (2003) reported that the surface water temperature in Lea Lake marsh varies seasonally from a low of about 12.7 ^oC (55 ^oF) in January to a high of about 26.7 ^oC (80 ^oF) in July. Water and sediment from Lea Lake were analyzed for potentially toxic chemicals, such as arsenic, beryllium and for other heavy metals, as well as pesticides (Davis and Joseph 1998), and none were found above concentrations of concern or found to exceed any water quality criteria. Davis and Joseph (1998) also reported that Lea Lake was well oxygenated throughout its depth and had a large diversity of algae and macroinvertebrate species.

The outflow from Lea Lake and the Lea Lake marsh are not formally classified waters under the New Mexico Water Quality Standards (§20.6.4 of the New Mexico Administrative Code [NMAC]). Consequently, the New Mexico Water Quality Control Commission has not adopted a stream segment description or defined the specific numeric water quality criteria necessary to protect the existing uses of the Lea Lake outflow channel or the Lea Lake marsh. However, all waters of the State of New Mexico are protected by the general water quality standards (20.6.4.12 NMAC) as well as by the Antidegradation Policy (20.6.4.8 NMAC), which are applicable to the Lea Lake outflow channel and to the Lea Lake marsh. Moreover, Davis and Joseph (1998) reported that the existing water quality of Lea Lake fully supports wildlife habitat, primary contact and warmwater fishery uses.

Vegetation

The Park is situated in a region of Chihuahuan desert scrub and desert grassland vegetation (Dick-Peddie 1993). Outflow from Lea Lake creates saltgrass marsh and meadows that support distinct plant communities which share few characteristics with the surrounding uplands (Blue Earth 2006a). The Lea Lake marsh closely resembles the iodineweed series of

alkali sink vegetation described by Dick-Peddie (1993), which is characterized by a dominance of salt-tolerant species such as iodinebush (*Allenrolfea occidentalis*), seepweed (*Suaeda sp.*), inland saltgrass (*Distichlis spicata*), and four-wing saltbush (*Atriplex canescens*).

Blue Earth (2006a) conducted a survey of the Lea Lake marsh in October 2003 to delineate and characterize the wetland communities. Blue Earth (2006a) determined the wetland indicator status of dominant plant species using the New Mexico list of wetland plant species (Reed 1988) and the Natural Resources Conservation Service's PLANTS Database (Natural Resources Conservation Service 2002). The taxonomic names of plants follow those of Allred (2003).

Vegetation in the Lea Lake marsh was characterized by relatively low species diversity of vascular plants (Blue Earth 2006a). Blue Earth (2006a) reported that the cumulative total number of dominant species was 19 (Appendix 1). The 19 dominant species, in order of the most frequently encountered to the least were: salt cedar, inland saltgrass, iodinebush, southwestern sea-lavender, alkali sacaton, narrowleaf cattail, shrubby seepweed, witchgrass, willow baccharis, sweet-scent, spiral ditch-grass, chairmaker's bulrush, four-wing saltbush, southern Jimmyweed, kochia, ragweed, Pecos sunflower, pepperweed, and rabbitfootgrass (Appendix 1). Blue Earth (2006a) reported that salt cedar and saltgrass were the most widespread and frequently-encountered dominant species in the Lea Lake marsh, occurring at 88 percent and 83 percent of the sample sites, respectively (Appendix 1).

The dominant plant species and hydrologic conditions were used by Blue Earth (2006a) to delineate wetland vegetation communities in Lea Lake marsh. Delineation resulted in defining10 community types: saltgrass wet meadow, saltgrass marsh, salt cedar copse, barren ground, iodinebush flats, cattail marsh, saltgrass-iodinebush marsh, bulrush marsh, and wetland channel (Figure 7). The wetland community types reported by Blue Earth (2006a) are summarized below and in Figure 7:

> The saltgrass wet meadow community was the most abundant, covering 25.4 percent or 4.41 ha (10.90 ac) of the Lea Lake marsh. Salt cedar invasion was widespread in this community, with salt cedar cover averaging about 50 percent. Saltgrass wet meadow was fairly variable in the Lea Lake marsh, ranging from areas with nearly 100 percent saltgrass cover to areas overgrown with salt cedar.
>
> The saltgrass marsh was the second most abundant community type, covering 3.25 ha (8.04 ac) or 18.7 percent of the Lea Lake marsh. This community type had standing water, which was often obscured by a thick, spongy mat of saltgrass that grew on the upper surface of standing water. Saltgrass typically

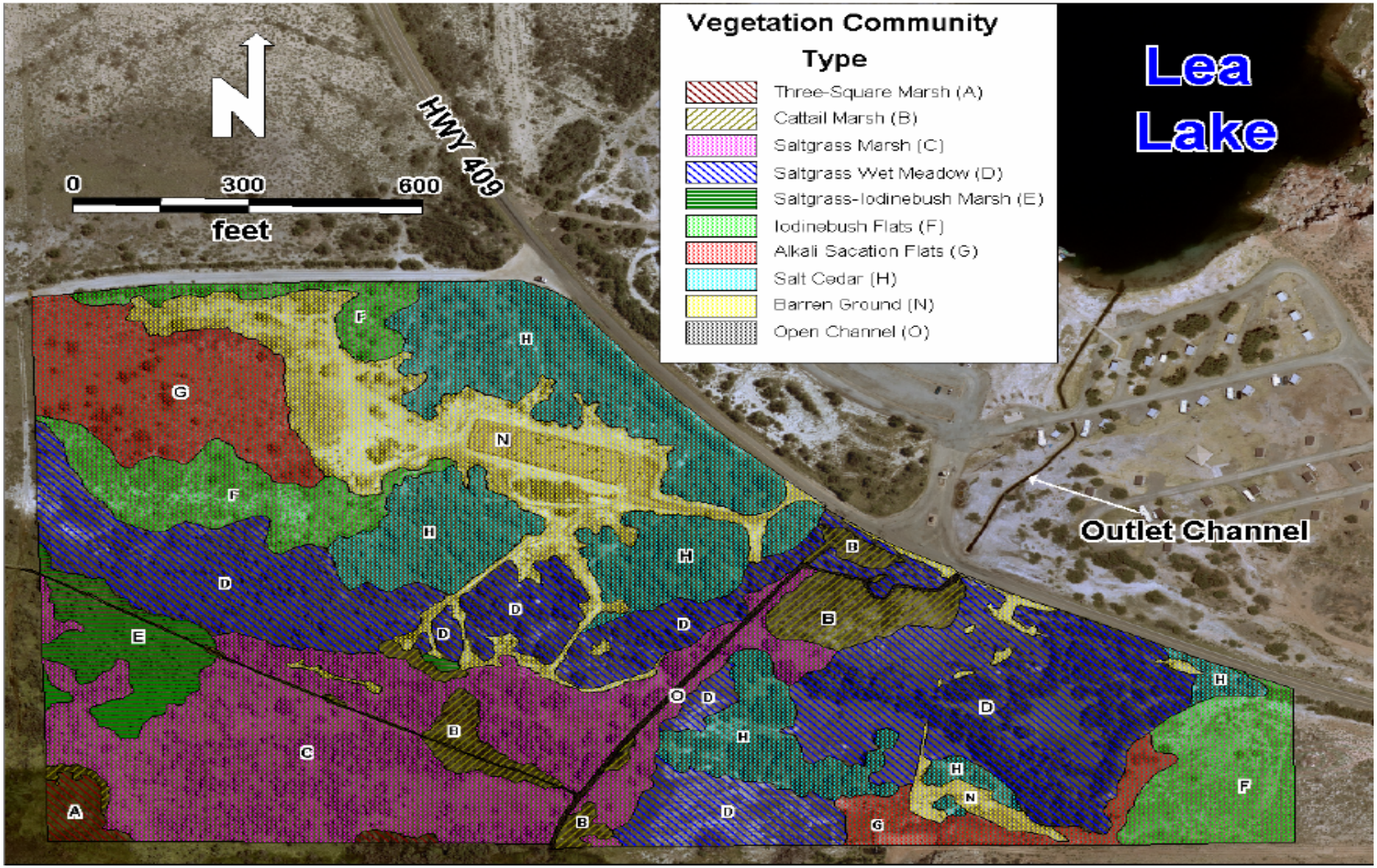

Figure 7. Map of vegetation community types identified by Blue Earth Ecological Consultants, Inc. (2006a) within the Lea Lake Marsh on the Bottomless Lakes State Park.

formed dense, monotypic stands in this community type, with occasional patches of alkali sacaton or witchgrass, and scattered individuals of southwestern sea-lavender. Iodinebush also occurred as scattered plants, typically near the boundary with drier community types, such as iodinebush flats and saltgrass-iodinebush marsh.

The salt cedar copse community was the third most abundant vegetation, covering 2.90 ha (7.16 ac) or 16.7 percent of the Lea Lake marsh. This community was typically characterized by very dense growth of salt cedar seedlings, saplings, and small trees. There was a relatively high percentage of bare ground in this community. Also, ragweed was a relatively common, although patchily distributed, plant species in this community type.

Barren ground was the fourth most common cover type, comprising 12.6 percent or 2.19 ha (5.40 ac) of the Lea Lake marsh. Barren ground was classified as areas with no more than 20 percent plant cover. Often, the whitish deposits of various salts and minerals are visible on the surface.

The iodinebush flats community type covered 9.7 percent of the Lea Lake marsh and comprised 1.69 ha (4.17 ac). This vegetation had a fairly high bare ground component, with iodinebush and alkali sacaton sharing dominance in the plant community.

About 8.4 percent of the Lea Lake marsh or 1.47 ha (3.63 ac) was covered by alkali sacaton flats. This was the only community where southern jimmyweed was found.

The cattail marsh community occurred in nine locations in the Lea Lake marsh. This community type comprised 3.9 percent of the Lea Lake marsh or 0.68 ha (1.69 ac). All of the cattail marsh stands were located near or adjacent to wetland channel habitat. Cattail marsh consisted of nearly monotypic stands of narrowleaf cattail.

The saltgrass-iodinebush marsh typically occurred as a transition community between saltgrass marsh and iodinebush flats or saltgrass wet meadow. This community type covered 0.54 ha (1.32 ac) and comprised 3.1 percent of the Lea Lake marsh.

The bulrush marsh was only found at two locations in the Lea Lake marsh. This community type occurred at sites that were perennially inundated. Bulrush marsh was much more common south and west edge of the Park boundary, bordering on private lands and on BLM lands. This community type covered 0.9 percent of the Lea Lake marsh or 0.15 ha (0.38 ac).

> The wetland channel habitat consisted of only 0.6 percent of the Lea Lake marsh. This community type covered 0.11 ha (0.27 ac). The Pecos sunflower and sweet-scent occurred almost exclusively in this community type. Also, this was the only community type where spiral ditch-grass was found.

In total, Blue Earth (2006a) reported that there were about 13.7 ha (33.9 ac) or 79 percent of the Lea Lake marsh were jurisdictional wetlands. Excluding the non-native salt cedar, Lea Lake marsh was characterized by a predominance of herbaceous plants. Seventeen of the nineteen dominant plant species (89 percent) in the Lea Lake marsh were classified as facultative, facultative wetland, or obligate wetland plants. Due to the absence of physical disturbance, plant communities at the Lea Lake marsh are relatively stable (Blue Earth 2006a)

FISH AND WILDLIFE IN THE PROJECT AREA

The Lea Lake marsh provides habitat for a diverse assemblage of plant, invertebrate, and vertebrate species (Blue Earth 2006a). Notably, the Lea Lake marsh has an extremely high odonate diversity, including 41 species of dragonflies and 22 species of damselflies (Larson 2001). Additionally, the Lea Lake marsh provides habitat for numerous rare, endemic, or protected species such as the Pecos sunflower (*Helianthus paradoxus*); Blanchard's cricket frog (*Acris crepitans blanchardi*); Pecos pupfish (*Cyprinodon pecosensis*); arid land ribbon snake (*Thamnophis proximus diabolicus*); least shrew (*Cryptotis parva*); Wright's marsh thistle (*Cirsium wrightii*); Pecos River muskrat (*Ondatra zibethicus ripensis*); and, Mexican tetra (*Astyanax mexicanus*) (Blue Earth 2006a). These wetlands also provide important habitat for migratory waterfowl, shorebirds and wading birds, as well as several neotropical songbirds. Blue Earth (2006a) provided the following summary of the fish and wildlife of the Lea Lake marsh.

Invertebrates

The aquatic invertebrate fauna of Lea Lake marsh has not been comprehensively studied. Brandenburg and Farrington (2003) found large numbers of the amphipod Hyalella in the Lea Lake marsh during their work on Pecos pupfish. Larsen (2001) recorded 41 species of dragonflies and 22 species of damselflies from the Park. Smith (2003) conducted a general insect and arthropod survey of the Park in August 2002, with an emphasis on species of public health importance. Smith (2003) sampled the shoreline of Lazy Lagoon and found common horsefly (*Tabanus punctifer*), desert locust (Cicadidae), kissing bug (*Triatoma sp*.), two ground beetle species (Carabidae), and four species of tiger beetles (*Cicindela circumpicta johnsoni, C. ocellata rectilatera, C. punctulata,* and *C. lemniscata rebaptisata*).

Fishes

The fish fauna of the Lea Lake marsh was described in a study of the Pecos pupfish conducted in 2002 and 2003 (Brandenburg and Farrington 2003). The study recorded five species of fish. These species, listed from the most to the least abundant, were Pecos

pupfish, western mosquitofish (*Gambusia affinis*), rainwater killifish (*Lucania parva*), plains killifish (*Fundulus zebrinus*), and green sunfish (*Lepomis cyanellus*). Western mosquitofish and green sunfish are introduced species while the other three species are native to the Pecos River Basin. Total number of fishes collected during the study was highest in Lea Lake marsh, compared to sites sampled in the BLM Overflow Wetlands. Also, Lea Lake marsh supported the highest population density of Pecos pupfish and was found to provide an important over-wintering habitat for these fish (Brandenburg and Farrington 2003). Brandenburg and Farrington (2003) concluded that there was a lack of shallow, low-velocity habitat at Lea Lake marsh and that this habitat is important for growth of larval pupfish.

Migratory Birds

In comparison to other animal groups, the avian fauna of the Park is well documented. The Park's bird list includes 81 species: 26 year-round resident species, 18 spring-summer residents, and 37 fall-winter residents (Appendix 2). Frequently observed bird species include American crow, barn swallow, black-necked stilt, blue grosbeak, belted kingfisher, common nighthawk, greater roadrunner, killdeer, mallard, mockingbird, mourning dove, northern flicker, rock wren, scaled quail, semipalmated sandpiper, turkey vulture, western kingbird, western meadowlark, white-crowned sparrow, and a variety of waterfowl (ducks, geese, and cranes). Commonly observed raptors include great horned owl, northern harrier, Swainson's hawk, and American kestrel. Bird surveys conducted in October 2000 found another 22 species: Virginia rail, greater yellowlegs, lesser yellowlegs, black phoebe, eastern phoebe, western scrub jay, juniper titmouse, brown creeper, Bewick's wren, western grebe, greenbacked heron, ring-billed gull, cooper's hawk, Cassin's kingbird, house wren, ruby-crowned kinglet, orange-crowned warbler, yellow rumped warbler, Townsend's warbler, spotted towhee, and song sparrow (S. Cary, State Parks Division, unpublished data).

Other Animals

Due to abundant water and wetland habitat, wildlife is plentiful and varied in the Park. Mammals populating the area include the mule deer, bobcat, coyote, raccoon, badger, skunk, jackrabbit and small rodents. The area supports a variety of reptiles and amphibians. In addition to a variety of snakes and lizards, the Park is home to two protected frogs: the eastern barking frog (*Eleutherodactylus augusti*) and the northern cricket frog (*Acris crepitans*). Other aquatic vertebrates observed by Blue Earth (2006a) included slider turtle (*Trachemys scripta*), muskrat (*Ondatra zibethicus ripensis*), plains leopard frog (*Rana blairi*), and checkered garter snake (*Thamnophis marcianus*).

Threatened and Endangered Species

Threatened and endangered plant or animal species are often protected under federal or state law. Protection from harm, harassment, or destruction of habitat is afforded to species protected under the federal Endangered Species Act. Of the 14 species listed under the federal Endangered Species Act in Chaves County, only seven federally-listed species were considered to potentially occur in the Lea Lake marsh based on habitat requirements (Blue Earth 2006a). These included Pecos sunflower, Roswell springsnail (*Pyrgulopsis*

roswellensis), Koster's tryonia (*Juturnia kosteri*), Pecos assiminea (*Assiminea pecosensis*), and Noel's amphipod (*Gammarus desparatus*), bald eagle, and southwestern willow flycatcher. These species are discussed below.

Pecos Sunflower

The Pecos sunflower was listed as threatened under the federal Endangered Species Act on 20 October 1999 (64 FR 56582). The main threat to continued existence of the Pecos sunflower is loss or alteration of wetland habitat. The known distribution of Pecos sunflower consists of six population centers, two of which are in Texas and four in New Mexico (Service 2004). The species is known from locations in Cibola, Valencia, Socorro, Guadalupe, and Chaves Counties in New Mexico, and from Pecos and Reeves Counties in Texas (New Mexico Rare Plant Technical Council 1999). Habitat for the Pecos sunflower is saturated, saline soils of desert wetlands associated with rivers and spring systems from 1,000 to 2,000 m (3,300 to 6,600 ft) elevation.

The species is restricted to saline wetland habitats and requires saturated soils for seed germination; adult plants grow well in standing water (New Mexico Rare Plant Technical Council 1999). In Texas, Pecos sunflower was found in locations where surface soil salinity was approximately 10 parts per thousand (van Auken and Bush 1998). The species appeared to be distributed along a moisture gradient where it was closely associated with saltgrass and was infrequently associated with alkali sacaton, which occurred on sites drier than those occupied by saltgrass (van Auken and Bush 1998). Persistence of Pecos sunflower populations depends upon annual re-establishment by seed (Service 2004). Viable seed may persist in the soil seed bank until germination conditions are suitable. Optimal conditions for seed germination occur when high water tables or precipitation reduce surface soil salinity (Service 2004). This is similar to seed of other halophytic plant species which often remain dormant under conditions of high salinity and delay germination until surface salinity is reduced (Ungar 1978).

Pecos sunflower blooms in September through October and seeds mature during October and November. A two- to three-month after-ripening period is required before germination (Service 2004). Distribution of individuals within populations is patchy and varies spatially from year to year, depending on seed dispersal, suitable germination sites, adequate soil moisture in the rooting zone, and occurrence of propagules in the seed bank. Pecos sunflower is shade intolerant and requires relatively open ground for germination and growth (Service 2004). Pecos sunflower has been found to respond positively to removal of salt cedar, which shade the understory and reduce habitat suitability for the species (Service 2004). Additionally, maintenance of saturated or inundated wetland soils is necessary for persistence of the species. It also appears that some form of disturbance that creates bare or sparsely-vegetated hydric soil sites is necessary for persistence of the species (e.g., water level fluctuations).

Pecos sunflower was observed by Blue Earth (2006a) in patchy distributions in the Lea Lake marsh during field investigation. The majority of the observations were of Pecos sunflower along the South Wetlands Channel, from the outlet of the culverts at NM 409 downstream to the south boundary of the Lea Lake marsh. A total of 320 plants were found by Blue Earth (2006a) along the south channel in the 12 patches. Pecos sunflower was found at only one location along the West Wetlands Channel, in a clump consisting of 12 individual plants along the right bank about halfway to the west boundary of the Park.

Roswell springsnail, Koster's tryonia, Pecos assiminea, and Noel's amphipod
Four invertebrate species occur in aquatic habitats in the Pecos River drainage in New Mexico and Texas. All four invertebrate species occur at sinkholes, springs, and associated spring runs and wetland habitat. The Roswell springsnail, Koster's tryonia, and Pecos assiminea are all aquatic snail species.

Although habitat appears to be suitable for these four invertebrate species, they were not considered to occur in the Lea Lake marsh based on recent sampling conducted by the NMDGF (B. Lang, NMDGF Invertebrate Biologist, personal communications, 17 September 2003 and 17 April 2006). There are also no historic collection records of any of these four invertebrates from Lea Lake marsh or from the Overflow Wetlands (B. Lang, NMDGF Invertebrate Biologist, personal communication, 4 May 2006).

Bald Eagle and Southwestern Willow Flycatcher
Neither of these species has been recorded from Lea Lake marsh. The bald eagle could potentially occur in the Lea Lake marsh during migration, but suitable roost sites are not present that would suggest longer-duration occurrence at the marsh. Similarly, suitable habitat for southwestern willow flycatcher (flycatcher) has not been found at the marsh. The flycatcher is a riparian obligate and nests in riparian thickets associated with streams and other wetlands where dense growths of willow, buttonbush, boxelder, Russian olive, salt cedar or other plants are present. Although there are some patches of dense salt cedar, none are large enough to provide suitable nesting habitat for the species (i.e., patch width of at least 10 m [30 ft]; Sogge et al. 1997).

The following discussion on species listed by the State of New Mexico (i.e., endangered or threatened or identified as a species of concern) was summarized from the USACE (2006).

Mexican Tetra
Mexican tetra is native to the lower Rio Grande, Pecos River, and Nueces River drainages in southern Texas and the lower Rio Grande and Pecos River in New Mexico (Sublette et al. 1990). Hoagstrom and Brooks (1999) collected Mexican tetra in Lea Lake and the South Wetlands Channel during field investigations conducted in 2003 (Blue Earth 2006a). Habitat suitable for the species is present in all of the outflow channels and in adjacent wetlands. Mexican tetra moves seasonally between habitats to avoid low winter water temperatures (Edwards 1977). Mexican tetra spawn in late spring to early summer and lays adhesive eggs.

Habitats used by Mexican tetra include stenothermal springs, often with abundant vegetation. The Mexican tetra is carnivorous, feeding on small fishes and insects (Sublette et al. 1990).

Pecos Pupfish

Pecos pupfish has been collected at Lea Lake marsh in the past (Hoagstrom and Brooks 1999; Brandenburg and Farrington 2003) and was observed in inundated emergent wetland habitat and channels in 2003 (Blue Earth 2006a). Suitable wetland habitat for the pupfish in the Lea Lake marsh includes bulrush marsh, cattail marsh, saltgrass marsh, saltgrass-iodinebush marsh, and wetland channels. Lea Lake marsh provides important over-wintering habitat for the Pecos pupfish that use the BLM Overflow Wetlands and adjacent wetlands on private land (Brandenburg and Farrington 2003).

Pupfish males are territorial and breeding occurs from May through June. The Pecos pupfish is omnivorous, feeding primarily on diatoms and detritus (Sublette et al. 1990). The main threats to Pecos pupfish include hybridization with sheepshead minnow (*Cyprinodon variegatus*) and habitat loss (Hoagstrom and Brooks 1999; Brandenburg and Farrington 2003). A fish barrier was constructed on the largest of the four surface water connections between the BLM Overflow Wetland and the Pecos River; however, the barrier was considered ineffective during high flows and fish movement from the river into the wetlands was possible in the other three connecting channels (Brandenburg and Farrington 2003).

Arid Land Ribbon Snake

Arid land ribbon snake has been collected in the vicinity of Lea Lake marsh (Degenhardt et al. 1996). Suitable habitats for arid land ribbon snake in the study area include bulrush marsh, cattail marsh, saltgrass marsh, and wetlands channel community types (Blue Earth 2006a). Arid land ribbon snake is found from 3,000 to 5,000 ft elevation where permanent water is present, including streams, ponds, marshes, and some stock tanks. Vegetation in such areas consist of riparian and emergent aquatic types, including willows, cattails, and bulrushes. Arid land ribbon snake forages in water and along the shoreline and on the adjacent land (Degenhardt et al. 1996).

In New Mexico, the arid land ribbon snake is known only from two areas in the State (Schmitt et al. 1985). These two areas are along Ute Creek in Harding and Union Counties, and along the Pecos Valley north to Roswell in Chaves and Eddy Counties. These areas are key habitat for the conservation of the arid land ribbon snake in New Mexico.

Least Shrew

The least shrew was recently collected at Lea Lake marsh (Frey 2005). The species also occurs in the BLM Overflow Wetlands (Frey 2005). Least shrew is most often found in mesic habitats, including marshy areas (Fitzgerald et al. 1994). Least shrew may construct burrows. Nests are constructed of loosely piled grass or leaves. Nesting is communal and breeding likely occurs mainly in spring and summer. Litter size ranges from three to seven. Young reach adult size about 30 days after birth. Main food items of least shrew are insects,

arthropods, and earthworms. Least shrew forage mainly at night, but may be active all day (Fitzgerald et al. 1994).

Wright's Marsh Thistle

Wright's marsh thistle has not been found at Lea Lake marsh (Blue Earth 2006a). However, the species has been documented from the Pecos River valley, where it occurs in alkaline wetlands (New Mexico Rare Plant Technical Council 1999). Suitable habitat for the species occurs in Lea Lake marsh. Wright's marsh thistle is an obligate wetland species that occurs in saturated alkaline soils associated with springs, seeps, streams and ponds from about 3,450 to 8,500 ft elevation (New Mexico Rare Plant Technical Council 2005).

Pecos River Muskrat

Muskrat foraging was observed in Lea Lake marsh during the field investigations (Blue Earth 2006a). The bulrush marsh, cattail marsh, and wetland channel community types are suitable habitats for Pecos River muskrat in the study area. Muskrats live in burrows in stream banks or in cone-shaped houses made of leafy vegetation in marsh habitats (Fitzgerald et al. 1994). Muskrats are primarily herbivorous. Both sexes are territorial and competition for breeding territories is intense. However, territories are typically quite small with most activity being confined to an area within about 15 m (50 ft) of the nest. Breeding commences in early spring, gestation takes 25 to 30 days, and litter size ranges from four to eight. Young are weaned about four weeks after birth. Several litters may be produced each year. Population density in good quality habitat may be elevated until food resources are rapidly depleted. Populations often undergo five- to ten- year cyclical, density-dependent fluctuations (Fitzgerald et al. 1994).

PROJECT DESCRIPTION

The Bottomless Lakes State Park Aquatic Habitat Restoration Feasibility Study was included in the Detailed Project Report/Environmental Assessment (DPR/EA; USACE 2006). The DPR/EA was conducted by the USACE under the authority of Section 206 of the Water Resources Development Act of 1996 (Public Law 104-303). This law provides the USACE with the authority to undertake aquatic ecosystem restoration and protection projects provided that each project: 1) will improve environmental quality; 2) is in the public interest; and 3) is cost-effective. The authority requires that a non-federal sponsor initiate each project. The non-federal sponsor is responsible for 35 percent of the project costs, which include planning and construction of the project.

The formation of alternatives for this project by the USACE began by defining the problems, opportunities, and constraints associated with the Park and the Lea Lake marsh. This led to the development of two study goals: 1) to determine the extent of aquatic habitat degradation in the Park south of Lea Lake; and 2) to develop a plan for restoration of existing aquatic and wetland habitats. Formulation of alternatives for restoring the Lea Lake marsh was based on a reference model that included published information on the vegetation dynamics of inland

saline marshes, an analysis of historic conditions in the Lea Lake marsh, and an assessment of changes in vegetation and hydrologic conditions that has occurred at Lea Lake marsh.

The USACE and the Park developed several objectives for developing and restoring the wetland and aquatic habitats in the Lea Lake marsh (USACE 2006). These objectives are to: 1) restore existing wetlands to a more natural condition in terms of ecosystem structure and function; 2) improve habitat for special status species; 3) reduce potential for flood damage to developed facilities surrounding Lea Lake; 4) improve efficiency of water movement from Lea Lake to the Pecos River; 5) reduce maintenance costs for NM 409; and 6) develop facilities for interpretation of wetland habitats (e.g. self-guided trail).

Constraints to developing alternatives were also identified. Identified constraints were: 1) not to increase consumption or loss of surface water within the Lea Lake marsh; 2) the location of the existing sewage treatment facility; 3) the existing locations of buried utility lines; and, 3) the need to maintain an area for expansion or replacement of the sewage treatment facility.

The proposed action is to move the Lea Lake marsh towards the reference condition by removing salt cedar and controlling its re-growth; removing debris piles from the wetlands; increasing hydrologic diversity; and planting disturbed areas with native species. Additionally, an initial outlet channel design recommended increasing the channel width to accommodate excessive winter flows. This would increase the channel capacity from 0.4 to 0.7 m^3/s (15 to 25 ft^3/s) and aid in moving overflow into the Lea Lake marsh and away from Park facilities. The proposed action was used as a basis for developing specific management measures that could then be implemented at various scales into various alternative plans. Various scales of each management measure were defined, associated with the area where each management measure was applied. Each management measure was assigned one or more letter codes by the USACE (2006) and are described below.

Management Measure A - Modify Outlet Channel and Culverts
The purpose of this measure is to ensure that all outflow from Lea Lake enters the Lea Lake marsh. The existing outlet channel and culverts are undersized for a discharge of 0.7 m^3/s (25 ft^3/s). Also, growth of aquatic vegetation in the existing channel may reduce capacity and is seen as a chronic maintenance problem. Modification of the outlet channel would include the following major features:

- move control structure upstream 9.8 m (32 ft) and widen structure to 1.8 m (6 ft);
- grade the outlet channel to a uniform slope from the concrete control structure at Lea Lake downstream to match with the existing channel bed;
- the reconstructed channel would have a bottom width of 1.8 m (6 ft) and 1.5H:1V side slopes lined with block or rip rap;
- replace corrugated metal culverts on the access road with a single 1.8 m (6 ft) wide by 0.9 m (3 ft) high concrete box culvert; and,
- replace corrugated metal culverts on NM 409 with two 0.9 m (3 ft) wide by 0.6 m (2 ft) high concrete box culverts

Management Measures B and C - Remove Salt Cedar
The purpose of this measure is to restore native wetland plant communities in Lea Lake marsh. Currently, nonnative salt cedar covers much of the wetland habitat and lowers habitat suitability for indicator species. Salt cedar would be removed mechanically using an excavator fitted with a bucket used for extracting whole salt cedar plants, including roots (e.g., BLM 2003). Salt cedar trees would be hauled out of the marsh and chipped. In areas that are too wet for the excavator to operate, salt cedar would be cut with a chainsaw and the stumps would be treated immediately by brushing the cut surface thoroughly with a full strength solution of a registered herbicide such as glyphosate (Rodeo®) mixed with a water-soluble dye to track treated stems or other registered herbicide (e.g., Renovate 3A or Habitat). Cut-stump treatments would preferably be conducted late in the growing season to improve translocation of the herbicide from the cut stump surface to the plant roots. Follow-up maintenance of salt cedar treatment areas would involve hand-pulling of sprouts and removal of larger trees not killed by the first treatment. This would be conducted by removing trees using a chainsaw and treating the cut stumps immediately with an herbicide (USACE 2006).

Management Measures D and E - Remove Debris
The purpose of this measure is to restore areas currently covered with debris to wetland habitat. Substantial portions of the Lea Lake marsh with wetland hydrology and hydric soils are occupied by debris piles. Removing debris and allowing wetland vegetation to establish would restore these sites. Debris piles would be removed using an excavator to pick up the debris and place it in dump trucks, which would then haul the material to the county landfill.

Management Measures F and G - Diversify Wetlands Hydrology
The purpose of this measure is to create more diversity in wetland hydrology conditions in the Lea Lake marsh by lowering the ground surface elevation in localized areas. Currently, there is little open water habitat and variation in water depth in the Lea Lake marsh. Open water areas with a diversity of water depths would be increased in the Lea Lake marsh by excavating shallow depressions at selected sites where there currently is no standing water. An excavator would be used to dig the shallow depressions or "wetland cells." Excavation spoil would be transported in dump trucks to an approved, non-wetland location within the Park boundaries.

Management Measures H, I, and J - Supplement Wetland Vegetation
The purpose of this measure is to promote establishment of diverse, native wetland plant species in areas subject to soil disturbance. Planting of live material and sowing seeds of native wetland species adapted to saline marshes in the Lea Lake marsh would help to ensure that desired vegetation becomes established because initial species composition of saline marsh sites is a strong determinant of the final plant community (e.g., van der Valk 1981; Smith and Kadlec 1985a, 1985b).

Management Measure K - Construct Interpretive Facilities
The purpose of this measure is to provide interpretation of wetlands and aquatic resources on the Park and the Pecos River. Currently, there are no interpretive facilities in the Lea Lake marsh and public use is low to nonexistent. Trails would be constructed to provide Park visitors access to the wetland ecosystem.

PROPOSED ACTION

The proposed action includes full implementation of all the management measures identified above (USACE 2006). Full implementation refers to the highest scale of each management measure including removal of salt cedar from the Lea Lake marsh; removing all debris piles; constructing three wetland cells; and planting both wetland cell and debris removal areas. The proposed action would include restoration of approximately 17.4 ha (43 ac) of wetland habitat by implementing the following elements:

- increasing the Lea Lake outlet channel capacity to 7.6 m^3/s (25 ft^3/s);
- removing all salt cedar from the approximately 17.4 ha (43 ac) Lea Lake marsh;
- removing all debris from the Lea Lake marsh;
- constructing three wetland cells totaling approximately 0.9 ha (2.2 ac);
- planting supplemental wetland vegetation in debris removal and wetland cell construction areas; and
- constructing a gravel parking lot, a gravel walking trail, a raised boardwalk trail, educational displays, and four wildlife viewing blinds.

In summary, the draft design for the outlet channel includes:

- The outlet-control weir from Lea Lake would be moved 9.7 m (32 ft) upstream from its current location, widened to 1.87 m (6 ft), with an elevation of 1053.9 (3,458 ft).
- The channel bed would be re-graded to a uniform slope from the outlet-control structure to match with the existing channel bed approximately 91.4 m (300 ft) downstream from the NM 409 crossing. This would eliminate a hump in the existing bed profile below the NM 409 road crossing.
- The new channel would be trapezoidal with a bottom width of 1.87 m (6 ft), 1.5H:1V side slopes and a top width of about 4.6 m (15 ft).
- Two 0.6 m (24-in) corrugated metal pipe culverts at NM 409 would be replaced with two 0.9 m (3 ft) wide by 0.6 m (2 ft) high concrete box culverts.
- Two 0.6 m (24-in) corrugated metal pipe culverts at the campground road crossing would be replaced with a 1.8 m (6 ft) wide by 0.9 m (3 ft) high concrete box culvert.
- Similar to the existing channel, the new channel would be lined with articulated concrete blocks and river cobbles for its entire length between the lake outlet and the campground access road as well as in the vicinity of each culvert.
- The walking bridge near the campground would be replaced with a structure that would span the wider channel.

- Salt cedar would be removed mechanically using an excavator to extract whole salt cedar plants, including roots (e.g., BLM 2002).
- Salt cedar trees would be hauled out of the marsh and chipped. In areas that are too wet for the excavator to operate, salt cedar would be cut with a chainsaw and the stumps would be treated immediately by brushing the cut surface thoroughly with a full strength solution of herbicide (e.g., Rodeo®) mixed with a water-soluble dye. Herbicides used will be those registered for use in aquatic habitats. Cut-stump treatments would preferably be conducted late in the growing season to improve translocation of the herbicide from the cut stump surface to the plant roots.
- Debris piles would be removed using an excavator to pick up the debris and place it in dump trucks, which would then haul the material to the county landfill. Salvageable material would be removed first and stored at the park equipment yard. About 6,116 cubic meters (m^3)(8,000 cubic yards [yd^3]) of debris would be removed. An excavator would also be used to dig shallow depressions for construction of the wetland cells. Excavation spoil would be transported to an approved, non-wetland location within the Park boundaries.
- Supplementing wetland vegetation would be conducted by planting live material and sowing seeds of native wetland species adapted to Lea Lake marsh.

Estimated area of ground disturbance for the proposed action is approximately 2.1 ha (5.2 ac). Construction of the various plan elements is expected to last about eight months. Timing of construction is critical to allow channel work to be conducted during low-flow periods (i.e., summer and fall) and yet also avoid migratory bird breeding and nesting seasons (i.e., spring to mid-summer). Details of the construction schedule would be identified prior to issuing a contract.

After construction is completed, several features of the project would require operation, maintenance, repair, replacement, and/or rehabilitation (OMRR&R) with associated costs for labor and materials. The Park has proposed a plan for 20 years of OMRR&R including, clearing vegetation from the channel, suppressing salt cedar reestablishment, and maintaining recreation facilities. Excess growth of aquatic vegetation could be a problem in the widened channel and in the new "feeder channels" that would provide water to new wetland cells. Currently, vegetation is removed manually (i.e., pulled by hand or extracted with shovels and rakes) from the outlet channel approximately eight times per year. To reduce hand-pulling, equipment such as a small backhoe may be used upstream from NM 409, although special care would be necessary to avoid damaging the channel lining or disturbing the fish.

Downstream from NM 409, use of mechanical equipment would not be feasible in order to avoid impacting the restored Lea Lake marsh. Follow-up maintenance of salt cedar treatment areas would involve annual hand-pulling of sprouts and continued removal of larger trees not killed by the first treatment. Removal of larger trees would be conducted by chainsaw and treating the cut stumps immediately with an approved herbicide.

If the proposed action is implemented, a monitoring plan would be developed and implemented for five years to ensure that the desired wetland vegetation becomes established and that methods used to eradicate salt cedar are effective. The monitoring results would be used to adjust maintenance methods or frequency and to identify any corrective actions that would need to be undertaken.

Also, the newly-enlarged outlet channel would be monitored to ensure it functions properly. This would primarily involve monitoring the discharge capacity and condition of the channel. Channel capacity would be monitored by measuring the discharge on a regular basis and observing the water-surface elevations in the lake and key areas along the outlet channel. The USACE (2006) has also suggested that cross sections be established in the channels downstream from NM 409 to monitor changes in both channel capacity and stability.

The USACE would prepare an Operations and Maintenance manual for the project upon completion of construction. This manual would provide a summary of all OMRR&R needs for 20 years. It is anticipated that State Parks would be responsible for the labor and associated costs for all maintenance during this period.

EVALUATION METHODOLOGY

Project planning began in January 2006, and the USACE and the Service discussed the project features, design, construction methods and mitigation measures.
Blue Earth Ecological Consultants, Inc.(Blue Earth) conducted the ecological inventory of the Lea Lake marsh (BLUE EARTH 2006a) as well as the assessment of restoration alternatives on the wetland form and functions (Blue Earth 2006b). Mussetter Engineering, Inc. (MEI 2003) conducted the Lea Lake and associated wetland water budget report as well as described the area hydrology. These reports (Blue Earth 2006a, 2006b; MEI 2003;USACE 2006) were extensively used throughout this report. Additional biological and water quality data and background information were derived through review of the draft feasibility study (USACE 2006), the ecological monitoring report (Blue Earth 2006a), the assessment of ecosystem outputs (Blue Earth 2006b), the Lea Lake wetland water budget report (MEI 2003) and other relevant literature, internet searches and personal communications. Conversations with representatives from the NMDGF, the BLM, the Service, the Park Superintendent, the Chavez County Planning Director and other area scientists were conducted in April and May 2006 to discuss this report and potential options for wildlife and wetland conservation.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

This section discusses the anticipated future conditions of resources if no plan is developed and implemented to restore aquatic habitats in Lea Lake marsh. Recent discharge measurements of Lea Lake outflows by the NMISC show that flows are reduced during summer months as the aquifer levels drop due to irrigation. In addition, the USGS well water-level data show that although aquifer levels fluctuate, no evidence exists to suggest that aquifer levels would drop substantially in the future (USACE 2006). The NMISC has described a plan to purchase 12,000 acres of land and associated water rights in the Roswell region, which if retired, could increase water levels in the Roswell Artesian Basin (USACE 2006). It is therefore considered unlikely that the process of dissolution of carbonate rocks and evaporites would be altered substantially by events into the future. Development of the karst topography in the area of the Park would continue as in the past, which could result in additional sinkholes, expansion of existing sinkholes, and perhaps additional rock slides.

There is a hydrologic relationship between Lea Lake outflows and the artesian aquifer levels (MEI 2003). Lea Lake outflows are primarily dependent upon the hydraulic head within the artesian aquifer. Therefore, an understanding of the causes of recharge and discharge in the Roswell Artesian basin is necessary to predict future conditions of the aquifer, and hence Lea Lake outflows. Future characteristics within the Roswell region such as well pumping rates, irrigation practices, and retirement of water rights could potentially affect the hydraulic head in the aquifer. According to the New Mexico Office of the State Engineer, metering of all wells has been imposed since 1963 (USACE 2006). Because the farmers water rights are currently metered, it is unlikely that water use for current farmland would vary significantly. The largest potential for affecting aquifer water levels in the near future is the planned purchase of around 12,000 acres of land and water rights by NMISC (USACE 2006). If the NMISC retires these wells, water levels in the aquifer could rise. However, if the NMISC activates any of the purchased water rights that were previously dormant to augment Pecos River flows, the additional pumping could lower aquifer levels.

Due to uncertainty in predicting future flows, the USACE (2006) evaluated three scenarios to assess possible future discharges to Lea Lake marsh. The three scenarios included stabilizing Lea Lake outflows at approximately their current levels, a continued increase of Lea Lake outflows, and a future decrease in Lea Lake outflows. The impact of each of these possibilities should be considered in the future design alternatives for the project. The analysis of historical and existing conditions suggests that the Lea Lake outflows would probably stabilize or slightly increase as more wells are retired. There is no evidence to suggest large changes in Lea Lake discharges in the future.

Assuming that flows from Lea Lake would remain similar or slightly higher than existing conditions, discharges would likely continue to exceed the capacity of the existing outlet channel. Without changes to the channel size and constant maintenance, growth of aquatic

vegetation and sedimentation would diminish the capacity of the outlet channel. Therefore, high lake levels would occasionally flood the Park's facilities.

Ecological resources would largely remain the same – except salt cedar would continue to encroach, reducing aquatic habitat diversity and eventually contributing to a species-poor riparian habitat.

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

Temporary, short-term impacts to fish and wildlife may occur from noise, dust, and the presence of workers and machinery during project construction. Runoff from construction work sites, access routes, staging areas, and unprotected fills could degrade water quality in the downstream wetlands. Accidental spills of fuels, lubricants, hydraulic fluids and other petrochemicals, although unlikely, would be harmful to aquatic life.

The following measures were identified as part of the proposed action by the USACE (2006) to minimize the effects on ecological, cultural, and social resources.

- Modification of the outlet channel would be conducted in dry conditions. This would be accomplished by dewatering the outlet channel and diverting outflow from Lea Lake around the work area and into Lea Lake marsh.
- Feeder channels connecting the excavated wetland cells to the wetlands channels would be dug from the cells outward. The feeder channel connections to the wetlands channels would not be breached until sediments have settled in the excavated areas.
- Cut-stump herbicide treatment for removing salt cedar would only be conducted in areas with deeper standing water where the whole-tree extractor cannot be used. Only approved herbicides such as Rodeo® would be used. Herbicides may be mixed with a water-soluble dye to allow visual tracking of application. The herbicide would be applied to stumps immediately after cutting using a paint brush or similar method by an experienced, licensed pesticide applicator.
- Salt cedar removal would be conducted outside of the bird breeding season (i.e. September through March) to avoid destruction of nests and mortality of young birds.
- The boundaries of all aggregations of Pecos sunflower in the Lea Lake marsh would be marked with a continuous band of brightly-colored flagging attached to stakes.
- Operation of the tree extractor would be restricted as much as possible to salt cedar stands and moved as little as necessary to minimize the chance of destroying least shrew communal nests.
- A qualified biologist would be on site to monitor work, inspect work areas before work begins, and provide guidance to avoid to prevent or minimize impacts to Pecos sunflower, least shrew and other wildlife species.

Potential Impacts and Protective Measures for Water Quality
Implementation of the proposed action may affect water quality by disturbing soils in or adjacent or surface water during modification of the outlet channel, salt cedar removal, debris removal, and excavation of the wetland cells. Direct effects of these activities would consist of short-term increases in suspended sediment loads and turbidity. Indirect effects could include increased turbidity and suspended sediment levels downstream and off-site.

Impacts to water quality would be minimized in several ways. First, modification of the outlet channel would be conducted in dry conditions. This would be accomplished by dewatering the outlet channel and diverting outflow from Lea Lake around the work area and into Lea Lake marsh. Consequently, impacts to water quality from channel modification would be short-term. There may be a visible increase in turbidity immediately following resumption of outflow in the reconstructed outlet channel. However, this increase in suspended sediments would likely persist only for about two hours. Also, increased turbidity levels may lessen with downstream distance as a result of dilution or precipitation. Therefore, noticeable changes in suspended sediments and turbidity are likely to be absent at the Park boundary, upon entering slack water conditions, or filtration through existing wetland vegetation. Removal of debris and salt cedar are proposed in areas that are shallowly inundated with very low current velocity.

Treatment areas for these two management measures that have standing water include cattail marsh, saltgrass marsh, saltgrass wet meadow, saltgrass-iodinebush marsh, iodinebush flats, alkali sacaton flats, salt cedar copse, and barren ground community types. Only the cattail marsh, saltgrass marsh, saltgrass wet meadow, and saltgrass-iodinebush marsh community types have standing surface water. Average current velocity in all of these communities except for cattail marsh is 0 meters per second (m/s) (0 feet per second [ft/sec]). Current velocity in these communities is not expected to increase following salt cedar or debris removal. Therefore, suspended sediments would not be expected to be transported into surface water downstream.

According to the USACE (2006), removal of the salt cedar or debris would have only localized impacts to water quality, including, short-term increases in suspended sediments in saltgrass marsh, saltgrass wet meadow and saltgrass-iodinebush marsh communities. Because of the low water velocity and shallow water depth, sediments suspended in surface water by debris removal would likely settle quickly. Turbid conditions would therefore be expected to last during debris removal and persist for only a few hours following completion of debris removal. Average current velocity in cattail marsh habitat is 0.1 m/s (0.4 ft/sec). While no debris piles are located in the cattail community type, salt cedar removal would occur. Salt cedar removal in cattail marsh habitat would be conducted by hand using chainsaws. Increases in turbidity and suspended sediments would result from workers being in the marsh. These increases in turbidity and suspended sediment would occur in areas immediately surrounding the workers impact and would persist during salt cedar removal and likely for several hours following completion of the work.

Excavation of wetland cells to diversify wetland hydrology would be conducted in areas with no standing water or in areas with shallow standing water, but with no or low flow rates. Consequently, effects on water quality would be the same as those described above for salt cedar and debris removal. Connection of the excavated cells to the wetlands channels would require digging small feeder channels. These channels would be dug from the cells outward to the channels. The feeder channel connections to the wetlands channels would not be breached until sediments settled in the excavated areas. This will help prevent flushing of turbid water into downstream areas, thereby avoiding impacts to the BLM Overflow Wetlands and to those wetlands on adjacent private lands.

Excavation of wetland cells would create about 0.8 ha (2.1 ac) of open surface water exposed to direct sunlight. These areas would be expected to have the same water temperature regimes as existing inundated areas at Lea Lake marsh.

Additional water quality impacts may occur and preventative measures identified by the USACE (2006) include:

- All equipment would be inspected at least twice a day to ensure that oils, fuels, or lubricants are not leaking.

- All servicing and fueling of equipment would be conducted in a designated area hydrologically isolated from surface waters and outside of the floodplain.

- Additionally, emergency spill kits would be placed in the designated fueling area to absorb and contain any accidental spills of fuels, lubricants, or other chemicals.

- The proposed action involves application of herbicides to cut-stumps for removal of large trees. One herbicide proposed for cut-stump treatment is Rodeo® (glyphosate), which is registered for use in aquatic habitats. Rodeo® consists of 53.8 percent of the active ingredient glyphosate (–[phosphonomethyl]glycine, isopropylamine salt, CAS# 038641-94-0) and 46.2 percent inert ingredients.

- Cut-stump herbicide treatments would only be conducted in areas with deeper standing water where the whole-tree extractor cannot be used. These deeper-water areas encompass approximately 4.9 ha (12 ac) in the Lea Lake marsh. This would be the maximum area subject to hand-removal of salt cedar using chainsaws and cut-stump herbicide treatment. Average salt cedar density in the inundated area is 22.6 stems/926 square meter (m^2)(22.6 stems/10,000 square feet [ft^2]). Average stump diameter of salt cedar trees in the handcutting area is about 0.1 m (4 in), which would require a maximum of 7.4 milliliters (ml) (0.25 ounces [oz]) of herbicide to completely coat the cut surface. Using the average density of 22.6 stems/926 m^2 (22.6 stems/10,000 ft^2), there are approximately 1,200 salt cedar trees that would require hand cutting in the inundated portion of Lea Lake marsh.

- Use of a water-soluble dye would provide a means to visually control application of the herbicide to only cut-stump surfaces and minimize the amount of herbicide that could potentially enter surface water. A conservative estimate of accidental herbicide spills into surface water during cut-stump application is 1 percent of the total volume applied. Consequently, about 0.74 ml (0.025 oz) of herbicide could potentially enter surface water adjacent to any given cut stump.

Potential Impacts and Protective Measures for Wetland Modifications
Implementation of the proposed action would result in changes in the extent of each wetland community type in the Lea Lake marsh (USACE 2006). Most notably, the salt cedar copse community type would be converted to saltgrass wet meadow vegetation by implementing the proposed action. Coverage of bare ground would be markedly reduced by supplemental planting in the Lea Lake marsh. Cattail marsh vegetation would decrease slightly from excavation of wetland cells, debris removal, and supplemental planting. The spatial extent of saltgrass marsh, saltgrass-iodinebush marsh, and iodinebush flats would not change with implementation of the proposed action. Substantial increases in the spatial extent of wetland channel (open water) habitat, saltgrass wet meadow, bulrush marsh, and alkali sacaton flats vegetation would result from implementation of the proposed action. Species composition within community types is also expected to change with the proposed action.

Removal of salt cedar from existing vegetation communities would result in increased coverage by native species such as saltgrass, chairmaker's bulrush, cattail, willow baccharis, and alkali sacaton. The 289 ha (715 ac) of the Lea Lake wetlands between Lea Lake and the Pecos River, including the Lea Lake marsh, comprise a functioning, interconnected ecological unit. Therefore, the entire Lea Lake wetlands was used as the resource boundary for considering cumulative effects to vegetation from the proposed action. Furthermore, the cumulative aggregate impact of past actions on vegetation in the Lea Lake marsh was considered to be represented by the existing condition.

Ongoing and proposed future actions affecting vegetation in the analysis area consist of continued salt cedar removal and control by the Park and the BLM. The BLM proposes to conduct salt cedar removal and control on the BLM Overflow Wetlands using mechanical, hand removal, and herbicide techniques (BLM 2003). This action would overlap temporally with the proposed wetlands restoration at Lea Lake marsh. These combined actions would markedly decrease salt cedar density in the 289 ha (715 ac) Lea Lake wetlands between Lea Lake and the Pecos River by as much as 80 percent. This is expected to result in a concordant increase in native wetland vegetation, especially with the proposed replanting.

The spatial extent and character of wetlands in the Lea Lake marsh will change with implementation of the proposed action (USACE 2006). Increased outflow from Lea Lake, coupled with directing all of the outflow to Lea Lake marsh via modifying the outlet channel, are likely to increase the spatial extent of wetlands in the Lea Lake marsh. The magnitude of this change is not known. The only available data applicable to predicting changes in

wetland area are the increases in wetland size from 1954 to 2003 as interpreted from aerial photography (USACE 2006). During this period, emergent marsh habitat increased by 3.5 ha (8.6 ac). It is likely that most of this increase occurred when ground water levels began to recover between 1976 and 2003. During that time, outflow from Lea Lake increased to about 0.5 m^3/s (17 ft^3/s) while the emergent marsh increased in extent by 3.5 ha (8.6 ac). Assuming a linear relationship between the amount of emergent marsh and the rate of increase in flow, an increase of 0.2 of wetlands per 0.2 m^3/s (0.49 ac/ ft^3/s) increase in outflow from Lea Lake is anticipated. Therefore, with a potential maximum outflow from Lea Lake of about 0.7 m^3/s (25 ft^3/s), an increase in the Lea Lake marsh of 0.8 ha (1.96 ac) would be expected.

Average water depth and hydroperiod in several of the wetland vegetation communities are expected to change with implementation of the proposed action. Average depth of inundation would increase from 0.2 to 0.5 m (7 to 18 in) in bulrush marsh, 0.1 to 0.3 m (2.4 to 12 in) in saltgrass marsh, 0.01 to 0.1 m (0.4 to 4 in) in saltgrass wet meadow, 0.03 to 0.2 m (1.2 to 8 in) in saltgrass-iodinebush marsh, and 0 to 0.03 m (0 to 1.2 in) in converted salt cedar copse vegetation. Hydroperiod would change in saltgrass marsh habitat from semi-permanently flooded to intermittently exposed and from seasonally flooded to semi-permanently flooded in saltgrass wet meadow. Also, hydroperiod in converted salt cedar copse vegetation would change from saturated to semi-permanently flooded.

Impacts of the proposed action on wetlands are limited to the boundaries of the Lea Lake marsh (USACE 2006). The cumulative aggregate impact of past actions on wetlands in the Lea Lake marsh was considered to be represented by the existing condition (USACE 2006). No other actions are planned in the future for the Lea Lake marsh that would have impacts on wetlands. Consequently, there would be no long term impacts to wetlands that overlap spatially or temporally with the proposed action (USACE 2006).

It is reasonable to propose that plant communities at Lea Lake marsh are relatively stable, with the exception of salt cedar invasion and expansion of the marsh as a result of the increased discharge from Lea Lake (USACE 2006). If a marsh site is physically disturbed to create bare soil conditions, soil seed bank composition and seed dispersal will be a major determinant of subsequent plant species composition (Smith and Kadlec 1985a, 1985b). These initial conditions may be modified to varying degrees by seeding, planting live material, and controlling seed sources of adjacent marsh plants, such as cattail. For example, Grace (1987) determined that initial seed density strongly influenced the early outcome of interspecific competition. However, the initial effects of preemption may be overcome by subsequent vegetative expansion and competitive displacement by other wetland species (Grosshans and Kenkel 1997). A potential physical disturbance regime which may have been operative at Lea Lake marsh in the past is natural fire. Fire has been identified as an important physical disturbance factor influencing plant community structure and dynamics in other in inland saline marsh systems (e.g., Root and Ryan 2004; Smith and Kadlec 1985b).

Potential Impacts and Protective Measures for Pecos Sunflower
Direct impacts to stands of Pecos sunflower will be avoided by the proposed action (USACE 2006). Aggregations of plants would be flagged to delineate areas where no work is to be performed and restoration activities would be monitored to ensure that no Pecos sunflower plants are disturbed. Pesticide exposure would also be avoided.

Pecos sunflower seed may be indirectly affected by the proposed action. Excavation of wetland cells that are hydrologically connected to the wetland channels may provide suitable sites for establishment of Pecos sunflower by seed. Seed may be carried by surface water flow into the wetland cells and deposited along the margins of the ponds, which could lead to establishment of additional aggregations of plants in the Lea Lake marsh.

Colonization of disturbed ground by Pecos sunflower in areas subject to mechanical removal of salt cedar was observed immediately south of the Lea Lake marsh. Also, sites along the South Wetlands Channel subject to past ground disturbance from channel maintenance activities were also colonized by Pecos sunflower. Therefore, it seems likely that the species would also colonize the margins of the wetland cells. Pecos sunflower is restricted to the margins of Lea Lake and Lea Lake marsh; none have been documented on the BLM Overflow Wetlands (BLM 2003).

Current and planned actions in the Lea Lake marsh that may affect Pecos sunflower consist of hand-clearing of aquatic vegetation and sediment from small segments of the South and West wetlands channels. This action creates sites suitable for colonization by Pecos sunflower. Thus, there would be an overall beneficial long-term effect on Pecos sunflower through an increase in area suitable for establishment of plants in the Lea Lake marsh.

Additional analysis of effects to Pecos sunflower will be addressed in detail during ESA section 7 consultation between the USACE and the Service.

Potential Impacts and Protective Measures for Other Species of Concern
Operation of tree-extractor and excavation equipment for removing salt cedar and debris and excavating wetland cells would cause direct impacts. There would be an unknown amount of direct mortality of relatively immobile organisms such as aquatic invertebrates. Other more mobile organisms such as birds and fish would be disturbed and may flush from work areas.

Another direct impact of the proposed action would be removal of mature salt cedar from the marsh, which may serve as nesting sites for birds. In order to avoid destruction of active nests and mortality of young birds, salt cedar removal would be conducted outside of the breeding season (i.e., September through March).

Cut-stump herbicide treatment of salt cedar may result in some accidental introduction of registered herbicides into surface waters. Introduction of herbicide into surface water would be minimized by carefully applying the herbicide directly to cut stumps using a brush. No

herbicide spraying would be conducted. Concentrations of the herbicide in localized areas are not expected to exceed the acute toxicity concentration (~25 mg/L) for most organisms.

Implementation of the proposed action would change wildlife habitat characteristics at Lea Lake marsh in several ways. First, the proposed action would eliminate the only trees (salt cedar) from the marsh. Second, the proposed action would create more diversity in water depths and increase open water habitat. Third, the proposed action would increase the area covered by native herbaceous wetland vegetation.

In order to assess the indirect effects of these changes in habitat conditions on fauna of the marsh, two indicator species groups were used. These indicator groups were: 1) the 18 species of birds known to occur at Lea Lake marsh during the breeding season; and 2) dragonflies and damselflies (the taxonomic Order Odonata in the Class Insecta) known to occur in the marsh.

Of the 18 migratory bird species known to occur in Lea Lake marsh during spring and summer, eight nest in trees or shrubs. Two of these species are unlikely to nest at Lea Lake marsh. The osprey uses large stick nests, none of which were found in the Lea Lake marsh. House sparrows nest in cavities of trees, but cavity-nesting birds rarely use salt cedar (Hunter et al. 1988; Lovich and DeGouvenain 1998). The remaining six species may potentially have nest sites reduced or eliminated by removal of salt cedar trees and shrubs from Lea Lake marsh. However, abundance of baccharis, a native shrub, is expected to increase following implementation of the proposed action. This shrub may provide suitable nesting habitat for black-headed grosbeak and white-crowned sparrow.

The proposed action would contribute to a net loss of salt cedar in the analysis area, which would have a cumulative impact on nesting birds that now use the invasive salt cedar trees. Direct impacts to nesting birds would be avoided through seasonal restrictions. Cumulatively, wildlife would be affected by the loss of salt cedar habitat over the entire 715 wetland complex as the BLM has also planned salt cedar removal in the Overflow Wetlands portion (BLM 2003). However, it is unlikely that this impact would decrease the population the bird species known to occur at Lea Lake marsh (that may nest in salt cedar). Bird species that use salt cedar for nesting are relatively widespread and abundant and can use other trees and shrubs besides salt cedar as nest sites. Also, other wetland bird species will gain nesting and feeding habitat by the removal of salt cedar and the creation of wetland cells (Blue Earth 2006b). More importantly, the available information on historic conditions of the Lea Lake marsh indicate that these wetlands have likely existed at the site of Lea Lake marsh since as early as the 1300s and they lacked woody plant species (Blue Earth 2006a). Therefore, the removal of the invasive salt cedar would be considered a restoration technique along with the proposed action as it will return the saltgrass marsh, wet meadow and wetland community to a more productive and biologically diverse condition. Using the example of the yellow-headed blackbird, Blue Earth (2006b) identified that the proposed action would increase yellow-headed blackbird habitat by more than 200 percent, with the majority of the increase

due to salt cedar removal. Consequently, migratory birds and other wildlife would be expected to increase in abundance and diversity in the long-term from implementing the proposed action.

Dragonflies and damselflies occur in aquatic habitats such as ponds, streams, and marshes with open water (Westfall and Tennessen 1996). All of the species documented from Lea Lake marsh are known to occur in standing or flowing water habitats. Many of the genera known to occur in the marsh are also associated with vascular hydrophytic plants. Increasing the diversity of water depths, area of open water, and emergent wetland vegetation such as bulrush marsh would create additional habitat for dragonflies and damselflies in the Lea Lake marsh. Consequently, this group would be expected to increase in abundance and diversity long-term from implementing the proposed action.

Mexican Tetra

The proposed action is unlikely to have any measurable direct or indirect effects on Mexican tetra in the study area (USACE 2006). The proposed action would directly impact the Lea Lake outlet channel. Channel modification work would involve dewatering of the channel and diverting flow around the work area into Lea Lake marsh. Fish occurring in the outlet channel would likely move downstream as flows recede following cessation of flow at the upstream end of the channel. The turbidity increase following resumption of flow in the channel are unlikely to be of sufficient magnitude or duration to cause fish mortality.

Pecos Pupfish

Operation of mechanized equipment to remove salt cedar and excavate wetland cells in the study area may cause direct mortality of some Pecos pupfish, especially young-of-year fish inhabiting very shallow water (USACE 2006). Mechanized equipment operation would be restricted to areas with no surface water or with only extremely shallow surface water. Therefore, mortality is likely to be small, perhaps consisting of 10 to 20 individuals. Impacts to water quality from the proposed action are unlikely to affect Pecos pupfish because they are of small magnitude and short duration. The proposed action is likely to increase suitable habitat for Pecos pupfish in the project area by at least 0.8 ha (2 ac), associated with excavation of the wetland cells. Wetland cells would provide important over-wintering habitat for the population of Pecos pupfish that inhabits Lea Lake marsh and the BLM Overflow Wetlands (Blue Earth 2006a).

Pecos pupfish in the study area are part of a larger population that inhabits the 289 ha (715 ac) wetland supported by outflow from Lea Lake. The aggregate effect of past actions in the study area on Pecos pupfish was assumed to be represented by the existing baseline condition. Current and planned future actions that may potentially affect Pecos pupfish in the analysis area are construction of fish barriers in the BLM Overflow Wetlands at outflow points to the Pecos River. The purpose of the fish barriers are to prevent movement of non-native sheepshead minnow (*Cyprinodon variegatus*) into the wetlands. Sheepshead minnow hybridization is considered a major threat to Pecos pupfish (Blue Earth 2006a). The proposed action, when combined with the effect of fish barrier construction by the BLM, is

likely to result in beneficial cumulative effects to Pecos pupfish through diversification of open water wetlands and an increase in feeding, spawning and sheltering habitat. The overall status of the population would be markedly improved by preventing invasion of the wetlands by sheepshead minnow and increased availability of over-wintering habitat (USACE 2006).

Arid Land Ribbon Snake

The proposed action is unlikely to have any effect on arid land ribbon snake, as this species is almost always associated with permanent water (Degenhardt et al. 1996). In the study area, arid land ribbon snake would most likely be found along the wetland channels, which would not be affected by the proposed action (USACE 2006).

Least Shrew

The proposed action would directly impact saltgrass marsh and saltgrass wet meadow habitat east of the South Wetlands Channel that is occupied by least shrew (Frey 2005). Operation of mechanized equipment for removing salt cedar may potentially result in mortality of some least shrew by crushing (USACE 2006). The tree extractor exerts a force of approximately 34,474 Pascals (~5 pounds per square inch) and the tracks have a surface area of about 4.8 m^2 (52 ft^2). Mortality of least shrew would be minimized by limiting movement of the salt cedar extractor machine to salt cedar stands, where possible. This would reduce operation of the equipment in suitable saltgrass wet meadow and saltgrass marsh habitat.

The tree extractor has a reach of about 9.1 m (30 ft), so any given position of the machine would allow for treatment of a 262 m^2 (2,820 ft^2)(BLM 2003). Each position of the tree extractor would have a tread impact area of 4.8 m^2 (52 ft^2), which is about 2 percent of the treated area. If movement of the machine is also considered, then it can be assumed that tread impacts would occur to about 10 percent of the treated area. The area on the east side of the South Wetlands Channel comprises about 5.0 ha (12.4 ac), of which about 25 percent is covered by 1.3 ha (3.1 ac) of salt cedar. If it is assumed that the tree extractor tread impact is about 10 percent of the treated area, then about 0.1 ha (0.3 ac) of occupied habitat would be impacted (USACE 2006). Four individual least shrew were captured in the 5.0 ha (12.4 ac) area east of the South Wetlands Channel (Frey 2005). If least shrew is uniformly distributed, a density of 0.1 least shrew/ha (0.3 least shrew/ac) could be assumed (USACE 2006).

However, least shrew is gregarious and nests communally (Fitzgerald et al. 1994). Least shrew likely breed throughout the year in the study area, but most will breed in spring and summer (Fitzgerald et al. 1994). Therefore, operation of the tree extractor could incidentally crush several individuals because distribution of least shrew is aggregated and not uniform. To minimize the chance of crushing an occupied communal nest of least shrew, operation of the tree extractor would be restricted as much as possible to salt cedar stands. Additionally, a qualified biologist would be on site to inspect work areas and provide guidance on areas to avoid. These measures would reduce incidental take of least shrew so that measurable impacts to the population would not occur (USACE 2006).

Potential Impacts through Recreation
Implementation of the proposed action would change the use of the land in the Lea Lake marsh. A new location would be selected in the Park for storage of extra construction and related materials as well as a place to store debris. Development of the approximately one-half mile of raised trails, where visitors can walk in relatively dry conditions, would make more area of the Park available for use by the average visitor. Removal of debris and salt cedar, creating small areas of open water, and planting native wetland vegetation would improve the aesthetic appeal of the Lea Lake marsh. Coupled with the new trails, interpretive signs, and viewing blinds, the area would become more appealing to visitors. This is likely to increase recreation use of the Lea Lake marsh by providing a trail for persons wishing to view and learn about wildlife or just take a walk.

Although these new recreational facilities are unlikely to draw large numbers of new visitors to the Park, development of the trail would provide additional recreation and educational experiences for visitors coming to the park for other reasons (e.g., camping). Group educational use of the Lea Lake marsh is likely to rise as school groups would have an easily-accessible site for learning about wetlands, studying plants or water, and viewing wildlife.

DISCUSSION

Wetlands form where a persistent water supply is at or near the land surface. The outflow from Lea Lake is currently sufficient to maintain over 715 acres of wetlands as this water flows south to the Pecos River. The Lea Lake wetlands store and filter water and allow for biological productivity, natural diversity, and food and habitat for fish and wildlife, as well as other ecosystem functions (e.g., pollination services, soil formation, biochemical processes, livestock watering, as well as potential genetic, agricultural or medicinal services provided by native, salt-tolerant plants and animals). Although a complete inventory of all plant and wildlife species that occupy these wetlands has not been completed, the Lea Lake marsh portion on the Park has been found to provide habitat for seven federally-listed or State-listed species and over 100 species of migratory birds and waterfowl (Blue Earth 2006a).

The USACE (2006) and the Park have a proposed action that will improve the Park's 34-acre Lea Lake marsh by removing nonnative vegetation and debris, by diversifying aquatic habitat and replanting with native vegetation. The proposed action will benefit fish and wildlife in the long-term through the restoring the Park's portion of these saltgrass wetlands to a more native and productive biotic community. In addition, the proposed action will provide the public with a quality outdoor educational experience on the Park, as well as create opportunities for the comprehensive conservation of these wetlands. The desired future condition of these wetlands is their conservation in perpetuity. Wetland habitat in this

region should persist in the condition, connectivity, and quantity necessary to sustain the rare and unique populations of plants and animals that are found there now.

Although the Lea Lake marsh currently contains an abundance of exotic species; overall, these wetland habitats are classified in Category 2 of the Service's because they are scarce. The Service's mitigation policy states that the degree of mitigation should correspond to the value and scarcity of the fish and wildlife habitat at risk. Consequently, no net loss of in-kind habitat value should be the mitigation goal for this resource category. The Service believes that the proposed project not only meets, but exceeds the "no net loss of in-kind habitat" mitigation goal for this resource category. Therefore, no mitigation is recommended for the project as proposed.

The Service anticipates some minor short-term impacts to fish and wildlife resources associated with the construction phases, but long-term the project would provide important migratory bird and resident fish and wildlife habitat within the Pecos River valley. Temporary, short-term impacts to fish and wildlife may occur from noise, dust, and the presence of workers and machinery during project construction. Runoff from construction work sites, access routes, staging areas, and unprotected fills could temporarily degrade water quality. Accidental spills of fuels, lubricants, hydraulic fluids and other petrochemicals, although unlikely, would be harmful to aquatic life. However, the USACE (2006) has committed to various protective and mitigation measures that address temporary project construction impacts provided that they are incorporated as stipulations into various contractor and subcontractor plans.

The USACE (2006) has also identified measures to protect or minimize the impacts to the federally-listed Pecos sunflower. The USACE and the Service will continue ESA section 7 consultation to ensure that the Pecos sunflower is not jeopardized by the proposed action. However, this consultation must be completed prior to the initiation of construction.

To ensure that the objectives of the project are met, post-construction monitoring of the project area should be conducted. The spread of non-native or invasive plant and animal species in these wetlands should be monitored and controlled or minimized to a level that these plant and animals within these wetlands are not adversely affected.

The outflow and wetland channels provide swift flow habitats and connectivity between the lake and the wetlands downstream, including the proposed open-water wetlands. Where practical, the outflow channel designs should plan for some flow and habitat diversity to benefit the Mexican tetra and Pecos pupfish. Where practical, design considerations could include slight variations in shape, substrate, bottom roughness, and allow for occasional patches of emergent or submergent vegetation, while not affecting the overall goal of providing water conveyance and public safety.

Due to its proximity to the campgrounds, the Lea Lake outflow channel is a visible and central feature of the Park. Therefore, its design also offers an opportunity to educate the public about the unique fishes that reside there. As appropriate, consider educational opportunities alongside the outflow channel, perhaps including identification or options for display of the native fish found there as well as signage prohibiting disposal of nuisance species (sheepshead minnow, goldfish, crayfish, etc.) and their impact to environment.

Currently, the portion of wetlands on the Park is termed Lea Lake marsh and the portion of the wetlands on BLM lands is termed Overflow Wetlands. All of the wetlands associated with the outflow from Lea Lake would benefit from a unified naming convention, and the Service recommends they be termed the Lea Lake Wetlands throughout. Approaches to conserve the biological diversity on the Lea Lake marsh alone would be inadequate to conserve the species associated with the entire area wetlands. Therefore, the entire wetlands would benefit from a comprehensive management plan. Federal, State and local agencies, private landowners and the public should collaborate to implement a comprehensive wetland conservation and management plan that addresses natural resource goals for protection, conservation, and restoration of these wetlands. Such a comprehensive plan would address fire management, invasive species, wildlife conservation, monitoring and research, access, and hydrological connection and wetland changes.

Water levels in these wetlands should be maintained to sustain the native plant and animal communities. The Office of the State Engineer, the State Parks Division, the BLM, as well as other Federal, State or local agencies and the interested public should continue to monitor the connectivity between groundwater levels and the outflow of Lea Lake. Data from these monitoring efforts should be provided to the public and used to update the models that identify the amount of water in the wetlands and that enters the Pecos River.

The USACE, the Park, and the BLM should work with other Federal and State agencies, county agents, private landowners, research institutions, schools and universities to monitor and survey these wetlands to track changes to the plant and animal communities and to design and implement projects that will provide information about these wetlands to the public. In conjunction with others, the Service could provide additional mapping services and inventory of these wetland communities to delineate and categorize their functions under the National Wetland Inventory.

Cooperative approaches to wetland conservation could also include county zoning for both the protection of the wetlands along with area development, paying particular attention to ground water supplies and land use. The goal would be to make the region a more compatible place so that these wetland plants and animals can survive in conjunction with future growth and development expected in Chavez County. The comprehensive planning process could be used to identify areas that can act as corridors for wildlife migration across public lands as well as for connectivity of important riparian, wetland, and wildlife habitats. Planning for the conservation of these wetlands as well as identifying areas for development

and growth in association with nearby land owners would allow for a collaborative approach to managing future changes in land use and wildlife habitat conservation.

Private landowners should have an opportunity to participate in the conservation of the Lea Lake Wetlands. Contact the Service's Partners for Fish and Wildlife for assistance developing conservation agreements with private landowners to conserve these wetlands on private land. There are other opportunities for the conservation of these wetlands in New Mexico that could be pursued in association with this project. The 1986 Emergency Wetlands Resources Act (Public Law 99-645; 100 USC. 3582), allows for the purchase of wetlands using Land and Water Conservation Fund monies. Additionally, there are opportunities to manage waterfowl on these wetlands. Grants are available through the 1989 North American Wetlands Conservation Act (103 USC 1968; 16 U.S.C. 4401-4412; Public Law 101-233). Annually, grants are available from the Service to fund implementation of the North American Waterfowl Management Plan on wetlands important to migratory waterfowl.

To further protect the Lea Lake Wetlands, as well as similar wetlands found on the Bitter Lake National Wildlife Refuge, a proposal could be considered to nominate these sinkhole lakes, saltgrass wetlands and wet meadows for status under the Ramsar Convention on Wetlands of International Importance (http://ramsar.org). The Convention on Wetlands of International Importance – often called the Ramsar Convention from its place of adoption in 1971 in Iran—is an intergovernmental treaty that provides a framework for international cooperation for the conservation of wetland habitats. The major objectives of the Ramsar Convention are to stem the loss of wetlands and to ensure their conservation. The Ramsar Convention is not an international regulatory agency, nor does it presume to impose any restrictions or conditions that affect in any way the sovereignty of countries. Under the Ramsar Convention there is a general obligation for member countries to include wetland conservation considerations in their natural resource planning processes and to promote the wise use of wetlands within their territory.

The wetlands associated with the Lea Lake outflow, the natural lakes on the Park, and the similar sinkhole lakes and wetlands on Bitter Lake National Wildlife Refuge are unique examples of saltgrass wetlands and wet meadows in terms of their ecology, botany, zoology, limnology and hydrology and their wetland values and functions should be conserved. Placing these wetlands on the Ramsar List could have considerable benefit upon the conservation of these natural resources as well as the public recognition would identify their global importance and thereby foster ecotourism, wildlife conservation and wildlife viewing in this area and therefore, the regional economy (Service 2002).

RECOMMENDATIONS

The Service offers the following recommendations concerning fish and wildlife resources for the proposed project.

1. Implement protection and mitigation measures identified in the DPR/EA (USACE 2006).

2. Verify the locations of Pecos sunflower and complete the Section 7 ESA consultation prior to construction.

3. Monitor the spread of nonnative or invasive plants or animal species and control or minimize their impact on native species.

4. Design the outflow channel to include enhancement of fish habitat without affecting the channel's conveyance capacity or public safety.

5. Plan for educational opportunities alongside the outflow channel design including, but not limited to, identification of the native fish found in the Park or post prohibitions to public disposal of nuisance species (e.g., sheepshead minnow, goldfish, crayfish, etc.).

6. Work with land owners, State and Federal agencies and the public to develop a comprehensive management plan for the entire Lea Lake Wetlands.

7. Work with State and federal agencies, private landowners, research institutions, the local soil and water district, and schools and universities to map and survey these wetlands to monitor changes in the plant and animal communities and educate the public.

8. Work with the Office of the State Engineer and the US Geological Survey to continue studies into the connectivity between groundwater levels, Lea Lake outflow and changes in these wetlands.

9. Work with land owners, natural resource agencies, Chavez County officials, and the public to conserve these wetlands through zoning (or other through other planning processes) as well as identify and plan for wildlife migration corridors and areas of connectivity between other important wildlife habitats.

10. Work with private landowners to develop conservation easements or acquire these portions of the wetlands through land exchange or purchase.

11. Work towards nominating these unique saltgrass wetlands, wet meadows and sinkhole lakes on the Park and on BLM lands as well as those on the Bitter Lake National Wildlife Refuge as Wetlands of International Importance under the Ramsar Convention to foster their conservation.

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Appendix 1. Occurrence of dominant plant species at the Bottomless Lakes State Park Wetlands. Functional group codes are a combination of life history (P = perennial, A = annual) and growth habit (T = tree, S= shrub, F = forb, and G = graminoid). Source: Blue Earth Ecological Consultants, Inc., (2006a).

Plant Species	**Functional Group**	**Frequency of Occurrence**	**Percent Occurrence (Rank)**
salt cedar (*Tamarix chinensis*)	P-T	37	88% (1)
inland saltgrass (*Distichlis spicata*)	P-G	35	83% (2)
iodinebush (*Allenrolfea occidentalis)*	P-S	22	52% (3)
southwestern sea-lavender (*Limonium limbatum*)	P-F	17	40% (4)
alkali sacaton (*Sporobolus airoides*)	P-G	14	33% (5)
narrowleaf cattail (*Typha angustifolia*)	P-G	12	29% (6)
shrubby seepweed (*Suaeda nigra*)	P-S	7	17% (7)
witchgrass (*Panicum capillare*)	A-G	7	17% (7)
willow baccharis (*Baccharis salicifolia*)	P-S	5	12% (8)
sweet-scent (*Pluchea odorata*)	P-F	5	12% (8)
spiral ditch-grass (*Ruppia cirrhosa*)	P-F	3	7% (9)
Three-square bulrush (*Schoenoplectus americanus*)	P-G	3	7% (9)
four-wing saltbush (*Atriplex canescens*)	P-S	2	5% (10)
southern Jimmyweed (*Isocoma pluriflora*)	P-F	2	5% (10)
kochia (*Kochia scoparia*)	A-F	2	5% (10)
ragweed (*Ambrosia psilostachya*)	A-F	2	5% (10)
Pecos sunflower (*Helianthus paradoxus*)	A-F	1	2% (11)
pepperweed (*Lepidium montanum*)	P-F	1	2% (11)
rabbitfoot grass (*Polypogon monspeliensis*)	A-G	1	2% (11)

Appendix 2. Common and Scientific Names of Avian Species of the Bottomless Lakes State Park. (Source: Blue Earth Ecological Consultants, Inc. 2006a)

Common Name	**Scientific Name**
Common Loon	*Gavia immer*
Pied-billed Grebe	*Podilymbus podiceps*
Western Grebe	*Aechmophorus occidentalis*
American White Pelican	*Pelecanus erythrorhynchos*
Great Blue Heron	*Ardea herodias*
Snowy Egret	*Egretta thula*
Green Heron (= Green-backed Heron)	*Butorides virescens*
Cattle Egret	*Bubulcus ibis*
White-faced Ibis	*Plegadis chihi*
Tundra Swan	*Cygnus columbianus*
Ross' Goose	*Chen rossii*
Snow Goose	*Chen caerulescens*
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Gadwall	*Anas strepera*
American Widgeon	*Anas americana*
Northern Shoveler	*Anas clypeata*
Blue-winged Teal	*Anas discors*
Green-winged Teal	*Anas crecca*
Redhead	*Aythya americana*
Canvasback	*Aythya valisineria*
Common Goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Turkey Vulture	*Cathartes aura*

Appendix 2. Common and Scientific Names of Avian Species of the Bottomless Lakes State Park. (Source: Blue Earth Ecological Consultants, Inc. 2006a)~ *Continued.*

Northern Harrier	*Circus cyaneus*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
Osprey	*Pandion haliaetus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Scaled Quail	*Callipepla squamata*
Virginia Rail	*Rallus limicola*
American Coot	*Fulica americana*
Sandhill Crane (Greater and Lesser forms)	*Grus canadensis*
Killdeer	*Charadrius vociferus*
American Avocet	*Recurvirostra americana*
Black-necked Stilt	*Himantopus mexicanus*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Semipalmated Sandpiper	*Calidris pusilla*
Ring-billed Gull	*Larus delawarensis*
Rock Dove	*Columbia livia*
White-winged Dove	*Zenaida asiatica*
Mourning Dove	*Zenaida macroura*
Inca Dove	*Columbina inca*
Greater Roadrunner	*Geococcyx californianus*
Barn Owl	*Tyto alba*
Great Horned Owl	*Bubo virginianus*
Burrowing Owl	*Athene cunicularia*
Common Nighthawk	*Chordeiles minor*
Belted Kingfisher	*Ceryle alcyon*
Black-chinned Hummingbird	*Archilochus alexandri*

Appendix 2. Common and Scientific Names of Avian Species of the Bottomless Lakes State Park. (Source: Blue Earth Ecological Consultants, Inc. 2006a)~ *Continued.*

Rufous Hummingbird	*Selasphorus rufus*
Northern Flicker (includes Yellow-shafted)	*Colaptes auratus*
Ladder-backed Woodpecker	*Picoides scalaris*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Black Phoebe	*Sayornis nigricans*
Eastern Phoebe	*Sayornis phoebe*
Say's Phoebe	*Sayornis saya*
Cassin's Kingbird	*Tyrannus vociferans*
Western Kingbird	*Tyrannus verticalis*
Loggerhead Shrike	*Lanius ludovicianus*
Scrub Jay	*Aphelocoma coerulescens*
American Crow	*Corvus brachyrhynchos*
Chihuahuan Raven	*Corvus cryptoleucus*
Horned Lark	*Eremophila alpestris*
Barn Swallow	*Hirundo rustica*
Juniper Titmouse	*Baeolophus ridgwayi*
Brown Creeper	*Certhia americana*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Rock Wren	*Salpinctes obsoletus*
Cactus Wren	*Campylorhynchus brunneicapillus*
Ruby-crowned Kinglet	*Regulus calendula*
Mountain Bluebird	*Sialia currucoides*
American Robin	*Turdus migratorius*
Northern Mockingbird	*Mimus polyglottos*
European Starling	*Sturnus vulgaris*
Orange-crowned Warbler	*Vermivora celata*
Townsend's Warbler	*Dendroica townsendii*

Appendix 2. Common and Scientific Names of Avian Species of the Bottomless Lakes State Park. (Source: Blue Earth Ecological Consultants, Inc. 2006a)~ *Concluded.*

Yellow-rumped Warbler	*Dendroica coronata*
Wilson's Warbler	*Wilsonia pusilla*
Pyrrhuloxia	*Cardinalis sinuatus*
Blue Grosbeak	*Passerina caerulea*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Spotted Towhee	*Pipilo maculatus*
Eastern Towhee (= Rufous-sided Towhee)	*Pipilo erythrophthalmus*
Dark-crowned Sparrow (= Rufous-crowned Sparrow)	*Aimophila ruficeps*
Song Sparrow	*Melospiza melodia*
Dark-eyed Junco	*Junco hyemalis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Western Meadowlark	*Sturnella neglecta*
Red-winged Blackbird	*Agelaius phoeniceus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Great-tailed Grackle	*Quiscalus mexicanus*
Brown-headed Cowbird	*Molothrus ater*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*

Appendix 3
Clean Water Act Section 404 Coordination

The memoranda on the following pages regarding the Clean Water Act section 404 jurisdictional wetlands determination for the Bottomless Lakes State Park Section 206 Habitat Restoration Project reference the *Draft Wetland Determination, Delineation, and Habitat Evaluation Report for the Bottomless Lakes State Park Section 206 Aquatic Habitat Restoration Feasibility Study*, dated 19 November 2003 (draft report).

This draft wetland report was finalized in the *Lea Lake Marsh Ecological Inventory and Analysis Report*, dated 6 January 2006 (final report), which is provided in Technical Appendix B. This final report contains the same wetland determination and delineation information that was contained in the draft report, which was reviewed by the Albuquerque District Regulatory Branch in making their jurisdictional determination.

A "cross-walk" between sections in the draft and final reports regarding wetland delineation and determination is provided below. The data presented in the draft report regarding wetland determination and delineation remained unchanged in the final wetland report.

Wetlands-Related Information	**Corresponding Section in the "Draft Report"** **19 November 2003**	**Corresponding Section in the "Final Report"** **Technical Appendix B** **6 January 2006**
Methods used for wetland determination and delineation	Section 2.2, pages 3-5	Section 2.1.2, pages 5-7
Results of wetland delineation and mapping of vegetation	Section 3.2, pages 16-23	Section 2.4, pages 17-31 (vegetation mapping) Section 2.5, pages 32-35 (wetland determination and delineation)
Data Sheets for wetland determinations	Appendix, pages 30-114	Appendix A, pages 68-152

CESPA-PM-LE (1105-2-10b) 16 December 2003

MEMORANDEUM FOR CH, Regulatory Branch, (CESPA-OD-R/ Daniel Malanchuk)

SUBJECT: Request for a Jurisdictional Determination for the Bottomless Lakes State Park Section 206 Aquatic Habitat Restoration, Chavez County, New Mexico.

1. The U.S. Army Corps of Engineers (Corps), Albuquerque District, in cooperation with the New Mexico Energy, Minerals, and Natural Resources Department – State Parks Division, is studying the feasibility of restoring aquatic habitat under the authority of Section 206 of the Water Resources Development Act of 1996 (Public Law 104-303). The study area is located about 12 miles southeast of Roswell and is within the Bottomless Lakes State Park in Chaves County, New Mexico.

2. Bottomless Lakes State Park consists of seven small sinkhole lakes, or *cenotes*, formed in gypsum deposits. Lea Lake, the largest of the sinkhole lakes, covers approximately 15 acres and is 90 feet deep. Lea Lake has an outflow that contributes to sustaining hundreds of acres of wetlands to the south. Most of the wetlands are on lands that are privately-owned or managed by the Bureau of Land Management, but approximately 55 acres of degraded wetlands fed by the outflow from Lea Lake are located within the park boundary south of New Mexico Highway 409.

3. The goal of the study is to determine the extent of aquatic habitat degradation and develop alternatives to restore the aquatic habitat associated ecosystem within the study area. Achieving these two goals will provide for the opportunity to attain several project objectives, including: 1) restoration of existing wetlands to a more natural condition in terms of ecosystem structure and function; 2) improved habitat for special status species; 3) reduced potential for flood damage to developed recreation facilities surrounding Lea Lake; 4) improved efficiency of water movement from Lea Lake to the Pecos River; and 5) reduction of maintenance costs for New Mexico Highway 409.

4. Blue Earth Ecological Consultations, Inc. (Blue Earth) has prepared a Draft Wetland Determination, Delineation and Habitat Evaluation Report for the Bottomless Lakes State Park Section 206 Aquatic Habitat Restoration Feasibility Study dated 19 November 2003. Blue Earth determined that approximately 79% of the study area was jurisdictional wetlands.

5. Please concur with this determination and delineation (see attached). We would also like to include the Regulatory Section in our project team meetings. Please provide a point of contact.

6. If you have any questions or need additional information, please contact Ms. Patty Phillips, Biologist, at Ext. 3354 or email address patricia.l.phillips@spa02.usace.army.mil.

1 Enclosure

Julie A. Hall
Chief, Environmental Resources Section

CESPA-OD-R (1145b) 24 Dec 2003

MEMORANDUM FOR Ch, Environmental Resources Section (CESPA-EC-R/Julie A. Hall)

SUBJECT: Request for a Jurisdictional Determination for the Bottomless Lakes State Park Section 206 Aquatic Habitat Restoration, Chaves County, New Mexico

1. This is in reference to your memorandum dated 16 December 2003 requesting a Section 404 jurisdictional determination for a potential Section 206 project area located adjacent to Lea Lake at Bottomless Lakes State Park near Roswell, Chaves County, New Mexico. We have assigned Action No. 2003 00875 to this request.

2. Enclosed with your memorandum was a document entitled "Wetland Determination, Delineation and Habitat Evaluation Report for the Bottomless Lakes State Park Section 206 Aquatic Habitat Restoration Feasibility Study", dated 19 November 2003, and prepared by Blue Earth Ecological Consultants. We have reviewed this report with regard to our responsibilities under Section 404 of the Clean Water Act.

3. We concur with the determination in the above report that approximately 79% of the potential project area contains wetlands. Based on discussions with Ms. Patty Phillips of the Environmental Resources Section and a review of a draft water budget report which has been prepared for the project, we have determined that these wetlands drain to the Pecos River at a minimum of six locations. Therefore, these wetlands are connected to the Pecos River and are waters of the United States.

4. The placement of dredged or fill material into these wetlands will require authorization under Section 404 of the Clean Water Act. Mr. James Wood of the Regulatory Branch has been designated as the point of contact for this action. Please notify him at x3280 or by e-mail at james.a.wood@usace.army.mil with regard to future meetings pertaining to this project.

Daniel Malanchuk

DANIEL MALANCHUK
Chief, Regulatory Branch

Appendix 4
Herbicide Specimen Label and Material Safety Data Sheets for Herbicide and Dye

Habitat®

herbicide

SPECIMEN

Applications may only be made for the control of undesirable emergent and floating aquatic vegetation in and around standing and flowing water, including estuarine and marine sites. Applications may be made to control undesirable wetland, riparian and terrestrial vegetation growing in or around surface water when applications may result in inadvertent applications to surface water.

Active ingredient:

Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*	28.7%
Inert ingredients	71.3%
Total	100.0%

* Equivalent to 22.6% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon.

EPA Reg. No. 241-426 **U.S. Patent No. 4,798,619** **EPA Est. No.**

KEEP OUT OF REACH OF CHILDREN.

CAUTION/PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

In case of an emergency endangering life or property involving this product, call day or night, 800-832-HELP.

See Next Page for Additional Precautionary Statements

Net contents: _____

For more information, please visit our web site:
www.vmanswers.com

PROFESSIONAL VEGETATION MANAGEMENT

BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709

BASF

FIRST AID	
If on skin or clothing	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If in eyes	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If inhaled	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.
HOT LINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact BASF Corporation for emergency medical treatment information: 1-800-832-HELP (4357).	

PRECAUTIONARY STATEMENTS

HAZARD TO HUMANS
CAUTION!

Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category A on an EPA chemical-resistant category selection chart.

Applicators and other handlers must wear:

- Long-sleeve shirt and long pants
- Chemical-resistant gloves, Category A
- shoes plus socks

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions are given for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

PHYSICAL AND CHEMICAL HAZARDS

Spray solutions of **HABITAT® herbicide** should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

DO NOT mix, store or apply **HABITAT** or spray solutions of **HABITAT** in unlined steel (except stainless steel) containers or spray tanks.

ENVIRONMENTAL HAZARDS

DO NOT apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

This pesticide is toxic to vascular plants and should be used strictly in accordance with the drift precautions on the label.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

HABITAT should be used only in accordance with recommendations on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

STORAGE AND DISPOSAL

DO NOT contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: DO NOT store below 10° F.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in an approved sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

IMPORTANT

DO NOT use on food crops. **DO NOT** apply this product within one-half mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within one-half mile of an active potable water intake in a standing body of water, such as a lake, pond or reservoir. **DO NOT** apply to water used for irrigation except as described in APPLICATION TO WATERS USED FOR IRRIGATION section of this label. Keep from contact with fertilizers, insecticides, fungicides and seeds. **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the treated soil may be washed or moved into contact with their roots. **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas. **DO NOT** side trim desirable vegetation with this product unless severe injury and plant death can be tolerated. Prevent drift of spray to desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

GENERAL USE PRECAUTIONS AND RESTRICTIONS

Applications may only be made for the control of undesirable emergent and floating aquatic vegetation in and around standing and flowing water, including estuarine and marine sites. Applications may be made to control undesirable wetland, riparian and terrestrial vegetation growing in or around surface water when applications may result in inadvertent applications to surface water.

Do not apply more than 6 pints of product (1.5 lbs. acid equivalent) per acre per year.

Aerial application is restricted to helicopter only.

Application of **HABITAT® herbicide** can only be made by federal or state agencies, such as Water Management District personnel, municipal officials and the U.S. Army Corps of Engineers, or those applicators who are licensed or certified

as aquatic pest control applicators and are authorized by the state or local government.

Treatment to other than non-native invasive species is limited to only those plants that have been determined to be a nuisance by a federal or state government entity.

Applications to private waters: Applications may be made to private waters that are still, such as ponds, lakes and drainage ditches where there is minimal or no outflow to public waters.

Application to public waters: Applications may be made to public waters such as ponds, lakes, reservoirs, marshes, bayous, drainage ditches, canals, streams, rivers, and other slow-moving or quiescent bodies of water for control of aquatic weeds or for control of riparian and wetland weed species.

Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

Recreational Use of Water in Treatment Area: There are no restrictions on the use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock Use of Water in/from Treatment Area: There are no restrictions on livestock consumption of water from the treatment area.

Precautions for Potable Water Intakes: Do not apply **HABITAT** directly to water within one-half mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within one-half mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within one-half mile of active potable water intakes, the water intake must be turned off during application and for a minimum of 48 hours after the application. These aquatic applications may be made only in the cases where there are alternative water sources or holding ponds, which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. Note: Existing potable water intakes which are no longer in use, such as those replaced by connections to wells or a municipal water system, are not considered to be active potable water intakes. This restriction does not apply to intermittent, inadvertent overspray of water in terrestrial use sites.

APPLICATION TO WATERS USED FOR IRRIGATION

Water treated with **HABITAT** may not be used for irrigation purposes for 120 days after application or until **HABITAT** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

Seasonal Irrigation Waters: HABITAT may be applied during the off-season to surface waters that are used for irrigation on a seasonable basis, provided that there is a minimum of 120 days between **HABITAT** application and the first use of treated water for irrigation purposes or until **HABITAT** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

Irrigation Canals/Ditches: DO NOT apply **HABITAT** to irrigation canals/ditches unless the 120-day restriction on irrigation water usage can be observed or **HABITAT** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less. DO NOT apply **HABITAT** to dry irrigation canals/ditches.

Quiescent or Slow Moving Waters: In lakes and reservoirs DO NOT apply **HABITAT** within one (1) mile of an active irrigation water intake during the irrigation season. Applications less than one (1) mile from an inactive irrigation water intake may be made during the off-season, provided that the irrigation intake will remain inactive for a minimum 120 days after application or until **HABITAT** residue levels are determined by laboratory analysis, or other appropriate means of analysis, to be 1.0 ppb or less.

Moving water: DO NOT apply within one-half mile downstream of an active irrigation water intake. When making applications upstream from an active irrigation water intake, the intake must be turned off for a period of time sufficient to allow the upstream portion of treated water to completely flow past the irrigation intake before use can resume. Shut off time will be determined by the speed of water flow and the distance and length of water treated upstream from the intake. Consult local, state and/or federal authorities before making any applications upstream from an active irrigation water intake.

GENERAL INFORMATION

Use Sites: HABITAT® herbicide is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to control floating and emergent undesirable vegetation (see **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT** section) in or near bodies of water which may be flowing, non-flowing, or transient. **HABITAT** may be applied to aquatic sites that include lakes, rivers, streams, ponds, seeps, drainage ditches, canals, reservoirs, swamps, bogs, marshes, estuaries, bays, brackish water, transitional areas between terrestrial and aquatic sites and seasonal wet areas. See **AQUATIC USE** section of this label for precautions, restrictions, and instructions on aquatic uses.

Read and observe the following directions if aquatic sites are present in terrestrial noncrop areas and are part of the intended treatment area:

Herbicidal Activity: HABITAT® herbicide will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline. **HABITAT** is readily absorbed through emergent leaves and stems and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground or submerged storage organs, which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until two or more weeks after application. Complete kill of plants may not occur for several weeks. Applications of **HABITAT** are rainfast one hour after treatment.

HABITAT does not control plants which are completely submerged or have a majority of their foliage under water.

Application Methods: HABITAT must be applied to the emergent foliage of the target vegetation and has little to no activity on submerged aquatic vegetation. **HABITAT** concentrations resulting from direct application to water are not expected to be of sufficient concentration or duration to provide control of target vegetation. Application should be made in such a way as to maximize spray interception by the target vegetation while minimizing the amount of overspray that enters the water. For maximum activity, weeds should be growing vigorously at the time of application and the spray solution should include a surfactant (See **ADJUVANTS** section for specific recommendations). **HABITAT** may be selectively applied by using low-volume directed application techniques or may be broadcast-applied by using ground equipment, watercraft or by helicopter. In addition, **HABITAT** may also be used for cut stump, cut stem and frill and girdle treatments within aquatic sites (see **AERIAL APPLICATIONS** and **GROUND APPLICATIONS** sections for additional details).

HABITAT should be applied with surface or helicopter application equipment in a minimum of 5 gallons of water per acre. When applying by helicopter, follow directions under the **AERIAL APPLICATIONS** section of this label, otherwise refer to section on **GROUND APPLICATIONS** when using surface equipment.

Applications made to moving bodies of water should be made while traveling upstream to prevent concentration of this herbicide in water. DO NOT apply to bodies of water or portions of bodies of water where emergent and/or floating weeds do not exist.

When application is to be made to target vegetation that covers a large percentage of the surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in the suffication of some sensitive aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas.

Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash for one hour after application.

Apply **HABITAT** at 2 to 6 pints per acre depending on species present and weed density. DO NOT exceed the maximum label rate of 6 pints per acre (1.5 lb ai/A) per year. Use the higher labeled rates for heavy weed pressure. Consult the **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE** section of this label for specific rates.

HABITAT® herbicide may be applied as a draw down treatment in areas described above. Apply **HABITAT** to weeds after water has been drained and allow 14 days before reintroduction of water.

PRECAUTIONS FOR AVOIDING INJURY TO NON-TARGET PLANTS

Untreated desirable plants can be affected by root uptake of **HABITAT** from treated soil. Injury or loss of desirable plants may result if **HABITAT** is applied on or near desirable plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. When making applications along shorelines where desirable plants may be present, caution should be exercised to avoid spray contact with their foliage or spray application to the soil in which they are rooted. Shoreline plants that have roots that extend into the water in an area where **HABITAT** has been applied generally will not be adversely affected by uptake of the herbicide from the water.

If treated vegetation is to be removed from the application site, DO NOT use the vegetative matter as mulch or compost on or around desirable species.

MANAGING OFF-TARGET MOVEMENT

Spray Drift: Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determines the potential for spray drift. The applicator and the entity authorizing spraying are responsible for considering all these factors when making decisions.

Spray drift from applying this product may result in damage to sensitive plants adjacent to the treatment area. Only apply this product when the potential for drift to these and other adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, or non-target crops) is minimal. Do not apply when the following conditions exist that increase the likelihood of spray drift from intended targets: high or gusty winds, high temperatures, low humidity, temperature inversions.

To minimize spray drift, the applicator should be familiar with and take into account the following drift reduction advisory information. Additional information may be available from state enforcement agencies or the Cooperative Extension on the application of this product.

The best drift management strategy and most effective way to reduce drift potential are to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see **WIND**, **TEMPERATURE AND HUMIDITY**, and **TEMPERATURE INVERSIONS**).

CONTROLLING DROPLET SIZE

- Volume - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- Pressure - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- Number of Nozzles - Use the minimum number of nozzles that provide uniform coverage.
- Nozzle Orientation - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is recommended practice. Significant deflection from the horizontal will reduce droplet size and increase drift potential.
- Nozzle Type - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift. Do not use nozzles producing a mist droplet spray.

APPLICATION HEIGHT

Making applications at the lowest possible height (helicopter, ground driven spray boom) that is safe and practical reduces exposure of droplets to evaporation and wind.

SWATH ADJUSTMENT

When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the treatment area, the applicator must compensate for this displacement by adjusting the path of the application equipment (e.g. aircraft, ground) upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller droplets, etc.).

WIND

Drift potential is lowest between wind speeds of 3-10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 3 mph due to variable wind direction and high inversion potential. NOTE: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud, which can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

WIND EROSION

Avoid treating powdery dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

AERIAL APPLICATION METHODS AND EQUIPMENT

HELICOPTERS ONLY

Water Volume: Use 2 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

Managing spray drift from aerial applications: Applicators must follow these requirements to avoid off-target drift movement: 1) boom length - the distance of the outermost nozzles on the boom must not exceed ¾ the length of the rotor, 2) nozzle orientation - nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees, and 3) application height - without compromising helicopter safety, applications should made at a height of 10 feet or less above the crop canopy or tallest plants. Applicators must follow the most restrictive use cautions to avoid drift hazards, including those found in this labeling as well as applicable state and local regulations and ordinances.

GROUND APPLICATION (BROADCAST)

Water Volume: Use 5 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

ADJUVANTS

Postemergence applications of **HABITAT® herbicide** require the addition of a spray adjuvant. Only spray adjuvants that are approved or appropriate for aquatic use should be utilized.

Nonionic Surfactants: Use a nonionic surfactant at the rate 0.25% v/v or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with a HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product (alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements).

Methylated Seed Oils or Vegetable Oil Concentrates: Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, methylated seed oil or vegetable based seed oil concentrates should be mixed at a rate of 1% of the total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in **HABITAT** deposition and uptake by plants under moisture or temperature stress.

Silicone Based Surfactants: See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet, allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Invert emulsions: HABITAT can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray run-off, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

Other: An antifoaming agent, spray pattern indicator or drift reducing agent may be applied at the product labeled rate if necessary or desired.

TANK MIXES

HABITAT may be tank-mixed with other aquatic use herbicides for the control of emergent and floating aquatic vegetation.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank-mixes.

AERIAL APPLICATIONS

All precautions should be taken to minimize or eliminate spray drift. Helicopters can be used to apply **HABITAT**; however, DO NOT make applications by helicopter unless appropriate buffer zones can be maintained to prevent spray drift out of the target area, or when spray drift as a result of helicopter application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a Microfoil™ boom, Thru-Valve™ boom or raindrop nozzles, must be used and calibrated. Except when applying with a Microfoil boom, a drift control agent may be added at the recommended label rate. To avoid drift, applications should not be made during inversion conditions, when winds are gusty, or any other conditions which allow drift. Side trimming is not recommended with **HABITAT** unless death of treated tree can be tolerated.

Uniformly apply the recommended amount of **HABITAT** in 5 to 30 gallons of water per acre; include in the spray solution a nonionic surfactant or methylated seed oil or manufacturer's label rate of a silicone-based surfactant (See the **Adjuvants** section of this label for specific recommendations). A foam reducing agent may be added at the recommended label rate, if needed.

IMPORTANT: Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

GROUND APPLICATIONS

FOLIAR APPLICATIONS

Low Volume Foliar:

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5 to 5% **HABITAT** plus surfactant (see the **ADJUVANTS** section of this label for specific recommendations). A foam reducing agent may be applied at the recommended label rate, if needed. For control of difficult species (see **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes but do not apply more than 6 pints of **HABITAT** per acre. Excessive wetting of foliage is not recommended. See the **MIXING GUIDE** below for some suggested volumes of **HABITAT** and water.

For low volume, select proper nozzles to avoid over-application. Proper application is critical to ensure desirable results. Best results are achieved when the spray covers the crown and approximately 70 percent of the plant. The use of an even flat fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Recommended tip sizes include 4004E, or 1504E. For a straight stream and cone pattern, adjustable cone nozzles such as 5500 X3 or 5500 X4 may be used. Attaching a rollover valve

onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat fan and cone tips on the same gun.

Moisten, but do not drench target vegetation causing spray solution to run off.

Low Volume Foliar with Backpacks:

For low-growing species, spray down on the crown, covering crown and penetrating approximately 70% of the plant.

For target species 4 to 8 feet tall, swipe the sides of target vegetation by directing spray to at least two sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For target species over 8 feet tall, lace sides of the target vegetation by directing spray to at least two sides of the target in smooth zigzag motions from crown to bottom.

Low Volume Foliar with Hydraulic Handgun Application Equipment:

Use same technique as described above for **Low Volume with Backpacks**.

For broadcast applications, simulate a gentle rain near the top of target vegetation, allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution which contacts the understory may result in severe injury or death of plants in the understory.

SPRAY SOLUTION MIXING GUIDE FOR LOW-VOLUME FOLIAR APPLICATIONS

AMOUNT OF SPRAY SOLUTION BEING PREPARED	DESIRED CONCENTRATION (fluid volume)				
	0.5%	0.75%	1%	1.5%	5%
	(amount of **HABITAT** to use)				
1 gallon	0.6 oz.	0.9 oz.	1.3 oz.	1.9 oz.	6.5 oz.
3 gallons	1.9 oz.	2.8 oz.	3.8 oz.	5.8 oz.	1.2 pint
4 gallons	2.5 oz.	3.8 oz.	5.1 oz.	7.7 oz.	1.6 pint
5 gallons	3.2 oz.	4.8 oz.	6.5 oz.	9.6 oz.	2 pints
50 gallons	2 pints	3 pints	4 pints	6 pints	10 quarts
100 gallons	4 pints	6 pints	8 pints	6 quarts	5 gallons

2 tablespoons = 1 fluid ounce

High Volume Foliar:

For optimum performance when spraying medium to high-density vegetation, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray run-off, causing increased ground cover injury, and injury to desirable species. To prepare the spray solution, thoroughly mix **HABITAT® herbicide** in water and add a surfactant (see **ADJUVANT** section for specific recommendations and rates of surfactants). A foam-reducing agent may be added at the recommended label rate, if needed. For control of difficult species (see **AQUATIC WEEDS CONTROLLED** section and the **ADDITIONAL WEEDS CONTROLLED BY HABITAT** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but do not apply more than 6 pints of **HABITAT** per acre. Uniformly cover the foliage of the vegetation to be controlled but do not apply to run-off. Excessive wetting of foliage is not recommended.

Side Trimming:

DO NOT side trim with **HABITAT** unless severe injury or death of the treated tree can be tolerated. **HABITAT** is readily translocated and can result in death of the entire tree.

CUT SURFACE TREATMENTS

HABITAT may be used to control undesirable woody vegetation by applying the **HABITAT** solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. Do not overapply solution causing run-off from the cut surface.

Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

CUT SURFACE APPLICATIONS WITH DILUTE AND CONCENTRATE SOLUTIONS:

HABITAT may be mixed as either a concentrated or dilute solution. The dilute solution may be used for applications to the cut surface of the stump or to cuts on the stem of the target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

- To prepare a dilute solution, mix 8 to 12 fluid ounces of **HABITAT** with one gallon of water. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums.
- To prepare a concentrated solution, mix 2 quarts of **HABITAT** with no more than 1 quart of water.

Cut stump treatments:

- Dilute Solution- spray or brush the solution onto the cambium area of the freshly cut stump surface. Insure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

Cut stem (injection, hack & squirt) treatments:

- Dilute Solutions- Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than one-inch intervals between cut edges. Insure that the injector completely penetrates the bark at each injection site.
- Concentrate Solutions- Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least one injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than one injection site place the injection cuts at approximately equal intervals around the tree.

Frill or girdle treatments:

- Using a hatchet, machete, or chainsaw, make cuts through the bark and completely around the tree to expose the cambium. The cut should angle downward extending into the cambium enough to expose at least two growth rings. Using a spray applicator or brush, apply a 25% to 100% solution of **HABITAT** into each cut until thoroughly wet. Avoid applying so much herbicide that runoff to the ground or water occurs.

AQUATIC SPECIES CONTROLLED

HABITAT® herbicide will control the following target species as specified in the BASF RECOMMENDATION section of the table. Rate recommendations are expressed in terms of product volume for broadcast applications and as a % solution for directed applications including spot treatments. **For % solution applications, DO NOT apply more than the equivalent of 3 quarts of HABITAT per acre.**

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
Floating Species		
Duckweed	*Lemna minor*	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Duckweed, Giant	*Spirodela polyriza*	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Frogbit	*Limnobium spongia*	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Spatterdock	*Nuphar luteum*	Apply a tank-mix of 2-4 pints/acre **HABITAT** + 4 to 6 pints/acre glyphosate (0.5% **HABITAT** + 1.5% glyphosate) in 100 GPA water for best control. Ensure 100% coverage of actively growing, emergent foliage.
Water Hyacinth	*Eichhornia crassipes*	1-2 pints/acre (0.5% solution) applied in 100 GPA water to actively growing foliage.
Water Lettuce	*Pistia stratiotes*	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Emerged Species		
Alligatorweed	*Alternanthera philoxeroides*	1 to 4 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage. Tank-mix with glyphosate is NOT recommended, and may reduce alligatorweed control, requiring higher **HABITAT** rates.
Arrowhead, Duck-potato	*Sagittaria* spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Bacopa, lemon	*Bacopa* spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Parrot feather	*Myriophyllum aquaticum*	Must be foliage above water for sufficient **HABITAT** uptake. Apply 2 - 4 pints to actively growing emergent foliage.
Pennywort	*Hydrocotyle* spp.	1-2 pints/acre (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Pickerelweed	*Pontederia cordata*	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Taro, wild; Dasheen; Elephant's Ear; Coco Yam	*Colocasia esculentum*	4-6 pints/acre (1.5% solution) applied in 100 GPA with a high quality 'sticker' adjuvant. Ensure good coverage of actively growing, emergent foliage.
Water lily	*Nymphaea odorata*	2-3 pints/acre (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing, emergent foliage.
Water primrose	*Ludwigia uruguayensis*	4-6 pints/acre (1.5% solution), ensure 100% coverage of actively growing, emergent foliage. Tank-mix with glyphosate is NOT recommended and may reduce water primrose control.

(continued)

AQUATIC SPECIES CONTROLLED *(continued)*

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
Terrestrial/Marginal		
Soda Apple, aquatic; Nightshade	*Solanum tampicense*	2 pts./acre applied to foliage
Bamboo, Japanese	*Phyllostachys* spp.	3 to 4 pints/acre applied to the foliage when plant is actively growing. Before setting seed head. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Brazilian Pepper; Christmasberry	*Schinus terebinthifolius*	2 - 4 pints/acre applied to foliage
Cattail	*Typha* spp.	2-4 pints (1% solution) applied to actively growing, green foliage after full leaf elongation. Lower rates will control cattail in the north; higher rates are needed in the south.
Chinese Tallow Tree	*Sapium sebiferum*	16 to 24 oz applied to foliage
Cogon Grass	*Imperata cylindrica*	Burn foliage, till area, that fall spray 2 qt./acre **HABITAT** + MSO applied to new growth.
Cordgrass, prairie	*Spartina* spp.	4-6 pints applied to actively growing foliage
Cutgrass	*Zizaniopsis miliacea*	4-6 pints applied to actively growing foliage
Elephant Grass; Napier Grass-	*Pennisetum purpureum*	3 pts./acre applied to actively growing foliage
Flowering rush	*Butumu typla*	2-3 pints applied to actively growing foliage
Giant Reed, Wild Cane	*Arundo donax*	4 to 6 pints/acre applied in spring to actively growing foliage
Golden Bamboo	*Phyllostachys aurea*	3 to 4 pints/acre applied to the foliage when plant is actively growing. Before setting seed head. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Junglerice	*Echinochloa colonum*	3-4 pints applied to actively growing foliage
Knapweeds	*Centaurea species*	Russian Knapweed - 2 to 3 pints + 1 qt./acre MSO fall applied after senescence begins
Knotweed, Japanese (see Fallopia japonica)	*Polygonum cuspidatum*	3 to 4 pts./acre applied postemergence to actively growing foliage
Melaleuca; Paperbark Tree	*Melaleuca quinquenervia*	For established stands, apply 6 pints/acre **HABITAT® herbicide** + 6 pints/acre glyphosate + spray adjuvant. For best results use 4 qt./A methylated seed oil as an adjuvant. For ground foliar application, uniformly apply to ensure 100% coverage. For broadcast foliar control, apply aerially in a minimum of two passes at 10 gallons/acre applied cross treatment. For spot treatment use a 25% **HABITAT** + 25% solution of + glyphosate + 1.25% MSO in water applied as a frill or stump treatment.
Nutgrass; Kili'p'opu	*Cyperus rotundus*	2 pints **HABITAT** + 1 qt./acre MSO applied early postemergence
Nutsedge	*Cyperus* spp.	2 to 3 pints postemergence to foliage or pre-emergence incorporated, non-incorporated preemergence applications will not control.

(continued)

AQUATIC SPECIES CONTROLLED (CONT.)

COMMON NAME	SCIENTIFIC NAME	BASF RECOMMENDATION
Terrestrial/Marginal (Cont.)		
Phragmites; Common Reed	*Phragmites australis*	4 to 6 pints/acre applied to actively growing, green foliage after full leaf elongation, ensure 100% coverage. If stand has a substantial amount of old stem tissue, mow or burn, allow to regrow to approximately 5' tall before treatment. Lower rates will control phragmites in the north; higher rates are needed in the south.
Poison Hemlock	*Conium maculatum*	2 pints **HABITAT** + 1 qt./acre MSO applied preemergence to early postemergence to rosette, prior to flowering
Purple Loosestrife	*Lythrum salicaria*	1 pint/acre applied to actively growing foliage
Reed canarygrass	*Phalaris arundinacea*	3 to 4 pints/acre applied to actively growing foliage
Rose, swamp	*Rosa palustris*	2 to 3 pts./acre applied to actively growing foliage
Russian-Olive	*Elaeagnus angustifolia*	2 to 4 pints/acre or a 1% solution, applied to foliage
Saltcedar; Tamarisk	*Tamarix* species	Aerial apply 2 qts. **HABITAT** + 0.25%v/v NIS applied to actively growing foliage during flowering. For spot spraying use 1% solution of **HABITAT** + 0.25%v/v NIS and spray to wet foliage. After application wait at least two years before disturbing treated saltcedar. Earlier disturbance can reduce overall control.
Smartweed	*Polygonum spp.*	2 pints/acre applied early postemergence
Sumac	*Rhus* spp.	2 to 3 pts./acre applied to foliage
Swamp Morning Glory; Water Spinach; Kangkong	*Ipomoea aquatica*	1 to 2 pints/acre **HABITAT** + 1 qt./acre MSO applied early postemergence
Torpedo Grass	*Panicum repens*	4 pints/acre (1 - 1.5% solution), ensure good coverage to actively growing foliage.
White Top; Hoary Cress	*Cardaria draba*	1 to 2 pints/acre applied in spring, to foliage, during flowering.
Willow	*Salix* spp.	2 to 3 pts./acre **HABITAT** applied to actively growing foliage, ensure good coverage.

ADDITIONAL WEEDS CONTROLLED BY HABITAT HERBICIDE

In terrestrial sites, **HABITAT® herbicide** will provide preemergence or postemergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of **HABITAT**. **For established biennials and perennials postemergence applications of HABITAT are recommended.**

The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low volume spray solutions (see "Low Volume" section of "Ground Applications"); low volume applications may provide control of the target species with less **HABITAT** per acre than is shown for the broadcast treatments. **HABITAT** should be used only in accordance with the recommendations on this label and the leaflet label.

The relative sensitivity of the species listed below can also be used to determine the relative risk of causing non-target plant injury if any of the below listed species are considered to be desirable within the area to be treated.

Resistant Biotypes: Naturally occurring biotypes (a plant within a given species that has a slightly different, but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled. If naturally occurring resistant biotypes are present in an area, **HABITAT** should be tank-mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

GRASSES

COMMON NAME	SPECIES	GROWTH HABIT[2]
Apply 2-3 pints per acre[1]		
Annual bluegrass	*(Poa annua)*	A
Broadleaf signalgrass	*(Brachiaria platyphylla)*	A
Canada bluegrass	*(Poa compressa)*	P
Downy brome	*(Bromus tectorum)*	A
Fescue	*(Festuca* spp.*)*	A/P
Foxtail	*(Setaria* spp.*)*	A
Italian ryegrass	*(Lolium multiflorum)*	A
Johnsongrass	*(Sorghum halepense)*	P
Kentucky bluegrass	*(Poa pratensis)*	P
Lovegrass	*(Eragrostis* spp.*)*	A/P
Napier grass	*(Pennisetum purpureum)*	P
Orchardgrass	*(Dactylis glomerata)*	P
Paragrass	*(Brachiaria mutica)*	P
Quackgrass	*(Agropyron repens)*	P
Sandbur	*(Cenchrus* spp.*)*	A
Sand dropseed	*(Sporobulus cryptandrus)*	P
Smooth brome	*(Bromus inermis)*	P
Vaseygrass	*(Paspalum urvillei)*	P
Wild oats	*(Avena fatua)*	A
Witchgrass	*(Panicum capillare)*	A
Apply 3-4 pints per acre[1]		
Barnyardgrass	*(Echinochloa crus-gali)*	A
Beardgrass	*(Andropogon* spp.*)*	P
Bluegrass, Annual	*(Poa annua)*	A
Bulrush	*(Scirpus validus)*	P
Cheat	*(Bromus secalinus)*	A
Crabgrass	*(Digitaria* spp.*)*	A
Crowfootgrass	*(Dactyloctenium aegyptium)*	A
Fall panicum	*(Panicum dichotomiflorum)*	A
Goosegrass	*(Eleusine indica)*	A
Itchgrass	*(Rottboellia exaltata)*	A
Lovegrass	*(Eragrostis* spp.*)*	A
Maidencane	*(Panicum hemitomon)*	A
Panicum, Browntop	*(Panicum fasciculatum)*	A
Panicum, Texas	*(Panicum texanum)*	A
Prairie threeawn	*(Aristida oligantha)*	P
Sandbur, Field	*(Cenchrus incertus)*	A
Signalgrass	*(Brachiaria platyphylla)*	A
Wild barley	*(Hordeum* spp.*)*	A
Wooly Cupgrass	*(Eriochloa villosa)*	A

GRASSES (CONT)

COMMON NAME	SPECIES	GROWTH HABIT[2]
Apply 4-6 pints per acre[1]		
Bahiagrass	*(Paspalum notatum)*	P
Bermudagrass[3]	*(Cynodon dactylon)*	P
Big bluestem	*(Andropogon gerardii)*	P
Dallisgrass	*(Paspalum dilatatum)*	P
Feathertop	*(Pennisetum villosum)*	P
Guineagrass	*(Panicum maximum)*	P
Saltgrass[3]	*(Distichlis stricta)*	P
Sand dropseed	*(Sporobolus cryptandrus)*	P
Sprangletop	*(Leptochloa* spp.*)*	A
Timothy	*(Phleum pratense)*	P
Wirestem muhly	*(Muhlenbergia frondosa)*	P

BROADLEAF WEEDS

COMMON NAME	SPECIES	GROWTH HABIT[2]
Apply 2-3 pints per acre[1]		
Burdock	*(Arctium* spp.*)*	B
Carpetweed	*(Mollugo verticillata)*	A
Carolina geranium	(Geranium carolinianum)	A
Clover	*(Trifolium* spp.*)*	A/P
Common chickweed	*(Stellaria media)*	A
Common ragweed	*(Ambrosia artemisiifolia)*	A
Dandelion	*(Taraxacum officinale)*	P
Dog fennel	*(Eupatorium capillifolium)*	A
Filaree	*(Erodium* spp.*)*	A
Fleabane	*(Erigeron* spp.*)*	A
Hoary vervain	*(Verbena stricta)*	P
Indian mustard	*(Brassica juncea)*	A
Kochia	*(Kochia scoparia)*	A
Lambsquarters	*(Chenopodium album)*	A
Lespedeza	*(Lespedeza* spp.*)*	P
Miners lettuce A	*(Montia perfoliata)*	
Mullein	*(Verbascum* spp.*)*	B
Nettleleaf goosefoot	*(Chenopodium murale)*	A
Oxeye daisy	*(Chrysanthemum leucanthemum)*	P
Pepperweed	*(Lepidium* spp.*)*	A
Pigweed	*(Amaranthus* spp.*)*	A
Puncturevine	*(Tribulus terrestris)*	A
Russian thistle	*(Salsola kali)*	A
Smartweed	*(Polygonum* spp.*)*	A/P
Sorrell	*(Rumex* spp.*)*	P
Sunflower	*(Helianthus* spp.*)*	A
Sweet clover	*(Melilotus* spp.*)*	A/B
Tansymustard	*(Descurainia pinnata)*	A
Western ragweed	*(Ambrosia psilostachya)*	P
Wild carrot	*(Daucus carota)*	B
Wild lettuce	*(Lactuca* spp.*)*	A/B
Wild parsnip	*(Pastinaca sativa)*	B
Wild turnip	*(Brassica campestris)*	B
Woollyleaf bursage	*(Franseria tomentosa)*	P

BROADLEAF WEEDS (CONT)

COMMON NAME	SPECIES	GROWTH HABIT[2]
Yellow woodsorrel	*(Oxalis stricta)*	P
Apply 3-4 pints per acre[1]		
Broom snakeweed[4]	*(Gutierrezia sarothrae)*	P
Bull thistle	*(Cirsium vulgare)*	B
Burclover	*(Medicago* spp.)	A
Chickweed, Mouseear	*(Cerastium vulgatum)*	A
Clover, Hop	*(Trifolium procumbens)*	A
Cocklebur	*(Xanthium strumarium)*	A
Cudweed	*(Gnaphalium* spp.)	A
Desert Camelthorn	*(Alhagi pseudalhagi)*	P
Dock	*(Rumex* spp.)	P
Fiddleneck	*(Amsinckia intermedia)*	A
Goldenrod	*(Solidago* spp.)	P
Henbit	*(Lamium aplexicaule)*	A
Knotweed, prostrate	*(Polygonum aviculare)*	A/P
Pokeweed	*(Phytolacca americana)*	P
Purslane	*(Portulaca* spp.)	A
Pusley, Florida	*(Richardia scabra)*	A
Rocket, London	*(Sisymbrium irio)*	A
Rush skeletonweed[4]	*(Chondrilla juncea)*	B
Saltbush	*(Atriplex* spp.)	A
Shepherd's-purse	*(Capsella bursa-pastoris)*	A
Spurge, Annual	*(Euphorbia* spp.)	A
Stinging nettle[4]	*(Urtica dioica)*	P
Velvetleaf	*(Abutilon theophrasti)*	A
Yellow starthistle	*(Centaurea solstitialis)*	A
Apply 4-6 pints per acre[1]		
Arrowwood	*(Pluchea sericea)*	A
Canada thistle	*(Cirsium arvense)*	P
Giant ragweed	*(Ambrosia trifida)*	A
Grey rabbitbrush	*(Chrysothamnus nauseosus)*	P
Little mallow	*(Malva parviflora)*	B
Milkweed	*(Asclepias* spp.)	P
Primrose	*(Oenothera kunthiana)*	
PSilverleaf nightshade	P	
(Solanum	*eleagnifolium)*	
Sowthistle	*(Sonchus* spp.)	A
Texas thistle	*(Cirsium texanum)*	P

VINES AND BRAMBLES

COMMON NAME	SPECIES	GROWTH HABIT[2]
Apply 1 pint per acre		
Field bindweed	*(Convolvulus arvensis)*	P
Hedge bindweed	*(Calystegia sequium)*	A
Apply 2-3 pints per acre[1]		
Wild buckwheat	*(Polygonum convolvulus)*	P
Apply 3-4 pints per acre[1]		
Greenbriar	*(Smilax* spp.)	P
Honeysuckle	*(Lonicera* spp.)	P
Morningglory	*(Ipomoea* spp.)	A/P
Poison ivy	*(Rhus radicans)*	P
Redvine	*(Brunnichia cirrhosa)*	P

VINES AND BRAMBLES (CONT)

COMMON NAME	SPECIES	GROWTH HABIT[2]
Wild rose	*(Rosa* spp.)	P
	Including:	
	Multiflora rose	*(Rosa*
multiflora)	P	
	McCartney rose	*(Rosa*
bracteata)	P	
Apply 4-6 pints per acre[1]		
Kudzu[3]	*(Pueraria lobata)*	P
Trumpetcreeper	*(Campsis radicans)*	P
Virginia creeper	*(Parthenocissus quinquefolia)*	P
Wild grape	*(Vitis* spp.)	P

BRUSH SPECIE

	seudoacacia)	P
Black gum	*(Nyssa sylvatica)*	P
Box elder	*(Acer negundo)*	P
Cherry	*(Prunus* spp.)	P
Chinaberry	*(Melia azadarach)*	P
Dogwood	*(Cornus* spp.)	P
Elm[6]	*(Ulmus* spp.)	P
Hawthorn	*(Crataegus* spp.)	P
Hickory	*(Carya* spp.)	P
Honeylocust[5]	*(Gleditsia triacanthos)*	P
Maple	*(Acer* spp.)	P
Mulberry	*(Morus* spp.)	P
Oak	(Quercus spp.)	P
Persimmon	*(Diospyros virginiana)*	P
Pine[5]	*(Pinus* spp.)	P
Poplar	*(Populus* spp.)	P
Privet	*(Ligustrum vulgare)*	P
Red Alder	*(Alnus rubra)*	P
Red Maple	*(Acer rubrum)*	P
Russian Olive	*(Eleagnus angustifolia)*	P
Sassafras	*(Sassafras albidum)*	P
Sourwood	*(Oxydendrum arboreum)*	P
Sweetgum	*(Liquidambar styraciflua)*	P
Water willow	*(Justica americana)*	P
Willow	*(Salix* spp.)	P
Yellow poplar	*(Liriodendron tulipifera)*	P

[1] The higher rates should be used where heavy or well-established infestations occur.

[2] Growth Habit - A = Annual, B = Biennial, P = Perennial

[3] Use a minimum of 75 GPA - Control of established stands may require repeat applications.

[4] For best results early postemergence applications are required.

[5] Tank mix with glyphosate or triclopyr.

[6] Tank-mix with with glyphosate.

For more information, please visit our web site www.vmanswers.com

DISCLAIMER

The label instructions for the use of this product reflect the opinion of experts based on research and field use. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Turf injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the use of, or application of the product contrary to label instructions, all of which are beyond the control of BASF Corporation (BASF). All such risks shall be assumed by the user.

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BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709

Agricultural Products

BASF

BASF

The Chemical Company

Safety data sheet
HABITAT

1. Substance/preparation and company identification

Company
BASF CORPORATION
100 Campus Drive
Florham Park, NJ 07932

24 Hour Emergency Response Information
CHEMTREC: (800) 424-9300
BASF HOTLINE: (800) 832-HELP

Substance number:	000000063383
Molecular formula:	C(13) H(15) N(3) O(3). C(3) H(9) N
Molecular weight:	320.4 g/mol
Chemical family:	imidazole derivative
Synonyms:	Isopropylamine salt of imazapyr (active ingredient)

2. Composition/information on ingredients

CAS Number	Content (W/W)	Chemical name
	71.3 %	Proprietary ingredients
81510-83-0	28.7 %	Isopropylamine salt of imazapyr

3. Hazard identification

Emergency overview

CAUTION: KEEP OUT OF REACH OF CHILDREN.
Avoid contact with the skin, eyes and clothing.
Avoid inhalation of mists/vapours.

Potential health effects

See Product Label for additional precautionary statements.

Primary routes of exposure
Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Acute toxicity:
Relatively nontoxic after single ingestion. Slightly toxic after short-term skin contact. Relatively nontoxic after short-term inhalation.

Irritation:
May cause slight but temporary irritation to the eyes. May cause slight irritation to the skin.

Sensitization:
Skin sensitizing effects were not observed in animal studies.

Repeated dose toxicity:
No other known chronic effects.

Potential environmental effects

Aquatic toxicity:
There is a high probability that the product is not acutely harmful to fish.
There is a high probability that the product is not acutely harmful to aquatic invertebrates.
Acutely harmful for aquatic plants.

Terrestrial toxicity:
With high probability not acutely harmful to terrestrial organisms.

4. First-aid measures

General advice:
First aid providers should wear personal protective equipment to prevent exposure. Remove contaminated clothing. Move person to fresh air. If person is not breathing, call 911 or ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or physician for treatment advice. Have the product container or label with you when calling a poison control center or doctor or going for treatment.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary.

If on skin:
Rinse skin immediately with plenty of water for 15 - 20 minutes.

If in eyes:
Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing.

If swallowed:
Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to by a poison control center or doctor. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician

Antidote:	No known specific antidote.
Treatment:	Treat symptomatically.

5. Fire-fighting measures

Flash point:	> 210 °F
Self-ignition temperature:	93 °C

Suitable extinguishing media:
foam, dry extinguishing media, carbon dioxide, water spray

Hazards during fire-fighting:
carbon monoxide, carbon dioxide, Nitrogen oxide,
If product is heated above decomposition temperature, toxic vapours will be released. The substances/groups of substances mentioned can be released if the product is involved in a fire.

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Evacuate area of all unnecessary personnel. Contain contaminated water/firefighting water. Do not allow to enter drains or waterways.

NFPA Hazard codes:
Health : 1 Fire: 1 Reactivity: 0 Special:

6. Accidental release measures

Personal precautions:
Take appropriate protective measures. Clear area. Shut off source of leak only under safe conditions. Extinguish sources of ignition nearby and downwind. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions:
Do not discharge into the subsoil/soil. Do not discharge into drains/surface waters/groundwater. Contain contaminated water/firefighting water.

Cleanup:
Dike spillage. Pick up with suitable absorbent material. Place into suitable containers for reuse or disposal in a licensed facility. Spilled substance/product should be recovered and applied according to label rates whenever possible. If application of spilled substance/product is not possible, then spills should be contained, solidified, and placed in suitable containers for disposal. After decontamination, spill area can be washed with water. Collect wash water for approved disposal.

7. Handling and storage

Handling

General advice:
RECOMMENDATIONS ARE FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS. PESTICIDE APPLICATORS & WORKERS must refer to the Product Label and Directions for Use attached to the product for Agricultural Use Requirements in accordance with the EPA Worker Protection Standard 40 CFR part 170. Ensure adequate ventilation. Provide good ventilation of working area (local exhaust ventilation if necessary). Keep away from sources of ignition - No smoking. Keep container tightly sealed. Protect contents from the effects of light. Protect against heat. Protect from air. Handle and open container with care. Do not open until ready to use. Once container is opened, content should be usedup as soon as possible. Avoid aerosol formation. Avoid dust formation. Provide means for controlling leaks and spills. Do not return residues to the storage containers. Follow label warnings even after container is emptied. The substance/ product may be handled only by appropriately trained personnel. Avoid all direct contact with the substance/product. Avoid contact with the skin, eyes and clothing. Avoid inhalation of dusts/mists/vapours. Wear suitable personal protective clothing and equipment.

Protection against fire and explosion:
The relevant fire protection measures should be noted. Fire extinguishers should be kept handy. Avoid all sources of ignition: heat, sparks, open flame. Sources of ignition should be kept well clear. Avoid extreme heat. Keep away from oxidizable substances. Electrical equipment should conform to national electric code. Ground all transfer equipment properly to prevent electrostatic discharge. Electrostatic discharge may cause ignition.

Storage

General advice:
Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Protect containers from physical damage. Protect against contamination. The authority permits and storage regulations must be observed.

Storage incompatibility:
General: Segregate from incompatible substances. Segregate from foods and animal feeds. Segregate from textiles and similar materials.

8. Exposure controls and personal protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Advice on system design:
Whenever possible, engineering controls should be used to minimize the need for personal protective equipment.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:
Wear respiratory protection if ventilation is inadequate. Wear a NIOSH-certified (or equivalent) TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas and vapours. For situations where the airborne concentrations may exceed the level for which an air purifying respirator is effective, or where the levels are unknown or Immediately Dangerous to Life or Health (IDLH), use NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:
Chemical resistant protective gloves, Protective glove selection must be based on the user's assessment of the workplace hazards.

Eye protection:
Safety glasses with side-shields. Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:
Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

General safety and hygiene measures:
Wear long sleeved work shirt and long work pants in addition to other stated personal protective equipment. Work place should be equipped with a shower and an eye wash. Handle in accordance with good industrial hygiene and safety practice. Personal protective equipment should be decontaminated prior to reuse. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Store work clothing separately. Hands and/or face should be washed before breaks and at the end of the shift. No eating, drinking, smoking or tobacco use at the place of work. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Form:	liquid
Odour:	ammonia-like, faint odour
Colour:	blue, clear
pH value:	6.6 - 7.2
Density:	1.04 - 1.09 g/ml
Relative density:	1.04 - 1.09
Solubility in water:	miscible

10. Stability and reactivity

Conditions to avoid:
Avoid all sources of ignition: heat, sparks, open flame. Avoid extreme temperatures. Avoid prolonged exposure to extreme heat. Avoid contamination. Avoid electro-static discharge. Avoid prolonged storage.

Substances to avoid:
oxidizing agent, reducing agents

Hazardous reactions:
The product is chemically stable.

Decomposition products:
Hazardous decomposition products: nitrogen oxides
carbon monoxide, carbon dioxide

Thermal decomposition:
Possible thermal decomposition products:
carbon monoxide, carbon dioxide, Nitrogen oxide
Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released. If product is heated above decomposition temperature hazardous fumes may be released.

Corrosion to metals:
Corrosive effect on: mild steel brass

11. Toxicological information

Acute toxicity

Oral:
LD50/rat/male/female: > 5,000 mg/kg

Inhalation:
LC50/rat: > 4.62 mg/l / 4 h

Dermal:
LD50/rabbit/male/female: > 2,000 mg/kg

Skin irritation:
rabbit: Mildly irritating. (Primary skin irritation test)

Eye irritation :
rabbit: Nonirritating.

Sensitization:
Skin sensitization test/guinea pig: Skin sensitizing effects were not observed in animal studies.

Genetic toxicity:
Information on: imazapyr
No mutagenic effect was found in various tests with microorganisms and mammals.

Carcinogenicity:
Information on: imazapyr
In long-term studies in rats and mice in which the substance was given by feed, a carcinogenic effect was not observed.

Reproductive toxicity:
Information on: imazapyr
The results of animal studies gave no indication of a fertility impairing effect.

Developmental toxicity/teratogenicity:
Information on: imazapyr
No indications of a developmental toxic / teratogenic effect were seen in animal studies.
---

12. Ecological information

Information on: imazapyr
Acute and prolonged toxicity to fish:
Rainbow trout/LC50 (96 h): > 100 mg/l

Information on: imazapyr
Acute toxicity to aquatic invertebrates:
Daphnia magna/EC50 (48 h): > 100 mg/l

Information on: imazapyr
Toxicity to aquatic plants:
green algae/EC50: 71 mg/l

Information on: imazapyr
Other terrestrial non-mammals:
mallard duck/LC50: > 5,000 ppm
With high probability not acutely harmful to terrestrial organisms.
Honey bee/LD50: > 100 ug/bee
With high probability not acutely harmful to terrestrial organisms.
---

13. Disposal considerations

Waste disposal of substance:
Pesticide wastes are regulated.
Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law.
If pesticide wastes cannot be disposed of according to label instructions, contact the State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container disposal:
Rinse thoroughly at least three times (triple rinse) in accordance with EPA recommendations. Consult state or local disposal authorities for approved alternative procedures such as container recycling. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

14. Transport information

Reference Bill of Lading

15. Regulatory information

Federal Regulations

Registration status:
TSCA, US released / exempt

OSHA hazard category: Chronic target organ effects reported, ACGIH TLV established

SARA hazard categories (EPCRA 311/312): Acute

16. Other information

Refer to product label for EPA registration number.

Recommended use: crop protection product

Local contact information
Product Stewardship
919 547-2000

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END OF DATA SHEET

Phoenix Brands
1437 West Morris Street
Indianapolis, Indiana 46221 USA

Consumer Service Telephone Number: 1-866-794-0800
Emergency Contact: PROSAR IPC
Emergency Phone Number: 1-866-794-0800

SECTION #1 – IDENTIFICATION

Products: RIT® Liquid Dye

Chemical Formula: Aqueous solutions of inorganic and organic compounds

SECTION #2 - HAZARDOUS CHEMICAL COMPONENTS

These products contain no substances defined as *Health Hazards* or as *Physical Hazards* according to the requirements of 29CFR, Part 1910.1200. The identity of specific components of these products may be determined in accordance with the provisions of 29CFR, Part 1910.1200(l).

SECTION #3 - PHYSICAL DATA

Percent Volatiles: not applicable
Boiling: ≈212° F./100° C.
Evaporation Rate: not applicable

Vapor pressure: not applicable
Vapor density: not applicable
Appearance: colored liquids, mild odor

SECTION #4 - FIRE FIGHTING & EXPLOSION DATA

Flash Point: not applicable
Lower Explosive Limit (%): not applicable
Autoignition Temperature: not applicable

Flammability Class: not applicable
Upper Explosive Limit (%): not applicable

Fire and Explosion Hazards

Some components of these products may decompose when exposed to flame, very high temperatures, or by reaction with incompatible materials (see Section #6 for incompatible materials). Fires or explosions involving these products may emit carbon monoxide, smoke, and/or irritant gases as decomposition byproducts.

Extinguishing Media

Not applicable (non-flammable mixtures)

Special Fire Fighting Instructions

Use self-contained breathing apparatus with full-facepiece operated in pressure-demand or other positive pressure mode.

SECTION #5 - EXPOSURE EFFECTS and FIRST AID

Route of Exposure - Inhalation

Inhalation of the components of these products should not occur when the products are used according to instructions and with appropriate protective measures (see Section #8). If a product is raised to boiling temperature, inhalation of mist may irritate the nose, throat, and upper respiratory tract.

First Aid - Inhalation

If signs and symptoms of irritation occur, remove subject from the area. Perform artificial respiration and/or seek medical assistance if necessary.

Route of Exposure - Skin

Skin contact may produce mild irritation on abraded or sensitive skin. In some individuals, some components of these products may produce skin sensitization following prolonged contact.

First Aid - Skin

Remove contaminated clothing. Wash affected area with soap, and rinse with water.

Route of Exposure - Eyes

Contact with the eyes may produce irritation.

First Aid - Eyes

Flush affected areas with water for at least 15 minutes. Seek medical assistance.

Route of Exposure - Ingestion

Ingestion of these products may produce mild gastric irritation.

First Aid - Ingestion

If the subject is conscious, induce vomiting. If unconscious or convulsive, seek immediate medical assistance. Do not attempt to give liquids to an unconscious person.

Miscellaneous Toxicological Information

Some components of these products have produced both positive and negative findings in *in vitro* mutagenicity assays. None of the components are classified as potential or demonstrated human carcinogens by IARC, NTP, or OSHA.

SECTION #6 – REACTIVITY & POLYMERIZATION

Conditions to Avoid

These products are stable at room temperature. Hazardous polymerization will not occur.

SECTION #6 – REACTIVITY & POLYMERIZATION Continued...

Incompatible Materials

Strong oxidizing agents; strong acids.

Hazardous Decomposition Products

If these products are exposed to flame sufficient to evaporate the water content, decomposition of the remaining ingredients may produce carbon monoxide, smoke, and irritant gases.

SECTION #7 – SPILL, LEAK, & DISPOSAL PROCEDURES

Steps to be Taken in The Event of Spills, Leaks, or Release

Wear protective equipment (e.g., gloves, chemical goggles) to prevent contact with skin or eyes. For large spills, transfer product into a container for reclaim. For small spills, flush with large quantities of water.

Waste Disposal Methods

Dispose of in accordance with applicable Federal, State/Provincial, and local regulations.

SARA Title III Notifications and Information

SARA Title III - Hazard Class(es): Acute Health Hazard

SARA Title III - Section 313 Supplier Notification: These products contain no chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

SECTION #8 – SPECIAL PROTECTIVE MEASURES

Ventilation

If a product is used in a manner that generates airborne mist, provide appropriate ventilation (dilution, local exhaust) adequate to control mist concentrations in air.

Eye Protection

If eye contact with a product is possible, wear eye protection (e.g., chemical goggles) adequate to prevent eye contact and/or injury.

Skin Protection

Wear gloves suitable for protection against irritant chemicals. Rubber, PVA, or nitrile are satisfactory materials.

SECTION #8 - SPECIAL PROTECTIVE MEASURES Continued...

Respiratory Protection

Respiratory protection is not normally required. If a product is used in a manner that generates airborne mist not controlled by ventilation, wear a NIOSH-approved respirator with filters for protection against mists (type N95 or better). For guidance on the selection and use of respiratory protection, consult American National Standard Z88.2-1992 (ANSI, New York, NY 10036 USA).

Work/Hygienic Practices

To avoid ingestion of material, wash hands and face before eating, drinking, or using tobacco.

SECTION #9 - SPECIAL PRECAUTIONS - STORAGE & HANDLING

Storage & Handling Conditions

Store in a cool, dry place away from flames and incompatible materials (see Section #6). Keep containers tightly closed.

DISCLAIMER OF EXPRESS AND IMPLIED WARRANTIES

The foregoing data has been compiled from sources that the company, in good faith, believes to be dependable and is accurate and reliable to the best of our knowledge and belief. However, the company cannot make any warranty or representation respecting the accuracy or completeness of the data, and assumes no responsibility for any liability or damages relating thereto or for advising you regarding the protection of your employees or others. Users should make their own tests to determine the applicability of such information or the suitability of any products for specific use.

Appendix 5
Section 7 ESA Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

October 27, 2006

Cons. #22420-2007-I-0007

Memorandum

To: Chief, Environmental Resources Section, U.S. Army Corps of Engineers, Albuquerque, New Mexico

From: Acting Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico

Subject: Biological Assessment for the Bottomless Lakes State Park Restoration Project, Roswell, New Mexico

Thank you for submitting your biological assessment for your Bottomless Lakes State Park restoration project in Roswell, Chaves County, New Mexico. This document was received by the U.S. Fish and Wildlife Service (Service) on September 6, 2006.

This memorandum is in response to your request for concurrence with the determination of "may affect, not likely to adversely affect" for the Pecos sunflower (*Helianthus paradoxus*) (sunflower) in regards to the proposed restoration project at Bottomless Lakes State Park, in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Bottomless Lakes State Park (BLSP) is located in Chaves County, about 12 miles southeast of Roswell, New Mexico. The park includes 7 sinkholes formed in gypsum deposits, with Lea Lake being the largest. The outflow from Lea Lake supports approximately 715 acres of wetlands south of the park on privately-owned lands or lands managed by the Bureau of Land Management (BLM). Approximately 43 acres of this wetland habitat are located within the park boundary and are the subject of this review.

The BLSP Restoration Project is a Section 206 Aquatic Ecosystem Restoration project under the Water Resources Development Act of 1996 (Public Law 104-303). This law provides the U.S. Army Corps of Engineers (USACE) with the authority to undertake aquatic ecosystem restoration and protection projects that meet certain parameters and have a non-Federal sponsor who contributes a 35 percent cost-share for each project. For this project the non-Federal sponsor is the State Parks Division of the New Mexico Energy, Minerals, and Natural Resources Department.

The proposed restoration of 43 acres of wetland habitat will include: increasing Lea lake outlet channel capacity; removing all salt cedar from the project area; removing all solid waste; constructing three open water areas; supplemental plantings with wetland vegetation; construction of visitor parking, trails, boardwalks, and wildlife viewing blinds; replacement of existing pipe culverts with concrete box culverts; and replacement of a walking bridge near the existing campground.

The Service concurs with your determination that the Bottomless Lakes State Park Restoration Project "may affect, and is not likely to adversely affect" the Pecos sunflower because the USACE has committed to minimize environmental impacts from these proposed actions as follows:

- Feeder channels connecting the excavated open water habitats to the wetland channels will be dug from the cells outward to the channels. The feeder channel connections to the wetland channels will not be breached until sediments have settled in the excavated areas. This will prevent flushing of turbid water into downstream or down-gradient areas.
- All equipment will be inspected at least twice a day to ensure that oils, fuels, or lubricants are not leaking. All servicing and fueling of equipment will be conducted in a designated area hydrologically isolated from surface waters. Additionally, emergency spill kits will be placed in the designated fueling area to absorb and contain any accidental spills of fuels, lubricants, or other chemical contaminants.
- All herbicides will be applied according to manufacturer's specifications and label instructions. Cut-stump herbicide treatment for removing salt cedar will be conducted only in areas with deeper standing water where the whole-tree extractor cannot be used. Only the herbicide Habitat will be used. Habitat will be mixed with water-soluble RIT fabric dye to allow visible tracking of application. The herbicide will be applied to stumps immediately after cutting using a paint brush or similar method by an experienced, licensed pesticide applicator.
- Construction-related effects to air quality will be minimized by: 1) requiring the contractor to have emission control devices on all equipment; and 2) employing the use of Best Management Practices to control wind erosions, including wetting of soils within the construction zone and compliance with local soil sedimentation and erosion control regulations.
- The boundaries of all aggregations of Pecos sunflowers in the study area will be marked with a continuous band of brightly-colored flagging tape attached to wooden lathe stakes. The flagging will be placed 10 feet beyond the actual location of sunflower aggregations to provide a buffer from work activities. A biologist will be present on-site during project implementation to ensure that no sunflowers are disturbed.
- Operation of the tree extractor will be restricted as much as possible to salt cedar stands and moved as little as possible to minimize disturbance.
- A qualified biologist periodically will monitor work, inspect work areas before construction activity begins, and provide guidance on areas to avoid during construction in order to avoid impacts to the sunflower.
- The boundary of the project area adjacent to NM 409 and the BLM access road will be flagged or delineated with temporary construction fencing to prevent public access during implementation.
- All Pecos sunflower plants will be avoided during project implementation.
- Aggregations of plants with a 10-foot buffer zone will be flagged to delineate areas where no work is to be performed.

A qualified biologist will periodically monitor and inspect work areas before construction begins, and provide guidance on areas to avoid during construction in order to prevent impacts to the sunflower during construction.
Hand-clearing of aquatic vegetation and sediment from small segments of the South and West wetland channels near areas of sunflowers will create sites for sunflower colonization. This could result in an increase in the numbers of sunflowers occupying suitable habitat at Bottomless Lakes State Park.

Please contact Daniel Boggas at the BLM office in Roswell, New Mexico at (505) 627-0264, for additional information about the most up-to-date survey information for the Pecos sunflower on BLM lands in the vicinity of this project. This includes the BLM Overflow wetlands where recently sunflowers have been identified.

Please contact the Service to verify the above determination and concurrence are still valid if: 1) Future surveys detect listed, proposed or candidate species in habitats where they have not been previously observed; 2) the project is changed or new information reveals effects of the actions to listed species or their habitats to an extent not considered in these evaluations; or 3) a new species is listed that may be affected by this project.

This concludes section 7 consultation on the Bottomless Lakes State Park Restoration Project for the U.S. Army Corps of Engineers in Albuquerque, New Mexico. The Service appreciates the substantial amount of information and analysis contributed by USACE staff in preparing this comprehensive evaluation. We also commend the intent of USACE to avoid adverse effects to listed species, to protect and enhance wetland habitats, and to provide benefits to other species with this project.

In future communications regarding this memorandum or the proposed project, please refer to Consultation #22420-2007-I-0007. If you have any questions concerning this memorandum, please contact Dr. Patricia Zenone, of my staff, at (505) 761-4718.

David Campbell
Acting Field Supervisor

cc:
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry and Resources Conservation Division, Santa Fe, New Mexico
Bureau of Land Management, 2909 W. Second, Roswell, New Mexico 88201

BIOLOGICAL ASSESSMENT
for the

BOTTOMLESS LAKES STATE PARK RESTORATION PROJECT
Roswell, New Mexico

Prepared by

U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, NM 87109

September 5, 2006

US Army Corps
of Engineers®
Albuquerque District

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Background

The Bottomless Lakes State Park (BLSP) Restoration Project is a Section 206 Aquatic Ecosystem Restoration project under the Water Resources Development Act of 1996 (Public Law 104-303). This law provides the U.S. Army Corps of Engineers (USACE) with the authority to undertake aquatic ecosystem restoration and protection projects provided that each project: 1) will improve environmental quality; 2) is in the public interest; and 3) is cost-effective. The authority requires that a non-federal sponsor cost-share 35% of each project. The non-federal sponsor for this project is the State Parks Division of the New Mexico Energy, Minerals, and Natural Resources Department.

BLSP is located about 12 miles southeast of Roswell, New Mexico. The park includes seven sinkhole lakes formed in gypsum deposits. Lea Lake is the largest of the seven lakes. Lea Lake has an outflow that sustains about 715 acres of wetlands to the south. Most of the wetlands are on lands that are privately-owned or managed by the Bureau of Land Management (BLM), but approximately 43 acres of wetland habitat sustained by Lea Lake outflow are located within the park boundary south of NM Highway 409 (Figure 1).

Previous discussions have been held with U. S. Fish and Wildlife Service (USFWS) staff regarding this project during development of the *Draft Fish and Wildlife Coordination Act Report for the Lea Lake Aquatic Habitat Restoration Feasibility Study at the Bottomless Lakes State Park, Chavez County, New Mexico* (May 2006).

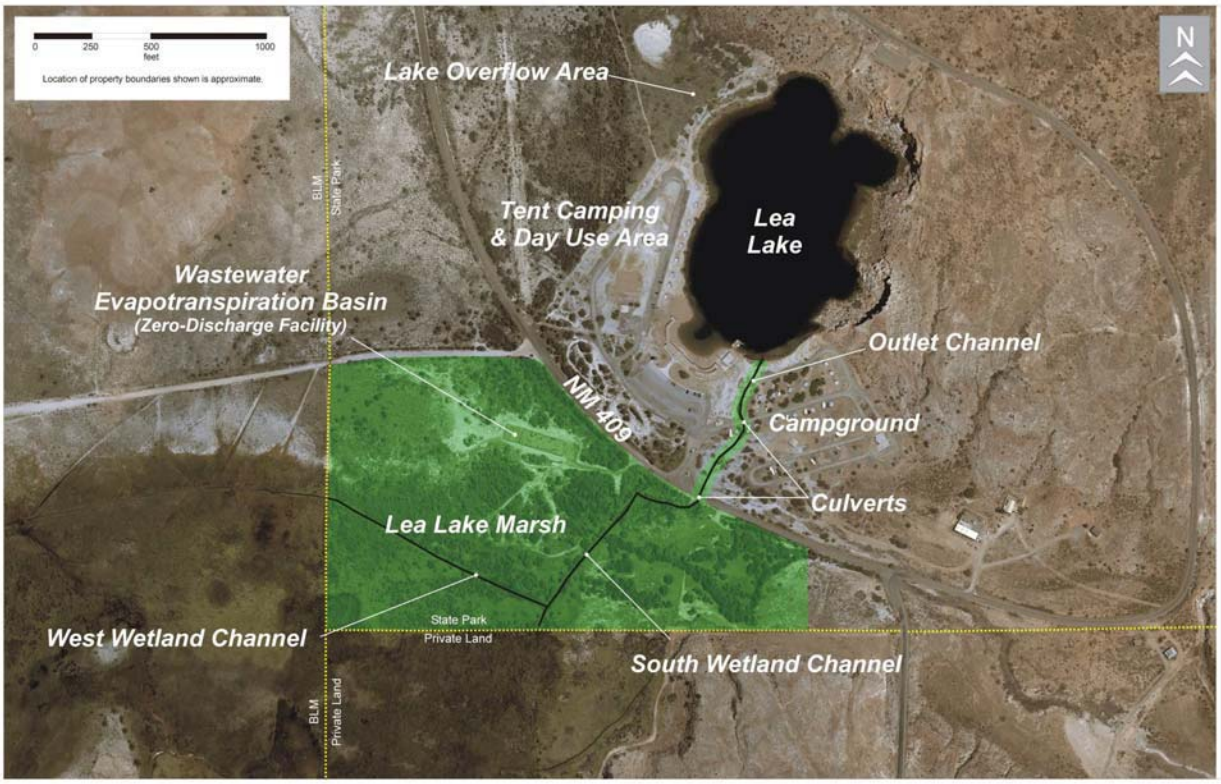

Figure 1. Aerial photograph of the study area

Opportunities and Problems at the Bottomless Lakes State Park study area include the following:

1) There has been a dramatic loss of spring-fed wetland habitats in the lower Pecos River drainage in New Mexico and Texas.
2) Non-native salt cedar has invaded Lea Lake Marsh and formed dense, monotypic stands that have replaced native wetland vegetation.
3) Flow patterns and hydrologic regimes in the wetland have been altered.
4) Solid waste debris (including soil, cut brush, concrete, scrap metal, fence posts, and scrap lumber) has been placed in the wetland.

Proposed Action

The Proposed Action would include restoration of approximately 43 acres of wetland habitat by implementing the following elements (see Figures 2-5):

- increasing the Lea Lake outlet channel capacity from 15 cfs to 25 cfs;
- removing all salt cedar from the approximately 43-acre study area;
- removing all solid waste debris from the study area;
- constructing three open water habitats totaling approximately 2.07 acres;
- planting supplemental wetland vegetation in solid waste debris removal areas and around the margins of open water habitats (approximately 7.32 acres); and
- constructing a 0.5-acre gravel parking lot, a 3,786-ft gravel loop trail, a 517-ft raised boardwalk trail, and four wildlife viewing blinds.

A draft design for the outlet channel modification is summarized here. See Figure 6.

- The outlet-control weir from Lea Lake would be moved 32 feet upstream from its current location, placed at an elevation of 3,457.8 feet, and widened to 6 feet.
- Modification of the outlet channel would be conducted in dry conditions. This would be accomplished by dewatering the outlet channel and diverting outflow from Lea Lake around the work area and into Lea Lake Marsh.
- The channel bed would be re-graded to a uniform slope from the outlet-control structure to match with the existing channel bed approximately 300 feet downstream from the NM 409 crossing. This would eliminate a hump in the existing bed profile below the road crossing and would result in a maximum bed cut upstream of NM 409 of approximately 0.5 feet.
- The new channel would be trapezoidal with a bottom width of 6 feet, 1.5H:1V side slopes and a top width of about 15 feet.
- Two 24-inch corrugated metal pipe culverts at NM 409 would be replaced with two 3-ft wide by 2-ft high concrete box culverts.
- Two 24-inch corrugated metal pipe culverts at the campground access road crossing would be replaced with a single 6-ft wide by 3-ft high concrete box culvert.
- Similar to the existing channel, the new channel would be lined with articulated concrete blocks and river cobbles for its entire approximately 280-foot length between the lake outlet and the campground access road as well as in the vicinity of each culvert.
- The walking bridge near the campground would be replaced with a structure that would span the wider channel.

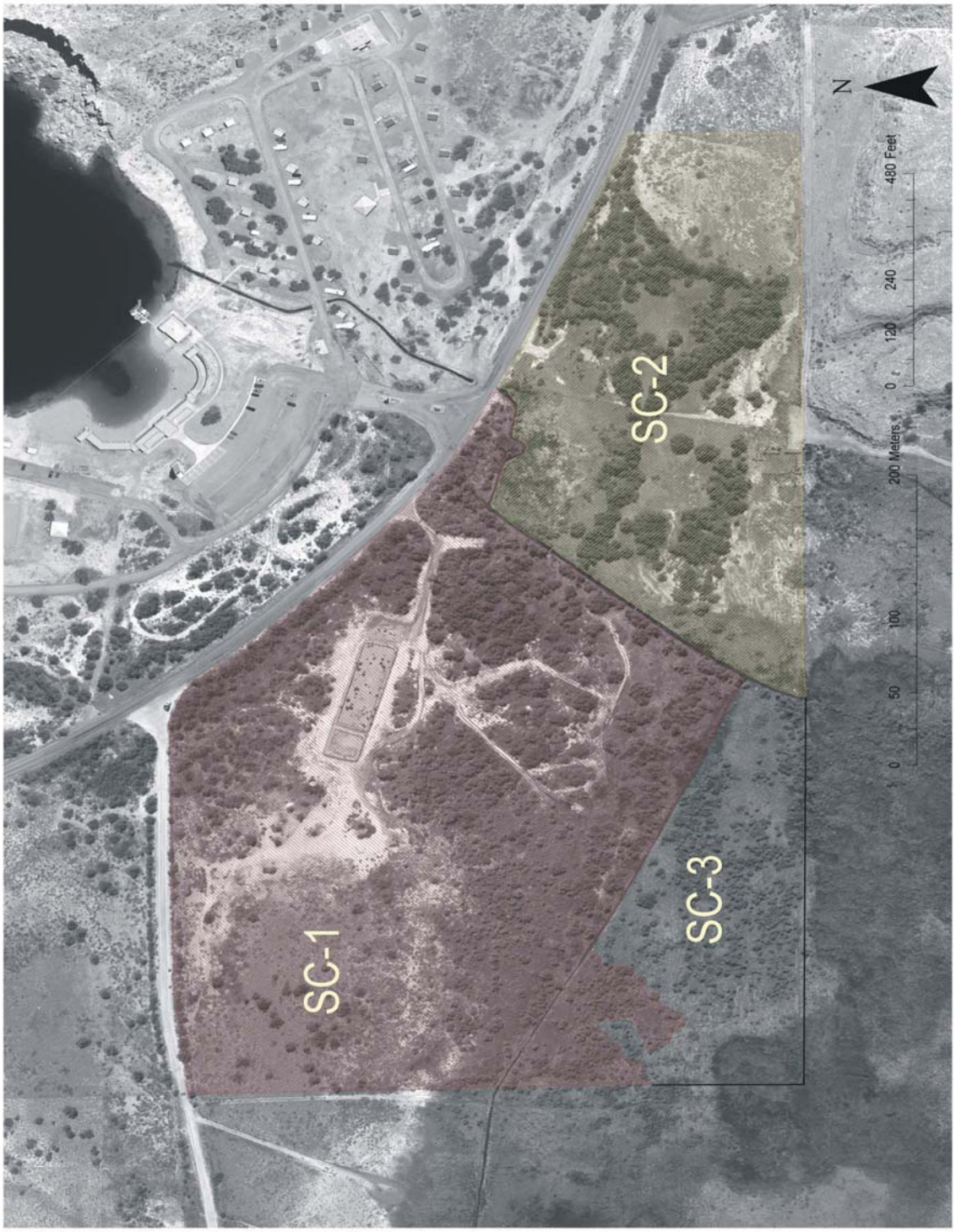

Figure 2. Treatment areas for salt cedar removal.

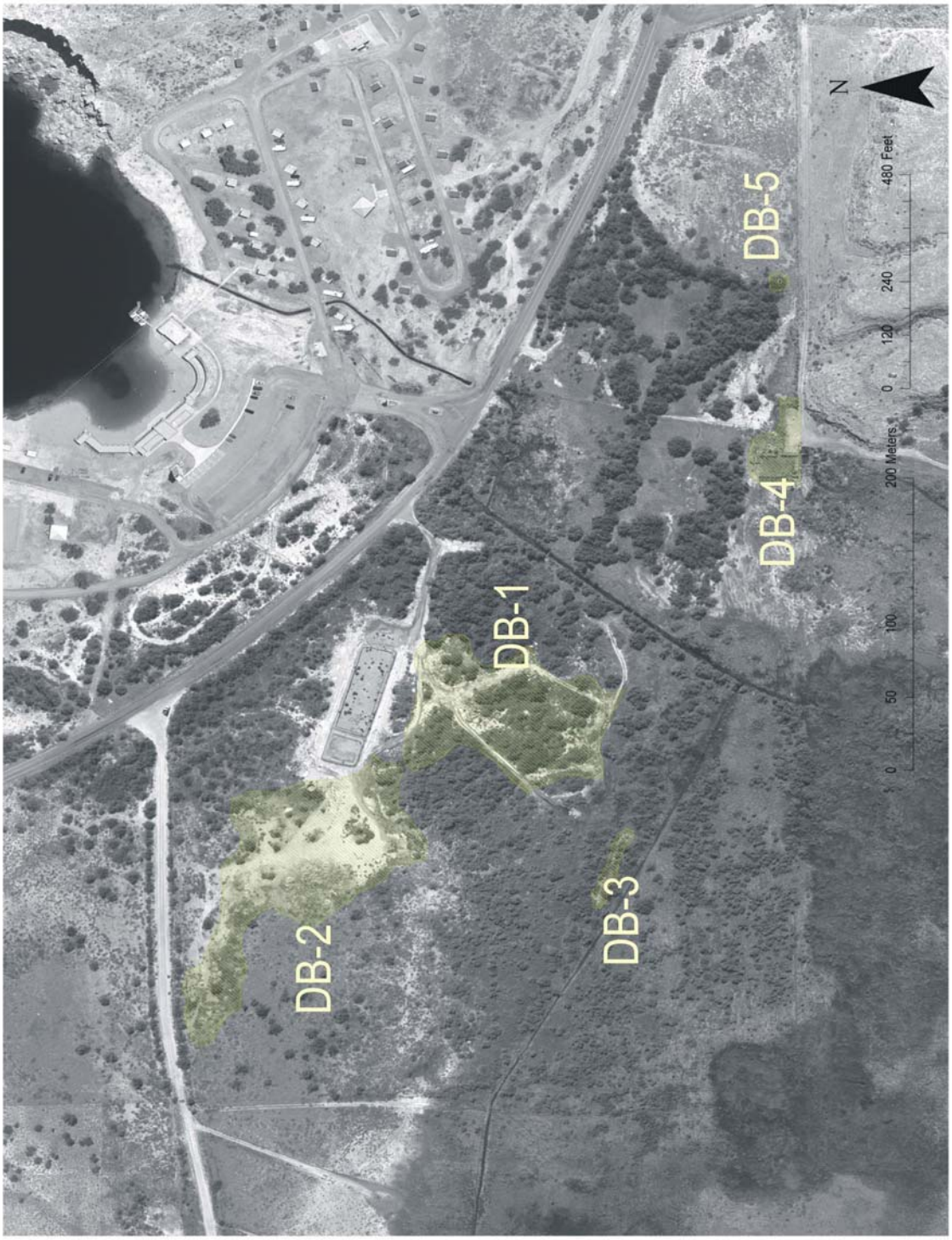

Figure 3. Treatment areas for solid waste debris removal.

Figure 4. Proposed open water habitat construction.

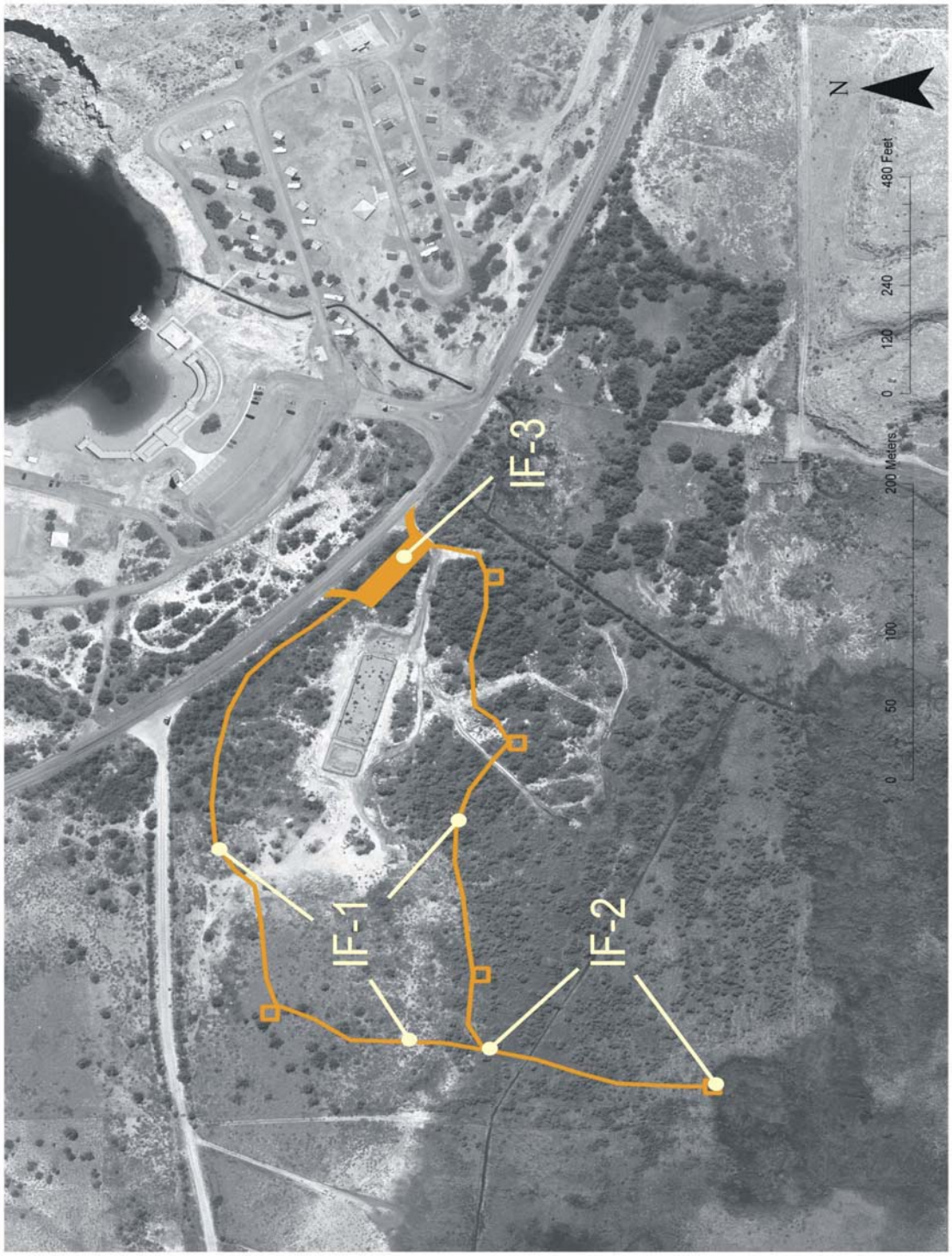

Figure 5. Proposed interpretive facilities.

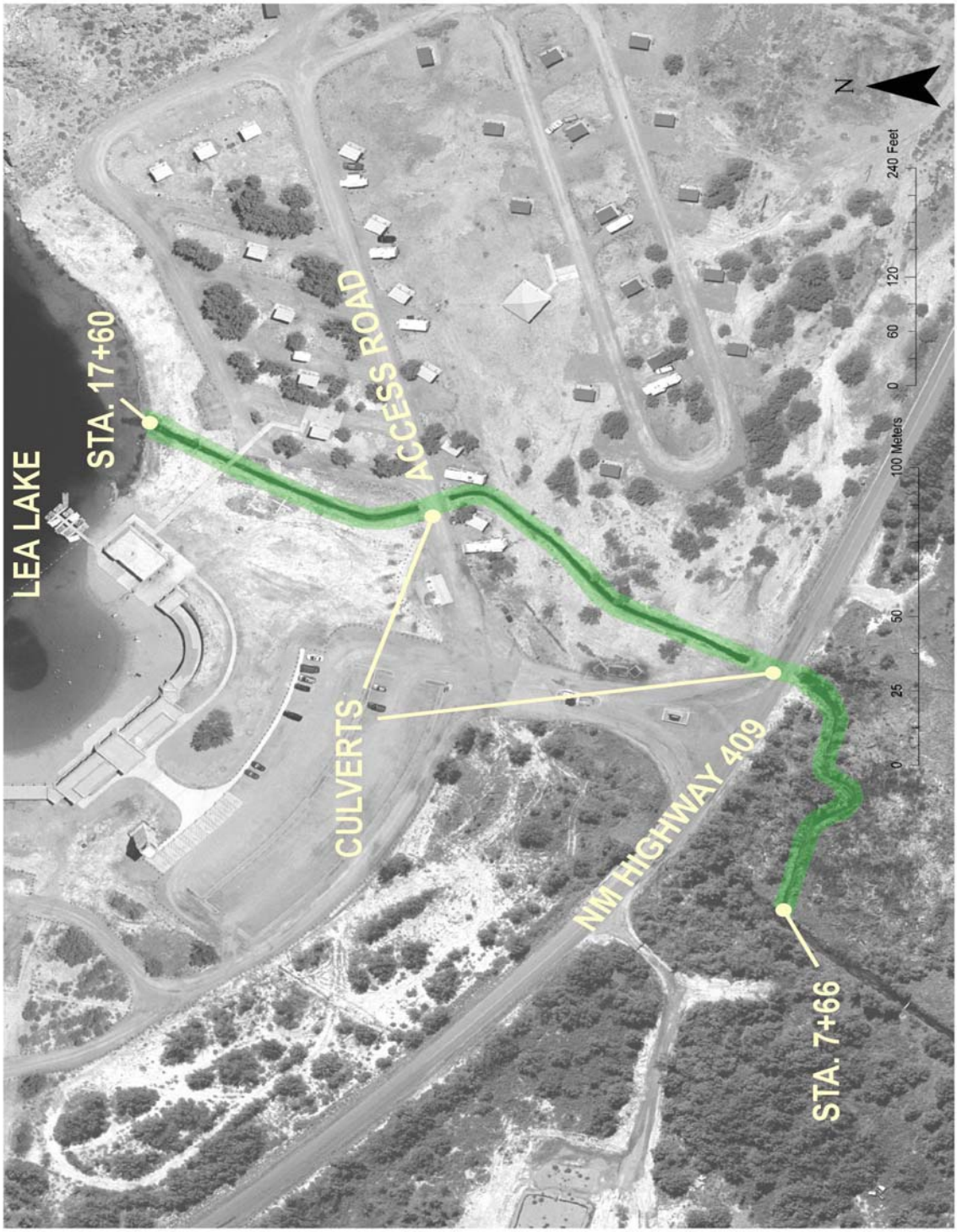

Figure 6. Proposed outlet channel modifications.

Construction of the open water habitats in the Proposed Action would not involve construction of a structure that would impound water. The Proposed Action does not require a change in the place or purpose of use of water in the study area, nor does it require any new point of diversion or change in an existing point of diversion.

Salt cedar would be removed mechanically using a 23-ton excavator fitted with a special bucket used for extracting whole salt cedar plants, including roots (*e.g.* Bureau of Land Management, 2002). Salt cedar trees would be hauled out of the marsh and chipped. In areas that are too wet for the excavator to operate, salt cedar would be cut with a chainsaw and the stumps would be treated immediately by brushing the cut surface thoroughly with a full strength solution of isopropylamine salt of Imazapyr (Habitat®) mixed with water-soluble RIT® fabric dye to track treated stems. Habitat® is registered for use in aquatic habitats. Cut-stump treatments would preferably be conducted late in the growing season to improve translocation of the herbicide from the cut stump surface to the plant roots.

Solid waste debris piles would be removed using an excavator to pick up the debris and place it in dumpsters, which would then be hauled to the county landfill where the debris would be dumped.. Salvageable material would be removed first and stored at the park equipment yard. About 8,000 yd^3 of solid waste debris would be removed. An excavator would also be used to dig shallow depressions for construction of the open water habitats. Excavation spoil (approximately 12,300 yd^3) would be temporarily stockpiled on bare ground in the study area before being transported in dump trucks to an upland site within the park boundaries that is devoid of any significant cultural or ecological resources. Supplementing wetland vegetation would be conducted by planting live material and sowing seeds of native wetland species adapted to saline marshes in the study area.

Construction of the various plan elements is expected to last about eight months. Timing of construction is critical to allow channel work to be conducted during low-flow periods (*i.e.* summer and fall) and yet also avoid migratory bird breeding and nesting seasons (*i.e.* spring to midsummer). Therefore, construction would take place between September and April (September to December within the channel). The Park's fenced and paved maintenance lot would be used for the construction staging area.

Wetland Vegetation Planting

The purpose of supplementing the wetland vegetation is to promote establishment of diverse, native wetland plant species in areas subject to soil disturbance. Planting of live material and sowing seeds of native wetland species adapted to saline marshes in the project area would help to ensure that desired vegetation becomes established because initial species composition of saline marsh sites is a strong determinant of the final plant community (*e.g.* van der Valk 1981; Smith and Kadlec, 1985). Planting would significantly contribute to establishment of an abundant and diverse assemblage of wetland and aquatic vascular plants at disturbed sites in the project area. Increasing the diversity and abundance of wetland and aquatic vascular plants would have beneficial effects such as improving habitat for aquatic macroinvertebrates (*e.g.* Campeau *et al.*, 1994; Mittlebach, 1998). The measures of supplementing wetland vegetation

correspond to and depend upon solid waste debris removal and hydrologic regime diversification measures described above.

Species Information

Federally listed species for Chavez County include the following: Pecos sunflower (Threatened), Mexican tetra (Species of Concern), Pecos pupfish (Species of Concern), Arid land ribbon snake (Species of Concern), Wright's marsh thistle (Species of Concern), and Pecos River muskrat (Species of Concern). The Pecos sunflower is the only species that was determined to be potentially affected by the Proposed Action and will be discussed further below.

Pecos sunflower (*Helianthus paradoxus*)
The Pecos sunflower was listed as threatened under the federal Endangered Species Act on 20 October 1999 (64 FR 56582). The main threat to continued existence of the Pecos sunflower is loss or alteration of wetland habitat. The known distribution of Pecos sunflower consists of six population centers, two of which are in Texas and four in New Mexico (USFWS, 2004). The species is known from locations in Cibola, Valencia, Socorro, Guadalupe, and Chaves Counties in New Mexico, and from Pecos and Reeves Counties in Texas (New Mexico Rare Plant Technical Council, 2005). Habitat for the Pecos sunflower is saturated, saline soils of desert wetlands associated with rivers and spring systems from 1,000 to 2,000 m (3,300 to 6,600 ft) elevation.

The species is restricted to saline wetland habitats and requires saturated soils for seed germination; adult plants grow well in standing water (New Mexico Rare Plant Technical Council 1999). In Texas, Pecos sunflower was found in locations where surface soil salinity was approximately 10 parts per thousand (van Auken and Bush 1998). The species appeared to be distributed along a moisture gradient where it was closely associated with saltgrass and was infrequently associated with alkali sacaton, which occurred on sites drier than those occupied by saltgrass (van Auken and Bush 1998). Persistence of Pecos sunflower populations depends upon annual re-establishment by seed (USFWS, 2004). Viable seed may persist in the soil seed bank until germination conditions are suitable. Optimal conditions for seed germination occur when high water tables or precipitation reduce surface soil salinity (USFWS, 2004). This is similar to seed of other halophytic plant species which often remain dormant under conditions of high salinity and delay germination until surface salinity is reduced (Ungar 1978).

Pecos sunflower blooms in September through October and seeds mature during October and November. A two- to three-month after-ripening period is required before germination (USFWS, 2004). Distribution of individuals within populations is patchy and varies spatially from year to year, depending on seed dispersal, suitable germination sites, adequate soil moisture in the rooting zone, and occurrence of propagules in the seed bank. Pecos sunflower is shade intolerant and requires relatively open ground for germination and growth (USFWS, 2004). Pecos sunflower has been found to respond positively to removal of salt cedar, which shade the understory and reduce habitat suitability for the species (USFWS, 2004). Additionally, maintenance of saturated or inundated wetland soils is necessary for persistence of the species. It also appears that some form of disturbance that creates bare or sparsely-vegetated hydric soil sites is necessary for persistence of the species (e.g., water level fluctuations).

Analysis of the Effects of the Action

Pecos sunflower

Pecos sunflower was found in the project area during the field investigations. The majority of the observations were of Pecos sunflower along the South Wetlands Channel, from the outlet of the culverts at NM 409 downstream to the south boundary of the Lea Lake marsh. A total of 320 plants were found by the Corps' consultant Blue Earth (2006) along the south channel in the 12 patches. Pecos sunflower was found at only one location along the West Wetlands Channel, in a clump consisting of 12 individual plants along the right bank about halfway to the west boundary of the Park. Pecos sunflower is restricted to the margins of Lea Lake and Lea Lake marsh; none have been documented on the BLM Overflow Wetlands (BLM 2003).

Direct impacts to stands of Pecos sunflower would be avoided by the Proposed Action. Aggregations of plants would be flagged to delineate areas where no work is to be performed including a buffer area of 10 feet. Restoration activities would be monitored to ensure that no Pecos sunflower plants are disturbed. Pesticide exposure would also be avoided.

Pecos sunflower seed may be indirectly affected by the proposed action. Excavation of wetland cells that are hydrologically connected to the wetland channels may provide suitable sites for establishment of Pecos sunflower by seed. Seed may be carried by surface water flow into the wetland cells and deposited along the margins of the ponds, which could lead to establishment of additional aggregations of plants in the Lea Lake marsh.

Colonization of disturbed ground by Pecos sunflower in areas subject to mechanical removal of salt cedar was observed immediately south of the Lea Lake marsh. Also, sites along the South Wetlands Channel subject to past ground disturbance from channel maintenance activities were colonized by Pecos sunflower. Therefore, it seems likely that the species would also colonize the margins of the wetland cells.

Current and planned actions in the Lea Lake marsh that may affect Pecos sunflower consist of hand-clearing of aquatic vegetation and sediment from small segments of the South and West wetlands channels. This action creates sites suitable for colonization by Pecos sunflower. Thus, there would be an overall beneficial long-term effect on Pecos sunflower through an increase in area suitable for establishment of plants in the Lea Lake marsh.

Effects Determination

Pecos sunflower

Pecos sunflower would not be directly affected by the Proposed Action. All Pecos sunflower plants would be avoided during implementation of the Proposed Action. Aggregations of plants with a 10 foot buffer zone would be flagged to delineate areas where no work is to be performed.

The cumulative aggregate effect of past actions in the project area on Pecos sunflower was assumed to be represented by existing conditions. Current and planned actions in the project area that may affect Pecos sunflower consist of ongoing hand-clearing of aquatic vegetation and sediment from small segments of the South and West wetland channels. This action creates sites

suitable for colonization by Pecos sunflower. Thus, there would be an overall beneficial cumulative effect on Pecos sunflower through an increase in area suitable for establishment of plants in the project area. In conclusion, the proposed action may affect but is not likely to adversely affect Pecos sunflower.

Environmental Commitments

- Feeder channels connecting the excavated open water habitats to the wetland channels would be dug from the cells outward to the channels. The feeder channel connections to the wetland channels would not be breached until sediments have settled in the excavated areas. This would prevent flushing of turbid water into downstream or down-gradient areas.
- All equipment would be inspected at least twice a day to ensure that oils, fuels, or lubricants are not leaking. All servicing and fueling of equipment would be conducted in a designated area hydrologically isolated from surface waters. Additionally, emergency spill kits would be placed in the designated fueling area to absorb and contain any accidental spills of fuels, lubricants, or other chemical contaminants.

- All herbicides would be applied according to manufacturer's specifications and label instructions. Cut-stump herbicide treatment for removing salt cedar would only be conducted in areas with deeper standing water where the whole-tree extractor cannot be used. Only the herbicide Habitat® would be used. Habitat® would be mixed with water-soluble RIT® fabric dye to allow visual tracking of application. The herbicide would be applied to stumps immediately after cutting using a paint brush or similar method by an experienced, licensed pesticide applicator.
- Construction-related effects to air quality would be minimized by: 1) requiring the contractor to have emission control devices on all equipment; and 2) employing the use of Best Management Practices to control wind erosion, including wetting of soils within the construction zone and compliance with local soil sedimentation and erosion-control regulations. Construction and operation of the recommended plan would conform with air quality control regulations as established by the Clean Air Act and the New Mexico Air Quality Control Act.
- Salt cedar removal would be conducted outside (*i.e.* September through March) of the bird breeding season to avoid destruction of active nests and mortality of young birds.

- The boundaries of all aggregations of Pecos sunflower in the study area would be marked with a continuous band of brightly-colored tape flagging attached to wooden lathe stakes. The flagging would be placed 10 feet outside of the aggregations to allow some buffer. A biologist would be present on site during project implementation to ensure that no Pecos sunflower is disturbed.
- Operation of the tree extractor would be restricted as much as possible to salt cedar stands and moved as little as possible to minimize disturbance.
- A qualified biologist would periodically monitor work, inspect work areas before construction activity begins, and provide guidance on areas to avoid to prevent or minimize impacts to Pecos sunflower.
- The boundary of the project area adjacent to NM 409 and the BLM access road would be

flagged or delineated with temporary construction fencing to prevent public access during implementation

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Appendix 6
Cultural Resources Coordination

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

January 30, 2006

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

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HISTORIC PRESERVATION DIVISION

Ms. Katherine Slick
State Historic Preservation Officer
New Mexico Department of Cultural Affairs
Historic Preservation Division
228 East Palace Avenue, Room 320
Santa Fe, New Mexico 87501

Rec'd back 3-3-2006
GDE

Dear Ms. Slick:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, is seeking your concurrence in our determination of "No Adverse Effect to Historic Properties" for a proposed Aquatic Habitat Restoration project at Bottomless Lakes State Park. The Corps, at the request of Bottomless Lakes State Park, as managed by the State Parks Division of the New Mexico Energy, Minerals and Natural Resources Department, is planning the project under Section 206 of the Water Resources Development Act of 1996 (Public Law 104-303), as amended. The project area is located within Bottomless Lakes State Park, approximately 16 miles southeast of Roswell, Chaves County, in southeastern New Mexico.

The proposed project would enlarge the existing drainage ditch/outlet channel that drains artesian water flows from Lea Lake to a 43-acre wetland. The project would remove the existing outlet-control weir and construct a new weir about 30 feet upstream of the existing weir, install larger culverts under State Highway 409, increase habitat diversity in the existing wetland by creating three open-water ponds by mechanical excavation (about 2.2 acres total), and remove exotic, introduced tamarisk (salt cedar) from the wetland area. The proposed plan also calls for a 0.5-acre parking area and about 4,000 lineal feet of graveled hiking trail. Gravel for construction would come from a pre-approved commercial quarry.

The proposed project would not only provide for Aquatic Habitat Restoration, it would also reduce high ground water levels and flooding problems that are occurring in the immediate vicinity of the Bottomless Lakes State Park facilities that were constructed in the 1930s by the CCC/WPA. In 1975 there was a large rock-fall from the sandstone bluff above Lea Lake. Since that time, artesian water flow from the lake has gradually increased and is now nearly doubled, to

approximately 5-6 million gallons per day, with flooding occurring in portions of the State Park during the fall and winter months. The flooding and high ground water levels adjacent to the lake have the potential to threaten the stability of the footings of the CCC/WPA structures at the park. The proposed project would primarily grade and enlarge the existing drainage/outflow ditch from a delivery capacity of about 15 cfs to about 25 cfs to enhance the evacuation of artesian flows.

Enclosed for your review is the cultural resources survey report entitled **An Archeological Survey at Bottomless Lakes State Park, Chaves County, New Mexico.** The University of New Mexico's Office of Contract Archeology prepared the report (OCA/UNM Report No. 185-827, NMCRIS No. 87023). The OCA survey resulted in the discovery of three archaeological sites and two isolated occurrences, all of which are historic. The sites include LA142877, a homestead patented in 1910; LA142878, two drainage ditch alignments, a main ditch and a lateral, that are thought to date to the 1930s; and LA142879, another drainage ditch also thought to date to the 1930s. The project will be confined to OCA's Survey Areas No. II (2) and V (5). The existing State Parks maintenance yard, OCA Survey Area No. I (1) will be used for staging purposes. As currently planned, OCA's Survey Areas No. III (3) and IV (4) are no longer a part of the project. American Indian Tribes have been afforded the opportunity to comment on the proposed project. No traditional cultural properties are known to occur within or adjacent to the project area.

Since Survey Area IV (4) is no longer a part of the project, the proposed project would have no effect on LA142877 or LA142879. The Corps agrees with OCA's recommendation that LA142877, the 1910 homestead, is potentially eligible for inclusion to the National Register under criterion *d* of 36 CFR 60.4. The site contains several structural components that upon further investigation may provide additional historic information regarding the site as well as the local area and the regions rural ranching lifestyle. OCA recommends that their investigation has exhausted the important information potential for IO's 1 and 2, and the Corps agrees.

LA142878 is the drainage/outflow ditch (a main ditch and a lateral) that is planned for grading and enlargement under the proposed project. OCA reports that the two ditches that make up LA142878 "…likely date to the CCC/WPA Lea Lake Pavilion construction activity (1933-1938)." Both ditches remain in use today, actively draining water from Lea Lake. OCA recommended that LA142878 is "…eligible for inclusion on the National Register of Historic Places under criterion *d* of 36 CFR 60.4 for its potential to provide information concerning historic construction of the larger CCC complex and historic use in the area." The Corps, however, disagrees with the OCA eligibility recommendation for LA142878.

Originally, the "ditch" was most likely a natural outflow channel from the lake. At some unknown date, the ditch was modified by human hands that may have enlarged, realigned, straightened, and/or deepened the natural channel. The modified drainage was subsequently maintained as a ditch. Human modification may have occurred prehistorically but more probably sometime during early Hispanic and/or Anglo occupation of the area. Early Hispanic livestock grazing in the Rio Pecos Valley began in the early 1800s with the establishment of Spanish Colonial and Mexican land grant communities located a substantial distance north of the project area. Due to the threat of raiding, grazing/agricultural/ranching activity in the vicinity of the project area did not begin until about the 1850s. The Lea Lake drainage channel could have been modified after the 1850s, perhaps during the Plains droughts that occurred in the late 1870s and 1880s; it may be associated with the nearby 1910 homestead (LA142877); or perhaps it is associated with the 1930s CCC/WPA construction of the Lea Lake park facilities. It none-the-less has been rehabilitated numerous times for operations and maintenance purposes. It is, however, unknown if it retains any original form or alignment. It appears that it has served as a drainage ditch with the sole purpose of draining water from the lake; therefore, the ditch may retain the integrity of function.

A portion of the drainage ditch downstream of the weir is currently lined with modern preformed, interlocking concrete blocks to maintain the channel bottom. Corps' contractors working on the environmental planning and coordination portion of the project indicate that the outlet channel was for a time (when and for how long is unknown) confined to a buried corrugated metal culvert dug up about five years ago. Any historic value of the ditch that may come under criterion *d* most likely has been significantly diminished and additional information regarding the ditch may only come from historic documentary information. Therefore, the Corps is of the opinion that the existence of the ditch would not necessarily make it eligible for inclusion to the National Register. The same would be true for the LA142879 ditch. Therefore, the Corps disagrees with the OCA recommendation that the LA142878 and LA142879 ditches are eligible for inclusion to the National Register. The Corps, also recommends, upon further investigation and documentation, that the area around Lea Lake is potentially eligible for nomination the National Register of Historic Places as a rural historic landscape under Criteria *a*, *c*, and *d* of 36 CFR 60.4.

Based on the information provided above and in the enclosed OCA report, the Corps is of the opinion that the proposed Bottomless Lakes Aquatic Habitat Restoration project would have "No Adverse Effect to Historic Properties" for the rehabilitation efforts involving the LA142878 ditch. The proposed project would have no effect on LA142877 or LA142879 nor to other archaeological sites in the vicinity.

Pursuant to 36 C.F.R. 800.11, should previously unknown artifacts or cultural resource manifestations be encountered during construction, work would cease in the immediate vicinity of the resource. A determination of significance would be made, and a mitigation plan would be formulated in consultation with the New Mexico State Historic Preservation Officer and with American Indian Tribes that may have concerns in the area.

If you have questions or require additional information regarding the Bottomless Lakes Aquatic Habitat Restoration project, please contact Mr. Gregory Everhart, Archaeologist, at (505) 342-3352 or Mr. John Schelberg, Archaeologist, at (505) 342-3359.

Sincerely,

Julie A. Hall
Chief, Environmental Resources Section

2/26/06
Date

I CONCUR
KATHERINE SLICK
NEW MEXICO STATE HISTORIC
PRESERVATION OFFICER

Enclosure

Copy Furnished (w/o enclosure):

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