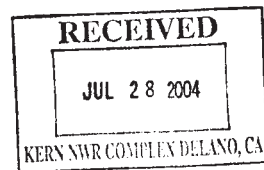


Appendix A.
Response to Comments on
Draft CCP/EA

Fish and Wildlife Service
Kern National Wildlife Refuge Complex
PO Box 670
Delano, CA 93216
July 26, 2004

Mr Dave Hardt,

On behalf of Tulare County Audubon Society, I would like to respond to the CCP for Kern and Pixley NWR.



- 1 | Tulare County Audubon is opposed to expanding the hunt area. The report states that
- 2 | hunters are able to take more waterfowl at Kern than the average for a refuge in California.
- 3 | Perhaps this is a reflection of the large amounts of refuge which are not open to hunting and
- 4 | visitors. Quite likely there would be less success with hunting with more areas opened both
- 5 | to hunters and to auto tours. In addition, we are opposed to opening Kern Refuge on
- 6 | Sundays to hunters. First, we are committed to restoring wildlife and wildlife habitat
- 7 | because we believe that maintaining biodiversity improves the welfare of everyone, not
- 8 | solely for the recreation of sportsmen. While a major amount of funding comes from hunting
- 9 | sources, the fact remains that the amount and quality of habitat for waterfowl is already
- 10 | amazingly low in the South Valley compared with historical habitat. Secondly the aesthetic
- 11 | value of wildlife viewing, photography, and birding would be significantly decreased with
- 12 | the sounds of hunting occurring at the same time. Although the new proposed auto route
- 13 | would not endanger other visitors, many of us would not enjoy the sound of firing in the
- 14 | distance. The public at large might use the Refuge much less if both weekend days were
- 15 | open to hunting.
- 16 | Restoration of habitat is also a prime concern and we are in favor of those measures
- 17 | designed to improve both upland and riparian habitat, and to improve the entrance areas.
- 18 | Most of these measures are included in Alternative C. Unfortunately, Alternative C
- 19 | increases the hunt area as well.
- 20 | Of the alternatives offered, Tulare County Audubon endorses either Alternative A or
- 21 | Alternative D as these do not increase the hunt area. Alternative D is the most acceptable
- 22 | in that it includes many habitat improvements. It seems that no alternative maintains the hunt
- 23 | schedule and still allows for development of habitat and public viewing. We do not expect
- 24 | hunters to give up more of their hunt areas, but we would like to see more habitat
- 25 | development. If the new proposed auto route is to offset hunting on Sundays, then we are
- 26 | adamantly opposed to the new auto route- creating more pressure on wildlife with both the
- 27 | hunting and the auto route. If hunting is not allowed on Sundays, perhaps a new auto route
- 28 | is not even necessary.
- 29 | Alternative B is completely unacceptable both in the amount of new area opened to
- 30 | hunting and Sunday hunting.

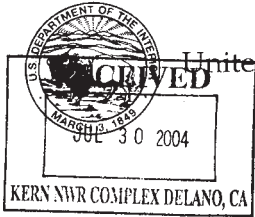
Thank you for the opportunity to participate in this public comment period. We are interested in a Friends group involving Pixley NWR which is within our Tulare County borders. Thank you for all your endeavors to maintain Pixley and Kern Refuges which are really gems in the South Valley.

Sincerely,


Mary Merriman
President, Tulare County Audubon Society

U.S. Fish & Wildlife Service Response

1. Comment noted.
2. Given the fact that most other refuges in the Central Valley have similar ratios of open to closed habitat, we believe that the primary reason for Kern Refuge's better than average hunter success is that, unlike other Central Valley refuges, Kern does not have a Sunday hunt. In general, waterfowl hunters are less successful on the second of back-to-back hunt days. As a result, the weekly and season-long average ducks taken per hunter is usually lower on refuges with a Sunday hunt.
3. We agree that hunter success may decline slightly with an expanded hunt area and new tour route. Nevertheless, we believe Kern Refuge will still offer a high quality hunt program with a reasonable chance of success.
4. Comment noted.
5. The selected plan maintains Wednesdays and Saturdays as the only hunt days. As a result, nonhunters will still have a weekend day to visit the Refuge when hunters are not present. In addition, the selected plan includes a new tour route on the north end of the Refuge which will give nonhunting visitors an opportunity to view wildlife on hunt days at a safe distance from the hunt area.
6. Comment noted.
7. The selected plan maintains the existing hunt schedule and includes the same habitat improvements as Alternative D.
8. See response to comment 5.
9. Comment noted.



United States Department of the Interior



FISH AND WILDLIFE SERVICE
 Kern National Wildlife Refuge Complex
 P.O. Box 670
 Delano, CA 93216

June 24, 2004

Dear Readers:

The U.S. Fish and Wildlife Service is proud to present the enclosed Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) for Kern and Pixley National Wildlife Refuges for your review. This EA describes and evaluates four alternatives for managing the refuges for the next 15 years. The CCP provides a detailed description of the refuges' resources as well as our preferred alternative for managing the refuges.

The Draft CCP/EA can also be obtained electronically at <http://pacific.fws.gov/planning>.

Your input is important to the development of a high-quality CCP. We encourage you to review and provide comments on this draft CCP/EA. Please submit written comments on or before July 30, 2004 to:

David Hardt, Project Leader
 Kern National Wildlife Refuge Complex
 P.O. Box 670
 Delano, CA 93216

Comments may also be submitted via fax at (916) 414-6512 or electronic mail to FWPlanningComments@fws.gov. Please type "Kern and Pixley CCP" in the subject line. Thank you for your interest in Kern and Pixley Refuges.

Sincerely,

David Hardt
 Project Leader

Enclosure

7-27-2004

Dear Mr Hardt,
 I do not want Wildlife Service used on
 my acreage because I intend to use it.
 I can not type.
 Sincerely,
 Regina Riggred,

1

U.S. Fish & Wildlife Service Response

1. Comment noted.

U.S. Fish & Wildlife Service Response

us doi usfws noa kern pixley wildlife REFUGE

CALLING IT A REFUGE WHEN IT IS A KILLING FIELD IS COMPLETELY OBNOXIOUS.

1 | ALLOWING HUNTING SO CLOSE TO A CONDOR RESTORATION PROJECT IS THE HEIGHT OF FOLLY AND WASTE OF TAXPAYERS MONEY SINCE THEY ARE PAYING TO RESTORE CONDORS.

2 | i do not want to see hunting increased. in fact i want hunting banned entirely. there is no need for the guns, violence,slaughter, gun wackos to be there at all. the american public spends far greater amounts of money on wildlife watching, bird watching than these gun wackos do. i see no reason to let them make our woods and open spaces into killing fields where other human beings cannot even go for fear of being killed by these gun wackos. the worship of the gun is disgusting and refuges should not permit killing.

3 | i oppoe opening additional 187 acres to killing and new blinds to allow easier killing.

4 | i completely oppose hunting on sundays, a day of rest, and should be a day of peace and tranquility, not killing. this is outrageous making sundays a day of killing.

5 | I oppose grassland mgt plan since that is simply an excuse to grow birds that human sadistic predators can shoot to death. i see no reason why the general american public should be taxed to pay for gun wackos to shoot to death birds that have been purposely grown. i see no reason to ever grow birds so they can be targets for shotguns to be shot to smithereens by human sadists.

i think the plan is absolutely outrageous.

b. sachau
15 elm st
florham park nj 07932

Do You Yahoo!?
Tired of spam? Yahoo! Mail has the best spam protection around
<http://mail.yahoo.com>

1. Condors have never been sighted on the Refuge and are not expected to occur there. The nearest condor foraging habitat is the foothills of the Coast Range which is more than 20 miles west of the Kern Refuge's hunt area.

2. Comment noted.

3. Comment noted.

4. Comment noted.

5. The purpose of the grassland management plan is to improve habitat management practices for the endangered blunt-nosed leopard lizard and Tipton kangaroo rat. No hunting will be permitted on the grassland areas of the Refuge.



EdSandell1@aol.com
07/07/2004 02:53 PM

To: dave_hardt@r1.fws.gov
cc: fw1planningcomments@fws.gov
Subject: Kern and Pixley CCP

Mr Hardt,

As I am sure you know, I have been a supporter and defender of the refuge system (particularly Kern Refuge) for many years. I have been an avid waterfowl hunter at Kern, and both of my sons learned valuable lessons about sportsmanship and life... at Kern. Work parties and functions like those of Ducks Unlimited have been no stranger to me. This being said...I have some knowledge about which I speak.

I have an opinion on the proposed Conservation Plans that I believe are based on fact and experience. It is my opinion that because of the critical location of these refuges, it is imperative that we move forward with expansion and improvements to better serve both people and nature. In brief, I believe that Plan "C" is the best direction to proceed based on both a "common sense" and scientific approach. Plan "B" is the second best choice.

Brief Critical Synopsis of Plans:

Plan "A" This plan is unacceptable for several reasons. Obviously, it is the easiest tack to take because it stays with the status quo of what is being done now. It fails to address a growing need for both waterfowl conservation and recreation/sport. Needed development and improvements are generally ignored.

Plan "B" This plan is good, but has some red-flagged concerns that need to be considered. Firstly, as a hunter/conservationist, I certainly understand the need for "closed zones" for waterfowl during hunting season. By reducing this protected area to 30%, it jeopardizes waterfowl populations and conservation at the refuge. Ironically, hunter success rarely (if ever) increase under this situation. It can be a lose-lose situation. There is need for a new tour route and photography station (for birders) which are shunned by this plan.

Plan "C" This is the best plan from a conservative stance, yet includes needed improvements. It addresses needed hunter opportunity/sport, tour route and photography blind, monitors bird response to riparian restoration ("A" and "B" do not), provides a needed biological science technician. Simply put: It is the most sensible plan to conservatively and reasonably bring needed improvements without getting radical or "breaking the bank".

Plan "D" This is the worst plan of the lot. It is ill-concieved in many areas. It trashes the valued hunter/sport public use by drastically reducing the program. It prohibits the effective use of herbicides to manage the "choking out" of wetlands and needed open space. Mowing and discing are ineffective and temporary means of clearing growth, which results in quick grow-back of unwanted problematic vegetation.

In conclusion: I believe it is imperative we move in a positive direction to improve these refuges to better serve both man and beast. Waterfowl in North America are at a critical point. The hunter/conservationist is putting his money where his mouth is. The Refuge System should do the same. Improved hunting and conservation efforts certainly can work together...and usually do. By adopting Plan "C" we can step forward and improve these important areas without "selling the farm".

Thankyou, "Ed" Sandell Somis, Ca.

This letter may be copied and presented to anyone.

U.S. Fish & Wildlife Service Response

1. Comment noted.
2. Comment noted.
3. Comment noted.
4. Comment noted.
5. Comment noted.



"Beverly Brock"
<bevbrock@earthlink.net>

07/17/2004 08:50 AM
Please respond to
bevbrock

To: Jihadda_Govan@r1.fws.gov
cc:
Subject: Kern NWR hunting

- 1 I have learned that Kern NWR is proposing to allow hunting all weekend during coming hunting seasons. I don't think that's a good idea. Working people wanting to use the refuge for other purposes (birding, wildlife viewing, nature study, etc.) would not be able to use it then. Please keep the hunting schedule as it is! Thanks.

Bev Brock
bevbrock@earthlink.net
Sanger, Fresno County, CA

U.S. Fish & Wildlife Service Response

1. The selected plan maintains Wednesdays and Saturdays as the only hunt days.



Dian Schultz
 <wschultz1@juno.com>
 m>

To: dave_hardt@r1.fws.gov, EdSandell1@aol.com
 cc:
 Subject: Kern and Pixley CCP

07/20/2004 12:06 PM

Dave,

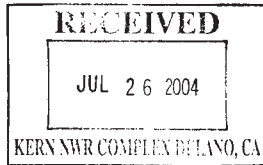
I spoke recently with my friend Ed Sandel. He told me about the four plans proposed for the Kern Refuge for the coming season of 2004-2005. I have been visiting and hunting the refuge for thirty seven years and I would like to express my opinions concerning the four plans. Basically, I believe in conservation and support it in all senses of the word. As a hunter I enjoy sitting and watching all wildlife as much as any bird watcher enjoys their viewing. Being a quality habitat is the most important factor for the refuge. With a quality habitat everything falls into place, better viewing, better hunting, and better opportunity for wildlife to grow and produce for the future. Two of the four plans I oppose are A & D. These plans are radical and will not solve any of the present problems, but make everything worse for all concerned. B is a fair plan, however, I do not believe it is the best plan. ***I totally support plan C*** because it is the best plan for all visitors (hunters and viewers) concerned, and from a managers stand point, the one he can use to his best advantage in restoring some of the areas (area 1) to past productivity and quality habitat so badly needed for all visitors to the refuge. In summary, we should try to improve the quality of habitat for all visitors in the present and the future. ***Plan C would best serve that objective.*** Quality habitat can only breed success for all concerned.

Bob Schultz
 805-526-4972
 3324 Faxton Ct.
 Simi Valley, CA 93063

U.S. Fish & Wildlife Service Response

1. Comments noted.

BRUCE J. WYANT
1217 Tam O'Shanter Drive
Bakersfield, California 93309
(661) 831-9787
FAX (661) 831-9787
bjwyant@bak.rr.com



July 23, 2004

David Hardt, Project Leader
Kern National Wildlife Refuge Complex
P.O. Box 670
Delano, CA 93216

Kern-Pixley National Wildlife Refuges
Draft CCP/EA

Gentlemen:

I am writing you again to comment on the Kern/Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment.

In the Draft CCP/EA, there are presented four alternatives management plans: A, B, C & D for both the Kern and the Pixley refuges. As to the Pixley Refuge, it's unfortunate there are no plans to incorporate hunting opportunities. I will address the Kern Refuge.

- 1 • Alternative A, the no action alternative, does nothing to make things better.
- 2 • Alternative B would likely be the most advantageous to waterfowlers by providing the most wetlands and the greatest hunting opportunity. The increase in wetlands hopefully would attract and hold more waterfowl, and the increase in open hunting area would benefit hunters both on the refuge and, hopefully, the duck clubs. Shooting the refuge three days a week could be very beneficial by disbursing some birds to other wetlands in the area, particularly those that at the time aren't being hunted.
- 3 • Alternative C may be worse than Alternative A from the hunter's point of view because of the significant increase in wetlands closed to hunting, while only modestly increasing the hunting area. Alternative C would be more tolerable if Area 6A was included as a hunt area.
- 4 • Alternative D is the choice if wetlands via duck clubs are no longer desirable in this part of the valley.

5 As I'm sure you have heard many times before, if the duck clubs in the area are to continue to exist, and thereby provide desired wetlands in the southern San Joaquin Valley, the duck clubs need ducks to make it worthwhile for the considerable expense of obtaining water. The refuges can't provide the clubs with water, but they probably can increase the number of ducks using the clubs

I believe that the areas open to hunting should be rotated with the closed areas on a weekly or bi-weekly basis in an attempt to move the birds to the wetland areas outside of the refuge system where they commonly feed at night. Expensive water plus few ducks equals fewer wetlands.

Sincerely,

U.S. Fish & Wildlife Service Response

1. Comment noted.
2. Comment noted.
3. The selected plan (Alternative C) will have more wetlands open to hunting than Alternative A. The map of Alternative A in Figure 4 of the Environmental Assessment mistakenly labeled unit 14 as "other areas closed to hunting" when it should have be labeled as a wetland closed to hunting. All alternatives have the same amount of wetland habitat.
4. Comment noted.
5. The Service is concerned about the continued existence of clubs in the area of Kern Refuge and realizes that hunter success is a significant factor in determining if a club will continue to flood waterfowl habitat. Rotating the location of a closed area on the Refuge has been considered as a means of dispersing birds from the refuge to local hunt clubs. However, there are major drawbacks involved with this type of management. Rotating a closed area on the Refuge during the season would require constant reprinting of hunt maps and reposting of the hunt area, both contributing significantly to increased labor and overhead costs to operate the public hunting program. Additionally, frequent changes to the closed area would result in continuous confusion with Refuge hunters. Past efforts to open of the Refuge closed area on shoot days have not contributed significantly to increasing hunter success on the local duck clubs and may have resulted in the loss of waterfowl use in the southern San Joaquin Valley area.

Under the selected plan, the proportion of flooded habitat hunted would remain the same as in the past. The Service is committed to monitoring waterfowl use patterns in the Tulare Basin and is open to making changes in the hunt program in the future, if necessary.



Jim Hatcher
<jimhatcher@yahoo.com>

07/30/2004 12:20 PM

To: FW1PlanningComments@fws.gov
cc:
Subject: Kern and Pixley CCP

Mr. Hardt,

1 Thank you and the CCP team for your efforts and draft of the plan you sent to me. I have reviewed a good deal of the draft and believe Alternate "C" would be in the best interest of the public and adheres to the goals set for KNWR. As a waterfowl hunter and enthusiast, I did like Alternate "B"; however, I assume there are ecological, financial, and political reasons for not expanding the hunting acreage at this time.

My thanks to you and everyone for the hunting opportunities my family and friends have experienced for many years at Kern Refuge. I sincerely appreciate your work.

Yours truly,

Jim Hatcher
Porterville, California

Do you Yahoo!?

[Y! Messenger](#) - Communicate in real time. Download now.

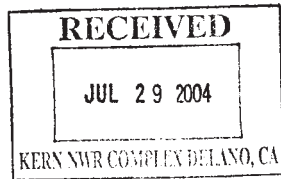
U.S. Fish & Wildlife Service Response

1. Comment noted.

U.S. Fish & Wildlife Service Response

July 25, 2004

David Hardt, Project Leader
Kern National Wildlife Refuge Complex
P.O. Box 670
Delano, CA 93216



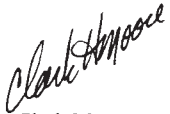
Dear Folks

Thank you for the opportunity to comment on the Comprehensive Conservation Plan Draft for the Kern and Pixley National Wildlife Refuges. These remaining jewels of what was the natural winter refuge of the Tulare Lake watershed are valuable to both the wildlife and flora diversity of the southern San Joaquin as well as the consumptive and non-consumptive usage by the growing population of the area.

- 1 Overall this CCP is a well-constructed document outlining and suggesting many needed enhancements for both refuges. Further, the refuge vision statements for Kern and Pixley NWR's read very well. The statement as respects the Pixley Refuge is most important for this is truly an exceptional and unique piece of ground for wildlife-dependent visitor's education and interpretation.
- 2 The proposals for enhancement of riparian, grasslands and other habitats as well as the eradication, as much as possible, of the water consuming Salt Cedar will be fine improvements. Land acquisitions as linkages and corridors between units certainly are needed. Special attention to the needs of the fast disappearing Tri-colored Blackbirds would be an important project.
- 3 An increase in both aerial and ground surveys will blend into the adaptive management process. At some point down the road a "Friends of the Kern and Pixley Refuges" (or under whatever name) will be an important addition for interpretive services and fund raising. The second tour route to the north of the headquarters is not only necessary during the hunting season, but would also be welcomed by all wildlife visitors.
- 4 Expansion of wildlife viewing at Pixley will be of great interest, especially the Vernal Pools portion of the plan. Also at Pixley, any enhancement of the Sandhill Crane habitat used for night roosting and daytime loafing, as well as adjacent grain fields, is of most interest to many refuge visitors.
- 5 An important comment about Pixley: having tracked and followed the "Sandys" in all the western states and parts of Canada, any thought of opening Pixley to hunting would probably be the end of usage by the cranes. Often the lifting of binoculars is enough to flush these birds from their roosts or foraging grounds.
- 6 It would also seem that expanding the number of units open for hunting on the Kern Refuge would affect the ponds where many of the shorebirds are observed each season. In this area of discussion, alternative D appears to be the most acceptable.

1. Comment noted.
2. Comment noted.
3. Comment noted.
4. Comment noted.
5. The Service agrees that allowing waterfowl hunting on Pixley Refuge could adversely affect crane usage. Under the selected plan, Pixley Refuge remains closed to hunting.
6. Most shorebird use occurs during the spring migration when wetlands are being drawn down for the summer. This is well after the end of the hunting season, which is typically mid January. Some shorebird use occurs throughout the fall and winter hunt season. The Service believes that there is sufficient wetland sanctuary to minimize the effects of this disturbance on shorebirds. Nevertheless, the Service is committed to monitoring potential impacts on shorebird populations to determine if management changes are necessary.

7 | In fact, and in conclusion, the D alternative in most every case of the plan would be the best in the long range for both refuges. Again, thanks for the opportunity to comment.



Clark Moore
President
Tehachapi Mountains Birding Club
24501 Paramount Drive
Tehachapi, CA 93561

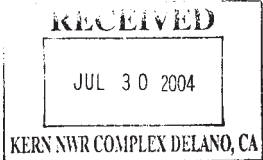
(661) 821-5303
bvsbird@earthlink.net

U.S. Fish & Wildlife Service Response

1. Comment noted.

U.S. Fish & Wildlife Service Response

No comments on this page.



ERNEST L. ANTONGIOVANNI
2026 17TH STREET, STE 106, BAKERSFIELD, CA. 93301
PHONE (661) 335-1234 FAX (661) 335-1236

July 30, 2004

Kern National Wildlife Refuge Complex
P.O. Box 670
Delano, Ca. 93216

Re: Comprehensive Conservation Plan and Environmental Assessment

Gentlemen

After reviewing the Comprehensive Conservation Plan and Environmental Assessment draft, I was quite impressed by the scale of this plan. It became clear to me that all this has to be part of an ongoing program. The last few years you have had quite a talented and innovative young manager/supervisor on your staff here. We have been very impressed by the ingenuity of David Hardt.

As neighboring landowner-farmer we have always found him to be approachable, have time to discuss mutual issues and come to compatible and realistic solutions.

I noticed subtle changes to the landscape of the refuge almost from the day Mr. Hardt arrived. Over time its become quit an impressive up scale. We farm to the west of the refuge and have for many years. The last several years' these lands have been planted to small grains; wheat, or barley. Wheat has become our crop the last five years. It's planted in November and December. There are a few years, because of heavy rains that some planting spills over into January. Beginning in the 1970's we have had problems with blackbirds as the young plants emerged. The blackbirds like the young seedling (its white and tender) as it emerges. They grab it and literally tear it out of the ground. The real sweet part must be the seed hull, because they devour that also. After a few hours the area where they have fed appears to have been renovated! In contrast to a nice disked surface after we have planted. We have some blackbird damage while planting, but the larger herds that cause the most damage seem to appear when the young seedling begin to emerge. This has been an ongoing problem. We have address the problem by sowing more seed per acre. But in the last few years it seems, each year to become more intense. This past winter the damage was atrocious!! We had sown 1,400/1,500 acres by December 24, 2003. There had been a half-inch of rain in early December. December 24th and 25th the field received and inch and a quarter and in January 1st and 3rd another half inch. This made for ideal situation for this wheat crop. On January 8, 2004 when we could reenter the area to begin to continue planting the rest of unplanted acres and review what we expected to be a excellent stand of wheat on the planted area. We expected to have some blackbird damage, maybe as much as 150 acres. But what we found was that the entire 1,400/1,500 acres had been devoured.

A few day later, after talking to Dave Hardt and other state /federal government agency we set up a tour. We toured the area on January 16, 2004. Many experts were in attendance and none hac

ever view or experienced this size of damage. The question in our mind is that we feel that most of these blackbirds over winter (when there is a very limited amount of feed in the area) at the Kern Refuges. When we begin to plant our field which are next door they become the main source of feed for the next few months, for these blackbirds. The period of blackbird's pressure is between November and April.

1 Over the last few years, as the improvements of the habitat area at the Kern Refuge has grown we have experienced more and greater blackbird pressure/damage.

I read, with interest in early April 2004 an article in the Bakersfield Californian about the work being done to protect a blackbird species!! I would be surprised if this species are not among these large herd of crop damaging blackbirds.

Thank you

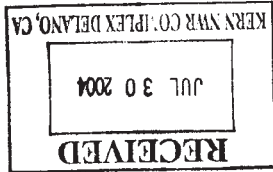

Ernest L. Antongiovanni
King Kern Ranch, Manager

U.S. Fish & Wildlife Service Response

1. The dense cattail marshes of the Kern Refuge have provided habitat for several species of blackbirds for many years and these birds, mostly red-winged and Brewer's blackbirds may have contributed to damage to adjacent farmers crops in the past. Current Federal depredation control regulations contained in 50 CFR 21.43 permit a landowner to take direct action to control problematic blackbirds so long as control measures are in accordance with state regulations. The refuge manager is willing to work with you to help resolve the depredation problems that you have experienced in the past. The blackbird protection work you referenced from the Bakersfield Californian article is targeting the tricolored blackbird, a species which normally does not occur in large numbers on the Refuge and would not normally be associated with this type of depredation issue.

July 28, 2004

U. S. Fish and Wildlife Service
Kern National Wildlife Refuge Complex
P. O. Box 670
Delano, CA 93216



Dear David Hardt,

The very comprehensive CCP for the Kern and Pixley Wildlife Refuges represents a great amount of work on the part of you and your staff. It is obvious you put a lot of research, thought and effort into the document.

The remarks below reflect my own thoughts as a birder and not those of any group.

1 | Population growth and the resulting increase in interest in recreational activities such as birding, hunting, photography and viewing wildlife will increase pressure on both refuges. Alternative A is not acceptable for either refuge as it maintains the status quo and does not provide for growth in use of the refuges.

2 | For Pixley, Alternatives B,C and D are acceptable as they offer habitat improvement for wintering and migrating waterfowl and Sand Hill Cranes as well as protection for endangered species. D offers the possibility of a parking lot and trail to view vernal pools. This is acceptable as long as it is not disturbing to the cranes which are present when vernal pools are at their peak.

3 | For Kern Alternative B is not acceptable as the main focus should be on balanced use of the refuge rather than on hunting.

4 | Alternatives C and D offer acceptable provisions for habitat improvement (especially, enhancing the east end of 14 and removal of salt cedar on the refuge). They also offer acceptable provisions for mosquito abatement, protection of plant and animal species and enhancement of outreach through a Friends group and lessons in classrooms.

5 | The most contentious issue is the expansion of hunting in Alternatives B and C. Personally, I would like no hunting at all, but realize that is unreasonable. Alternative C provides for an increase of 800 hunters a year, over 500 acres less sanctuary and 9 more blinds. I suggest a decrease in those numbers to 500 additional hunters, 250 acres less sanctuary and 6 more blinds. Also, maintain the current use to Wednesdays and Sundays.

6 | Sundays are the most likely days for non-hunters to visit the refuge. Also, successive days of hunting increases pressure on the waterfowl.

Thank you for the opportunity to respond. I will be very interested in the final outcome.

Sincerely,

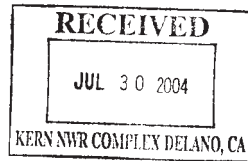
U.S. Fish & Wildlife Service Response

1. Comment noted.
2. Comment noted.
3. Comment noted.
4. Comment noted.
5. Although the selected plan would increase the size of the hunt area, the ratio of hunt area to sanctuary would remain the same as it has in the past several years (55 percent closed, 45 percent open). The hunt area was expanded in proportion to the new moist soil unit being developed in unit 14.
6. The selected plan maintains Wednesdays and Saturdays as the only hunt days.

SIERRA CLUB KERN-KAWEAH CHAPTER



2815 La Cresta Drive
Bakersfield CA 93305-1719



Kern-Kaweah Chapter
P.O. Box 3357
Bakersfield, CA 93385
<http://kernkaweah.sierraclub.org/>

Executive Committee
Lorraine Unger, Chair
Harry Love, Vice Chair
Ara Marderosian, Secretary
Richard Garcia
Gordon Nipp
Mary Ann Lockhart
Arthur Unger
Marisa Albridge

Regional Delegates
Harry Love, RCC
Mary Ann Lockhart, RCC
Ara Marderosian, RCC
Lorraine Unger, SC Council

Buena Vista Group
Glenn Shellcross, Chair
Elaine White, Vice Chair
Keith Dilday, Treasurer
Mitch Bolt, At Large

Condor Group
Chester Arthur, Chair
Candy Posson, Secretary
Marta Bigler, Treasurer

Kaweah Group
Pam Clark, Chair
Dianne Jetter, Vice Chair
Boyd Leavitt, Treasurer

Mineral King Group
Harold Wood, Chair
Kim Loeb, Vice Chair
Joanne Dudley, Secretary
Janet Wood, Treasurer

Owens Peak Group
Dennis Burge, Chair
Steve Smith, Vice Chair
Jean Bennett, Secretary
Dolph Amster, Treasurer

recycled paper 30% post
consumer waste

David Hardt, Project Leader
Kern National Wildlife Refuge Complex
PO Box 670
Delano, CA 93216

Re:CCP/EA for Kern and Pixley National Wildlife Refuges

Dear Mr. Hardt:

1 We are interested in the Wildlife Refuges being sanctuaries for resting and foraging migratory birds. We are concerned that there is no increase in hunting days and that more effort be made for public, non-consumptive use in protecting our avian heritage and biodiversity.

2 We wish to support "Public Use Goal 4, Alternative D". Visitor Services are of great importance to our organization and also research of the species using the area. One of the best ways to educate the public is through more visitor days and interpretative services. We are well aware of the constraints of a tight budget but sometimes reassignment of staff, networking with community educational resources, and promoting volunteerism can make up for shortages in funds. New signs, kiosks, boardwalks, and a potential friends group might help in this regard.

3 Visitor Services 4B and 4C and 4D and 4F can be combined with numerical goals shared by all and need not be exclusive. Public outreach can be the generic denominator. The nearby communities of Pixley and Earlimart can well use educational opportunities for their K-12 students. There is a link on the Audubon website to birding festivals throughout California. A small scale festival would be a start. Also, some community education comes to mind regarding the large Pixley NWR billboard on HWY 99. Several years ago I tried to find the refuge in Pixley by asking for directions at some commercial establishments near the highway. No one knew where it was.

(over)

U.S. Fish & Wildlife Service Response

1. The Service agrees that Kern and Pixley Refuges should provide Sanctuary for restoring and foraging migratory birds. The selected plan sets aside 55 percent of the wetland habitat on Kern Refuge and all of Pixley Refuge's wetlands as sanctuary.
2. The selected plan maintains Wednesdays and Saturdays as the only hunt days on Kern Refuge. The plan also includes the development of an additional tour route (open on hunt days), two new photo blinds, and a kiosk and boardwalk at Kern Refuge, and a new pullout and interpretive displays at Pixley Refuge. In addition, the selected plan expands environmental education and interpretation programs at both Refuges.
3. The Service agrees that visitor days and interpretive programs are excellent ways to educate the public. Refuge staff are committed to offering high quality visitor services by partnering with other agencies and organizations and utilizing volunteers to make the most of tight budgets.
4. The Service agrees that public outreach is critical to the success of Kern and Pixley Refuge's management programs and should be expanded. The selected plan substantially expands the number of outreach events offered each year to 12. As the commentator suggests, a small birding festival could be a valuable tool to showcase the Refuges' importance to migratory birds.
5. The Service agrees that there is a need to educate local communities about where the Refuges are located and what they have to offer. The Service plans to continue to participate in outreach events geared toward the local communities such as the Wasco Rose Festival, the Tulare Farm Show, and Kern Refuge's Waterfowl Expo. The Service also plans to coordinate with California Department of Transportation to install additional signs along highways and refuge displays at rest stops.

U.S. Fish & Wildlife Service Response

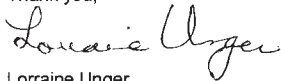
summer from the Fresno area who carried her own funding. The organization I presently volunteer with in Bakersfield has a paid part-time employee through a retired executive organization.

6 4G,H,I would all be logical outcomes of public outreach and approaching communities in the San Joaquin Valley with ties to those you wish to reach. The Environmental Justice community has non-profit organizations in Earlimart and Delano and there are Native American groups at the Santa Rosa Rancheria and the Tule Indian Reservation.

7 We understand there is a potential for an additional day of hunting. This would require additional staffing that would normally perform other duties. At present when our members visit on Sunday mornings to bird watch, there is no staff on duty and all the facilities are locked. It is not a great inconvenience for us to use the portable bathrooms, but would be more inviting if someone was available to the public and that the building restrooms were available.

Your two refuges are quite valuable to the San Joaquin Valley but yes, the non-hunting should know you are there.

Thank you,



Lorraine Unger

6. Comment noted.

7. The selected plan maintains Wednesdays and Saturdays as the only hunt days. At current staffing levels, we are not able to staff the Refuge on Sundays. However, we are open to having volunteers staff the refuge office on weekends, as is the practice at many Refuges.

Reference: SS20040219

July 29, 2004

Attn: David Hardt
Kern National Wildlife Refuge Complex
PO Box 670
Delano, CA 93216

RE: Kern and Pixley National Wildlife Refuges

Dear Mr. Hardt:

The San Joaquin Valley Unified Air Pollution Control District (District) has reviewed the information provided and has the following comments:

1 The entire San Joaquin Valley is non-attainment for ozone and fine particulate matter (PM-10). The Federal Clean Air Act (CAA) and the California Clean Air Act require areas that are designated non-attainment to reduce emissions until standards are met. Based upon the information provided the District concurs with the document that there does not appear to be a significant air quality impact.

2 A current list of District rules can be found at www.valleyair.org/rules/1ruleslist.htm. The following District Regulation has been discussed in the Environmental Assessment, however, the description of District rules 8021 & 8061 on page A-31 is no longer accurate. These rules have recently been updated. A synopsis highlighting some of the changes has been included for your reference. Compliance with the following regulation is required:

1. District Regulation VIII - Fugitive Dust Rules is a series of rules designed to reduce PM-10 emissions generated by human activity, including construction, road building, bulk materials storage, landfill operations, etc. A synopsis highlighting many of the requirements of this regulation has been enclosed. The Compliance Assistance Bulletin is not meant to be all-inclusive, but it can be a useful compliance aid in the field and office alike. Please be advised that the District is currently amending Regulation VIII and anticipates implementing

U.S. Fish & Wildlife Service Response

1. Comment noted.
2. The National Environmental Policy Act compliance will be updated to reflected the current fugitive dust rules.

U.S. Fish & Wildlife Service Response

See response 2 on the previous page.

revised requirements on or about October 1, 2004. If construction were to commence on or after October 1, the applicant should contact the District to determine where requirements may have changed and how rule changes may affect the project. Applicants can find the most current version on the District's web page at www.valleyair.org.

Thank you for the opportunity to comment. If you have any questions or concerns, please feel free to contact me at (661) 326-6980.

Sincerely,

Heather Ellison
Air Quality Planner

C: File

Appendix B.
Wilderness Review

A wilderness review is the process used by the Service to determine whether or not to recommend lands or waters in the National Wildlife Refuge System to Congress for designation as wilderness. The Service is required to conduct a wilderness review for each refuge as part of the CCP process. Lands or waters that meet the minimum criteria for wilderness are identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System.

According to Section 13 of the Service's Director's Order No. 125 (12 July 2000), in order for a refuge to be considered for wilderness designation, all or part of the refuge must:

- Be affected primarily by the forces of nature, with the human imprint substantially unnoticeable;
- Have outstanding opportunities for solitude or a primitive and unconfined type of recreation;
- Have at least 5,000 contiguous acres (2,000 ha) or be sufficient in size to make practicable its preservation and use in an unimpaired condition, or be capable of restoration to wilderness character through appropriate management, at the time of review; and
- Be a roadless island.

Kern Refuge contains a total 11,249 acres. However, it is subdivided into 14 smaller units surrounded by numerous roads and bisected by miles of cross levees. Units 11 and 12 (the San Joaquin Desert Research Natural Area) are the most natural of the Refuge units. They still contain much evidence of past human use, including dirt roads and remnants of past ranching activities. Furthermore, these units together comprise about 2,000 acres, which is smaller than the area required for designation as wilderness. For these reasons, Kern Refuge does not meet the criteria for wilderness designation.

Pixley Refuge contains a total of 6,385 acres in nine management units. The largest contiguous block of Service-owned lands is about 4,500 acres. However, this block is divided roughly in half by a county road and numerous smaller dirt roads. Pixley Refuge also contains much evidence of past and current human use, including nearly 800 acres of actively managed wetlands, and remnants of past ranching and farming activities. For these reasons, Pixley Refuge does not meet the criteria for wilderness designation.

Appendix C.
Landscape Level Goals

Landscape Level Goals Relevant to Kern and Pixley Refuges

CALFED Ecosystem Restoration Program

- Improve aquatic and terrestrial habitats and natural processes to support stable, self-sustaining populations of diverse and valuable plant and animal species, and includes recovery of species listed under the State and Federal Endangered Species Acts.
- Protect or restore functional habitat types throughout the watershed for public values such as recreation, scientific research, and aesthetics.
- Prevent establishment of additional non-native species and reduce the negative biological and economic impacts of established non-native species.
- Improve and maintain water and sediment quality to eliminate, to the extent possible, toxic impacts on organisms in the system, including humans.

Central Valley Habitat Joint Venture Implementation Plan

- Protect, maintain, improve, and restore habitat to increase waterfowl populations to desired levels in the Central Valley of California consistent with other objectives of the North American Waterfowl Management Plan.
- Protect 80,000 additional acres of existing wetlands through acquisition of fee-title or perpetual conservation easements.
- Secure an incremental, firm 402,450 acre-foot water supply that is of suitable quality and is delivered in a timely manner for use by the refuges, State wildlife areas, and the Grasslands Resources Conservation District.
- Secure CVP power for Refuges, State wildlife areas, Grasslands Resources Conservation District, and other public and private lands dedicated to wetland management.
- Increase wetland areas by 120,000 acres and protect these wetlands in perpetuity by acquisition of fee-title or conservation easements.
- Enhance waterfowl wetland habitats on 291,555 acres of public and private lands.
- Enhance waterfowl habitat on 443,000 acres of agricultural lands.
- Increase waterfowl populations to desired levels: total ducks (breeding): 400,000; mallard (breeding): 300,000; total ducks (winter): 4,700,000; mallard (winter): 531,000; pintail (winter): 2,800,000; total geese and swans: 875,000; cackling Canada: 200,000; Aleutian Canada: 5,000; lesser snow: 320,000; Ross': 100,000; tule white-fronted: 5,000; Pacific white-fronted: 200,000; tundra swan: 40,000.

Kern County General Plan Goals

- Habitats of threatened or endangered species should be protected to the greatest extent possible.
- Rivers and streams in the County are important visual and recreational resources and wildlife habitats. Areas of riparian vegetation along rivers and streams will therefore be preserved when feasible to do so.

North American Waterfowl Management Plan – 1998 Update

- Enhance the capability of landscapes to support waterfowl and other wetland-associated species by ensuring that Plan implementation is guided by biologically based planning, which in turn is refined through ongoing evaluation.
- Define the landscape conditions needed to sustain waterfowl and benefit other wetland-associated species, and participate in the development of conservation, economic, management, and social policies and programs that most affect the ecological health of these landscapes.

- Collaborate with other conservation efforts, particularly migratory bird initiatives, and reach out to other sectors and communities to forge broader alliances in a collective search for sustainable uses of landscapes.
- Maintain the current diversity of duck species throughout North America and achieve a continental breeding population of 62 million ducks during years with average environmental conditions, which would support a fall flight of 100 million.
- Attain a black duck mid-winter population index of 385,000.
- Increase or reduce goose populations to sustainable levels.
- Reduce Western tundra swan population to 60,000, and increase Pacific Coast trumpeter swan population to 43,200.
- In the Central Valley Habitat Joint Venture Area, protect 80,000 acres, restore 120,000 acres, and enhance 735,000 acres.

Pacific Flyway Management Plan: Western Management Unit Mourning Dove Goals and Objectives

- Maintain the Western Management Unit (WMU) population of mourning doves and its habitat at levels consistent with optimum distribution, density, and recreational uses of the resources.
- Determine the causes of mourning dove population declines in the (WMU) and establish procedures to reverse the trends.
- Increase the population levels of WMU mourning doves to a point where call-count indices average no less than 16 in the Coastal subunit.
- Increase and maintain adequate habitat to sustain the current seasonal distribution of WMU mourning doves throughout their range. The important habitat components are appropriate structures for nesting and roosting (trees), and food and water sources.
- Maximize the potential for sustained consumptive and non-consumptive uses of the mourning dove resource in the WMU.

Recovery Plan for Upland Species of the San Joaquin Valley, California.

- The ultimate goal of this recovery plan is to delist the 11 endangered and threatened species and ensure the long-term conservation of the 23 candidates and species of concern. An interim goal is to reclassify the endangered species to threatened status. The 11 listed species include five endangered plants (California jewelflower, palmate-bracted bird's-beak, Kern mallow, San Joaquin woolly-threads, and Bakersfield cactus), one threatened plant (Hoover's woolly-star), and five endangered animals (giant kangaroo rat, Fresno kangaroo rat, Tipton kangaroo rat, blunt-nosed leopard lizard, and San Joaquin kit fox). This plan details the recovery criteria and habitat protection, monitoring, and research priorities for each of these imperiled species.

Riparian Bird Conservation Plan (California Partners in Flight and the Riparian Habitat Joint Venture)

- Increase the breeding range of native birds and safeguard healthy bird communities with high productivity.
- Maximize riparian ecosystem health, promote a self-sustaining functioning system, and maximize the cost-effectiveness of riparian conservation activities.
- Increase the overall breeding range and/or abundance of native riparian birds by designing and implementing horticultural restoration projects that mimic natural riparian plant diversity and "patchiness". Such plantings will most quickly support a diverse community of bird species that can successfully nest in the restored habitat.
- Increase the value of existing/ongoing habitat and restoration projects for bird species.

- Ensure that large landscape-scale management and flood control projects maximize benefits to wildlife in conjunction with benefits to agriculture and urban populations. Achieving numerous goals simultaneously would maximize the overall value of such projects to the people of California.
- Implement and time land-management activities with the goal of maximizing bird species productivity or “source” populations.
- Protect, recreate, or minimize interruptions of natural processes, particularly hydrology and associated high-water events to allow/promote/facilitate the natural cycle of channel movement, sediment deposition, and scouring that results in a diverse mosaic of riparian vegetation classes.

Southern Pacific Coast Regional Shorebird Plan

- Increase the wintering population of the Mountain Plover in the Central Valley.
- Create suitable open foraging habitat by managing for giant kangaroo rats (*Dipodomys ingens*) and using fire and grazing, as appropriate.
- Increase populations of breeding and wintering Snowy Plovers and wintering Long-billed Curlews in the Central Valley.
- Increase breeding and wintering populations of other shorebirds in the Central Valley.
- Restore, enhance, and manage wetlands with integrated wetland management goals, which accommodate the needs of a greater diversity of birds, including shorebirds.
- Ensure the availability of high quality water for wetlands.
- Resist fragmentation or loss of existing wetland complexes by urban encroachment.
- Promote management practices in agricultural lands and vernal pool rangelands that will provide for a greater diversity of birds, including shorebirds. Also promote easements and other options for maintaining wildlife-friendly agricultural lands and vernal pool rangelands.
- Reduce use of contaminated agricultural evaporation ponds by shorebirds and other waterbirds while creating alternative uncontaminated habitats that will mimic historic saline playa wetlands thereby maintaining the current mix of waterbird communities.
- Increase shorebird use of sewage ponds or wetlands using treated sewage effluent if issues of disease transmission and contaminants can be addressed.

USFWS/CDFG Tricolored Blackbird Status Update and Management Guidelines

- Maintain viable, self-sustaining populations distributed throughout the current range of the species.
- Avoid losses of tricolored colonies and their reproductive effort throughout their range.
- Increase the breeding opportunities on suitable public lands and on private lands managed for this species.
- Enhance public awareness and support for protection of this unique species.
- Minimize losses of important foraging habitat for both nesting and wintering populations.

Appendix D.
Compatibility Determinations

Compatibility Determination

Use: Hunting waterfowl (ducks and geese), coots, moorhens, and upland game birds (ring-necked pheasant) (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge

Establishing and Acquisition Authorities:

The Kern National Wildlife Refuge, located in Kern County, California, was established in 1960 under provisions of the Migratory Bird Conservation Act (16 U.S.C. § 715d).

Refuge Purpose (s): Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. §71sd)

National Wildlife Refuge System Mission: The Mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee])

Description of Use: The Kern National Wildlife Refuge (Refuge) will continue to provide opportunities for hunting waterfowl (ducks and geese), coots, moorhens and upland game birds (pheasant). Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997. Other priority wildlife-dependent public uses identified by the Act include fishing, wildlife observation, photography, environmental education and interpretation. Hunting will be permitted on designated areas of the Refuge, pursuant to the conditions of a cooperative agreement with the State of California, Department of Fish and Game (CDFG) during the established state waterfowl hunting season (USFWS, 1999). This use has occurred annually since the first hunting season on the Refuge in 1963. The Refuge will remain closed to all other forms of hunting and target shooting.

The waterfowl hunting season typically begins the third weekend in October and continues to the third weekend in January with waterfowl hunting being allowed on the Refuge Wednesdays and Saturdays only. Shooting hours and daily limits conform to federal and state regulations. Complete copies of hunting regulations may be obtained from the Department of Fish & Game at www.dfg.ca.gov, the Kern NWR hunter check station during operational hours on Wednesdays and Saturdays, or at the Kern NWR office.

Pheasant hunting will only be permitted while hunting waterfowl in the free roam units and only during that portion of the state waterfowl hunting season when pheasant season is also open. While the majority of the pheasants on the refuge are found in upland areas located west of Goose Lake Canal where hunting is prohibited, pheasant hunting is only permitted within the wetlands where relatively few pheasants reside. While a limited number of pheasants are taken each year, the opportunity is there in the event that a hunter flushes a bird while walking to and from his waterfowl hunting location. The refuge does not plant pheasants on the area and all birds are wild from the self sustaining population.

A detailed discussion of the Kern NWR hunt program can be found in Chapter 3 of the Kern and Pixley Refuges Comprehensive Conservation Plan (USFWS 2004). The Refuge also plans to prepare a Visitor Services Plan that will provide updated management guidelines for operation of the Refuge hunting program.

A variety of seasonal and moist soil wetlands are managed by the Refuge to provide suitable habitat for migratory and wintering waterfowl. Some of these areas will also be managed to provide hunter access into both free roam units and units having designated blind sites. Each free roam unit will have an established hunter quota based on a ratio of one hunter per 20 acres of habitat. Within the spaced blind area, blinds which can accommodate up to 4 hunters per blind are established at fixed locations. The mandatory spacing and hunter quotas will help prevent overcrowding of specific areas within the hunt units on the refuge and contribute to a safer and higher quality hunting experience. Three handicapped accessible blinds will also be located in the spaced blind area. Throughout the waterfowl hunting season, new areas will be opened to hunting as additional wetland habitat is flooded on the refuge. Under ideal conditions, which depend largely on water availability and subsequent total area of flooded wetlands, the Refuge will be able to provide hunting opportunities for up to 152 hunters per day.

Designated hunting areas are delineated on refuge hunting maps and the hunt area and closed zones are posted annually with appropriate refuge signs. If new areas are added during the season, posting is changed to accommodate these modifications.

Hunting will be allowed in free roam Units 1, 1A, 2, and 2A as well as units having designated blind sites in one of 11 moist soil wetlands located in Units 4A, 4B, 5A and 5B. These units represent approximately 2,870 acres but may vary from year to year depending upon water availability and total acres flooded.

Each blind site will be designated with a numbered post. Hunters assigned to a blind must remain within 100 feet of the numbered post when engaged in shooting unless pursuing injured birds. The hunting area will be delineated annually, based on water and habitat availability, by signs and maps that are distributed to all hunters. Use of hunting dogs will be encouraged to reduce the crippling loss of birds, however, as with all dogs on the refuge, retrievers must be under the control of their handlers at all times. Failure to control a dog's activities can result in citation of the owner.

Hunter access to assigned hunt areas will be achieved by foot or, in some units, by boats. The use of non-motorized boats supports free roam hunters in deep water areas such as Units 1 & 2, and makes access much safer and easier and enables more efficient retrieval of birds. Boats used for hunting are normally small, less than 10 feet in length, or canoes capable of holding one or two

hunters and their gear. These boats are normally launched from the NW corners of Units 1 & 2 and the trailers used to transport such equipment are then moved either to the main parking area or to parking lot 1. Ample space is available in each area to park these vehicles.

All firearms are to remain unloaded until hunters are within the designated hunt area. Each hunter shall possess no more than 25 shells while in the field and only approved non-toxic shot may be possessed or used while in the field.

Prospective hunters will apply through a statewide CDFG reservation system for a particular hunt day on the refuge or if they are not drawn for a reservation they may enter a daily lottery drawing held each morning at the hunter check station. Neither a reservation nor a lottery drawing guarantees a hunter a specific hunting location on the refuge, it simply establishes the order in which a hunter enters through the check station. Each unit within the hunting area is filled to maximum quota level on a first-come first-served basis. Once hunter quotas are reached no other hunters are allowed to enter that unit until space is made available by hunters leaving the area. Daily permits are issued to hunters as they pass through the check station and each permit is marked with the assigned hunting area to assist in enforcement of unit quotas.

Hunting use has been heaviest on Saturdays, as opposed to Wednesdays, and this trend is expected to continue. During the waterfowl hunt season of fall/winter 2003/2004, an average of 2.74 birds per hunter were harvested from the Refuge. Season length and hunter bag limits change each year as regulations are modified to account for habitat and waterfowl population fluctuations throughout North America. On average, with the refuge hunting only two days a week there are approximately 26 shoot days per year with nearly 3,000 hunters participating.

Both the California Department of Fish & Game and the Service understand the importance to waterfowl of having areas closed to hunting in the southern San Joaquin Valley. For this reason CDFG and the Service have agreed that the first 1,000 acres of wetlands flooded on the refuge will be closed and any additional flooded habitat beyond this amount will be classified as 55% closed and 45% open to hunting. Therefore, if water availability results in 1,000 or less acres of flooded wetland habitat, no hunting will occur. Since the refuge was established under the authority of the Migratory Bird Conservation Act (MBCA), the Service is authorized to permit hunting on no more than 40% of the total area of the refuge. Based on the existing agreement with CDFG the refuge will open no more than 45% of the flooded wetland acreage which will not exceed 2,828 acres which is less than the allowable 4,247 acres authorized by the MBCA.

On the two days a week when hunting is permitted on the refuge, a check station is staffed by CDFG personnel that monitor all vehicle and pedestrian traffic entering and leaving the refuge. All hunters are checked in as they enter and are again checked as they exit the hunt area. In addition to the obvious safety aspects of ensuring that all hunters are accounted for at the end of the day, hunter success data is collected and hunter bags are checked for compliance with existing hunting regulations. To ensure that non-hunters do not accidentally enter the hunt area, check station personnel will contact all visitors and redirect non-consumptive users away from the hunt area. Alternative wildlife observation opportunities are suggested to these visitors. Never are hunters and non-hunters allowed in the same areas of the refuge. This is done primarily to limit the possible philosophical conflicts over the issue of hunting but also for safety reasons.

The hunting program at Kern conforms to the regulations established by the State of California pursuant to the regulatory framework provided by the Service. This framework is developed each year by the Flyway Councils, States and the Service through a process known as Adaptive Harvest Management which considers, among other factors, resource population levels, habitat conditions, and anticipated harvest levels (Williams and Johnson 1995). In addition to conforming to State and federal regulations, the refuge establishes Special Regulations that are published in the Code of Federal Regulations that further restrict hunter activities and hunting methods. Such restrictions as limiting hunters to 25 shells in their possession in the field helps reduce birds being shot at beyond acceptable ranges and reduces crippling losses. Other Special Regulations limit hunter movements within the spaced blind area, eliminate the use of motors on boats, require the use of non-toxic shot while hunting pheasants and restricts when firearms may be carried while loaded. Some of these restrictions contribute toward achieving a safe and enjoyable hunting experience, while others contribute toward a healthy refuge environment.

Availability of Resources: To facilitate hunting, the Refuge provides adequate staff which includes administrative, managerial, biological, and when available, a Refuge law enforcement officer to perform hunter compliance enforcement. Due to changes in Service policy regarding refuge law enforcement personnel, there may be times when a trained Service law enforcement officer (LEO) will not be available on the refuge in a full time capacity. When this is the case, LEO's from other refuges will be detailed to the refuge to provide the necessary refuge patrol activities. The California Department of Fish and Game provides one full-time and one or two seasonal employees to administer the hunter check station, process hunters, and monitor game taken. Additional law enforcement is provided by California Department of Fish and Game wardens and on occasion, Fish and Wildlife Service special agents.

The public hunting program on Kern NWR and eight other NWR's in California are administered cooperatively with the California Department of Fish & Game under the provisions of a Cooperative Agreement (USFWS 1999). This agreement details the responsibilities and costs associated with the implementation of the hunt program on each refuge and provides a detailed list of costs to be reimbursed to the Service by the State. Some of the cost items listed for reimbursement include: signs, brochures, permit compliance, access control, maintenance of the check station, blinds, and parking lots, and administrative functions such as managerial, biological and clerical support. Each year the State is invoiced for these costs by the Service including an inflation factor. For the 2003-04 hunting season, the reimbursement to the refuge for costs directly associated with the hunt program will be \$11,440. Essentially, the refuge incurs no unreimbursed expenses specifically for administering and monitoring the hunting program.

In addition to staffing the hunter check station and performing refuge clean-up duties, the CDFG staff also performs all refuge sign posting tasks as directed by the Refuge Manager to conform with current habitat conditions.

Anticipated Impacts of the Use: Annual fluctuations in the amount of refuge area open to hunting and consequently the numbers of hunters allowed on the refuge are a direct result of the quantity of fall water the refuge receives and the resulting wetlands flooded. Fluctuations in waterfowl population trends are monitored annually on a continent wide basis by the Service through breeding ground and waterfowl production surveys and migration surveys such as the

mid-winter inventory that is conducted on a flyway wide basis. As stated earlier, this data is analyzed by the Service and other agencies to develop season lengths and bag limits.

Threatened and Endangered Species: There are currently four species found on Refuge that are listed as endangered. The species are San Joaquin kit fox (*Vulpes macrotis mutica*), Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), blunt-nosed leopard lizard (*Gambelia sila*), and Buena Vista Lake shrew (*Sorex ornatius relictus*). Use of the hunter access route as well as the wetland areas of the refuge are very uncommon for the three upland dwelling species, blunt-nosed leopard lizard, Tipton kangaroo rat and San Joaquin kit fox. According to refuge files no confirmed sightings of any of these three species has occurred during the hunting season in the hunt area in the past 20 years. Both the San Joaquin kit fox and Tipton kangaroo rat are nocturnal and are generally not active during times when hunters are using the wetland areas. Since most hunters enter the refuge before sunrise and some wait to exit after sunset there is a remote possibility of these animals being on the public use roads before sunrise or after sunset. However, no documented vehicle strikes with these species have occurred. The refuge has a posted 20 mile per hour speed limit and this limit is enforced to protect all refuge wildlife and to support a safe environment for visitors. Speeding tickets have been issued and warnings are given as needed. The blunt-nosed leopard lizard is hibernating during the cooler months of hunting season so conflicts with hunters is not an issue.

The Buena Vista Lake shrew has been confirmed to occur within the spaced blind portion of the hunting area. However, the habitat occupied by the shrew is along riparian areas where vehicle traffic is prohibited. Its habitat is also off limits to pheasant hunters and no waterfowl hunting blinds are located within 1/4 mile of this habitat. Therefore, the potential for impacts by hunters on this species should not be considered significant. Pheasant hunting is only permitted within the free roam areas of wetland units so impacts from pheasant hunters to any listed species should be no greater than that of waterfowl hunters. Due to the limited nature of the upland pheasant cover where an extensive hunt could impact pheasant population levels and where possible conflicts with listed species could occur, a large scale pheasant hunt involving upland habitat has never been considered and is not being proposed at this time.

Due to the spatial separation of hunting activity and species habitat associations, season of use, as well as restrictions on hunter activity, the possibility of conflicts or impacts by hunters on listed species is very remote.

Migratory Birds: The hunting program is limited to waterfowl, coots, moorhens and ring-necked pheasants only within the wetland areas of the refuge. Therefore human activity may disturb or harm both target and non-target migratory birds only in wetland habitats on the Refuge. Hunters may accidentally take non-target migratory birds due to misidentification; however, this is rare and is usually reported to refuge or CDFG staff by other hunters. A certain level of self enforcement is prevalent with the refuge hunters. Select numbers of waterfowl belonging to target species will be taken by hunters each season, but this is not expected to result in significant adverse effects on their populations. As stated previously, hunting regulation frameworks which include hunting limits are established annually through the adaptive harvest management process which includes factors such as anticipated hunter harvest of waterfowl. These guidelines are proposed for the Pacific Flyway and the State establishes hunting limits which fall within these framework guidelines.

Other Biological Resources: Litter discarded by visitors can entangle wildlife or possibly be ingested, resulting in death or injury. Litter control is a major emphasis item in the routine maintenance of the refuge public use areas. Trash cans and restrooms are provided year round in parking areas for use by the public while involved in wildlife observation, photography, education, interpretation as well as hunting. Additional restrooms and trash cans are provided and maintained by the State during the hunting season. Each year the State employees assigned to the hunt program conduct daily litter patrols following each hunt day, clean the blind areas and levees at least monthly to collect spent shell casings and litter and conduct a major refuge clean-up at the end of the season. During the hunt season the trash cans are emptied daily by CDFG staff and the hunters are encouraged by the State employees to keep the area clean and to use the trash cans provided.

Additional potential impacts to resident and migratory wildlife include the trespass of hunters outside the established hunt zone and dogs harassing wildlife. The hunt area is patrolled on shoot days and refuge employees performing routine work also actively watch for hunters outside of their assigned areas. While hunter trespass may cause a temporary disturbance to wildlife in the immediate vicinity of the activity, this violation is rare and wildlife temporarily displaced have large areas closed to hunting in which to seek refuge. Dogs have not generally been observed harassing wildlife and are required to be kept under close control by the hunters themselves.

Boat hunters have access to the same areas as walk-in hunters within the unit to which they are assigned, but the use of boats allows better distribution of hunters within each unit and in this context contributes to a safer hunting program. All boats are required to be operated without the use of any motors, either gasoline or electric. This restriction greatly reduces the speed of boat travel in the units, nearly eliminates the danger of collisions with other boats, hunters or wildlife in the hunt area, significantly reduces the potential for contamination of water by fuel or battery acid and eliminates the noise and air pollution normally associated with boat motor use.

Temporary impacts to vegetation in very restricted areas of the boat launch sites is probable but no sensitive or listed species of plants or animals are present in these areas. The vegetation in these launch areas is primarily limited to annual grasses and forbs with occasional clumps of shrubs such as mule fat (*Baccharis salicifolius*) and salt bush (*Atriplex sp.*) which rebound rapidly following disturbance. The use of boats as permitted on the refuge is not anticipated to cause any additional impacts to refuge resources or visitors beyond that of walk-in hunters.

As the current hunt program is operated, the main tour route is closed on hunt days since it runs through the area that is hunted. Wildlife viewing opportunities on the two shoot days each week are limited due to this closure. Proposed in the Draft CCP is the creation of a new tour route located in a portion of what is now closed area. If this change is included in the finalized CCP then possible temporary displacement of waterfowl and other birds from a small portion of the closed area in close association to the new tour route is possible. Waterfowl displaced from limited areas within the closed area of Kern seldom move far and very rarely venture into the hunt area where they are impacted by hunters.

Public Review and Comment: During completion of the Kern and Pixley NWR's Master Plans (USFWS 1985), this use underwent public review. A notice of Proposed Action was issued as well as five informational news letters and four news releases. Public comment on this use was

also solicited throughout the development of the Kern and Pixley Draft Comprehensive Conservation Plan (USFWS 2004) beginning with public scoping meetings in 1999 and continuing through the public review of the Draft CCP and Environmental Assessment.

Determination (Check one Below)

Use is not compatible

Use is compatible with stipulations

Stipulations Necessary to Ensure Compatibility:

- I. The refuge will continue to follow the conditions of the agreement by establishing 1,000 acres of sanctuary before wetland habitat is open for public hunting. If 1,000 acres or less of wetland habitat are available due to water restrictions, then no hunting will be allowed for that particular waterfowl hunting season.
- II. Regulatory directional signs, as well as maps, will clearly mark hunting areas (free roam and blind site units), closed areas, and available parking lots. Additional pamphlets at the refuge headquarters will provide further information including special season restrictions, California, and refuge regulations. Signs will be maintained and replaced on an as needed basis.
- III. Law enforcement patrols will be conducted on a routine basis in cooperation with California Department of Fish and Game wardens to ensure regulation compliance and the protection of Refuge resources. All laws applicable to the refuge hunting program included in the Code of Federal Regulations and the State of California Fish and Game Code will be enforced. The Refuge will increase law enforcement patrols when staff is available, particularly during opening weeks of waterfowl hunting season, to document hunter use and ensure compliance with Refuge and California regulations.
- IV. By 2006, a new interpretive kiosk will be installed near the Refuge demonstration pond to inform hunters of refuge habitats as well as wildlife resources and ways to avoid adverse impacts to the resources. Other information will include general hunting and special regulations.
- V. To deter hunters from taking long shots thereby reducing disturbance, decreasing the possibility of target misidentification, and decreasing the crippling loss of target species, waterfowl hunters will be limited to no more than 25 shells while in the field and will be required to use only approved non-toxic shot. Current levels of shell compliance checks will be maintained to keep compliance at current or better rates.
- VI. Annual monitoring of waterfowl hunter use and impacts will continue to be implemented. The information gathered will be used to review and possibly revise hunting regulations to enhance the quality and safety of the Refuge's hunting program, and ensure hunting will continue to be compatible with the Refuge purpose and the mission of the National Wildlife Refuge System.

- VII. Upon final approval of the Kern and Pixley NWR Comprehensive Conservation Plan, a step down Public Use Plan will be developed that will provide management guidelines for operation of the refuge hunting program.
- VIII. The use of boats will be permitted in free roam hunting units where deep water is present but neither gas nor electric motors will be permitted.

Justification: The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. Additionally, the National Wildlife Refuge System Improvement Act of 1997 recognized the importance of connecting people with the land and its resources. Wildlife-dependent recreational activities such as hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation are all important opportunities for making this connection possible.

As early as the 1930's, sportsmen in Kern County became alarmed with the loss of wetlands in the area and began petitioning for the establishment of a refuge in the area. One of the five justifications for establishment of the refuge in 1960 was that the area will provide opportunities for public hunting. The purpose for establishing the refuge was "for use as an inviolate sanctuary or for any other management purpose, for migratory birds." Hunting is recognized as a management activity for migratory birds and therefore, hunting is consistent with the purpose for which the refuge was established.

Hunting is a high priority public use that has occurred on the refuge for over 40 years. The hunting program has been developed and modified over the years to minimize the impact to other users such as bird-watchers and photographers, provide adequate closed areas for waterfowl and other wetland dependent species, restrict hunter access and hunter densities in the hunt areas, protect T&E species from hunter impacts, and ensure that hunters conform to applicable state and federal hunting regulations. These actions have developed a safe program for participants while simultaneously protecting the natural resources on the refuge.

Regulations such as the limit on the number of shells a hunter may possess, the type of shot that may be used and the prohibition of boat motors all contribute to sustaining a healthy environment. Law enforcement patrols and enforcement of regulations limit impacts to non-target species and encourage the ethical and fair take of migratory game birds and pheasants in numbers appropriate for the population levels occurring during a specific season.

Mandatory Re-Evaluation Date (provide month and year):

2019 Mandatory 15-year Re-Evaluation Date (for priority public uses)

 Mandatory 10-year Re-Evaluation Date (for all uses other priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

References Cited:


USFWS, 1999. Cooperative Agreement between U.S. Fish & Wildlife Service and California Department of Fish & Game

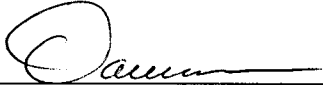
Williams, B.K. and F.A. Johnson, 1995. Adaptive Management and the Regulation of Waterfowl Harvests. The Wildlife Society Bulletin, Vol. 23(3):430-436.

USFWS. 1985. Master Plan, Kern National Wildlife Refuge. U.S. Fish and Wildlife Service, Region I, Portland, Oregon

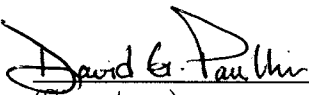
USFWS, 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. CA/NV Refuge Planning Office, Sacramento, CA.

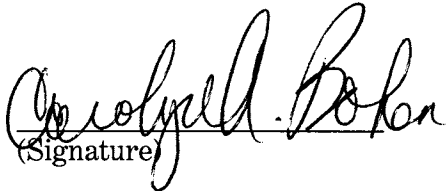
Refuge Determination:


Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Wildlife observation and photography (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge

Establishing and Acquisition Authority:

The Kern National Wildlife Refuge, located in Kern County, California, was established November 18, 1960, under the provisions of the Migratory Bird Conservation Act (16 U.S.C. § 715d).

Refuge Purpose(s):

Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d)

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” [National Wildlife Refuge Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee)]

Description of Use(s):

The Kern National Wildlife Refuge (Refuge) is open to the public daily from sunrise to sunset to engage in wildlife observation and photography along an established 6.5 mile auto tour route, on foot, utilizing established roads and levees found adjacent to the auto tour routes, and from non-motorized boats such as kayak, canoe, and pith boat. The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation and photography as well as hunting, fishing, interpretation, and environmental education as wildlife dependent public uses for NWR’s.

Areas closed to the public are signed as such and primarily include areas designed as sanctuary for waterfowl or habitat for threatened and endangered species. There are no established “trails” specifically designated for this use. Approximately 15 miles of levee roads, excluding the 6.5 mile auto tour route are available for these uses and 1,370 acres of flooded acres are available for these uses via non-motorized boats. Visitors engaged in this use are welcome to walk, not drive, the established roads and levees adjacent to the auto tour route and operate non-motorized boat in units 1 and 2 (see Figure 13 of the CCP). An average of 800 people per year participates in these uses.

The use of non-motorized boats access for wildlife viewing and photography in deep water areas such as Units 1 & 2, and makes access much safer and easier than walking. Boats used for these purposes are normally small, less than 10 feet in length, or canoes capable of holding one or two people. These boats are normally launched from the corners of Units 1 & 2 and the trailers used to transport are then to parking lot 1. Ample space is available in each area to park these vehicles.

Wildlife Observation: Wildlife observation is primarily conducted via auto along the self-guided, 6.5 mile auto tour route, foot access on established levees and roads adjacent to the auto tour route, and by non-motorized boat. Throughout the waterfowl hunt season, the tour route and units open to boating, are closed to all non-consumptive recreation on Wednesdays and Saturdays. This prevents philosophical conflicts over the issue of hunting but is also for safety reasons. Wildlife observation occurs in all habitat types on the refuge including riparian, alkali scrub, marsh/seasonal wetland, alkali playa, moist soil, and valley grassland all of which are accessible along the auto tour route and adjacent established levee roads.

A pamphlet is available at the kiosk or at the Refuge Headquarters which provides information for 10 interpretive stops along the auto tour route, as well as other general Refuge information. Interpretive panels have been placed along the tour route which provides additional information of wildlife and their respective habitats observed along this route. There are no interpretive panels along the auxiliary levees adjacent to the auto tour route.

Wildlife Photography: Wildlife photography will occur on the refuge and along the self-guided auto tour route, established roads and levees, and via non-motorized boats in units 1, and 2. Photographers, searching for a more unstudied photo opportunity than wildlife found along the auto tour route, will be allowed to seek out these opportunities along auxiliary levees and areas by boat. Commercial photography, or other forms of image capturing, requires a Special Use Permit issued by the refuge. Economic uses of natural resources are authorized on national wildlife refuges where the use is determined to be compatible and contributes to the accomplishment of the specific refuge purpose where the use is to take place (50 CFR 29.1). Economic uses on national wildlife refuges can include for example, timber removal, grazing of livestock, mineral extraction, or uses which facilitate approved programs on national wildlife refuges. Commercial photography, while very rare, would require a Special Use Permit. There are currently two photography blinds planned as part of the Comprehensive Conservation Planning process. Existing disabled waterfowl hunter blinds are available for photographing wildlife after the waterfowl hunting season beginning in early February and extending through early October.

Availability of Resources: Adequate funding and staff exist to meet the maintenance, monitoring, and management needs of the auto tour route for wildlife observation and wildlife photography. Activities include but are not limited to road and interpretive panel upkeep as well as updating pamphlets and replacing closed area signs. Estimated personnel and supply costs for grading roads (3 times per year), mowing road shoulders (4 times per year), cleaning litter from road shoulders, and adding road material where necessary annually totals \$5,000. Additionally, \$500 is expended to cover personnel costs and supplies for printing, updating, and stocking pamphlets. Administrative costs associated with issuing special use permits and monitoring visitor compliance and impacts from these uses is anticipated to be low based on past visitor use levels. With anticipated increases in these activities, these costs will increase accordingly but should not exceed \$1,000 per year. Further information regarding resources related to this use can be viewed in the Compatibility Determination for Environmental Education and Interpretation. By 2006, 2 new photography blinds will be constructed at an estimated cost of \$1,200 including labor and materials. A minimum fee of \$100.00 will be assessed to those engaging in commercial photography on the Refuge.

For information on road maintenance and additional coast analysis regarding these uses, please refer to the Environmental Assessment for the 2004 Draft Comprehensive Conservation Plan (USFWS 2004).

Anticipated Impacts of the Use:

Threatened and Endangered Species: Human activity has had adverse impacts on threatened and endangered species found in the Southern San Joaquin Valley (Germano and Williams 1993), (Williams 1985) and (Orloff et al. 1986). There are currently 4 species found on the refuge that are listed as endangered; San Joaquin kit fox (*Vulpes macrotis mutica*), Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), blunt-nosed leopard lizard (*Gambelia sila*), and Buena Vista Lake shrew (*Sorex ornatus relictus*). Impacts to these species are considered non-adverse as San Joaquin kit fox and Tipton kangaroo rats are generally not active during the time when the general public is on the refuge. San Joaquin kit fox and Tipton kangaroo rats have been observed in areas on the Refuge which consist of upland habitats, most of which is closed to public access. Blunt-nosed leopard lizards are diurnal, and therefore have a higher risk for adverse impacts, in particular through auto strikes. The speed limit on the auto tour route is regulated to 20 mph, providing ample time to slow and stop for wildlife. When necessary refuge staff remind visitors of the posted speed limit as no law enforcement officers are currently employed at the Refuge. Immediate habitat where the Buena Vista Lake shrew has been found is open to foot traffic only. Due to the sensitivity of the habitat area the public is discouraged from entering the area. Other impacts from auto traffic could involve temporary displacement of an animal from its living quarters, feeding, or breeding sites.

According to Refuge biological files, there are no known auto strikes of threatened or endangered species along the auto tour route.

For additional information on impacts to threatened and endangered species regarding this use, please refer to the Environmental Assessment for the 2004 Draft CCP (USFWS 2004).

Migratory Birds: Human activity involved with this use may disturb migratory birds utilizing the refuge's habitats primarily during feeding and breeding activities (Korschgen and Dahlgren 1992). Several species of ground nesting birds on the refuge include killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), and various waterfowl. White-faced ibis (*Plegadis chihi*) and tricolored blackbirds (*Agelaius tricolor*) also breed on the refuge. The use of boats will be prohibited after March 1 to prevent disturbance of nesting species. The previously mentioned species can be migratory, leaving wintering areas for breeding areas, or resident, living in the same area year-round. Short-term impacts to these species occur when they are temporarily displaced from marsh/seasonal wetland edge nests and roadside habitat as vehicles or people on foot pass by.

These disturbances are not vastly different than those which result from normal refuge operations that include large farm equipment and conducting of biological surveys. This displacement typically occurs during the breeding season, late March through early August, when avian species rearing young is at its peak, and for lengths of time ranging from 3-10 minutes. Monitoring and adjustable management of these uses will be implemented to ensure that impacts remain within

acceptable levels. Participation in these uses via non-motorized boat will be allowed between 1 September and 1 March to avoid impacts and disturbance to breeding and rearing of young.

Disturbances by the public will be more frequent during March-April, as the weather is of a mild nature. Public use of this type lessens considerably as the temperatures increase, May-August. Long-term positive impacts involve primarily the public's appreciation of the National Wildlife Refuge System, a long lasting education and appreciation of natural resources in the Southern San Joaquin Valley, and the importance of the Refuge in the Pacific Flyway.

Other possible adverse impacts due to disturbance of nesting migratory birds could involve nest failure, increased chick depredation, nest abandonment (Sowles 1955), and unknown long-term population declines. Human disturbance to waterfowl has been found to be of greatest impact by uses involving motorized boats, fishing, and hunting (Korschgen and Dahlgren 1992). These impacts are avoided on the refuge as fishing is not allowed, hunting occurs during the winter months when birds are not breeding, and only non-motorized boats are allowed between 1 September and 1 March during the non-breeding season.

Kern NWR was established and is managed for wintering waterfowl populations in the Southern San Joaquin Valley. Continuation of these uses on the Refuge is supported by the mission of the Refuge System and purpose for which the Refuge was created.

Refuge Habitats: Impacts to Refuge habitats, including riparian, alkali scrub, marsh/seasonal wetland, alkali playa, cultivated cropland, and valley grassland could be of concern if visitors are not restricted to the roads and levees. Impacts could involve the trampling of vegetation and displacement of wildlife. Closed area signs along the auto tour route and levee roads, are currently posted to prevent adverse impacts to refuge habitats. Visitors are allowed to walk or drive along these designated routes provided the area is not posted as closed.

Use of non-motorized boats gives visitors safer access to deep water areas for better wildlife viewing and photography opportunities. All boats are required to be operated without the use of any motors, either gasoline or electric. This restriction greatly reduces the speed of boat travel in the units and nearly eliminates the danger of collisions with other boats or wildlife, significantly reduces the potential for contamination of water by fuel or battery acid and eliminates the noise and air pollution normally associated with boat motor use.

Temporary impacts to vegetation in very restricted areas of the boat launch sites is probable but no sensitive or listed species of plants or animals are present in these areas. The vegetation in these launch areas is primarily limited to annual grasses and forbs with occasional clumps of shrubs such as mule fat (*Baccharis salicifolius*) and salt bush (*Atriplex sp.*) which rebound rapidly following disturbance. The use of boats as permitted on the refuge is not anticipated to cause any additional impacts to refuge resources or visitors beyond that of walk-in visitors.

Other Biological Resources: Litter discarded by visitors can entangle wildlife or possibly be ingested, resulting in death or injury. This has not posed a problem in the past and is not expected to increase as visitation increases. Additionally, adequate facilities for garbage disposal exist. Garbage disposal cans are found within the boundaries of three public parking areas as well as at Refuge headquarters. Restrooms are available for visitor use at Refuge headquarters and at the public parking areas along the auto tour route.

Public Review and Comment: During completion of the Kern and Pixley NWR's Master Plans (USFWS 1985), this use underwent public review. A notice of Proposed Action was issued as well as five informational news letters and four news releases. Public comment on this use was also solicited throughout the development of the Kern and Pixley Draft Comprehensive Conservation Plan (USFWS 2004) beginning with public scoping meetings in 1999 and continuing through the public review of the Draft CCP and Environmental Assessment.

Determination: (Check One Below)

Use is not compatible Use is compatible

Stipulations Necessary to Ensure Compatibility:

Regulatory and directional signs will clearly mark the tour route and areas along this route which are closed to the public as well as areas open to non-motorized boats.

Non-consumptive uses will not be allowed to occur within the hunt area on shoot days, Wednesdays and Saturdays, throughout the waterfowl hunting season.

Use of non-motorized boats for these uses will be allowed between 1 September and 1 March, excluding Wednesdays and Saturdays during the waterfowl hunting season.

Maps and public use information are to be made available at the kiosk at the entrance to the Refuge as well as at the Refuge Headquarters.

Participation in these activities by groups of 3 boats or greater will require a Special Use Permit.

Seasonal closures of specific auxiliary dikes will be posted if necessary. Closures will be in place due to rain and muddy road conditions or general refuge maintenance in order to maintain public safety and to prevent damage to roads when they are wet. Additional closures to these uses will occur on Wednesdays and Saturdays during the waterfowl hunting season.

Access to the Refuge will be allowed only between sunrise and sunset unless a special use permit is obtained from the Refuge Manager to engage in this use during alternative hours.

By 2006, a new interpretive kiosk will be installed near the refuge demonstration pond to inform visitors of habitats and wildlife resources on the refuge and ways to avoid adverse impacts to the resources including remaining on existing roads, keeping a respective distance from nesting birds, and alternative wildlife viewing opportunities during the waterfowl hunt season.

A minimum of a \$100 fee for commercial photography Special Use Permits will be collected.

The refuge currently has no law enforcement officers on staff to monitor this use. Refuge staff will periodically monitor activities of visitors participating in these activities to ensure compliance. In the event that participants in these activities do not comply with refuge rules and regulations and impacts associated with this use are observed, adaptive management measures will be taken.

Some adaptive management measures taken will involve, but not be exclusive to, fencing the public from sensitive areas, reviewing signed areas and making appropriate changes, or closing specific areas to public access.

Justification: Wildlife observation and photography are public uses that will allow the visitors to enjoy and experience native wildlife, plants, and habitats. Since the majority of the land near and adjacent to the refuge has been highly modified and converted to agriculture, and is held in private ownership, the refuge plays an important role in allowing the public to view and experience animals in a local, natural setting. Regulatory and directional signs, as well as maps and pamphlets, provide the necessary information for the public to enjoy the refuge wildlife while reducing long-term adverse impacts to wildlife and habitats on the refuge.

As expressed priority uses of the Refuge system, these uses take precedence over other potential public uses in Refuge planning and management. The Service strives to provide priority public uses when compatible with the purpose of the Refuge and the mission of the National Wildlife Refuge System.

These uses, when conducted in accordance with the stipulations, will not be expected to result in adverse impacts to refuge resources, and may benefit these resources by helping increase public awareness of refuge resource. Proposed wildlife observation and photography via non-motorized boat conducted in accordance with the stipulations herein will be compatible with the refuge purpose and the National Wildlife Refuge System mission.

Mandatory Re-evaluation Date (provide month and year):

2019 Mandatory 15 year Re-evaluation Date (for priority uses)

_____ Mandatory 10 year Re-evaluation (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

References Cited:

Germano, D.J. and D. F. Williams. 1993. Recovery of the Blunt-nosed Leopard Lizard: Past Efforts, Present Knowledge, and future Opportunities. Trans. West. Sec. Wildl. Soc. 28:38-47.

Korschgen, C.E. and R.B. Dahlgren. 1992. Human Disturbances of Waterfowl: Causes, Effects, and Management. USFWS, Fish and Wildlife Leaflet 13.2.15, pp 1-8.

Orloff, S.G., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. *Trans. West. Sect. Wildl. Soc.* 22:60-70.

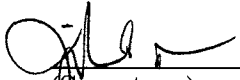
Sowles, L.K. 1955. "Prairie Ducks." Wildlife Management Institute, Washington, D.C.


USFWS. 1985. Master Plan, Kern National Wildlife Refuge. U.S. Fish & Wildlife Service, Region I, Portland, Oregon.

USFWS, 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. CA/NV Refuge Planning Office, Sacramento, California

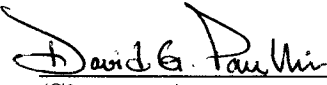
Williams, D.F. 1985. A Review of the Population Status of the Tipton Kangaroo Rat, *Dipodomys nitratoides nitratoides*. U. S. Fish and Wildlife Service, Sacramento, Non-game Wildl. Invest., Final Rep. E-W-R, IV-10.0 48 pp.


Refuge Determination


Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Environmental Education and Interpretation (Alternative C, Kern and Pixley National Wildlife Refuge Complex Draft Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge

Establishing and Acquisition Authority:

The Kern National Wildlife Refuge, located in Kern County, California, was established November 18, 1960, under the provisions of the Migratory Bird Conservation Act (16 U.S.C. § 715d).

Refuge Purpose(s):

Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d)

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” [National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee)].

Description of Use(s):

The Kern National Wildlife Refuge (refuge) proposes to enhance existing environmental education by strengthening existing partnerships with area schools, universities, conservation groups and other organizations such as California Regional Environmental Education Community (CREEC). Environmental education and interpretation have been identified as priority public uses for National Wildlife Refuges by the National Wildlife Refuge System Improvement Act of 1997.

The refuge has developed an educator’s guide and plans to develop more environmental education and interpretive materials that will include a new general refuge brochure, as well as various endangered species and native habitats fact sheets. To further accomplish this purpose, the refuge will also utilize existing National Wildlife Refuge System environmental education items such as those concerning wetlands and the ecology of migratory birds. These materials will serve to interpret the value of local wildlife and their respective habitats and the importance of the refuge and the National Wildlife Refuge System in conserving their biological integrity.

The refuge supports populations of endangered species such as Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), blunt-nosed leopard lizard (*Gambelia sila*), Buena Vista Lake shrew (*Sorex ornatus relictus*), and San Joaquin kit fox (*Vulpes macrotis mutica*). Other species found on the refuge that are of concern to the State of California and the federal government are tri-colored blackbirds (*Agelaius tricolor*) and burrowing owl (*Athene cunicularia*). The Refuge is an important location on the Pacific Flyway providing habitat for thousands of wintering waterfowl

species such as canvasback (*Aythya valisineria*), mallard (*Anas platyrhynchos*), and green-winged teal (*Anas crecca*) as well as various species of shorebirds during winter and spring months.

The refuge is currently open to the public everyday from sunrise to sunset to engage in environmental education and interpretation along an established 6.5 mile auto tour route and on foot, utilizing established roads and levees. There are no established “trails” for this use. Approximately 15 miles of levee roads, excluding the 6.5 mile auto tour route, are available for this use via foot. Visitors engaged in this use are welcome to walk, not drive, the established roads and levees adjacent to the auto tour route. Additionally, these activities will also occur near the refuge demonstration pond near the main headquarters building at the site of the proposed refuge kiosk to be completed in 2006.

The refuge currently has no interpretive or educational displays at its headquarters facilities and environmental education materials are somewhat sparse. Several educational and conservation organizations utilize the refuge for educational purposes, typically during the winter and spring months. Some of these organizations include Kern Audubon Society, Tulare Audubon Society, Tehachapi Mountain Birding Club, local museum groups, area historical societies, as well as groups from California State University Bakersfield and local elementary schools. Estimates for this use which involves conservation groups conducting environmental education and interpretation on the refuge averages 800 persons a year.

The refuge currently engages in environmental education and interpretation to illustrate the importance of native habitats for threatened and endangered species as well as those habitats for migratory birds, particularly waterfowl and resident wildlife. Tours are scheduled on a call-in basis and duties are shared among refuge staff. Tours are varied depending upon the groups request. Requests can focus on migratory bird resources, water use, habitat management, or a combination of the three. School groups which request a refuge educator’s guide are encouraged to request an additional environmental education game/activity as a part of the tour request.

A pamphlet is currently available at the existing kiosk or at the refuge headquarters that provides information for 10 interpretive stops along the self-guided auto tour route, as well as other general refuge information. Interpretive panels have been placed along the tour route and provide information on wildlife and their respective habitats.

By 2006, a new kiosk located near the refuge demonstration pond, will be built and will provide the following information:

1. An orientation map showing the location of the auto tour route, levees and roads available for foot and auto traffic, and other specific regulations.
2. A display panel which illustrates the National Wildlife Refuge System.
3. Interchangeable sign detailing the hunting season and applicable changes.
4. Spaces for various pamphlets including new general refuge brochure, species list, and wildlife fact sheets.
5. A history of the Southern San Joaquin Valley and its related wildlife resources illustrating wetland resources from pre-European arrival to the present.

This new kiosk and interpretive signs will be larger than the existing kiosk and will provide visitors with information on the various refuge habitats including marsh/seasonal wetland, alkali playa, valley grassland, moist soil, alkali scrub, and riparian. Information will include species found on the Refuge with emphasis on migratory waterfowl and their related habitats, threatened and endangered species, and ways visitors can minimize impacts to wildlife resources and their related habitats.

While most environmental education and interpretation will enlighten the visiting public concerning migratory waterfowl and localized endangered species, other educational aspects will acquaint the public to the National Wildlife Refuge System and the mission of the U.S. Fish and Wildlife Service.

Availability of Resources: Presently, adequate funding and staff meet the current needs for an environmental education and interpretive program at existing visitation rates, but as demand increases, new funding sources will need to be identified. Area schools are requesting hands-on nature activities to emphasize particular curricula topics concerning the environment and to provide students with a well rounded Refuge experience. Approximately \$90,000 will be needed for the proposed environmental education and interpretation materials, and building a kiosk with an outdoor education orientation area. In anticipation of increased use in this area, an outdoor recreation planner will be needed at an initial start up sum of \$128,000. The Refuge is currently pursuing and will continue to pursue various areas of funding for this use including grant opportunities, partnerships with non-governmental groups, resource sharing with other agencies, and volunteer recruiting.

For information on road maintenance and additional cost analysis associated with these uses, please refer to the Environmental Assessment for the 2004 Draft Comprehensive Conservation Plan (USFWS 2004).

Anticipated Impacts of the Use(s):

Threatened and Endangered Species: Human activity has had adverse impacts on threatened and endangered species found in the Southern San Joaquin Valley (Germano and Williams, 1993), (Williams 1985), and (Orloff et al. 1986). There are currently four species found on Refuge that are listed as endangered. The species listed as endangered are San Joaquin kit fox (*Vulpes macrotis mutica*), Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), blunt-nosed leopard lizard (*Gambelia sila*), and the Buena Vista Lake shrew (*Sorex ornatus relictus*). Impacts to these species are not considered adverse as San Joaquin kit fox and Tipton kangaroo rats are generally not active during the time when the general public is on the refuge. There are no known denning sites on the Refuge of San Joaquin kit fox, the most recent sightings of this species being south of the Refuge on private property. While blunt-nosed leopard lizards are diurnal, and therefore have a higher risk to be struck by autos, the speed limit on the auto tour route is regulated to 20 mph, providing ample time to slow and stop for wildlife. Additionally, areas along the tour route open to auto access are not optimal blunt-nosed leopard lizard habitat. According to Refuge files, there are no known auto strikes of blunt-nosed leopard lizard, Tipton kangaroo rats, or San Joaquin kit fox on the auto tour route. When necessary refuge staff on occasion reminds visitors of the posted speed limit as no law enforcement officers are currently employed at the Refuge. Immediate habitat where Buena Vista Lake shrew has been found is closed to the public. This habitat type is

found a minimum of 1000 feet from the auto tour route. Other impacts from auto traffic could involve temporary displacement of an animal from its living quarters, feeding, or breeding sites.

For additional information on impacts to threatened and endangered species regarding this use, please refer to the Environmental Assessment for the 2004 Draft Kern and Pixley National Wildlife Refuges Comprehensive Conservation Plan (USFWS 2004).

Migratory Birds: Some individuals belonging to species of ground nesting birds are year-round residents of the Refuge. These species include killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*) and American avocet (*Recurvirostra americana*). Various waterfowl species are present during early fall through early summer. The previously mentioned species can be migratory, leaving wintering areas for breeding areas, or resident, living in the same area year-round. Short-term impacts to these species occur when they are temporarily displaced from marsh/seasonal wetland edge nests and roadside habitat as vehicles or people pass by or stop on the self-guided auto tour route and along established roads and levees. This displacement typically occurs during the breeding season, late March through early August, and for lengths of time ranging from 3-10 minutes. Monitoring and adaptive management of this use will be implemented to ensure that impacts remain within acceptable levels.

These disturbances are not vastly different than those resulting from normal Refuge operations that may include movement of large farm equipment, transportation of employees to and from a work site, and conducting biological surveys. Disturbances by the public will be more frequent especially during the early breeding season, March-April, as the weather is of a mild nature. Public use of this type lessens considerably as the temperatures increase, May-August. These types of uses generally occur as group participation in environmental education and interpretation activities, minimizing the impacts to migratory birds and other wildlife by gathering a visiting group together, in one area or vehicle. Long-term positive impacts include the public's long lasting education and appreciation of natural resources in the Southern San Joaquin Valley, the importance of the Refuge in the Pacific Flyway, and the National Wildlife Refuge System.

Possible adverse impacts due to disturbance of nesting migratory birds could involve nest failure, increased chick depredation, nest abandonment (Sowls 1955), and unknown long-term population declines. Human disturbance to waterfowl has been found to be of greatest impact by water uses involving motorized boats, fishing, and hunting (Korschgen and Dahlgren 1992). These impacts are avoided on the refuge as fishing is not allowed, hunting occurs during the winter months when birds are not breeding, and only non-motorized boats are allowed between 1 September and 1 March during the non-breeding season.

The refuge was established and is managed for wintering waterfowl populations in the Southern San Joaquin Valley. Continuation of education and interpretation activities on the Refuge is supported by the purpose for which the refuge was created

Refuge Habitats: Impacts to refuge habitats including riparian, alkali scrub, marsh/seasonal wetland, alkali playa, moist soil, and valley grassland could be of concern if visitors do not confine environmental education activities to established roads and levees, as required. These impacts have not been observed from visitors engaged in this use in the past. Closed area signs along wildlife viewing routes are currently posted to protect against adverse impacts to refuge habitats. Insuring this use results in minimum impacts will be accomplished by Refuge staff who accompany groups while leading interpretive talks. Staff will send the refuge environmental

education guide to groups wishing to partake in this use. Part of the text includes specific rules and regulations concerning impacts to wildlife.

Other Biological Resources: Litter discarded by visitors can entangle wildlife or possibly be ingested, resulting in death or injury. This has not posed a serious problem in the past and is not expected to as visitation increases. Additionally, adequate facilities for garbage disposal exists to all Refuge visitors. Refuse disposal cans are found within the boundaries of three public parking areas as well as refuge headquarters. Restrooms are available for visitor use at Refuge headquarters and at one of the public parking areas along the auto tour route.

Public Review and Comment: Public comment on this use was solicited during an August 1999 public scoping workshop as associated with the Environmental Assessment for the Draft Kern NWR Complex Comprehensive Conservation Plan. All comments that were received were positive in nature and focused on increasing Refuge visibility and outreach. Two other comments received suggested that an alternative auto tour route be developed for this use thereby allowing visitors to engage in environmental education and interpretation on Wednesdays and Saturdays, during the waterfowl hunting season.

Determination: (Check One Below)

Use is not compatible Use is compatible

Stipulations Necessary to Ensure Compatibility: In order to allow environmental education and interpretation to occur on Refuge, the following provisions will be followed:

Educators and other groups who wish to visit the Refuge to independently instruct a classroom group or have refuge staff conduct environmental education and interpretation during their visit will receive a Kern NWR Educators Guide. The Educators Guide will be obtained by phoning and requesting a copy before scheduling a tour or trip. Other materials will be provided that include endangered species fact sheets, the refuge fact sheet, and auto tour route informational brochures. Special Use Permits will not be required for independent groups visiting the Refuge to engage in this use.

Seasonal information will be given which advises visitors of the special needs of breeding migratory birds to minimize disturbance.

Sign replacement/installation will be prioritized to keep visitors out of sensitive areas.

Group visitation will be encouraged over individual visitation by persons engaged in these uses. Groups will be encouraged to conduct environmental education and interpretation in established areas (i.e. refuge tour route and new and existing kiosk areas) to lessen impacts to wildlife.

As the need increases, the refuge will recruit volunteers or interns to assist with providing environmental education and interpretive tours.

By 2006, a new kiosk near the Refuge demonstration pond will be built to inform visitors and those engaged in environmental education and interpretation of the refuge's habitats and the wildlife

that depend on them. This kiosk will also illustrate refuge rules and regulations, as well as a history of the Southern San Joaquin Valley.

Access to the refuge will be allowed only between sunrise and sunset unless a special use permit is obtained from the project leader to engage in this use during alternative hours.

The project leader has the authority to close certain areas to interpretive programs, or to cancel activities as he or she deems necessary.

Public access will be restricted to auto tour route and established roads and levees which will result in minimal impact to listed breeding and wintering species.

The refuge currently has no law enforcement officers on staff to monitor this use. Refuge staff will periodically monitor activities of visitors participating in this use to ensure compliance. In the event this use is not being adhered to and impacts associated with this use are observed, adaptive management measures will be taken. Some adaptive management measures taken will involve, but not be exclusive to, fencing the public from sensitive areas, reviewing signed areas and making appropriate changes, or closing specific areas to public access.

Justification: The goals of the National Wildlife Refuge System include providing an understanding and appreciation of fish and wildlife ecology and the human role in the environment, and providing refuge visitors with high-quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife, to the extent these activities are compatible with the purpose for which a refuge was established and the mission of the System. In addition, the National Wildlife Refuge System Improvement Act of 1997 identifies environmental education and interpretation as priority wildlife dependent public uses for National Wildlife Refuges, along with hunting, fishing, wildlife observation and photography. As expressed priority public uses of the National Wildlife Refuge System, these uses take precedence over other potential public uses in refuge planning and management.

These uses, when conducted in accordance with the stipulations, will not be expected to result in adverse impacts to refuge resources, and may benefit these resources by helping increase public awareness of refuge resource. Proposed wildlife dependant public uses including environmental education and interpretation conducted in accordance with the stipulations herein will be compatible with the refuge purpose and the System mission.

Mandatory Re-evaluation Date (provide month and year):

2019 Mandatory 15 year Re-evaluation Date (for priority uses)

_____ Mandatory 10 year Re-evaluation (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

References Cited:

Germano, D.J. and D. F. Williams. 1993. Recovery of the Blunt-nosed Leopard Lizard: Past Efforts, Present Knowledge, and future Opportunities. *Trans. West. Sec. Wildl. Soc.* 28:38-47.

Korschgen, C.E. and R.B. Dahlgren. 1992. Human Disturbances of Waterfowl: Causes, Effects, and Management. USFWS, Fish and Wildlife Leaflet 13.2.15, pp 1-8.

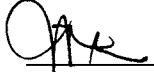
Orloff, S.G., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. *Trans. West. Sect. Wildl. Soc.* 22:60-70.

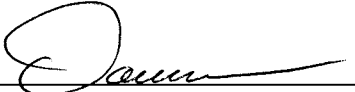
Sowles, L.K. 1955. "Prairie Ducks." Wildlife Management Institute, Washington, D.C.

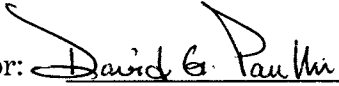
USFWS. 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. CA/NV Refuge Planning Office, Sacramento, CA.

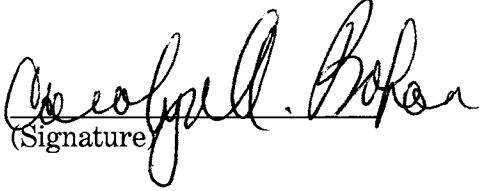
Williams, D.F. 1985. A Review of the Population Status of the Tipton Kangaroo Rat, *Dipodomys nitratoides nitratoides*. U. S. Fish and Wildlife Service, Sacramento, Non-game Wildl. Invest., Final Rep. E-W-R, IV-10.0 48 pp.


Refuge Determination

Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence
Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Grazing program to provide suitable habitat for the endangered Tipton kangaroo rat, blunt-nosed leopard lizard, and San Joaquin kit fox. (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge

Establishing and Acquisition Authority:

The Kern National Wildlife Refuge, located in Kern County, California, was established November 18, 1960, under the provisions of the Migratory Bird Conservation Act (16 U.S.C. § 715d).

Refuge Purpose(s):

Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C.S. §715d)

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” [National Wildlife Refuge Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee)]

Description of Use: The Kern National Wildlife Refuge (refuge) will administer a grazing program, which occurs on approximately 2,377 acres of upland habitat on the western side of the refuge; in the grassland areas of units 11 and 12 (see Figure 12, Kern CCP). This use has been occurring on the refuge since 1962 (USFWS 1962). The refuge will continue to administer this use as outlined in this Compatibility Determination. Although grazing is not identified as a wildlife dependent public use by the National Wildlife Refuge System Improvement Act of 1997, grazing will allow the refuge to manage non-native grassland habitats on the Refuge. This use will provide short sparse vegetation to provide suitable foraging and denning habitat for endangered San Joaquin kit foxes (*Vulpes macrotis mutica*), blunt-nosed leopard lizards (*Gambelia sila*), and Tipton kangaroo rats (*Dipodomys nitratooides nitratooides*). Habitat is provided in the form of introduced and native grasses as well as associated native plant food resources, introduced grasses making up a higher overall percentage of the short-grass environment.

The optimal time for grazing begins in November and given winter and spring rainfall, may continue through late April. Prior to the beginning of the grazing season, an assessment is made to determine the amount of residual dry matter (RDM) available to the cattle. The number of cattle allowed to graze on the refuge, for a specific amount of time, varies with the amount of local rainfall. Because grazing on the Refuge supports endangered species, this RDM level is linked to the needs of the endangered species and not the needs of the cattle. This RDM is determined by clipping, drying, and then weighing the amount of RDM in representative samples from the unit

cattle are to graze and varies upon temperature, monthly rainfall, and the density of new grass/forb growth. Provided that the amount of RDM is less than 800 lbs./acre, prior to or anytime during the grazing season, the refuge manager may request that the permit holder reduce the number of cattle grazing in that unit or remove them all together in order to prevent degradation of the resources in the unit.

Only the grazing of cattle is to be considered on the refuge; grazing by sheep, goats, or other creatures such as bison will not be considered. During drought years or years of low rainfall, cattle will not be allowed to graze on the refuge.

The timing of the placing of cattle on the refuge are termed turn in dates (November 1 or slightly later) and are adjusted year to year based upon the date of the first effective germinating rainfall, and the amount of dry forage available in the fall (Stechman 1995). The timing of removing cattle from the refuge is termed turn out dates and is determined solely on the amount of RDM within the unit. If and when 800 lbs per acre or less is achieved cattle will be removed from the unit.

The unit of measure used to summarize the quantity of cattle grazing on the refuge is termed Animal Unit Month (AUM). AUM is defined as the amount of forage needed by an “animal unit” (AU) grazing for one month. An AU is defined as one mature 1,000 pound cow and her sucking calf. An assumption in this definition is that a cow nursing her calf will consume about 26 pounds of dry matter per day. Other types of livestock are assigned AUM equivalents based on size and consumption.

The grazing cooperator is chosen following guidance in U.S. Fish and Wildlife Service Refuge Manual under heading 5 RM 17. At the time of this writing, there are no anticipated changes to grazing on the refuge.

Availability of Resources: Assistant refuge managers, under the direction of the project leader, will manage the grazing program. The permittee, working under a Cooperative Land Management Agreement, will accomplish certain facility management and improvement projects under the direction of the assistant manager. Accomplishments will be in direct support to the refuge grazing program; these projects may include maintenance or improvements of existing facilities or installation of new facilities. Projects may include installing and/or maintaining water control structures; fence installation, repair, or removal; sign repair, removal, or installation, gate installation, road, building, or deep well maintenance as well as vegetation control around facilities. The permittee is responsible for the cost of maintenance and/or installation of edifices associated with their grazing permit. Facilities that are installed primarily for refuge purposes are constructed or maintained at refuge expense. All projects will be agreed upon before the beginning of the grazing season and will directly support the unit being grazed.

Rates charged per AUM are based on a grazing rate survey of comparable grazing pastures that was conducted in 1995. Each year the current rate is established by adjusting the base rate using a formula created by LaCuesta Consulting that incorporates the average California beef cattle price from the previous year (Stechman 2003). This report was completed in March of 2003 and is updated every five years; all grazing fees are adjusted on a year to year basis based on fluctuations in annual beef prices. Receipts received from permittee(s) at the end of the grazing season are submitted to the General Fund.

At the end of each grazing season, the permittee submits information sufficient for refuge managers to calculate total AUM's for that particular grazing period. When AUM's are calculated, a bill is then submitted to the permittee for collection. Final billing will also take into consideration funds and in kind contributions furnished by each permittee as outlined in their individual Cooperative Land Management Agreements. These work contributions will be deducted on the permittee's final bill with proof of receipt or performed labor. Work contributions of this type will be associated with improvement projects for the particular grazed unit.

The refuge receives adequate funding to cover the costs associated with management of the grazing program including the RDM assessment conducted at the end of every grazing season. Staff costs associated with this use emanates from the annual review of Special Use Permits, Cooperative Land Management Agreement, and monitoring the impacts of this use as outlined in the grassland management plan. Annual costs to manage the grazing programs on both Kern and Pixley refuges averages \$3,000.00. Management of this use also involves monitoring resource impacts associated with this use on the short-grass environments as well as to endangered species. Funds provided to the refuge to manage this use are derived from the collection of refuge grazing receipts.

Anticipated Impacts of the Use: To provide this use, the refuge has adequate staff which includes biological, administrative, and managerial personnel. The grazing program results in both long and short term effects, both negative and positive. The Amended Biological Opinion (USFWS 2004) for Kern and Pixley National Wildlife Refuges Comprehensive Conservation Plan identified the following possible short and long-term negative impacts to wildlife resources from grazing: Trampling of desirable vegetation, disturbances to ground nesting species, trampling of rodent burrows, fencing that may restrict the movements of large animals, and soil compaction especially during wet periods. The ABO recommended the following activities to minimize negative impacts associated with grazing: Acquiring additional land with suitable habitat, allowing the use in years of adequate rainfall only, and supporting grazing within the same unit areas and not moving animals to un-grazed or sensitive areas.

Conversely, short and long-term positive impacts include an overall reduction of undesirable, non-native vegetation, as well as the re-establishment of native grass, forb, and shrub communities. The refuge was established on land which was previously used for the grazing of cattle and other ungulates. To provide adequate food for the grazing livestock, non-native grasses were seeded and encouraged. At the time of purchase, it was estimated that 85% of the refuge was covered in non-native grasslands. An impact of cattle to existing water supplies is negligible. Water is brought in to cattle from a well located off refuge. Water from the well is delivered, through a buried plastic pipe to a large, 2,000 gallon water tank then gravity fed to cattle troughs. To minimize negative impacts, the location of the plastic pipe will not change as well as the location of cattle troughs.

Sedimentation and erosion impacts are not an issue as there are no streams or creeks on the Refuge to be degraded, the topography is flat and annual rainfall is less than 7 inches.

While studies to determine the effects of grazing on local threatened and endangered species have been conducted on the refuge and surrounding lands in the Southern San Joaquin Valley and these studies have indicated a benefit from decreased vegetation to these species (Williams 1985) and (O'Farrell 1983), the duration and timing needed for optimal benefits is poorly understood. Part of the reason for a lack of strong correlative evidence is placed on an inconsistent annual

rainfall, where a consistent average rainfall will support data indicating either positive or negative impacts to local species from grazing.

While cowbirds are present on the Refuge, the potential for their population to increase resulting in an increase in nest parasitism on the resident and breeding songbirds, due to this use would not be considered adverse for the following reasons: The Refuge is not providing a resource that would attract or retain cowbird populations such as food (grains); the nesting substrate in the areas grazed are undesirable to many nesting songbird species resulting in a low number of nesting songbirds on the Refuge; and this use would occur in an area identified as sink scrub habitat and not within or adjacent to riparian habitat where an increase in cowbird numbers and an increase in nest parasitism on nesting songbirds is more common (per. Comm. Williams 2004).

Another endangered species, the Buena Vista Lake shrew (*Sorex ornatulus relictus*), is found in riparian habitats on the refuge. On the refuge, riparian habitat areas are not grazed by cattle and shrews are not located in the upland areas of the refuge where cattle will graze. Periodic surveys will provide presence/absence data for this species throughout the refuge.

Additionally, cattle are grazed in areas which are closed to the public and also are out of direct view of the general public. These grazed areas are fixed and grazing will not be rotated to area in direct view of the public.

Impacts to known cultural resources from this use are negligible. Arguelles and Moratto (1982) identified and reviewed known sites containing cultural resources on the refuge. Sites containing human remains are out of the area of impact and are similarly closed to public access. Any ground-disturbing activities will be coordinated with the Service's Regional Archaeologist, in order to preserve the Refuge's archaeological and historic resources.

The Draft Comprehensive Conservation Plan (USFWS 2004) identifies the need to develop additional information relating to the effects of grazing on local endangered species. While the effects have been determined to be generally positive, additional research and evaluation will allow the refuge to refine its management strategies and objectives for grassland management.

Public Review and Comment: During completion of the Master Planning process of 1985, the grazing program underwent public review. A notice of Proposed Action was issued as well as informational news letters and four news releases. Public comment on this use was solicited during an August 1999 public scoping workshop as associated with the Environmental Assessment for the Draft Comprehensive Conservation Plan. Several comments were obtained for this use during the workshop that suggested that cattle grazing should continue as a management tool on the Refuge.

Determination: (Check One Below)

Use is not compatible

Use is compatible, with Stipulations

Stipulations Necessary to Ensure Compatibility: The Cooperator is operating under the terms and conditions of a Cooperative Land Management Agreement (USFWS 2004), Special Use Permit, and a draft Refuge Grazing Plan. These documents provide the necessary information and assistance from the refuge to determine start and end dates for cattle placement and removal.

Additional Stipulations are as follows:

- It is the responsibility of the refuge manager to determine fair market value of grazing, to issue special use permits, monitor permittee compliance, and maintain up-to-date files on all grazing activities.
- In order to minimize the amount of new noxious weeds being introduced to the refuge, cattle brought to the refuge to graze from within Kern County, California, will be allowed immediate access to the refuge with no period of containment. Animals brought from areas outside of Kern County will be subject to a 7 day containment period where grazing cooperators will be required to feed weed free hay.
- All cattle grazing on the Refuge would be removed no later than April 30.

Monitoring: A monitoring program will be established to provide data on stubble height, residual dry matter, and apparent cover density. This data will establish guidelines for making management decisions concerning the grazing program. One monitoring site will be established in each management unit on the refuge that is grazed. Each monitoring site selected will be representative of the unit. It will not be near water troughs, salt blocks, roads or fence lines. Once a year, between September 15 and October 15, a monitoring photo will be taken, one 300 foot transect will be run to determine average stubble height, apparent cover density and approximate residual dry matter. Rainfall will be monitored to determine when enough precipitation has been received to effect germination. This data will be collected at the Kern NWR Complex headquarters weather station and compared with records at the weather monitoring station in Corcoran, California. Transects will be monitored periodically during the season and near the scheduled turn-out date for stubble height and cover volume. The monitoring of the habitat along with close adherence to stocking rates and grazing season will provide a sound management program to benefit the species of concern.

Justification: The primary management goals of the refuge are to provide wintering and migration habitat for waterfowl and water birds; to maintain populations and habitats for native plants and animals; and to preserve and improve habitats that support the endangered blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat. The mission of the National Wildlife Refuge System also includes the conservation, management and restoration of wildlife resources. The grazing program is designed to enhance habitat for the endangered species which inhabit the refuge. The regulated use of grazing to benefit listed species clearly supports both the System mission and the purpose for which the refuge was established.

While the duration and timing of grazing required for optimal benefits to these species is not fully understood, the decreased vegetation density and removal of non-native plant material are believed to be beneficial. It has been suggested that up to 98% of the biomass comprising California's grassland communities are of non-native plant origin (Menke 1992). Studies on the requirements of Tipton kangaroo rat habitat found that they prefer areas with sparsely scattered woody shrubs with scant to moderate ground cover of grasses and forbs (Williams 1985). Additionally, San Joaquin kit fox have been found primarily in habitats made of annual grasslands and sparsely vegetated shrubs (O' Farrell 1983). Tollustrup (1983) found that blunt-nosed leopard lizards are found in highest abundance within habitats categorized as San Joaquin saltbush and California prairie plant communities which are comprised of sparse vegetation allowing open areas for basking and searching for prey.

With the dramatic changes to the plant communities in California over the past 150 years, has come an increase in the density of ground cover due to the introduction of nonnative grasses and forbs (Kuchler 1988). The dense growth of exotic plants has replaced the sparse cover of annuals and shrubs to which native animal species such as the Tipton kangaroo rat and blunt-nosed leopard lizard are adapted. As a result, these animals probably have more difficulty foraging and are more vulnerable to predation (Germano et al. 2001). Declines in rodent populations could also have a negative effect on San Joaquin kit fox which utilize on them for food. Moderate grazing of these annual grasslands may be needed to help maintain this habitat in a more open structure which these species require. A limited grazing season (less than 6 months) will also greatly benefit the recovery of native perennials. The benefit of grazing to reduce exotic plant biomass as well as increased seed production and stimulation of native perennial production is well documented (Engler and Chapin 1995). Stechman (2003) recommends removing cattle no later than April 30 to reduce selective grazing on the native perennials and native annuals during the seed development stage. This practice of removing cattle by late spring allows nesting by migratory bird species such as western meadow lark (*Sturnella neglecta*) and horned larks (*Eremophila alpestris*) that utilize short –grass uplands.

Prior to the acquisition of the Refuge, the uplands were altered from their original native condition by the introduction of non-native grasses and intensive grazing practices. In order to maintain the biological integrity and diversity of the Refuge, the threatened and endangered species component must be maintained. The use of moderate grazing to reduce the build-up of annual introduced grassland biomass is viewed as beneficial to these listed species. By restricting the intensity and duration of grazing, and by adhering to the stipulations for this use, the environmental health of the Refuge will be maintained.

Mandatory Re-evaluation Date (provide month and year):

_____ Mandatory 15 year Re-evaluation Date (for priority uses)

2014 Mandatory 10 year Re-evaluation (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

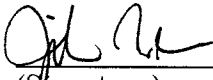
_____ Environmental Impact Statement and Record of Decision

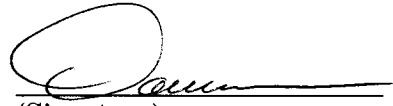
Literature Cited

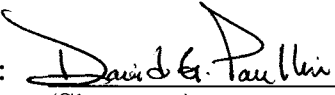
Arguelles, M.R. and M.J. Moratto. 1982. Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. Infotec. Kern NWRC files.

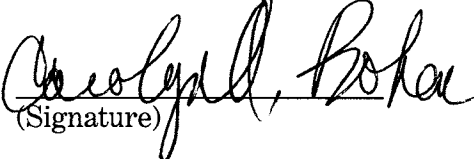
- Engler, J.D. and K. A. Chapin. 1995. Effects of Grazing/Non-grazing/Prescribed Burning on Flora Regimes at Pixley National Wildlife Refuge. U. S. Fish and Wildlife Service, Kern NWRC files.
- Germano, D, G. Rathbun, and L. Saslaw. 2001. Managing exotic grasses and conserving declining species. *Wildlife Society Bulletin*. 29:551-559
- Kuchler, A.W. 1988. The Map of the Natural Vegetation of California. 909-938 pp. In: M.G. Barbour and J. Major (editors); *Terrestrial Vegetation of California*. Calif. Native Plant Society Special publication No. 9.
- Menke J. W. 1992. Presentation from USFWS Biodiversity Workshop. Region 1 Refuge Biologists Workshop, Corvallis, Oregon.
- O'Farrell, T.P. 1983. San Joaquin Kit Fox Recovery Plan. U.S. Fish and Wildlife Service, Sacramento, California. 84p.
- Stechman, J.V. 1995. Periodic Reappraisal of Grazing Fees for the Kern National Wildlife Refuge and Recommendations for Grazing Management of the Pixley NWR. Prepared for Kern NWR by John V. Stechman, Certified Consultant. Consulting in the Natural Environmental and Agricultural Resources, Avila Beach, California.
- Stechman, J.V. 2003. Periodic Reappraisal of Beef Cattle and Grazing Fee Base Rate Prices and Recommendations for Monitoring. Prepared for Kern NWR by John V. Stechman, Certified Consultant. Consulting in the Natural Environmental and Agricultural Resources, Avila Beach, California.
- Tollestrup, K. 1983. The social behavior of two closely related leopard lizards, *Gambelia sila* and *Gambelia wislizenii*. *J. Tierpsychol.* 62:307-320pp.
- USFWS. 2004. Amended Biological Opinion, Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. CA/NV Refuge Planning Office, Sacramento, California.
- USFWS. 2004. Cooperative Land Management Agreement between U.S. Fish & Wildlife Service and Eureka Livestock Company. Kern National Wildlife Refuge Complex, Delano, CA.
- USFWS. 1985. Master Plan, Kern National Wildlife Refuge. U.S. Fish and Wildlife Service, Region I, Portland Oregon.
- USFWS. 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment . CA/NV Refuge Planning Office, Sacramento, California.
- Williams, D.F. 1985. A Review of the Population Status of the Tipton Kangaroo Rat, *Dipodomys nitrotooides nitrotooides*. U.S. Fish & Wildlife Service, Sacramento, Non-game Wildl. Invest., Final Rep. E-W-R, IV-10.0 48pp.
- Williams, P. 2004. Personal communication. Biologist, Kern National Wildlife Refuge Complex.


Refuge Determination

Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence
Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Grazing program to provide suitable habitat for the endangered Tipton kangaroo rat, Blunt-nosed leopard lizard, and San Joaquin kit fox. (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Pixley National Wildlife Refuge

Establishing and Acquisition Authorities:

The Pixley National Wildlife Refuge, located in Tulare County, California was established in 1959 under provisions of the Bankhead-Jones Farm Tenant Act (U.S.C. § 1101), Secretarial Order 2843, and the Endangered Species Act of 1973 (16 U.S.C. § 1534).

Refuge Purpose (s):

Bankhead -Jones Farm Tenant Act (7 U.S.C. § 1011)” for purposes of a land conservation and land-utilization program”.

Secretarial Order 2843, dated November 17, 1959 “as a refuge for migratory birds and other wildlife”.

Endangered Species Act of 1973 (16 U.S.C. § 1534), “to conserve fish, wildlife and plants including those which are listed as endangered species or threatened species”.

National Wildlife Refuge System Mission: The Mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”
[National Wildlife Refuge Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee)]

Description of Use: The Pixley National Wildlife Refuge (Refuge) will administer a grazing program on approximately 4,600 acres on 10 units (see Figure 14, Pixley CCP). This use has been occurring on the refuge since 1960 (USFWS 1962). The Refuge will continue to administer this use as outlined in this Compatibility Determination. Although grazing is not identified as a wildlife dependent public use by the National Wildlife Refuge System Improvement Act of 1997, grazing will allow the Refuge to manage non-native grassland habitats.. This use will provide short sparse vegetation to provide suitable foraging and denning habitat for endangered San Joaquin kit foxes (*Vulpes macrotis mutica*), blunt-nosed leopard lizards (*Gambelia sila*), and Tipton kangaroo rats (*Dipodomys nitratooides nitratooides*).

The optimal time for grazing begins in November and given winter and spring rainfall, may continue through late April. Prior to the beginning of the grazing season, an assessment is made by refuge staff to determine the amount of residual dry matter (RDM) available to the cattle. Because grazing on the Refuge benefits endangered species, this RDM level is linked to the needs of the endangered species and not the needs of the cattle. The RDM is determined by clipping, drying, then weighing representative samples from a given unit. RDM values can vary depending on temperature, annual rainfall, and the density of new grass/forb growth. Provided that the amount of RDM is less than 800 lbs./acre anytime during the grazing season, the Refuge Manager may request that the permit holder reduce the number of cattle grazing in that unit or remove them all together in order to prevent degradation of the resources in the unit.

Only the grazing of cattle will be considered on the Refuge with the exception of Horse Pasture Unit 1 where horses and mules are grazed through an agreement with National Park Service (USFWS 1998). This Interagency Agreement allows NPS to graze Government owned horses and mules on the refuge pursuant to the conditions of a special use permit. This SUP is subject to all of the conditions and restrictions levied on the other refuge grazing permittees including limitations on the grazing period due to poor rainfall induced forage conditions. At the time the Horse Pasture ownership was transferred to the Service, NPS was the permittee on this property and the subsequent agreement with the Service was negotiated to allow the continued use of this land by NPS while still achieving the habitat management goals of the refuge. In exchange for grazing privileges, NPS agrees to maintain all fences, gates and water facilities associated with their portion of the grazing program. At a later date if it is determined that grazing is not the preferred method of maintaining the vegetation in the upland units of the refuge, this agreement and associated SUP may be cancelled by FWS.

Grazing by sheep, goats, or other creatures such as bison will not be considered. During drought years or years of low rainfall, horses, mules, and cattle will not be allowed to graze on the Refuge.

The timing of the placing of cattle on the Refuge, also known as turn in dates (November 1 or slightly later) are adjusted each year based upon the date of the first effective germinating rainfall, and the amount of dry forage available in the fall (Stechman 1995). The timing of removing cattle from the Refuge (turn out dates) is determined solely on the amount of RDM within the unit. If and when 800 lbs per acre or less is achieved cattle will be removed from the unit.

The unit of measure used to summarize the quantity of cattle grazing on the Refuge is termed Animal Unit Month (AUM). AUM is defined as the amount of forage needed by an “animal unit” (AU) grazing for one month. An AU is defined as one mature 1,000 pound cow and her sucking calf. An assumption in this definition is that a cow nursing her calf will consume about 26 pounds of dry matter per day. Other types of livestock are assigned AUM equivalents based on size and consumption. From 2000 through 2004, an average of 3,860 AUM’s were removed from the grazing units on Pixley.

The grazing cooperator is chosen following guidance in U.S. Fish and Wildlife Service Refuge Manual under heading 5 RM 17. At the time of this writing, there are no anticipated changes to grazing on the refuge.

Although grazing is permitted on all upland units of the refuge, vernal pool areas are fenced to prohibit damage by grazing cattle. These areas may contain western spadefoot toads (*Spea hammondi*) and fencing to protect this habitat is recommended for their management (Jennings and Hayes 1994).

Availability of Resources: Assistant refuge managers, under the direction of the project leader, will manage the grazing program. The permittee, working under a Cooperative Land Management Agreement, will accomplish certain facility management and improvement projects under the direction of the assistant manager. Accomplishments will be in direct support to the refuge grazing program and may include maintenance or improvements of existing facilities or installation of new facilities. Projects may include installing and/or maintaining water control structures; fence installation, repair, or removal; sign repair, removal, or installation; gate installation, road, building, or deep well maintenance as well as vegetation control around facilities. The permittee is responsible for the cost of maintenance and/or installation of edifices associated with their grazing permit. Facilities that are installed primarily for refuge purposes are constructed or maintained at refuge expense.

Rates charged per AUM are based on a grazing rate survey of comparable grazing pastures that was conducted in 1995. Each year the current rate is established by adjusting the base rate using a formula created by LaCuesta Consulting that incorporates the average California beef cattle price from the previous year (Stechman 2003). This report was completed in March of 2003 and is updated every five years, all grazing fees are adjusted on a year to year basis based on fluctuations in annual beef prices. Receipts received from permittee(s) at the end of the grazing season are submitted to the General Fund.

At the end of each grazing season, the permittee submits information sufficient for refuge managers to calculate total AUM's for that particular grazing period. When AUM's are calculated, a bill is then submitted to the permittee for collection. Final billing will also take into consideration funds and in kind contributions furnished by each permittee as outlined in their individual Cooperative Land Management Agreements. These work contributions will be deducted on the permittee's final bill with proof of receipt or performed labor. Work contributions of this type will be associated with improvement projects for the particular grazed unit.

The Refuge receives adequate funding to cover the costs associated with management of the grazing program including the RDM assessment conducted at the end of every grazing season. Staff costs associated with this use emanates from the annual review of Special Use Permits, Cooperative Land Management Agreement, and monitoring the impacts of this use as outlined in the Grazing Plan. Annual costs to manager both the Kern and Pixley grazing programs averages \$3,000. Management of this use also involves monitoring resource impacts associated with this use on the short-grass environments as well as to endangered species. Funds provided to the refuge to manage this use are derived from the collection of refuge grazing receipts.

Anticipated Impacts of the Use: The grazing program results in both long and short term effects, both negative and positive. The Amended Biological Opinion (USFWS 2004) for the Draft Kern and Pixley National Wildlife Refuges Comprehensive Conservation Plan, identified the following possible short and long-term negative impacts to wildlife resources from grazing: Trampling of desirable vegetation, disturbances to ground nesting species, trampling of rodent

burrows, fencing that may restrict the movements of large animals, and soil compaction especially during wet periods. The BO recommended the following activities to minimize negative impacts associated with grazing: Acquiring additional land with suitable habitat, allowing the use in years of adequate rainfall only, and supporting grazing within the same unit areas and not moving animals to un-grazed or sensitive areas. Conversely, short and long-term positive impacts include an overall reduction of undesirable, non-native vegetation, as well as the re-establishment of native grasses, forbes, and shrub communities. The Refuge was established on land which was previously used for the grazing of cattle and other ungulates. To provide adequate food for the grazing livestock, non-native grasses were seeded and encouraged. At the time of purchase, it was estimated that 85% of the refuge was covered in non-native grasslands. Impacts of cattle to existing water supplies is negligible.

Other impacts such as erosion and sedimentation are not considered significant since the topography of the area is flat and any limited runoff to the only water course in the area is prevented by large levees. While cow birds are present on the Refuge, the potential for this population to increase resulting in an increase in nest parasitism on resident and breeding songbirds due to this use would not be considered adverse for the following reasons: The Refuge is not providing a resource that would attract or retain cowbird populations such as food (grain); the nesting substrate in the areas being grazed are undesirable to many nesting songbirds species resulting in a low number of nesting songbirds on the Refuge; and this use would occur in an area identified as sink scrub habitat and not within or adjacent to riparian habitat where an increase in cowbird numbers and an increase in nest parasitism on nesting songbirds is more common (per. Comm. Williams 2004).

Cattle on the various units of the refuge receive water in the following manner: cattle grazing in the Los Feliz unit receive water which is piped from a well into cement water troughs, 40 acre unit cattle receive water from a water tank located within the grazing unit which is supplied with water that is brought in via truck, Dickey Tract cattle have water supplied from a well off refuge brought in through a pipeline to a water trough; Horse Pasture units 1 and 2, Centerfield, Two Well, 200 Acre, and Deer Creek units West and East obtain water from refuge owned wells that is piped into a series of cement water troughs.

Studies to determine the effects of grazing on local threatened and endangered species have been conducted on the Refuge and surrounding lands in the Southern San Joaquin Valley. These studies have indicated a benefit to listed species from decreased vegetative cover (Williams 1985) and (O'Farrell 1983). However, the duration and timing needed for optimal benefits is poorly understood. One reason for a lack of strong correlative evidence is inconsistent annual rainfall.

Vernal pools are of a special concern on the Refuge, and cattle and horses will be excluded from these habitats.

Cattle are grazed in areas which are in direct view of the general public. The use of grazing as a management tool on the Refuge is described in an interpretive pamphlet accessible to the public at the Refuge and no negative comments from the public have been received.

Impacts to known cultural resources from this use are negligible. Arguelles and Moratto (1982) identified and reviewed known sites containing cultural resources on the refuge. These sites were all of minimal importance and contained no human remains. Any ground-disturbing activities will

be coordinated with the Service's Regional Archaeologist, in order to preserve the Refuge's archaeological and historic resources.

The Draft Comprehensive Conservation Plan (USFWS 2004) identifies the need to develop additional information relating to the effects of grazing on local endangered species. While the effects have been determined to be generally positive, additional research and evaluation will allow the refuge to refine its management strategies and objectives for grassland management.

Public Review and Comment: During completion of the Master Planning process of 1985, the grazing program underwent public review. A notice of Proposed Action was issued as well as informational news letters and four news releases. Public comment on this use was solicited during an August 1999 public scoping workshop associated with the Environmental Assessment for the Draft Comprehensive Conservation Plan. Several comments were obtained for this use during the workshop that suggested that cattle grazing should continue as a management tool on the refuge.

Determination (Check one Below)

Use is not compatible

Use is compatible, with Stipulations

Stipulations Necessary to Ensure Compatibility: The Cooperator is operating under the terms and conditions of a Cooperative Land Management Agreement, Special Use Permit, and a draft Refuge Grazing Plan. These documents provide the necessary information and assistance for the refuge manager to determine start and end dates for cattle placement and removal.

Additional Stipulations are as follows:

It will be the responsibility of the refuge manager to determine fair market value of grazing, to issue special use permits, monitor permittee compliance, and maintain up-to-date files on all grazing activities.

In order to minimize the amount of new noxious weeds being introduced to the refuge, cattle, horses, and mules brought to the refuge to graze from within Tulare County, California, will be allowed immediate access to the refuge with no period of containment. Animals brought from areas outside of Tulare County will be subject to a 7 day containment period where grazing cooperator will be required to feed weed free hay.

Cattle and horses will be fenced out of vernal pools on the refuge to eliminate any adverse impacts to sensitive species, such as western spadefoot toads (*Spea hammondi*), that may be present in these areas.

All livestock grazing on the Refuge will be removed no later than April 30.

Monitoring: A monitoring program will be established to provide data on stubble height, residual dry matter, and apparent cover density. This data will establish guidelines for making management decisions concerning the grazing program.

Depending on the total acreage of each grazing unit, a minimum of 2 monitoring sites will be established in each management unit on the Refuge that is grazed. Each monitoring site selected will be representative of the unit. It will not be near water troughs, salt blocks, roads or fence lines. Once a year, between September 15 and October 15, a monitoring photo will be taken, one 300 foot transect will be run to determine average stubble height, apparent cover density and approximate residual dry matter.

Rainfall will be monitored to determine when enough precipitation has been received to effect germination. This data will then be collected at the Kern NWR Complex headquarters weather station and compared with records at the weather monitoring station in Corcoran, California.

Transects will be monitored periodically during the season and near the scheduled turn-out date for stubble height and cover volume.

The monitoring of the habitat along with close adherence to stocking rates and grazing season will provide a sound management program to benefit the species of concern.

Justification: Two of the purposes for the Refuge are defined “as a refuge for migratory birds and other wildlife” and “to conserve fish, wildlife and plants including those which are listed as endangered species or threatened species.” The mission of the National Wildlife Refuge System also includes the conservation, management and restoration of wildlife resources. The grazing program is designed to enhance habitat for the endangered species which inhabit the refuge. The use of grazing to benefit listed species clearly supports both the System mission and the purpose for which the refuge was established.

While the duration and timing of grazing required for optimal benefits to these species is not fully understood, the decreased vegetation density and removal on non-native plant material are believed to be beneficial. It has been suggested that up to 98% of the biomass comprising California’s grassland communities are of non-native plant origin (Menke 1992). Studies on the habitat requirements of Tipton kangaroo rats found that they prefer areas with sparsely scattered woody shrubs with scant to moderate ground cover of grasses and forbs (Williams 1985). Additionally, San Joaquin kit fox have been found primarily in habitats consisting of annual grasses and sparsely vegetated shrubs (O’ Farrell 1983). Tollustrup (1983) found that blunt-nosed leopard lizards are found in highest abundance within habitats categorized as San Joaquin saltbush and California prairie plant communities which are comprised of sparse vegetation allowing open areas for basking and searching for prey. With the dramatic changes to the plant communities in California over the past 150 years, has come an increase in the density of ground cover due to the introduction of nonnative grasses and forbes (Kuchler 1988). The dense growth of exotic plants has replaced the sparse cover of annuals and shrubs to which native animal species such as the Tipton kangaroo rat and blunt-nosed leopard lizard are adapted. As a result, these animals probably have more difficulty foraging and are more vulnerable to predation (Germano et al. 2001). Declines in rodent populations could also have a negative effect on San Joaquin kit fox which utilize them as a source of food. Moderate grazing of these annual grasslands may be needed to help maintain this habitat in a more open structure which these species require. A

limited grazing season (less than 6 months) may also benefit the recovery of native perennials. The benefits of grazing to reduce exotic plant biomass as well as increase seed production and stimulate native perennial production is well documented (Engler and Chapin 1995). Stechman (2003) recommends removing cattle no later than April 30 to reduce selective grazing on the native perennials and annuals during the seed development stage.

Mandatory Re-evaluation Date (provide month and year):

Mandatory 15 year Re-evaluation Date (for priority uses)

2014 Mandatory 10 year Re-evaluation (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

Categorical Exclusion without Environmental Action Statement

Categorical Exclusion and Environmental Action Statement

Environmental Assessment and Finding of No Significant Impact

Environmental Impact Statement and Record of Decision

Literature Cited

Arguelles, M.R. and M.J. Moratto. 1982. Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. Infotec. Kern NWRC files.

Engler, J.D. and K. A. Chapin. 1995. Effects of Grazing/Non-grazing/Prescribed Burning on Flora Regimes at Pixley National Wildlife Refuge. U. S. Fish and Wildlife Service, Kern NWRC files.

Germano, D, G. Rathbun, and L. Saslaw. 2001. Managing exotic grasses and conserving declining species. Wildlife Society Bulletin. 29:551-559

Jennings, M.A. and Hayes, M.P. 1994. Amphibians and Reptile Species of Special Concern in California. 96 pp. Final report submitted to California Department of Fish & Game, Rancho Cordova, California. Contract number 8023.

Kuchler, A.W. 1988. The Map of the Natural Vegetation of California. 909-938 pp. In: M.G. Barbour and J. Major (editors); Terrestrial Vegetation of California. Calif. Native Plant Society Special publication No. 9.

Menke J. W. 1992. Presentation from USFWS Biodiversity Workshop. Region 1 Refuge Biologists Workshop, Corvallis, Oregon.

O'Farrell, T.P. 1983. San Joaquin Kit Fox Recovery Plan. U.S. Fish and Wildlife Service, Sacramento, California. 84p.

Stechman, J.V. 1995. Periodic Reappraisal of Grazing Fees for the Kern National Wildlife Refuge and Recommendations for Grazing Management of the Pixley NWR. Prepared for Kern NWR by John V. Stechman, Certified Consultant. Consulting in the Natural Environmental and Agricultural Resources, Avila Beach, California.

Stechman, J.V. 2003. Periodic Reappraisal of Beef Cattle and Grazing Fee Base Rate Prices and Recommendations for Monitoring. Prepared for Kern NWR by John V. Stechman, Certified Consultant. Consulting in the Natural Environmental and Agricultural Resources, Avila Beach, California.

Tollestrup, K. 1983. The social behavior of two closely related leopard lizards, *Gambelia sila* and *Gambelia wislizenii*. J. Tierpsychol. 62:307-320pp.

USFWS. 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. CA/NV Refuge Planning Office, Sacramento, California

USFWS. 1962. Kern National Wildlife Refuge Complex Annual Narrative. Kern NWRC files.

USFWS, 1998. Interagency Agreement between U.S. Fish & Wildlife Service and National Park Service.

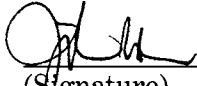
USFWS, 2004. Amended Biological Opinion, Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment, CA/NV Refuge Planning Office, Sacramento, California.


USFWS. 2004. Cooperative Land Management Agreement between U.S. Fish & Wildlife Service and Marion Howard, Bayou Vista Farms and Stanley White. Kern National Wildlife Refuge Complex, Delano, CA

Williams, D.F. 1985. A Review of the Population Status of the Tipton Kangaroo Rat, *Dipodomys nitroideus nitroideus*. U.S. Fish & Wildlife Service, Sacramento, Non-game Wildl. Invest., Final Rep. E-W-R, IV-10.0 48pp.

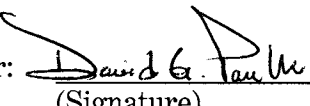
Williams, P. 2004. Personal Communication. Biologist, Kern National Wildlife Refuge Complex.

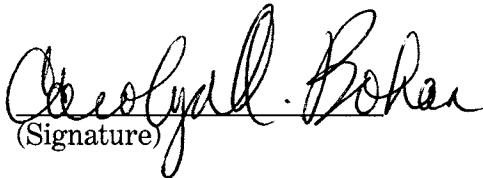
Refuge Determination:

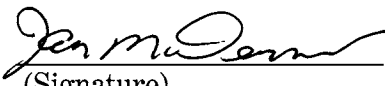
Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Active California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Research (Alternative C, Kern and Pixley National Wildlife Refuge Complex comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge

Establishing and Acquisition Authorities:

The Kern National Wildlife Refuge, located in Kern County, California, was established November 18, 1960, under the provisions of the Migratory Bird Conservation Act (16 U.S.C. § 715d).

Refuge Purpose (s): Migratory Bird Conservation Act “for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d)

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” [National Wildlife Refuge Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee)]

Description of Use: The Kern National Wildlife Refuge (refuge), receives periodic requests to conduct research from various universities, research groups; federal, state, and county agencies; as well as environmental consulting firms. Although research is not identified as a wildlife dependent public use by the National Wildlife Refuge System Improvement Act of 1997, scientific research can benefit refuge resources and support the purpose of the refuge and mission of the National Wildlife Refuge System. The refuge proposes to give priority to studies that contribute to the enhancement, protection, use, preservation, and management of native refuge wildlife populations and their habitats specifically that of the endangered Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), Buena Vista Lake shrew (*Sorex ornatus relictus*), San Joaquin kit fox (*Vulpes macrotis mutica*), and blunt-nosed leopard lizard (*Gambelia sila*).

Other researchers conducting studies and investigations on the Refuge include those from universities, graduate students collecting data, as well as other Fish and Wildlife Service personnel from other offices and stations. Research conducted to collect baseline information will include, but is not limited to, mist netting and banding avian species; census counts via transects, mark-recapture using small mammal traps, pit traps for reptiles, or determining habitat suitability through various vegetation sampling methods.

Research activities will occur on the refuge throughout the year and during daylight and night time hours. All habitat types of the refuge will be open to research including uplands, moist soil, seasonal wetland, and riparian areas. The duration of research studies will vary as length of investigations will be dependant upon the type of question being posed and impacts to areas resulting in extended human traffic.

All research applicants will be required to submit a proposal summarizing the following:

1. Objectives of the study;
2. Justification for the study;
3. Detailed study methodology and schedule;
4. Potential impact on refuge wildlife and/or habitats, including short and long-term disturbance, injury, and mortality; and measures taken in the study design to avoid and minimize these impacts:
5. Type and number of research personnel required and their qualifications/experience;
6. Status of necessary permits (i.e., scientific collecting permits, migratory bird, as well as federal and state endangered species permit);
7. Costs to refuge and refuge staff time requested, if any; and
8. Anticipated end products (i.e., reports, publications).

Research proposals will be reviewed by refuge staff and others, as appropriate. The following criteria will be used to assess research proposals:

1. Research that will contribute to enhancing refuge management will have higher priority than other requests.
2. Research that will conflict with other ongoing research, monitoring, or management programs will not be approved.
3. Research projects that can be carried out elsewhere (off-refuge) will be less likely to be approved.
4. Research that causes undue disturbance or is intrusive will not be approved. The degree and type of disturbance will be carefully weighed when evaluating a research request. Many threatened and endangered species as well as migratory birds, and other species residing on the refuge, such as Buena Vista Lake shrew, are sensitive to disturbance which must be considered when considering a project.
5. Evaluation of research requests will determine whether any effort has been made to minimize disturbance through study design (for example, by considering adjustments in

the location, timing, or scope of the study; the number of participants, study methods, the number of study sites, etc.).

6. If it will be impossible for the Refuge to monitor researcher activities because of staffing or logistical constraints, requests for research may be denied, depending on the circumstances.
7. The duration of the project will be considered and agreed upon before approval. All projects will be reviewed annually to assess whether they continue to meet these criteria (and others as deemed necessary), will continue to operate as originally proposed, and are contributing to the objectives of the study.

Approved research projects will be conducted under a refuge-issued Special Use Permit with case-specific stipulations.

Availability of Resources: Adequate funding and staff exists to monitor and oversee research at the refuge. Administrative staff costs associated with this use consist of refuge staff time to review research proposals, collected data, special use permits, research summaries, and to evaluate impacts and that researchers are in compliance. Other staff time includes monitoring the use of the refuge temporary quarters where researchers are allowed to stay during their data collection period if space is available. Annual monetary costs expended by the refuge to administer this use averages less than \$1,000. Most of the research conducted on the refuge in the past has been funded from outside sources and for purposes of this proposed use is likely to remain the same.

Anticipated Impacts of the Use:

Threatened and Endangered: Human activity has had adverse impacts on threatened and endangered species found in the Southern San Joaquin Valley (Germano and Williams, 1993, Williams et al. 1998, and Orloff et al. 1986). These studies identified adverse impacts to these species as a result of increased agriculture, urbanization, and changes in water use within the species range. Disturbances by a small number of humans working near areas of endangered species, as will be the case pertaining to this use, should be inconsequential if all stipulations and conditions of SUP's are followed.

Resident wildlife, including threatened and endangered species, could be temporarily disturbed which may be due to the placing and/or retrieval of investigative equipment, working in close proximity to the species, and the temporary handling of species. As studies will follow an approved investigative or current protocol method, as stated in the Stipulations section of this document, impacts to wildlife will be considered minimal.

Migratory Birds: Human activity involved with this use may disturb migratory birds utilizing the refuge's habitats primarily during feeding and breeding activities (Korschgen and Dahlgren 1992). Human activity near wetland habitats could disturb migratory birds, including black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), and various waterfowl species (*Anas* spp.) which choose to breed on the refuge. Refuge staff as well as researchers permitted on the refuge are trained to minimize disturbances to resident and migratory wildlife. Training includes avoiding active nest areas and areas favorable to loafing during waterfowl hunt season, as well as reducing impacts to habitats.

Habitats: Minimal impact on the Refuge wildlife and habitats is anticipated during research studies. Some level of disturbance is expected with research activities, because most researchers will possibly be entering areas that are normally closed to the public and likely collecting samples or handling plants or wildlife. Special Use Permits will include conditions to ensure that impacts on wildlife and habitats are reduced as much as possible. Impacts to vegetation will be minimal and will not involve earthwork or cutting associated with reducing obstacles that impedes movement to and from data collection sites. Access routes to and from data collection sites will remain the constant throughout the study period.

Cultural Resources: Research studies are not likely to impact cultural resources on the refuge. Arguelles and Moratto (1982) identified and reviewed known sites containing cultural resources on the refuge. The presence of any known sites will be considered prior to issuance of an SUP for research activities. Any ground-disturbing activities will be coordinated with the Service's Regional Archaeologist, in order to preserve the Refuge's archaeological and historic resources.

Public Review and Comment: During completion of the Kern NWR Master Plan (USFWS 1985), this use underwent public review. A notice of Proposed Action was issued as well as five informational news letters and four news releases. Public comment on this use was also solicited throughout the development of the Kern and Pixley Draft Comprehensive Conservation Plan (USFWS 2004) beginning with public scoping meetings in 1999 and continuing through the public review of the Draft CCP and Environmental Assessment.

Determination (Check one Below)

Use is not compatible

Use is compatible

Stipulations Necessary to Ensure Compatibility:

Any researcher requesting to conduct research on the refuge will be required to submit a detailed study proposal.

All work will be coordinated with the project leader, or designated refuge staff, and researcher.

Vehicles will be operated only on established and designated refuge roads and operated at the posted speed limit.

Research will adhere to current protocol for the data to be collected or species to be studied.

Proposed research methods which will adversely affect, or will have the potential to adversely affect refuge resources will require the researcher to develop mitigation measures to minimize potential impacts; mitigation measures will be listed as a condition in the Special Use Permit.

Refuge staff will be free to accompany researchers at any time to assess potential impacts; to insure Special Use Permits are adhered to; and to determine if approved research proposals and Special Use Permits should be terminated because of adverse impacts.

All refuge rules and regulations must be followed unless otherwise excepted, in writing, by project leader.

Special Use Permits are valid for only one year. Renewal of such permits will be granted once refuge management has reviewed the validity of previously collected data, as well insuring all necessary permits have been updated.

The researcher will be responsible for acquiring all necessary permits, both from the State of California and/or U.S. Fish and Wildlife Service, if applicable, and to demonstrate that these permits are up to date prior to the beginning of research approval process.

All research studies undertaken will provide current biological information on the needs and limitations of refuge resources (wildlife or habitats).

All research activities conducted on the refuge will conform to the applicable provisions of Directors Orders 109 and 149 which govern the use of samples collected on refuge lands and conduct during the course of research activities.

Justification: Research activities conducted on the refuge will only be approved when the study results will be directly applicable to management and recovery of threatened and endangered species of the Southern San Joaquin Valley or management of other flora or fauna of concern to the refuge management. The anticipated level of research to be conducted on the Refuge at any given time will be compatible because the refuge will ensure that research proposals support the purpose of the refuge and mission of the National Wildlife Refuge System. In view of the impacts research activities may have on the U. S. Fish and Wildlife Service's ability to achieve the refuge purpose, sufficient restrictions will be placed on the researcher to ensure that disturbance is kept to an acceptable level.

Mandatory Re-Evaluation Date (provide month and year):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)

___2014_ Mandatory 10-year Re-Evaluation Date (for all uses other priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Literature Cited:

Arguelles, M.R. and M.J. Moratto. 1982. Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. Infotec. Kern NWRC files.

Germano, D.J. and D.F. Williams. 1993. Recovery of the Blunt-nosed Leopard Lizard: Past Efforts, Present Knowledge, and future Opportunities. *Trans. West. Sec. Wildl. Soc.* 28:38-47.

Korschgen, C.E. and R. B. Dahlgren. 1992. Human Disturbances of Waterfowl: Causes, Effects, and Management.


Orloff, S.G., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. *Trans. West. Sect. Wildl. Soc.* 22:60-70.

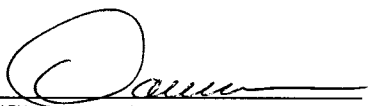
USFWS. 1985. Master Plan, Kern National Wildlife Refuge. U.S. Fish and Wildlife Service, Region I, Portland Oregon.

USFWS. 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment . CA/NV Refuge Planning Office, Sacramento, California.

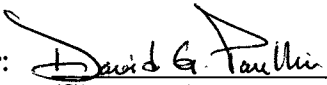
Williams, D.F., E.A. Cypher, P.A. Kelly, K.J. Miller, N. Norvell, S.E. Phillips, C.D. Johnson, and G.W. Colliver. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. U.S. Fish and Wildlife Service, Region I, Portland, Oregon. 319 p.

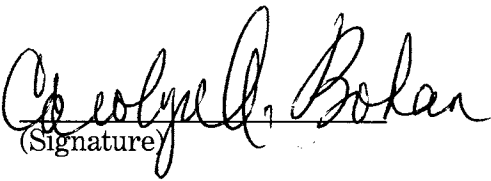
Refuge Determination:


Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Research (Alternative C, Kern and Pixley National Wildlife Refuge Complex comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Pixley National Wildlife Refuge

Establishing and Acquisition Authorities:

The Pixley National Wildlife Refuge, located in Tulare County, California, was established on November 17, 1959, under the provisions of the Bankhead-Jones Farm Tenant Act (U.S.C. § 1101), Secretarial Order 2843, and the Endangered / Species Act of 1973 (16 U.S.C. § 1534).

Refuge Purpose (s):

Bankhead -Jones Farm Tenant Act (7 U.S.C. § 1011 “for purposes of a land conservation and land-utilization program”.

Secretarial Order 2843, dated November 17, 1959 “as a refuge for migratory birds and other wildlife”.

Endangered Species Act of 1973 (16 U.S.C. § 1534) “to conserve fish, wildlife and plants including those which are listed as endangered species or threatened species”.

National Wildlife Refuge System Mission: The mission of the National Wildlife Refuge System (NWRS) is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” (National Wildlife Refuge Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee))

Description of Use: The Pixley National Wildlife Refuge (Refuge), receives periodic requests to conduct research from various universities, research groups; federal, state, and county agencies; as well as environmental consulting firms. Although research is not identified as a wildlife dependent public use by the National Wildlife Refuge System Improvement Act of 1997, scientific research can benefit Refuge resources and support the purpose of the Refuge and mission of the National Wildlife Refuge System. The refuge proposes to prioritize studies that contribute to the enhancement, protection, use, and management of native refuge wildlife populations and their habitats specifically that of the endangered Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), San Joaquin kit fox (*Vulpes macrotis mutica*), and blunt-nosed leopard lizard (*Gambelia sila*).

While the Refuge has received requests to conduct research from various entities, the vast majority of research conducted is done by the Endangered Species Recovery Program (ESRP). ESRP is a research group which started in 1992 primarily to conduct research on endangered

plants and animals in the San Joaquin Valley and surrounding areas and to identify population trends. This overall program is part of mitigation required of the Bureau of Reclamation (BOR) by the USFWS for renewal by BORs water contracts in the Friant Water Service Area of the eastern San Joaquin Valley. Part of the primary focus of this program is to gather seasonal data on the endangered Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) and blunt-nosed leopard lizard (*Gambelia sila*) on the refuge.

Other researchers conducting studies and investigations on the Refuge include those from universities, graduate students collecting data, as well as Fish and Wildlife Service personnel from other offices and stations. Research conducted to collect baseline information will include, but is not limited to: mist netting and banding avian species, census counts via transects, mark-recapture using small mammal traps, pit traps for reptiles, or determining habitat suitability through various vegetation sampling methods.

Research activities will occur on the Refuge throughout the year and during daylight and night time hours. All habitat types of the Refuge will be open to research including upland areas, moist soil, seasonal wetland, and riparian. The duration of research studies will vary as length of investigations will be dependant upon the type of question being posed and impacts to areas resulting in extended human traffic.

All research applicants will be required to submit a proposal summarizing the following:

1. Objectives of the study;
2. Justification for the study;
3. Detailed study methodology and schedule;
4. Potential impact on Refuge wildlife and/or habitats, including short- and long-term disturbance, injury, and mortality; and measures taken in the study design to avoid and minimize these impacts;
5. Number and type of research personnel required and their qualifications/experience;
6. Status of necessary permits (i.e., scientific collecting permits, migratory bird, as well as federal and state endangered species permit);
7. Costs to Refuge and Refuge staff time requested, if any; and
8. Anticipated end products (i.e., reports, publications).

Research proposals will be reviewed by refuge staff or others, as appropriate. The following criteria will be used to assess research proposals:

1. Research that will contribute to enhancing refuge management will have higher priority than other requests.
2. Research that will conflict with other ongoing research, monitoring, or management programs will not be approved.
3. Research projects that can be carried out elsewhere (off-refuge) will be less likely to be approved.
4. Research that causes undue disturbance or is intrusive will not be approved. The degree and type of disturbance will be carefully weighed when evaluating a research request. Threatened and endangered species, and special status species such as the spadefoot toad (*Spea hammondi*), as well as feeding and breeding birds are sensitive to disturbance and will require special attention.
5. Evaluation of research requests will determine whether efforts will be made to minimize disturbance through study design (for example, by considering adjustments in the location, timing, or scope of the study; the number of participants, study methods, the number of study sites, etc.).
6. If it will be impossible for refuge staff to monitor researcher activities because of staffing or logistical constraints, requests for research may be denied, depending on the circumstances.
7. The duration of the project will be considered and agreed upon before approval. All projects will be reviewed annually to assess whether they continue to meet these criteria (and others as deemed necessary), continue to operate as originally proposed, and are contributing to the objectives of the study.

Approved research projects will be conducted under a refuge-issued Special Use Permit with case-specific stipulations.

Availability of Resources: Adequate funding and staff exists to manage for research at Pixley National Wildlife Refuge. Administrative staff costs associated with this use consists of Refuge staff time to review research proposals, collected data, special use permits, research summaries, and to evaluate impacts and that researchers are in compliance. Other staff time includes monitoring the use of the Refuge temporary quarters where researchers are allowed to stay during their data collection period if space is available. Annual monetary costs expended by the Refuge to administer this use averages less than \$1,000.00. Most of the research conducted on the Refuge in the past has been funded from outside sources and this trend is expected to continue.

Anticipated Impacts of the Use:

Threatened and Endangered: Human activity has had adverse impacts on threatened and endangered species found in the southern San Joaquin Valley (Germano and Williams, 1993, Williams et al. 1998, and Orloff et al. 1986). These studies identified adverse impacts to these species as a result of increased agriculture, urbanization, and changes in water use within the species range. Disturbances by a small number of humans working near areas of endangered

species, as will be the case pertaining to this use, should be inconsequential if all stipulations and conditions of SUP's are followed.

Resident wildlife, including threatened and endangered species, could be temporarily disturbed which may be due to the placing and/or retrieval of equipment, working in close proximity to the species, and the temporary handling of species. As studies will follow an approved investigative or current protocol method, as stated in the Stipulations section of this document, impacts to wildlife will be considered minimal.

Vernal Pools: The potential for researchers to trample and destroy vernal pool habitats is of concern, particularly during the wet season, when vernal pools are at their most productive stage. Due to the sensitive nature of this habitat and the possible presence of special status species such as the spadefoot toad (*Spea hammondi*), access to vernal pool sites for research purposes will receive special scrutiny.

Migratory Birds: Human activity may disturb migratory birds utilizing the Refuge's habitats primarily during feeding and breeding activities (Korschgen and Dahlgren 1992). Human activities near the wetland habitats could disturb feeding and nesting migratory birds, including sandhill cranes (*Grus canadensis*), mountain plovers (*Charadrius montanus*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), and various waterfowl species (*Anas* spp.) which choose to breed on the refuge. Refuge staff as well as researchers permitted on the refuge are trained to minimize disturbances to resident and migratory wildlife. Training includes avoiding active nest areas, areas favorable to loafing during waterfowl hunt season, and reducing impacts to habitats.

Habitats: Minimal impact on the Refuge's wildlife and habitats is anticipated during research studies. Some level of disturbance is expected with research activities, because most researchers will possibly be entering areas that are normally closed to the public and likely collecting samples or handling plants or wildlife. Special Use Permits will include conditions to ensure that impacts on wildlife and habitats are reduced as much as possible. Impacts to vegetation will be minimal and will not involve earthwork or cutting associated with reducing obstacles that impedes movement to and from data collection sites. Access routes to and from data collection sites will remain the constant throughout the study period.

Cultural Resources: Research studies are not likely to impact cultural resources on the refuge. Arguelles and Moratto (1982) identified and reviewed known sites containing cultural resources on the refuge. The presence of any known sites will be considered prior to issuance of an SUP for research activities. Any ground-disturbing activities will be coordinated with the Service's Regional Archaeologist, in order to preserve the Refuge's archaeological and historic resources.

Public Review and Comment: During completion of the Pixley NWR Master Plan (USFWS 1985), this use underwent public review. A notice of Proposed Action was issued as well as five informational news letters and four news releases. Public comment on this use was also solicited throughout the development of the Kern and Pixley Draft Comprehensive Conservation Plan (USFWS 2004) beginning with public scoping meetings in 1999 and continuing through the public review of the Draft CCP and Environmental Assessment.

Determination (Check one Below)

Use is not compatible

Use is compatible

Stipulations Necessary to Ensure Compatibility:

Any researcher will be required to submit a detailed study plan.

All work will be coordinated with the project leader, or designated refuge staff, and researcher.

Vehicles will be operated only on established and designated refuge roads and operated at the posted speed limit.

Research will adhere to current protocol for the data to be collected and species to be studied.

Proposed research methods which will adversely affect, or will have the potential to adversely affect refuge resources will require the researcher to develop mitigation measures to minimize potential impacts; mitigation measures will be listed as a condition in the Special Use Permit.

Refuge staff will be free to accompany researchers at any time to assess potential impacts; to insure Special Use Permits are adhered to; and to determine if approved research proposals and Special Use Permits should be terminated because of adverse impacts.

All refuge rules and regulations must be followed unless otherwise exempted, in writing, by project leader.

Special Use Permits are valid for only one year. Renewal of such permits will be granted once refuge management has reviewed the validity of previously collected data, as well insuring all necessary permits have been updated.

The researcher will be responsible for acquiring all necessary permits, both from the State of California and/or U.S. Fish and Wildlife Service, if applicable, and to demonstrate that these permits are up to date prior to the beginning of research approval process.

All research studies undertaken will provide current biological information on the needs and limitations of refuge resources (wildlife or habitats).

All research activities conducted on the refuge will conform to the applicable provisions of Directors Orders 109 and 149 which govern the use of samples collected on refuge lands and conduct during the course of research activities.

Justification: Research activities conducted on the refuge will only be approved when the study results will be directly applicable to management and recovery of threatened and endangered species of the Southern San Joaquin Valley or management of other flora or fauna of concern to the refuge management. The anticipated level of research to be conducted on the Refuge at any given time will be compatible because the Refuge will ensure that research proposals support the purpose of the Refuge and mission of the System. In view of the impacts research activities may have on the Service's ability to achieve the Refuge purpose, sufficient restrictions will be placed on the researcher to ensure that disturbance is kept at an acceptable level.

Mandatory Re-Evaluation Date (provide month and year):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)

___2014_ Mandatory 10-year Re-Evaluation Date (for all uses other priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Literature Cited:

Arguelles, Marcus R. and Michael J. Moratto. 1982. Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. Kern NWRC files.

Korschgen, C.E. and R. B. Dahlgren. 1992. Human Disturbances of Waterfowl: Causes, Effects, and Management.


Germano, D. J. and D. F. Williams. 1993. Recovery of the Blunt-nosed Leopard Lizard: Past Efforts, Present Knowledge, and future Opportunities. Trans. West. Sec. Wildl. Soc. 28:38-47.

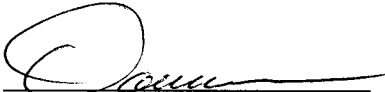
Orloff, S.G., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. Trans. West. Sect. Wildl. Soc. 22:60-70.

USFWS. 1985. Master Plan, Pixley National Wildlife Refuge. U.S. Fish and Wildlife Service, Portland Oregon.

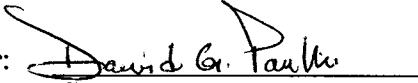
USFWS. 2004. Kern and Pixley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment . CA/NV Refuge Planning Office, Sacramento, California.
Williams, D.F., E.A. Cypher, P.A. Kelly, K.J. Miller, N. Norvell, S.E. Phillips, C.D. Johnson, and G.W. Colliver. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. U.S. Fish and Wildlife Service, Region I, Portland, Oregon. 319 p.


Refuge Determination:


Prepared by:  9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval:  9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor:  9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System:  9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager  9-30-04
(Signature) (Date)

Compatibility Determination

Use: Monitor and control mosquitoes (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)

Refuge Name: Kern National Wildlife Refuge (Established November 18, 1960)

Establishing and Acquisition Authority: The Kern National Wildlife Refuge, located in Kern County, California was established in 1960 under provisions of the Migratory Bird Conservation Act (16 U.S.C. ‘ 715d).

Refuge Purpose(s): Migratory Bird Conservation Act (16 U.S.C. ‘ 715d) “...inviolable sanctuary, or for any other management purpose, for migratory birds.”

National Wildlife Refuge System Mission: The Mission of the National Wildlife Refuge System is “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans”.

Description of Use: The Kern Mosquito Vector Control District (KMVCD) proposes to continue using Kern National Wildlife Refuge (Refuge) for monitoring and controlling mosquitoes to address human health concerns of neighboring communities. The Refuge is located in the Southern San Joaquin Valley and within the historic Tulare Lake Basin. The community of Lost Hills lies 6 miles southwest of the Refuge, the community of Delano lies 16 miles east of the Refuge, the community of Wasco lies 16 miles to the southeast, and the community of Corcoran lies 20 miles to the north. The city of Bakersfield is about 40 miles to the southeast. Nearer to the refuge there are small private duck clubs which are occupied on a fairly constant basis from late summer into early spring. Private residences for ranchers and farm workers are scattered in this rural area. Residents of Kern County have voiced concern about biting mosquitoes and mosquito-borne disease. To address these concerns the KMVCD has been monitoring and controlling mosquitoes on the refuge since 1983.

While mosquitoes are considered a nuisance because of their biting, many species are known vectors of serious diseases in California. Although 12 mosquito-borne viruses are known to occur in California, only western equine encephalomyelitis virus (WEE) and St. Louis encephalitis virus (SLE) have caused significant outbreaks of human disease (CA Dept. of Health Services 2003). California is also at risk for West Nile virus (WNV) which was first detected in the summer of 2003 in adult mosquitoes in Imperial County, and in crows in Orange County. WEE tends to be most serious in very young children, whereas elderly people are most at risk to SLE and WNV (CA Dept. of Health Services 2003). WEE and WNV can cause serious diseases in horses and emus, and WNV kills a wide variety of endemic and imported birds. Mosquito control is the only known practical method of protecting people and animals from WEE, SLE, and WNV (CA Dept. of Health Services 2003).

The mosquito species identified by KMVCD for monitoring and control are *Culex erythrothorax*, *Cx. pipiens*, *Cx. tarsalis*; *Ochlerotatus dorsalis*, *Oc. melanimon*, *Oc. nigromaculis*, and *Aedes vexans*. *Culex tarsalis* is the primary vector of WEE and SLE in California and is also considered to be a significant vector of WNV (CA Dept. of Health Services 2003). *Culex pipiens*, *Cx.*

erythrothorax, *Ochlerotatus melanimon*, *Oc. dorsalis*, and *Aedes vexans* may also contribute to disease transmission (Goddard 2002).

Mosquito Monitoring

KMVCD monitoring activities are designed to estimate the abundance of immature (larvae and pupae) and adult mosquito populations. During an average mosquito monitoring period, typically between the months of April through October, KMVCD assesses larval mosquito populations by using the 'dipper' method in various wetlands, moist soil, and riparian areas. Adults are monitored using carbon dioxide (CO₂) and light traps. Monitoring is conducted through a Special Use Permit (SUP) between KMVCD and the Refuge.

KMVCD monitors larval stage mosquito populations and identifies species using the dipper method. This entails using a long-handled ladle (ca 500 ml) called a dipper to collect water samples from pools potentially serving as mosquito sources. Dipping will occur about every two weeks wherever there are pools of water. Whenever water levels are changing on the Refuge, due to flooding-up or drawing-down specific units, dipping occurs weekly. Dip counts are used to estimate the numbers of immature mosquitoes and to determine the need for mosquito control. Captured immature mosquitoes will be identified taxonomically by skilled technicians.

All Refuge wetland units could potentially be monitored using the dipper method. However, the areas of Refuge wetland units that are potential mosquito habitat will be targeted. Target areas will include wetland margins, shorelines, and riparian areas.

KMVCD proposes to use carbon dioxide (CO₂) baited traps to monitor density of adult mosquitoes and to identify adults to species. The trap used is baited with 1-2 kg of dry ice next to the trap. A motor and fan on the 3 inch diameter trap sucks mosquitoes down into a container like a modified gallon ice cream carton with tubular surgical stockinet attached to the bottom of the motor housing unit to retain the collected mosquitoes. The trap uses a 6v battery.

Placement of CO₂ baited traps on the Refuge depends on host-seeking patterns of the target species. *Culex tarsalis* primarily bloodfeed on birds and mammals, and therefore hunt along vegetative borders and tree canopies where birds roost and nest. *Culex erythrothorax* are best collected within wetland areas near dense stands of tules and cattails. *Ochlerotatus melanimon* and *Oc. nigromaculis* are mammal feeders and typically hunt over open fields.

Six traps are deployed from April through October. In 2003 traps were monitored from March through November. In 2004, traps were set up at the beginning of March and may be run through the entire year. Traps are checked at least every two weeks. During peak mosquito activity traps will be checked more frequently.

A single light trap has been run at Refuge headquarters, and checked weekly throughout the year. Light traps are cylinders with a light, fan, and collecting jar. The mosquitoes are attracted to the light and enter the cylinder. The fan creates an air current that moves the mosquitoes into the collecting jar. The light trap is mounted on the shop building at headquarters.

As part of monitoring conducted by KMVCD for the presence of these viruses, a sentinel chicken flock is maintained in a pen on the Refuge. Sentinel chickens are exposed to the environment and to mosquitoes moving through the area that may choose to feed on them. Regular blood samples are periodically taken from the chickens to detect any mosquito-vector pathogen activity.

The monitoring activities described above are conducted under a SUP between the Refuge and KMVCD. The Refuge proposes to allow the KMVCD to continue these activities under an annual SUP.

In addition, the Refuge has an SUP with the Bakersfield arbovirus field station of the U.C. Davis Center for Vector-borne Disease Research. Staff of the field center periodically mist-net in designated areas to monitor resident, transient, and migratory birds, mainly small passerine species. Mist-netted avian species are banded and also have blood taken to detect the presence of any mosquito-vector pathogen activity. Mist netting/banding activities are conducted under this SUP. The Refuge proposes to allow the U.C. Davis arbovirus field station to continue these activities under an annual SUP.

Mosquito Control with larvicides:

The KMVCD proposes to control mosquitoes by treating areas infested with larval stages of *Culex erythrothorax*, *Cx. pipiens*, *Cx. tarsalis*; *Ochlerotatus dorsalis*, *Oc. melanimon*, *Oc. nigromaculis*, and *Aedes vexans*. Mosquito control will be initiated with the use of larvicides when an average of one or more larvae are captured per dip. KMVCD proposes to treat larval mosquitoes using *Bacillus thuringiensis* serovar. *israelensis* (Bti) and methoprene, which will be applied in multiple treatments using aerial and ground application methods.

Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Bti produces protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently bind to protein specific receptors of susceptible insect species resulting in the lethal response (Lacey and Mulla 1990). Bti must therefore be ingested by the target insect to be effective. It is most effective on younger mosquito larval instars but does not affect pupae or adult mosquitoes. KMVCD prefers to use Bti because of the low impacts to the environment and non-target organisms and its effectiveness in reducing the numbers of target pests. KMVCD proposes to use the formulated Bti product Teknar HP-D at rates of 0.5-1.0 pt/acre, and Vectobac 12AS at rates of 0.25-1 pt/acre.

Methoprene is a synthetic insect growth regulator (IGR) that mimics juvenile hormones (Tomlin, 1994). It interferes with the insect's maturation stages preventing the insect from transforming into the adult stage, thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars but does not affect pupae or adult mosquitoes (Extension Toxicology Network 1996). Treated larvae will pupate, but will not emerge as adults. KMVCD proposes to use the formulated methoprene product Altosid Liquid Larvicide Concentrate at a rate of 0.75-1.0 oz/acre.

During the early stages of larval growth, typically stages 2-4, Bti is most effective as larvae at these stages of life tends to feed on bacteria and consequently, Bti, that effectively chokes them to death. Altosid is used at later stages of larval growth when feeding ceases. Altosid is absorbed into the bodies of larvae, inhibiting their growth into adults. When larvae of various stages are encountered in large numbers, Bti and Altosid are used to form Duplex which is applied adhering to the same application rates stated above.

Treatment has been conducted mainly by aerial application in areas where monitoring has documented high mosquito larval densities or high concentrations of a specific vector bearing

mosquito species. Aerial application has been done using fixed-wing aircraft flown at an altitude of 10-20 feet above the vegetation and at airspeeds of 130-140 miles per hour. Treatment duration will average 20 minutes, but will vary given the size of the treatment area. Aerial pass distance will vary depending on the treatment area, but will average 70 feet. The pilot will use a map of units to be treated as well as utilizing a GPS system as an additional guide.

Applications of larvicides may occur anywhere in the wetland and moist soil units of the Refuge. The potential wetland areas for mosquito breeding and consequently mosquito treatment is 7,900 acres (see Figure 12 in the CCP). Most the Refuge's moist soil and winter wetland areas are devoid of water during the summer months. Fall flooding for migrating and wintering waterfowl habitat begins in August. Spring draining starts in March. Mosquito control applications can occur anytime between April through November, depending on environmental conditions, but normally occur during August, September, and October when water is being added to the wetland units. In the last five years, mosquito control treatments have occurred from August through October, except for once in June (6/15/99), once in July (7/23/02), and twice in November (11/2/99 and 11/1/01).

Annual precipitation amounts have a direct effect on mosquito populations. During drought years (seasons having low precipitation) mosquito populations tend to be low, and during wet years (seasons with high precipitation) mosquito populations tend to be high. Mosquito control is consequently conducted as a response to seasonality and/or climatic cycles.

The total area of the Refuge that is treated varies with the conditions of each year. The range in area treated in the last five years varied from a low of 1677 acres in 2003 to a high of 2468 acres in 2002. Some of these areas are treated more than once, resulting in the total acres treated ranging from 2525 acres sprayed in 1999 to 4570 acres sprayed in 2002. The average number of applications to units that were treated was about two, but applications may occur up to 4 times during the year at a specific site. Between 1988 and 2000, 5 to 10 treatments occurred per season. More recently the number of treatments required has risen to 13 in 2001, 19 in 2002, and 16 in 2003. The average area covered per treatment is 263 acres (124 acres standard deviation), but coverage has varied from 30 to 610 acres.

KMVCD has been controlling mosquito populations with larvicides on the Refuge for over 20 years. During the last 5 of those years KMVCD has accomplished mosquito control through the use of fixed-wing aircraft as well as ground application methods.

Mosquito control with adulticides

If efforts to control immature mosquitoes fail to prevent adult trap counts from exceeding 150 per night, and WNV and/or WEE or SLE are detected within or near the Refuge, KMVCD proposes to treat infested areas with a mosquito adulticide. KMVCD proposes to use the adulticides Pyrocyde or Pyrenone, which have natural pyrethrins as the active ingredient.

Pyrethrins are naturally occurring compounds produced by certain species of chrysanthemum flowers. The flowers of the plant are harvested shortly after blooming and are either dried and powdered, or oils within the flowers are extracted by solvents.

Pyrethrins are non-systemic contact poisons which quickly penetrate the nerve system of the insect and cause paralysis and subsequent death (EXTOXNET 1994, Tomlin 1994). A few minutes after application, the insect cannot move or fly away. But, a "knockdown dose" does not mean a

killing dose. Pyrethrins are swiftly detoxified by enzymes in the insect. Thus, some pests will recover. To delay the enzyme action so a lethal dose is assured, commercial products are formulated with synergists such as piperonyl butoxide, which inhibit detoxification (Tomlin, 1994). Both products KMVCD proposes, Pyroicide and Pyrenone, are composed of 5% pyrethrins and 25% piperonyl butoxide, They are applied as an ultra-low volume (ULV) fog at a rate of 0.1 fluid oz/ac (0.0025 lbs ai/ac pyrethrin) by air and/or ground.

Availability of Resources: Monitoring and control will not require refuge personnel. The KMVCD and U.C. Davis arbovirus field station are responsible for coordination of monitoring and control through the Refuge Manager or the Assistant Refuge Manager. In order to monitor treatment of wetland, moist soil, and riparian areas, it is estimated that 5% of a full-time employee's time will be required. Monitoring of treatments will include observations of sprayed areas before and after treatment and coordination of permitting, documentation, and record keeping. Additional funding will be required if a detailed, long-term study were to be conducted to determine effects of mosquito treatment on Refuge resources.

Up to the present we have not been required by Kern County to pay for mosquito control, and we have sufficient funds to cover our obligations. If costs of monitoring and control increase significantly in the future the County may ask for reimbursement.

Anticipated Impacts of the Use: The impacts of monitoring will be confined to pathways to shorelines where dip net samples will be taken. Small areas of vegetation may be crushed in transit to pools of water, but the vegetation will likely spring back after it has been bent under foot. There will be relatively little of this impact, as dipping is done at most once a week. Placing and checking of CO2 traps might also create a transient impact from footsteps on the vegetation going to and from the traps. Again, this is done at most once a week. There will be no disturbance of habitat associated with the single light trap, as it is in the maintenance yard at headquarters.

Toxicity and Effects to Non-target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. The possible effects of the larvicides Bti and methoprene and the pyrethroid adulticides will be discussed separately.

***Bacillus thuringiensis var. israelensis* (Bti)**

Bti has practically no acute or chronic toxicity to mammals, birds, fish, or vascular plants (U.S. EPA, 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shadduck, 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians or crustaceans (Brown et al. 2002, Brown et al. 2000, Garcia et al. 1980, Lee and Scott 1989, and Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar® HPD was attributed to xylene (Fortin et al. 1986, Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989, Jackson et al. 2002); no detectable adverse effects to breeding red-winged blackbirds using and nesting in Bti treated areas (Niemi et al. 1999, Hanowski 1997); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001).

In addition to mosquitoes (Family Culicidae), Bti affects some other members of the suborder Nematocera within the order Diptera. Also affected are members of the Family Simuliidae (black flies) and some chironomids midge larvae (Boisvert and Boisvert 2000, Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000, Lacey and Mulla 1990, Miura et al. 1980). In field studies, effects to target and susceptible nontarget invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; the Bti formulation used; the sample type (e.g. benthic, water column or drift); the sampling interval (e.g. from 48 hrs to one or more years after treatment); the habitat type (e.g. lentic or lotic); the biotic (e.g. aquatic communities), and abiotic factors (e.g. suspended organic matter or other suspended substrates, temperature, water depth); the mode of feeding (e.g. filter feeder, predator, scraper or gatherer); the larval development stage and larval density (Ali, 1981, Boisvert and Boisvert 2000, Lacey and Mulla,1990). Bti activity against target and susceptible nontarget invertebrates is also related to Bti persistence and environmental fate which are in turn affected by the factors associated with field study results (Dupont and Boisvert 1986, Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* sp. and *Chlorella* sp. resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla, 1999). For these reasons, Bti effects to target and susceptible nontarget organisms, and potential indirect trophic impacts in the field are difficult to predict.

Methoprene

Methoprene has moderate acute fish toxicity, slight acute avian toxicity, and practically no acute mammalian toxicity (U.S. EPA 2000, and U.S. Fish and Wildlife Service 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (U.S. EPA 1991). This figure exceeds the estimated environmental concentration by a factor 10 (Table 1). Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (U.S. EPA 1991). Up to 95 % of the residue in fish was excreted within 14 days (U.S. EPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Table 1) (Urban et al. 1986). In field studies no detectable adverse effects to breeding red-winged blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

Table 1. Risk assessment for Methoprene.

Animal	Acute Tox (ppm)	EEC (ppm)	RQ	LOC (ES)
Bird	> 4640 (8 D LC 50)	3.0 (short grass)	0.0006	0.1
Fish	0.4 (96 hr LC 50)	0.01 (6 inches)	0.025	0.05
Mammal	> 34,000 (LD 50)	3.0 (short grass)	0.00001	0.1

EEC calculated using a rate of 0.013 lbs ai/ac (1.0 fluid oz/ac Altosid 20 % methoprene)

LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

Methoprene affects terrestrial and aquatic invertebrates and is used to control fleas, sciarid flies in mushroom houses; cigarette beetles and tobacco moths in stored tobacco; Pharaoh's ants; leaf miners in glasshouses; and midges (Tomlin 1994). Methoprene may also be fed to livestock in a premix food supplement for control of hornfly (WHO, undated). Methoprene is highly toxic to

aquatic invertebrates with a 48 hour EC50 of 0.89 ppm for *Daphnia magna* (U.S. EPA, 1991). Laboratory studies show that methoprene is acutely toxic to chironomids, cladocerans, and some decapods, (Horst and Walker 1999, Celestial and McKenney 1994, McKenney and Celestial 1996, Chu et al. 1997). In field studies, significant declines of aquatic invertebrate, mollusk and crustacean populations have been directly correlated to methoprene treatments for mosquito control (Breaud et al. 1977, Miura and Takahashi 1973, Niemi et al. 1999, and Hershey et al., 1998).

Methoprene has a ten day half life in soil, a photolysis half life of ten hours, and solubility in water is 2 ppm (Zoecon 2000). Degradation in aqueous systems is caused by microbial activity and photolysis (U.S. EPA 1991). Degradation rates are roughly equal in freshwater and saltwater systems and are positively correlated to temperature (U.S. EPA 1991).

Pyrethroids

There are only two general classes of adulticides, organophosphates and pyrethroids. The pyrethroids include both natural products called pyrethrins and synthetic molecules that mimic the natural pyrethrins, such as permethrin, resmethrin, and sumithrin.

In general, pyrethroids have lower toxicity to terrestrial vertebrates than organophosphates. Although not toxic to birds and mammals, pyrethroids are very toxic to fish and aquatic invertebrates (Anderson 1989, Siegfried 1993, Milam et al. 2000). The actual toxicity of pyrethroids in aquatic habitats, however, is less than may be anticipated because of the propensity of these pesticides to adsorb organic particles in water (Hill et al. 1994). KMVCD proposes to use only natural pyrethrins.

Threatened and Endangered Species:

The Refuge is habitat for four endangered species: blunt-nosed leopard lizard (*Gambelia sila*), Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), Buena Vista Lake ornate shrew (*Sorex ornatus relictus*), and San Joaquin kit fox (*Vulpes macrotis nutica*). Three of these endangered species, the leopard lizard, kangaroo rat, and kit fox, use upland habitats that are concentrated on the west side of the Refuge and out of the potential spray zone. However, transient individuals could occur on levees on the east side of the refuge that is within the potential spray zone. The preferred habitat for the Buena Vista Lake ornate shrew is within the riparian areas of the Refuge which has, in the past, been subject to slight drift from aerial treatment flights. In an extensive literature review on the effects of Bti on mammals, Siegel and Shaddock (1992) found the bacterium to be innocuous. These studies exposed a variety of mammalian species to Bti at moderate to high doses and observed no pathological symptoms, nor disease, or mortality. Continued use of the bacterium, Bti, at moderate rates is likely to have a negligible effect on threatened and endangered species residing on the Refuge.

Fish

Screens across the water intake for the Refuge prevent any large fish from entering the refuge. However, very small individuals of carp, catfish, and bullheads may move through the screens. All these fish die when the ponds are drawn done in early spring. The water released from the refuge goes directly to irrigation either on the Refuge or adjacent lands; it does not return to any streams or lakes. Thus, the toxicity of any of these pesticides to fish populations will not be an issue, since

fish rarely occur on the Refuge, could not survive the draw-down in spring, and cannot move from the refuge to any other bodies of water.

Wetlands and Waterfowl:

The Refuge was established to provide habitat for migratory birds, in particular waterfowl which includes geese, swans, ducks, and coots. These species occur on the refuge during August, September, and October when newly flooded wetlands are being treated to control mosquitoes, so there is a potential impact on them.

There is not likely to be much impact on geese and swans are year round herbivores. Geese feed mainly on grasses and agricultural lands, while swans feed mainly on roots, tubers, stems, and leaves of submerged and emergent aquatic vegetation. While applications of Bti and Altosid will be likely to occur over areas of vegetation which may be used by geese and swans, it has been found that birds are not negatively affected by utilizing foods exposed to Bti or methoprene (Niemi et al. 1999).

In contrast, ducks are known to be opportunistic feeders on both plants and invertebrates, utilizing the most readily available food sources. Invertebrates, plants, and seeds compose the majority of their diet, varying with the season and the geographic location. A study in California's Sacramento Valley has shown that plant foods are dominant in fall diets of northern pintails, while invertebrate use increases in February and March (Miller 1987). Seeds of swamp timothy comprise the most important duck food in the summer-dry habitats of the San Joaquin Valley (Miller 1987). At the Kern National Wildlife Refuge, the fall diet of northern pintails and green-winged teal was composed of over two-thirds seeds (Euliss and Harris 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diet shifts to invertebrates after mosquito treatments are expected to be reduced in frequency, thereby allowing the invertebrate populations to recover.

Recent studies have shown that aquatic invertebrates are a dominant food of non-breeding waterfowl during the summer molt, and the fall and winter periods (Heitmeyer 1988). Invertebrates are also critical for egg production during the spring (Swanson et al. 1979), and duckling growth during the summer rearing period (Krapu and Swanson 1978). Mosquitoes and chironomids make an important contribution to invertebrate food resources throughout the year. Other significant food resource contributors of the invertebrate community are Coleoptera, Odonata, and Trichoptera.

However, during fall flood-up and peak mosquito populations, ducks tend to feed on seed and other plant material. Waterfowl in general tend to feed on seeds when they reach their wintering areas, perhaps to regain energy lost during long flights (Heitmeyer 1988, Miller 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diets shift to invertebrates after treatments are expected to be reduced in frequency thereby allowing invertebrate populations to recover.

Other Migratory Birds:

Shorebirds feed on a wide variety of invertebrates all year, feeding which intensifies at the onset of spring migration. Documentation of indirect food-chain effects have not come to light. Hanowski et al. (1997) studied 19 different bird species after collecting data on wetlands 2 years

before treatment and 3 years after treatment of both Bti and methoprene applications and found no negative effects. Niemi et al. found the same results from the same study site of a 3 year study on zooplankton or breeding birds.

There are primarily two California State Species of Concern which forage and nest on the Refuge, they are tri-colored blackbirds, and white-faced ibis. Both species are associated with wetland habitat that has been identified, through monitoring by KMVCD, to contain mosquitos targeted for control. While resident endangered species are limited to upland habitat on the Refuge, these sensitive species prefer wetland habitat or habitat bordering wetlands. While Hanowski et al. (1997) found no direct evidence to indicate Bti or methoprene negatively impacted the reproduction, growth, or foraging of red-winged blackbirds, to minimize impacts to these species, in particular, during their breeding season, no applications will occur where tri-colored blackbirds or white-faced ibis are nesting.

Public Review and Comment: If, through monitoring it is determined that targeted mosquito species that: 1) are known carriers of Encephalitis, and 2) that they occur in densities that warrant control, the public will be notified. However, given the nature of potential serious health risks and the rapid development of mosquito larvae, applications may occur simultaneously with public notification or before. As part of the Comprehensive Conservation Plan process, a public review and comment period will be conducted during which time the current mosquito management guidelines will be reviewed by the public.

Determination (Check one Below)

Use is not compatible

Use is compatible

Stipulations Necessary to Ensure Compatibility:

1. All application of pesticides/biological agents must be coordinated and approved by the Refuge Manger or Assistant Refuge Manager to avoid conflicts with nesting birds, public use, Refuge management activities, etc. **Refuge staff will be present during all ground and aerial applications.** Prior to all applications, KMVCD will provide a map and dip net counts to the Refuge Manager or Assistant Manger and obtain verbal approval. If Refuge Manager or Assistant Manager is not in the office, leave map and counts with clerk and call for approval later. In addition to verbal permission, the permittee or designated representative form the Bakersfield office will call and confirm flight and conditions.
2. A threshold level of 1 larva per dip average will be instituted for mosquito control.
3. Screens will be placed on and around the bottom of the chicken coop to exclude other wildlife.
4. The KMVCD will notify the Refuge Manager immediately if chickens die, disappear, or if blood samples exhibit disease conversion. All dead birds will be sent to the USFWS National Wildlife Health Center (NWHC) in Madison, WI., if requested by the Refuge Manager.

5. KMVCD will provide the Refuge with interim and final reports regarding the arbovirus studies on the Refuge and in Kern County, including data on dip netting and CO2 and light traps. KMVCD will also provide these reports to the NWHC. Maintaining careful records of immature mosquito occurrence, developmental stages treated, source size, and control effectiveness can provide an early warning to forecast the size of the adult population.
6. KMVCD will notify the Refuge Manager immediately if an arbovirus-induced mortality is observed in wild birds in Kern County.
7. Spray applications will occur only on designated refuge lands east of Goose Lake Canal and within Unit 9 and 14 west of this canal. Spraying will not be conducted on ephemeral pools or other such water basins resulting from rainwater accumulations in upland sites.
8. KMVCD has and will continue to consider environmental conditions, including water temperature, density of mosquito larvae, and presence of mosquito predators, when deciding mosquitoes on the Refuge pose a serious threat to human health and whether to treat.
9. Mosquito adulticides will only be allowed in cases of a human health emergency, following a specific request to the Refuge and written concurrence from appropriate Service or Department bureaus. A human-health emergency is defined by the presence of human disease virus-positive mosquitoes or virus-positive birds in Kern County or adjacent counties. Treatment may be allowed only when entomological surveys determine the presence of mosquitoes on Refuge pose a human health emergency.
10. At the end of the permitting period, KMVCD will provide the Refuge Manager with a list of all pesticides/biological agents used, and the quantities of each that were applied.
11. Access will be prohibited in closed areas on Wednesdays and Saturdays during the waterfowl hunt season.
12. Application of mosquito control measures is to be conducted in accordance with approved Pesticide Use Proposals.
13. Mosquito control will be authorized on an annual basis by a Special Use Permit (SUP). SUP condition will stipulate that all mosquito control work will be carried out under the guidance of pre-approved Pesticide Use Proposals.

Justification:

For many years the Refuge has worked cooperatively with KMVCD and its associated mosquito control activities. After a review of these activities, the Refuge has determined that allowing these uses to continue will not interfere or derogate from the purpose for the Refuge, nor the mission of the National Wildlife Refuge System.

As previously mentioned, the Refuge has, within a 20 mile radius, communities of various populations surrounding it. Species of mosquito like *Culex tarsalis*, *Aedes vexans*, *Ochlerotatus melanimon*, and *O. nigromaculis*, which are found on the Refuge, are capable of dispersing various miles to obtain a blood meal. With the exception of *Culex tarsalis*, the remaining fore mentioned species are capable of dispersing 5-10 miles; *Culex tarsalis* is known to disperse 25+

miles. All species are known to be vectors for Saint Louis encephalitis, California encephalitis, and western equine encephalitis; additionally, *C. tarsalis* is particularly known to transmit West Nile virus. In 1989 and 1990, sentinel chickens tested positive for Saint Louis encephalitis and in 1996, 1997, and 1998 (Kern Refuge files), tested positive for western equine encephalitis. Additionally, mosquitoes sampled during 1989 and 1998 tested positive for Saint Louis and western equine encephalitis respectively. Reisen et. al. (1992) found that the significant 1989 outbreak of Saint Louis encephalitis in the Southern San Joaquin Valley was tied directly to especially large numbers of *C. tarsalis*. Some factors which led to a greater than normal numbers of *C. tarsalis* in this area in 1989 were an unseasonably mild spring which allowed the species to successfully overwinter, further amplifying their numbers when warmer weather set in. This same study also indicated that many of the overwintering population were found on the Refuge. In order to protect neighboring communities from potential health threats from vector carrying mosquitoes, the Refuge will continue to allow mosquito control to take place on Refuge following the guidance of the stipulations within this document. In the event that a human health emergency has been declared, perhaps as a consequence of West Nile virus, the use of adulticides may be permitted with the concurrence of the refuge manager..

Because mosquito treatment occurs during the early weeks of fall flood-up, and frequency of treatments are low and spaced apart on a per unit basis, overall effects to non-target organisms are not expected to be significant. Treatments will further minimize adverse impacts to wildlife by being conducted during the early morning hours of 0600-0900, flight durations averaging 30 minutes to 2 hours depending on the treatment area. Treated areas are not overlapped and are treated, on average, twice a year during the breeding season. Breeding seasons vary for two targeted mosquito species *Culex tarsalis* and *Ochlerotatus melanimon*, the fore mentioned species breeds in standing water year round while the latter species is primarily a flood water breeder. Treatments for *Culex tarsalis* occurs year round, given the abundance of the species, and tends to be ground application during the summer months while treatments for *Ochlerotatus melanimon* occurs during late summer through late fall when the Refuge begins winter flood up.

While treatment on the ground may seem ideal because the impact area is small and can be accomplished from existing roads and levees, aerial treatment is preferred as the impacts to the ground are non-existent and the amount of coverage is larger, less time consuming, and effective over a large area.

Low flying aircraft will undoubtedly cause disturbances to wildlife. However, the number of treatment days per year is fairly low, and if the applicator (pilot or ground) follows the stipulations previously outlined and within the SUP, mosquito abatement practices should not materially interfere with or detract from the Refuge purpose or the mission of the National Wildlife Refuge System. If additional biological monitoring of this activity documents substantial negative impacts to migratory birds or other wildlife, this determination will be re-analyzed on the basis on new evidence.

Literature Cited:

- Ali, A. 1981. *Bacillus thuringiensis* serovar *israelensis* against chironomids and some non-target aquatic invertebrates. *Journal of Invertebrate Pathology* 38: 264-272.
- Anderson, R.L. 1989. Toxicity of synthetic pyrethroids to freshwater invertebrates. *Environmental Toxicology and Chemistry* 8: 403-410.
- Boisvert, M., and J. Boisvert. 2000. Effects of *Bacillus thuringiensis* var. *israelensis* on target and nontarget organisms: a review of laboratory and field experiments. *Biocontrol Science and Technology* 10: 517-561.
- Breaud, T.P., J.E. Farlow, C.D. Steelman, and P.E. Schilling. 1977. Effects of the insect growth regulator methoprene on natural populations of aquatic organisms in Louisiana intermediate marsh habitats. *Mosquito News*. 37(4); 704-712.
- Brown, M.D., T.M. Watson, S. Green, J.G. Greenwood, D. Purdie, and B.H. Kay. 2000. Toxicity of insecticides for control of freshwater *Culex annulirostris* (Diptera: Culicidae) to the nontarget shrimp, *Caradina indistincta* (Decapoda: Atyidae). *Journal of Economic Entomology*. 93(3): 667-672.
- Brown, M.D., J. Carter, D. Purdie, D. Thomas, D.M. Purdie, and B.H. Kay. 2002. Pulse-exposure effects of selected insecticides to juvenile Australian Crimson-Spotted Rainbowfish (*Melanotaenia duboulayi*). *Journal of Economic Entomology* 95(2):294-298.
- California Department of Health Services. 2003. California mosquito-borne virus surveillance and response plan.
- Celestial, D.M and C.L. McKenney, Jr. 1994. The influence of an insect growth regulator on the larval development of the mud crab *Rhithropanopeus harrisi*. *Environmental Pollution*. 85: 169-173.
- Centers for Disease Control and Prevention. 1999. Epidemic/Epizootic West Nile virus in the United States: Guidelines for Surveillance, Prevention, and Control. From a workshop co-sponsored by the Department of Health and Human Services, CDC, and the U.S. Department of Agriculture. Fort Collins, Colorado, November 8-9, 1999.
- Chu, K.H., Wong, C.K., and Chiu, K.C. 1997. Effects of the insect growth regulator (S)-methoprene on survival and reproduction of the freshwater cladoceran *Moina macrocopa*. *Environmental Pollution*. 96: 173-178.
- Dritz, D.A., S.P. Lawler, J. Albertson, W. Hamersky, and J.R. Rusmisl. 2001. The impact of Bti on survival of the endangered tadpole shrimp *Lepidurus packardii*. In *Proceeding and Papers of the Sixty-ninth Annual Conference of the Mosquito and Vector Control Association of California*. Jan. 21-24. pp. 88-91.

- Dupont, C. and J. Boisvert. 1986. Persistence of *Bacillus thuringiensis* serovar. *israelensis* toxic activity in the environment and interaction with natural substrates. *Water, Air, and Soil Pollution* 29:425-438.
- Euliss, N.H., and S.W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *Journal of Wildlife Management* 51(4): 724-732.
- Extension Toxicology Network. 1994. Pyrethrin Pesticide information profile. <http://ace.ace.orst.edu/info/extoxnet/pips/ghindex.html>
- Extension Toxicology Network. 1996. Methoprene Pesticide information profile. <http://ace.ace.orst.edu/info/extoxnet/pips/methopre.htm>
- Fortin, C, D. Lapointe, and G. Charpentier. 1986. Susceptibility of brook trout (*Salvelinus fontinalis*) fry to a liquid formulation of *Bacillus thuringiensis* serovar. *Israelensis* (Teknar®) used for blackfly control. *Canadian Journal of Fisheries and Aquatic Science* 43:1667-1670.
- Garcia, R., B. Des Rochers, and W. Tozer. 1980. Studies on the toxicity of *Bacillus thuringiensis* var. *israelensis* against organisms found in association with mosquito larvae. *California Mosquito and Vector Control Association Proceedings and Papers* 48:33-36.
- Goddard, L.B., A.E. Roth, W.K. Reisen, and T.W. Scott. 2002. Vector competence of California mosquitoes for West Nile virus. *Emerging Infectious Diseases* 8/12 1385-1391.
- Hanowski, J. M., G. J. Niemi, A. R. Lima, and R. R. Regal. 1997. Do mosquito control treatments of wetlands affect red-winged blackbird (*Agelaius phoeniceus*) growth, reproduction, or behavior? *Environmental Toxicology and Chemistry* 16(5):1014-1019.
- Hershey, A. E., A. R. Lima, G. J. Niemi, and R. R. Regal. 1998. Effects of *Bacillus thuringiensis israelensis* (Bti) and methoprene on non-target macroinvertebrates in Minnesota wetlands. *Ecological Applications* 8:41-60.
- Horst, M.N., and A.N. Walker. 1999. Effects of the pesticide methoprene on morphogenesis and shell formation in the blue crab *Callinectes sapidus*. *Journal of Crustacean Biology* 19: 699-707.
- Jackson, J. K., R.J. Horowitz, and B.W. Sweeny. 2002. Effects of *Bacillus thuringiensis israelensis* on black flies and nontarget macroinvertebrates and fish in a large river. *Transactions of the American Fisheries Society* 131:910-930.
- Lacey, L.A., and Mulla, M.S. 1990. Safety of *Bacillus thuringiensis* var. *israelensis* and *Bacillus sphaericus* to non-target organisms in the aquatic environment. In Laird, M., L.A. Lacey, E.W. Davidson, eds. *Safety of microbial insecticides*. CRC Press.
- Lee, B. M. And G. I. Scott. 1989. Acute toxicity of temephos, fenoxycarb, diflubenzuron, and methoprene and *Bacillus thuringiensis* var. *israelensis* to the mummichog (*Fundulus heteroclitus*). *Bulletin of Environmental Contamination and Toxicology* 43:827-832.

- McKenney, C.L., Jr., and D.M. Celestial. 1996. Modified survival, growth, and reproduction in an estuarine mysid (*Mysidoposis bahia*) exposed to a juvenile hormone analogue through a complete life cycle. *Aquatic Toxicology* 35:11-20.
- Merritt, R. W., E. D. Walker, M. A. Wilzbach, K. W. Cummings, and W. T. Morgan. 1989. A broad evaluation of Bti for black fly (Diptera: Simuliidae) control in a Michigan River: Efficacy, carry, and non-target effects on invertebrates and fish. *Journal of the American Mosquito Control Association* 5:397-415.
- Millam, D.C., J.L. Farris, and J.D. Wilhide. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. *Mosquito News* 40:619-622.
- Miller, M. R. 1987. Fall and winter foods of northern pintails in the Sacramento Valley, California. *Journal of Wildlife Management*. 51:405-414.
- Miura, T., and R.M. Takahashi. 1973. Insect development inhibitors. 3. Effects on nontarget aquatic organisms. *Journal of Economic Entomology*. 66(4):917-922.
- Miura, T.; Takahashi, R. M.; and Mulligan, F.S. 1980. Effects of the bacterial mosquito larvicide *Bacillus thuringiensis* stereotype H-14 on selected aquatic organisms. *Mosquito News*. 40:619-622.
- Mulla, M.S. 1992. Activity, Field Efficacy, and Use of *Bacillus thuringiensis israelensis* against Mosquitoes. Pp. 134-160 in de Barjac, Hugette and Donald J. Sutherland, eds. *Bacterial Control of Mosquitoes and Blackflies: Biochemistry, Genetics, and Applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus**. Kluwer Academic.
- Niemi, G. J., A. E. Hershey, L. Shannon, J. M. Hanowski, A. Lima, R. P. Axler, and R. R. Regal. 1999. Ecological Effects of Mosquito Control on Zooplankton, Insects, and Birds. *Environmental Toxicology and Chemistry*, 18(3):549-559.
- Reisen, W. K.; R. P. Meyer; M.M. Milby; S. B. Presser; R. W. Emmons; J. L. Hardy; and W. C. Reeves. 1992. Ecological Observations on the 1989 outbreak of St. Louis encephalitis virus in the Southern San Joaquin Valley of California. *Entomological Society of America*. 29(3):472-482.
- Siegel, Joel, P. and J. A. Shaddock. 1992. Mammalian safety of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Pp. 202-217 in de Barjac, Huguet and Donald J. Sutherland, eds. *Bacterial control of mosquitoes and blackflies: biochemistry, genetics, and applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus**. Kluwer Academic.
- Su. T., and M.S. Mulla. 1999. Microbial agents *Bacillus thuringiensis* ssp. *israelensis* and *Bacillus sphaericus* suppress eutrophication, enhance water quality, and control mosquitoes in microcosms. *Environmental Entomology* 28:761-767.
- Swanson, G.A., G.L. Krapu, and J.R. Serie. 1979. Foods of laying female dabbling ducks on the breeding grounds. Pages 47-57 in T.A. Bookhout, ed. *Waterfowl and wetlands-An integrated review*. Proc. Symp. North Cent. Sect., The Wildl. Soc.

- Tomlin, C. 1994. The Pesticide Manual. Farnham: British Crop Protection Council/Cambridge: Royal Society of Chemistry.
- Urban, J. D. and N.J. Cook. 1986. Standard evaluation procedure: Ecological risk assessment. U. S. EPA. Office of Pesticide Programs. Hazard evaluation division
- U.S. EPA. 1991. Re-registration eligibility document. Isopropyl (2E, 4E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate (Referred to as methoprene). List A. Case 0030. Office of pesticide Programs. Special Review and Registration Division.
- U.S. EPA. 1998. Re-registration eligibility document. *Bacillus thuringiensis*. Office of Prevention, Pesticides and Toxic Substances. EPA738-R-98-004.
- U.S. EPA. 2000. Ecotoxicity online database. Division of Environmental Fate and Effects. Office of Pesticide Programs.
- U.S. Fish and Wildlife Service. 1984. Acute toxicity rating scales. Research Information Bulletin No. 84-78.
- WHO. Undated. Data sheet on pesticides no. 47. Methoprene. World Health Organization. Food and Agriculture Organization. http://www.inchem.org/documents/pds/pds/pest47_e.htm
- Wipfli, M.S., R.W. Merritt. And W.W. Taylor. 1994. Low toxicity of the blackfly larvicide *Bacillus thuringiensis* var. *israelensis* to early stages of brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and steelhead trout (*Oncorhynchus mykiss*) following direct and indirect exposure. Canadian Journal of Fisheries and Aquatic Science 41:1451-1458.
- Zoecon. 2000. MSDS Altosid Liquid Larvicide Concentrate

Mandatory Re-Evaluation Date (provide month and year):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)

 2014 Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

 X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Refuge Determination:

Prepared by: Pamela L. Williams 9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval: [Signature] 9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor: [Signature] 9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System: [Signature] 9/30/04
(Signature) (Date)

Active California/Nevada
Operations Manager [Signature] 9-30-04
(Signature) (Date)

Compatibility Determination

- Use:** Monitor and control mosquitoes mosquitoes (Alternative C, Kern and Pixley National Wildlife Refuge Complex Comprehensive Conservation Plan Environmental Assessment)
- Refuge Name:** Pixley National Wildlife Refuge (Established November 17, 1959)
- Establishing and Acquisition Authorities:** The Pixley National Wildlife Refuge, located in Tulare County, California was established in 1959 under provisions of the Bankhead-Jones Farm Tenant Act (U.S.C. ‘ 1101), Secretarial Order 2843, and the Endangered / Species Act of 1973 (16 U.S.C. ‘ 1534).
- Refuge Purposes:** Bankhead-Jones Farm Tenant Act (7 U.S.C. ‘ 1101) for purposes of a land conservation and land-utilization program.
- Secretarial Order 2843, dated November 17, 1959 as a refuge for Migratory birds and other wildlife.
- Endangered Species Act of 1973 (16 U.S.C. ‘ 1534), to conserve fish, wildlife and plants which are listed as endangered or threatened species.

National Wildlife Refuge System Mission: The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use: The Tulare Mosquito Abatement District (TMAD) proposes to continue using Pixley National Wildlife Refuge (Refuge) for monitoring and controlling mosquitoes to address human health concerns of neighboring communities. The Community of Earlimart lies 10 miles south-east of the Refuge, the community of Pixley 6 miles due west, and the community of Alpaugh 8 miles south-west. Within a 20 mile radius of the Refuge are small to large dairies. Residents of Tulare County have voiced concern about biting mosquitoes and mosquito-borne disease. To address these concerns, TMAD has been monitoring and controlling mosquitoes on the Refuge since 1963 when the wetland basins were constructed, in years when ponds of water are present.

While mosquitoes are considered a nuisance because of their biting, many species are known vectors of serious diseases in California. Although 12 mosquito-borne viruses are known to occur in California, only western equine encephalomyelitis virus (WEE) and St. Louis encephalitis virus (SLE) have caused significant outbreaks of human disease (CA Dept. of Health Services, 2003). California is also at risk for West Nile virus (WN) which has been detected in 2003 in adult mosquitoes in Imperial County and crows in Orange County.

WEE tends to be most serious in very young children, whereas elderly people are most at risk to SLE and WN (CA Dept. of Health Services, 2003). WEE and WN can cause serious diseases in horses and emus, and WN kills a wide variety of endemic and imported birds. Mosquito control is the only known practical method of protecting people and animals from WEE, SLW, and WN (CA Dept. of Health Services, 2003). With the exception of available vaccines to protect horses against WEE and WN, there are no known specific treatments or cures for diseases caused by these viruses (CA Dept. of Health Services, 2003).

The mosquito species identified by TMAD for monitoring and control are *Culex erythrothorax*, *Cx. pipiens*, *Cx. tarsalis*; *Ochlerotatus dorsalis*, *Oc. melanimon*, *Oc. nigromaculis*, and *Aedes vexans*. *Culex tarsalis* is the primary vector of WEE and SLE in California and is also considered to be a significant vector of WN (CA Dept. of Health Services, 2003). *Culex pipiens*, *Cx. erythrothorax*, and *Oc. melanimon*, *Oc. dorsalis*, and *Aedes vexans* may also contribute to disease transmission (Goddard, 2002).

Mosquito Monitoring

TMAD monitoring activities are designed to estimate the abundance of immature (larvae and pupae) and adult mosquito populations. TMAD proposes to use the “dipper,” method to monitor immature mosquito populations. A dipper is simply a long-handled ladle (ca 500 ml) used to collect water samples from pools potentially serving as mosquito sources. Using the dipper method, the number of immature mosquitoes per “dip” can be estimated. Dip counts are also used to determine the need for mosquito control, and captured immature mosquitoes will be identified taxonomically by skilled technicians.

Only a small portion of the Refuge, 950 acres (15% of the total 6389 acres) has been set aside for wetland units (Figure 1), and only 300 acres (Units 2-4, Figure 2) are regularly flooded from mid-August to March for waterfowl habitat. Sampling will be conducted in these areas, and in any standing water in shallow ponds or ditches, such as the Deer Creek channel on the south edge of the Refuge.

During an average year, TMAD will assess mosquito populations between the months of April and November. However, because the wetlands are dry throughout the late spring and summer, sampling usually begins in mid-August with the exception of very wet years when there may be standing water during April, May, or even June. Dip samples will be taken about once a week, depending on presence or absence of water.

TMAD proposes to use carbon dioxide (CO₂) baited traps to monitor adult mosquito populations. There are two types of CO₂-baited traps used in California, the CDC trap and the EVS trap. Both traps are baited either with an insulated container holding 1-2 kg of dry ice or with a cylinder containing compressed CO₂ gas with a regulator that releases 0.5 - 1.0 liters/minute. Both traps use a screened collection bag or a modified gallon ice cream carton with tubular surgical stockinet attached to the bottom of the motor housing unit to retain the collected mosquitoes. The CDC trap uses a rechargeable 6v battery power source whereas the EVS trap uses three 1.5v D cell batteries. The CO₂ trap nearest Pixley Refuge is at a private residence one block south of Allensworth State Historic Park, about 2.5 miles to the south. Adults are sampled weekly from April through November and individuals collected will be identified taxonomically by skilled technicians and, could also be tested for WEE, SLE, and WN.

The monitoring activities described above are conducted under a Special Use Permit (SUP) between the Refuge and TMAD. The Refuge proposes to allow the TMAD to continue these activities under an annual SUP.

Mosquito Control with Larvicides

The TMAD proposes to control mosquitoes by treating areas infested with larval states of *Culex erythrothorax*, *Cx. pipiens*, *Cx. tarsalis*; *Ochlerotatus dorsalis*, *Oc. melanimon*, *Oc. nigromaculis*, and *Aedes vexans*. Mosquito control will be initiated with the use of larvicides when an average of two or more larvae is captured per dip. TMAD proposes to treat larval mosquitoes using *Bacillus thuringiensis* serovar *israelensis* (Bti) and methoprene, which will be applied in multiple treatments using aerial and ground application methods.

Bti is a microbial insect pathogen used to control larval stages of mosquitoes and black flies. It is a naturally occurring anaerobic spore forming bacteria that is mass produced using modern fermentation technology. Bti produces protein endotoxins that are activated in the alkaline mid-gut of insect species and subsequently bind to protein specific receptors of susceptible insect species resulting in the lethal response (Lacey and Mulla 1990). Bti must therefore be ingested by the target insect to be effective. It is most effective on younger mosquito larval instars but does not affect pupae or adult mosquitoes. TMAD prefers to use Bti because of the low impacts to the environment and non-target organisms and its effectiveness in reducing the numbers of target pests. TMAD proposes to use the formulated Bti product Teknar HP-D at rates of 0.5-1.0 pt/acre.

Methoprene is a synthetic insect growth regulator (IGR) that mimics juvenile hormones (Tomlin, 1994). It interferes with the insect's maturation stages preventing the insect from transforming into the adult stage, thereby precluding reproduction. Methoprene is a contact insecticide that does not need to be ingested. It is most effective on early larval instars but does not affect pupae or adult mosquitoes (Extension Toxicology Network, 1996). Treated larvae will pupate, but will not emerge as adults. TMAD proposes to use the formulated methoprene product Altosid Liquid Larvicide Concentrate at a rate of 0.75-1.0 oz/acre.

Bti is most effective during the early stages of larval growth, typically stages 2-4. Larvae at these stages of life tend to feed on bacteria, and consequently, Bti, which effectively chokes them to death. Altosid is used at later stages of larval growth when feeding ceases. Altosid is absorbed into the bodies of larvae, inhibiting their growth into adults.

Annual precipitation amounts have a direct effect on mosquito populations. During drought years (seasons having low precipitation) mosquito populations tend to be low, and during wet years (seasons with high precipitation) mosquito populations tend to be high. Mosquito control is consequently conducted as a response to seasonality and/or climatic cycles.

Treatment will be conducted mainly by aerial application in areas where monitoring has documented high mosquito larval densities or high concentrations of a specific vector bearing mosquito species. Aerial application has been done using fixed-wing aircraft flown at an altitude of 10-20 feet above the vegetation and at airspeeds of 130-140 miles per hour. Treatment duration will average 20 minutes, but will vary given the size of the treatment area. Aerial pass distance will vary depending on the treatment area, but will average 70 feet. The pilot will use a map of units to be treated as well as utilizing a GPS system as an additional guide.

Applications of larvicides may occur anywhere in the wetland and moist soil units of the Refuge. The potential wetland areas for mosquito breeding and consequently mosquito treatment are 450 acres. Most the Refuge's moist soil and winter wetland areas are devoid of water during the summer months. Fall flooding for migrating and wintering waterfowl habitat begins in August. Spring draining starts in March. Mosquito control applications can occur anytime from April through November, depending on environmental conditions, but normally occur during from mid-August through October, when water is being added to the wetland units.

TMAD proposes to apply larvicides when the threshold of an average of two larvae per dip is exceeded. Mosquito treatments on the Refuge have been rare; there have been no treatments since 1995.

Mosquito Control with Adulticides

If efforts to control immature mosquitoes fail to prevent adult trap counts from exceeding 150 per night, and WN, WEE, or SLE are detected within or near the Refuge, and a public health emergency is declared by the state or county, TMAD proposes to treat infested areas with a mosquito adulticide.

There are only two general classes of adulticides, organophosphates and pyrethroids. The organophosphates proposed for use is naled. The pyrethroids include both natural products called pyrethrins and synthetic molecules that mimic the natural pyrethrins, such as permethrin, resmethrin, and sumithrin.

TMAD proposes to use the adulticide naled to control adult mosquitoes. Naled is a non-systemic, broad spectrum organophosphate insecticide and acaricide (kills mites and ticks), with contact and stomach action, respiratory action, and cholinesterase inhibition. TMAD proposes to use the formulated naled product Trumpet EC at a rate of 0.24 fluid oz/acre by ground and/or 0.6-1.2 fluid oz/acre by air.

The Refuge suggests that TMAD uses Pyroicide or Pyrenone, in which the active ingredient, pyrethrins, are non-systemic contact poisons which quickly penetrate the nerve system of the insect, causing paralysis and subsequent death (EXTOXNET 1994, Tomlin 1994). Pyrethrins are naturally occurring compounds produced by certain species of chrysanthemum plants. The flowers of the plant are harvested shortly after blooming and are dried and powdered, or oils within the flowers are extracted by solvents. These active insecticidal components are collectively known as pyrethrins. Two pyrethrins are most prominent, pyrethrin-I and pyrethrin-II. The pyrethrins have another four different active ingredients, Cinerin I and II and Jasmolin I and II (EXTOXNET, 1994).

A few minutes after application, the insect cannot move or fly away. But, a "knockdown dose" does not mean a killing dose. Pyrethrins are swiftly detoxified by enzymes in the insect. Thus, some pests will recover. To delay the enzyme action so a lethal dose is assured, commercial products are formulated with synergists such as pepperoni butoxide, which inhibit detoxification (Tomlin, 1994). Both products TMAD proposes to use are composed of 5% pyrethrins and 25% piperonyl butoxide. They are applied as an ultra-low volume (ULV) fog at a rate of 0.0025 lbs/acre for pyrethrin and 0.0125 lbs/acre piperonyl butoxide.

The Refuge suggests the use of pyrethrins rather than naled because lower overall toxicity. Among other characteristics, pyrethroids are in a lower skin and eye toxicity class (class IV) than is naled (class I). In addition, naled is a class II toxic chemical, while pyrethroids, although not EPA listed, can be considered a class III toxicity class, on the basis of LD50 data (New York State Department of Health on the web).

TMAD proposes to apply adulticides using ground and/or aerial equipment consisting of an ultra-low volume (ULV) non-thermal aerosol device mounted on a truck or fixed wing aircraft. Adulticide application may occur only after a human health emergency has been declared by the state or county. Adulticides have never been sprayed on Pixley Refuge.

Availability of Resources: Monitoring and control will not require Refuge personnel. The TMAD is responsible for coordination of monitoring and control through the Refuge Manager. In order to monitor treatment of wetland, moist soil, and riparian areas, it is estimated that 5% of a full-time employee's time will be required. Monitoring of treatments will include observations of sprayed areas before and after treatment and coordination of permitting, documentation, and record keeping with TMAD.

If larvae are detected at sufficient density to create a problem, TMAD proposes to treat the area where the larvae are found on two occasions. Any control necessary beyond these initial treatments will need to be funded by another source. Additional funding will also be required if detailed long-term studies were to be conducted to determine effects of mosquito treatment on Refuge resources.

Anticipated Impacts of the Use

The impacts of monitoring will be confined to pathways and shorelines where dip net samples will be taken. Small areas of vegetation may be crushed in transit to the shoreline, but the vegetation will likely spring back after it has been bent under foot. There will be relatively little of this impact, as dipping is done at most once a week.

Toxicity and Effects to Non-target Organisms

The dominant impact of mosquito control will relate to the toxicity and effects of the treatments on non-target organisms. The possible effects of the larvicides Bti and methoprene and the pyrethroid adulticides will be discussed separately.

***Bacillus thuringiensis var. israelensis* (Bti)**

Bti has practically no acute or chronic toxicity to mammals, birds, fish, or vascular plants (U.S. EPA, 1998). Extensive acute toxicity studies indicated that Bti is virtually innocuous to mammals (Siegel and Shaddock, 1992). These studies exposed a variety of mammalian species to Bti at moderate to high doses and no pathological symptoms, disease, or mortality were observed. Laboratory acute toxicity studies indicated that the active ingredient of Bti formulated products is not acutely toxic to fish, amphibians or crustaceans (Brown et al. 2002, Brown et al. 2000, Garcia et al. 1980, Lee and Scott 1989, Wipfli et al. 1994). However, other ingredients in formulated Bti products are potentially toxic. The acute toxicity response of fish exposed to the formulated Bti product Teknar® HPD was attributed to xylene (Fortin et al. 1986, Wipfli et al. 1994). Field studies indicated no acute toxicity to several fish species exposed to Bti (Merritt et al. 1989, Jackson et al. 2002); no detectable adverse effects to breeding red-winged blackbirds using and

nesting in Bti treated areas (Niemi et al. 1999, Hanowski et al.1997); and no detectable adverse effects to tadpole shrimp 48 hours post Bti treatment (Dritz et al. 2001).

In addition to mosquitoes (Family Culicidae), Bti affects some other members of the suborder Nematocera within the order Diptera. Also affected are members of the Family Simuliidae (black flies) and some chironomid midge larvae (Boisvert and Boisvert 2000, Garcia et al. 1980). The most commonly observed Bti effects to non-target organisms were to larvae of some chironomids in laboratory settings when exposed to relatively high doses (Boisvert and Boisvert 2000, Lacey and Mulla 1990, Miura et al. 1980). In field studies, effects to target and susceptible nontarget invertebrates have been variable and difficult to interpret. Field study results are apparently dependent on the number, frequency, rate and aerial extent of Bti applications; the Bti formulation used; the sample type (e.g. benthic, water column or drift); the sampling interval (e.g. from 48 hrs to one or more years after treatment); the habitat type (e.g. lentic or lotic); the biotic (e.g. aquatic communities), and abiotic factors (e.g. suspended organic matter or other suspended substrates, temperature, water depth); the mode of feeding (e.g. filter feeder, predator, scraper or gatherer); the larval development stage and larval density (Ali 1981, Boisvert and Boisvert 2000, Lacey and Mulla 1990). Bti activity against target and susceptible nontarget invertebrates is also related to Bti persistence and environmental fate which are in turn affected by the factors associated with field study results (Dupont and Boisvert 1986, Mulla 1992). Simulated field studies resulted in the suppression of two unicellular algae species, *Closterium* sp. and *Chlorella* sp. resulting in secondary effects to turbidity and dissolved oxygen of aquatic habitats, with potential trophic effects (Su and Mulla 1999). For these reasons, Bti effects to target and susceptible nontarget organisms, and potential indirect trophic impacts in the field are difficult to predict.

Methoprene

Methoprene has moderate acute fish toxicity, slight acute avian toxicity, and practically no acute mammalian toxicity (U.S. EPA 2000, U.S. Fish and Wildlife Service 1984). In mallard ducks, dietary concentrations of 30 parts per million (ppm) caused some reproductive impairment (U.S. EPA 1991). This figure exceeds the estimated environmental concentration by a factor 10 (Table 1). Methoprene residues have been observed to bioconcentrate in fish and crayfish by factors of 457 and 75, respectively (U.S. EPA 1991). Up to 95 % of the residue in fish was excreted within 14 days (U.S. EPA 1991). Risk quotients for birds, fish and mammals are below EPA levels of concern for endangered species indicating negligible risk to those taxa resulting from direct exposure using maximum labeled rates for mosquito control (Table 1) (Urban et al. 1986). In field studies no detectable adverse effects to breeding red-winged blackbirds using and nesting in areas treated with methoprene were observed (Niemi et al. 1999).

Table 1. Risk assessment for Methoprene.

Animal	Acute Tox (ppm)	EEC (ppm)	RQ	LOC (ES)
Bird	> 4640 (8 D LC 50)	3.0 (short grass)	0.0006	0.1
Fish	0.4 (96 hr LC 50)	0.01 (6 inches)	0.025	0.05
Mammal	> 34,000 (LD 50)	3.0 (short grass)	0.00001	0.1

EEC calculated using a rate of 0.013 lbs ai/ac (1.0 fluid oz/ac Altosid 20 % methoprene)

LD 50 for mammals converted to 1 Day LC50 using a conversion factor of 0.1 for RQ calculation

Methoprene affects terrestrial and aquatic invertebrates and is used to control fleas, sciarid flies in mushroom houses; cigarette beetles and tobacco moths in stored tobacco; Pharaoh's ants; leaf miners in glasshouses; and midges (Tomlin 1994). Methoprene may also be fed to livestock in a premix food supplement for control of hornfly (WHO, undated). Methoprene is highly toxic to aquatic invertebrates with a 48 hour EC50 of 0.89 ppm for *Daphnia magna* (U.S. EPA 1991). Laboratory studies show that methoprene is acutely toxic to chironomids, cladocerans, and some decapods (Horst and Walker 1999, Celestial and McKenney 1994, McKenney and Celestial 1996, Chu et al. 1997). In field studies, significant declines of aquatic invertebrate, mollusk and crustacean populations have been directly correlated to methoprene treatments for mosquito control (Breaud et al. 1977, Miura and Takahashi 1973, Niemi et al. 1999, Hershey et al. 1998).

Methoprene has a ten day half life in soil, a photolysis half life of ten hours, and solubility in water is 2 ppm (Zoecon 2000). Degradation in aqueous systems is caused by microbial activity and photolysis (U.S. EPA 1991). Degradation rates are roughly equal in freshwater and saltwater systems and are positively correlated to temperature (U.S. EPA 1991).

Naled

The organophosphate naled is toxic to fish, aquatic invertebrates, wildlife, and bees (see label). Naled has high acute mammalian toxicity, slight acute avian toxicity, high acute fish toxicity, and super acute aquatic invertebrate toxicity (U.S. EPA 2000 and U.S. Fish and Wildlife Service 1984). The adulticide Trumpet, with the active ingredient naled, that TMAD proposes for possible use in case of a public health emergency, has the word "Danger" on the label. The "Danger" label indicates that the chemical is highly toxic. The amount of such chemicals that could kill an average adult person lies somewhere between a taste and a teaspoonful. Naled is also in the highest (most potent) of four categories for irritation to the skin and eyes (New York State Department of Health on the web).

Pyrethroids

In general, pyrethroids have lower toxicity to terrestrial vertebrates than organophosphates. Although not toxic to birds and mammals, pyrethroids are very toxic to fish and aquatic invertebrates (Anderson 1989, Siegfried 1993, Milam et al. 2000). The actual toxicity of pyrethroids in aquatic habitats, however, is less than may be anticipated because of the propensity of these pesticides to adsorb organic particles in water (Hill et al. 1994). The adulticides Pyrocyde and Pyrenone, which the Refuge proposes for use in case of a public health emergency, have the word "Caution" on the label. The "Caution" label indicates that it will require more than an ounce and perhaps as much as a pint to kill the average adult. Pyrethroids are also in the lowest (least potent) of four categories for irritation to the skin and eyes (New York State Department of Health on the web).

Threatened and Endangered Species:

The Refuge is habitat for four endangered species: blunt-nosed leopard lizard (*Gambelia sila*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), San Joaquin kit fox (*Vulpes macrotis mutica*). These species use upland habitats that are concentrated on the east and north sides of wetlands on the Refuge and out of the potential spray zone. However, transient individuals could occur on levees surrounding the wetlands and thus fall within the potential spray zone. In an extensive literature review on the effects of Bti on mammals, Siegel and Shaddock (1992) found the bacterium to be innocuous. These studies exposed a variety of mammalian species to Bti at moderate to high doses and observed no pathological symptoms, nor disease, or mortality.

Continued use of the bacterium, Bti, at moderate rates is likely to have a negligible effect on threatened and endangered species residing on the Refuge.

Fish

Screens across the water intake for the Refuge prevent any large fish from entering the Refuge. However, very small individuals of carp, catfish, and bullheads may move through the screens. All these fish die when the ponds are drawn down in early spring. The water released from the Refuge goes directly to irrigation either on the Refuge or adjacent lands; it does not return to any streams or lakes. Thus, the toxicity of any of these pesticides to fish populations will not be an issue, since fish rarely occur on the Refuge, could not survive the draw-down in spring, and cannot move from the Refuge to any other bodies of water.

Wetlands and Waterfowl:

The Refuge was established to provide habitat for migratory birds, in particular waterfowl, including geese, swans, ducks, and coots. These species occur on the Refuge during August, September, and October when newly flooded wetlands are being treated to control mosquitoes, so there is a potential impact on them.

There is not likely to be much impact on geese and swans are year round herbivores. Geese feed mainly on grasses and agricultural lands, while swans feed mainly on roots, tubers, stems, and leaves of submerged and emergent aquatic vegetation. While applications of Bti and Altosid will be likely to occur over areas of vegetation which may be used by geese and swans, it has been found that birds are not negatively affected by utilizing foods exposed to Bti or methoprene (Niemi et al. 1999).

In contrast, ducks are known to be opportunistic feeders on both plants and invertebrates, utilizing the most readily available food sources. Invertebrates, plants, and seeds compose the majority of their diet, varying with the season and the geographic location. Studies in California's Sacramento Valley have shown that plant foods are dominate in fall diets of northern pintails, while invertebrate use increases in February and March (Miller 1987). Seeds of swamp timothy comprise the most important duck food in the summer-dry habitats of the San Joaquin Valley (Miller 1987). At the Kern National Wildlife Refuge, the fall diet of northern pintails and green-winged teal was composed of over two-thirds seeds (Euliss and Harris 1987). Thus any food chain impacts resulting from larvicide and adulticide treatment will have limited impacts to the mainly seed diet of newly arriving ducks. Their diets shift to invertebrates after treatments are expected to be reduced in frequency thereby allowing invertebrate populations to recover.

Other Migratory Birds:

Shorebirds feed on a wide variety of invertebrates all year, feeding which intensifies at the onset of spring migration. Documentation of indirect food-chain effects have not come to light. Hanowski et al. (1997) studied 19 different bird species after collecting data on wetlands 2 years before treatment and 3 years after treatment of both Bti and methoprene applications and found no negative effects. Niemi et al. found the same results from the same study site of a 3 year study on zooplankton or breeding birds.

When water is available, up to 5,000 sandhill cranes (*Grus canadensis*) are known to roost on the wetlands on the Refuge during the winter. The shallow water of the Refuge gives roosting cranes protection from ground predators such as coyotes. They forage during the day mainly in upland

habitats. When available, cultivated grains are a major food item. In addition, they capture invertebrates and small mammals from the surface of the ground or by probing into the ground. The cranes are present from October through March, with peak numbers occurring in December and January. Since most of their foraging is done off the Refuge and their presence overlaps with possible mosquito treatments for only a short time, it is not expected that there will be any effect on the cranes.

Public Review and Comment

If, through monitoring it is determined that targeted mosquito species: (1) are known carriers of encephalitis or West Nile Virus, and (2) that they occur in densities that warrant control, the public will be notified. However, given the nature of potential serious health risks and the rapid development of mosquito larvae, applications may occur simultaneously with or before public notification. As part of the CCP process, a public review and comment period will be conducted during which time the current mosquito management guidelines will be reviewed by the public.

Determination (Check one Below)

Use is not compatible

Use is compatible

Stipulations Necessary to Ensure Compatibility:

1. Access to Pixley NWR is restricted to levees within sections 21 and 22, via Road 88.
2. All application of pesticides/biological agents must be coordinated and approved by the Refuge Manager or Assistant Manager in order to avoid conflicts with nesting birds, public use, Refuge management activities, etc. Prior to all applications, TMAD will provide a map and dip net counts to the Refuge Manager or Assistant Manager and obtain verbal approval. If Refuge Manager or Assistant Manager is not in the office, leave map and counts with clerk and call for approval later. In addition to verbal permission, the permittee or designated representative from the TMAD office will call and confirm flight and conditions. Access is limited to weekdays, Monday-Friday, only unless prior approval has been granted by the Refuge Manager for access during the weekend, Saturday and Sunday.
3. A threshold level of 2 larvae per dip average will be instituted for mosquito control. At this dip rate, frequency of application should decrease.
4. Monitoring operations are restricted to dip netting, CO2 traps light traps.
5. TMAD will provide the Refuge with interim and final reports on dipping for larval mosquitoes. Data is to include species and number from each sample. Maintaining careful records of immature mosquito occurrence, developmental stages treated, source size, and control effectiveness can provide an early warning to forecast the size of adult populations.
6. TMAD will notify the Refuge Manager immediately if an arbovirus-induced mortality is

observed in wild birds in Tulare County.

7. TMAD has and will continue to consider environmental conditions including water temperature, density of mosquito larvae, and presence of mosquito predators when deciding mosquitoes present pose a serious threat to human health and whether to treat.
8. Treatment for the general control of mosquitoes will be limited to Bti and Altosid.
9. The use of mono-molecular films is to be dissuaded at all expense unless other larvicides utilized fail to control mosquitoes, a human health concern exists, and if the majority of larvae present are species which are vectors of arboviruses transmittable to humans. A determination for the use of mono-molecular films will be made with the Refuge and TMAD along with the appropriate health authorities. Notification will be given to appropriate divisions within the U.S. Fish and Wildlife Service for agreement to treat with larvicides other than Bti and Altosid. Frequent monitoring will be normal operating procedures to avert the use of mono-molecular films. The use of mono-molecular films has not occurred on the Refuge since the 1960's.
10. Mosquito adulticides will only be allowed in cases of a human health emergency, following a specific request to the Refuge and written concurrence from appropriate Service or Department bureaus. A human-health emergency is defined by the presence of human disease virus-positive mosquitoes or virus-positive birds in Tulare County or adjacent counties. Treatment may be allowed only when entomological surveys determine the presence of mosquitoes on Refuge pose a human health emergency.
11. Spray applications will not be conducted on ephemeral (vernal) pools or other such water basins resulting from rainwater accumulations in upland sites.
12. At the end of the permitting period, TMAD will provide the Refuge manager with a list of all pesticides/biological agents used, and the quantities of each that were applied.
13. Application of mosquito control measures is to be conducted in accordance with current approved Pesticide Use Proposals.
14. Mosquito control will be authorized on an annual basis by a Special Use Permit (SUP). SUP condition will stipulate that all mosquito control work will be carried out under the guidance of pre-approved Pesticide Use Proposals.

Justification

For many years the Refuge has worked cooperatively with TMAD and its associated mosquito control activities. After a review of these activities, the Refuge has determined that allowing those uses to continue will not interfere or derogate from the purpose for the Refuge, nor the mission of the National Wildlife Refuge System.

As previously mentioned, the Refuge has, within a 20 mile radius, communities of various populations and a number of commercial dairy operations. Species of mosquito like *Culex*

tarsalis, *Aedes vexans*, *Ochlerotatus melanimon*, and *Oc. nigromaculis*, which are found on the Refuge, are capable of dispersing various miles to obtain a blood meal. With the exception of *Culex tarsalis*, the remaining fore mentioned species are capable of dispersing 5-10 miles, *Culex tarsalis* is known to disperse 25+ miles. All species are known to be vectors for Saint Louis encephalitis, California encephalitis, and western equine encephalitis; additionally, *C. tarsalis* is particularly known to transmit West Nile Virus. Reisen et. al. (1992) found that the significant 1989 outbreak of Saint Louis encephalitis in the Southern San Joaquin Valley was tied directly to especially large numbers of *C. tarsalis*. Some factors which led to a greater than normal numbers of *C. tarsalis* in this area in 1989 were an unseasonably mild spring which allowed the species to successfully over winter, further amplifying their numbers when warmer weather set in. This same study also indicated that many of the overwintering population were found on the Refuge. In order to protect neighboring communities from potential health threats from vector carrying mosquitoes, the Refuge will continue to allow mosquito control to take place on Refuge following the guidance of the stipulations within this document. In a case of a large scale human health emergency, perhaps as a consequence of West Nile Virus, mosquito control will not demand thresholds. In the event that a human health emergency has been declared, perhaps as a consequence of West Nile virus, the use of adulticides may be permitted with the concurrence of the Refuge manager.

Because mosquito treatment occurs during the early weeks of fall flood-up, and frequency of treatments are low and spaced apart on a per unit basis, overall effects to non-target organisms are not expected to be significant. Treatments will further minimize adverse impacts to wildlife by being conducted during the early morning hours of 0600-0900, with flight durations averaging 30 minutes to 2 hours depending on the treatment area. Treated areas are not overlapped and are treated, on average, twice a year during the breeding season. Breeding seasons vary for two targeted mosquito species *Culex tarsalis* and *Ochlerotatus melanimon*; the fore mentioned species breeds in standing water year round while the latter species is primarily a flood water breeder. Treatments for *Culex tarsalis* occur year round, given the abundance of the species, while treatments for *Oc. melanimon* occur during late summer through late fall when the Refuge begins winter flood up.

Low flying aircraft will undoubtedly cause disturbances to wildlife. However, the number of treatments per year is fairly low, and if the applicator (pilot or ground) follows the stipulations previously outlined and within the SUP, mosquito abatement practices should not materially interfere with or detract from the Refuge purpose or the mission of the National Wildlife Refuge System. If additional biological monitoring of this activity documents substantial negative impacts to migratory birds or other wildlife, this determination will be re-analyzed on the basis on new evidence.

Literature Cited:

- Ali, A. 1981. *Bacillus thuringiensis* serovar *israelensis* against chironomids and some non-target aquatic invertebrates. *Journal of Invertebrate Pathology* 38:264-272.
- Anderson, R.L. 1989. Toxicity of synthetic pyrethroids to freshwater invertebrates. *Environmental Toxicology and Chemistry* 8: 403-410.

- Boisvert, M., and J. Boisvert. 2000. Effects of *Bacillus thuringiensis* var. *israelensis* on target and nontarget organisms: a review of laboratory and field experiments. *Biocontrol Science and Technology* 10: 517-561.
- Breaud, T.P., J.E. Farlow, C.D. Steelman, and P.E. Schilling. 1977. Effects of the insect growth regulator methoprene on natural populations of aquatic organisms in Louisiana intermediate marsh habitats. *Mosquito News* 37(4): 704-712.
- Brown, M.D., T.M. Watson, S. Green, J.G. Greenwood, D. Purdie, and B.H. Kay. 2000. Toxicity of insecticides for control of freshwater *Culex annulirostris* (Diptera: Culicidae) to the nontarget shrimp, *Caradina indistincta* (Decapoda: Atyidae). *Journal of Economic Entomology*. 93(3): 667-672.
- Brown, M.D., J. Carter, D. Purdie, D. Thomas, D.M. Purdie, and B.H. Kay. 2002. Pulse-exposure effects of selected insecticides to juvenile Australian Crimson-Spotted Rainbowfish (*Melanotaenia duboulayi*). *Journal of Economic Entomology* 95(2):294-298.
- California Department of Health Services. 2003. California mosquito-borne virus surveillance and response plan.
- Celestial, D.M, and C.L. McKenney, Jr. 1994. The influence of an insect growth regulator on the larval development of the mud crab *Rhithropanopeus harrisi*. *Environmental Pollution* 85: 169-173.
- Centers for Disease Control and Prevention. 1999. Epidemic/Epizootic West Nile virus in the United States: Guidelines for Surveillance, Prevention, and Control. From a workshop co-sponsored by the Department of Health and Human Services, CDC, and the U.S. Department of Agriculture. Fort Collins, Colorado, November 8-9, 1999.
- Chu, K.H., Wong, C.K., and Chiu, K.C. 1997. Effects of the insect growth regulator (S)-methoprene on survival and reproduction of the freshwater cladoceran *Moina macrocopa*. *Environmental Pollution* 96: 173-178.
- Dritz, D.A., S.P. Lawler, J. Albertson, W. Hamersky, and J.R. Rusmiser. 2001. The impact of Bti on survival of the endangered tadpole shrimp *Lepidurus packardii*. *In* Proceeding and Papers of the Sixty-ninth Annual Conference of the Mosquito and Vector Control Association of California. Jan. 21-24. pp. 88-91.
- Dupont, C., and J. Boisvert. 1986. Persistence of *Bacillus thuringiensis* serovar. *israelensis* toxic activity in the environment and interaction with natural substrates. *Water, Air, and Soil Pollution* 29:425-438.
- Euliss, Ned H., and Stanley W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *J. Wild. Manage.* 51(4):724-732.
- Extension Toxicology Network. 1994. Pyrethrin Pesticide information profile. <http://ace.ace.orst.edu/info/extoxnet/pips/ghindex.html>

- Extension Toxicology Network. 1996. Methoprene Pesticide information profile.
<http://ace.ace.orst.edu/info/extoxnet/pips/methopre.htm>
- Fortin, C., D. Lapointe, and G. Charpentier. 1986. Susceptibility of brook trout (*Salvelinus fontinalis*) fry to a liquid formulation of *Bacillus thuringiensis* serovar. *Israelensis* (Teknar®) used for blackfly control. Canadian Journal of Fisheries and Aquatic Science 43:1667-1670.
- Garcia, R., B. Des Rochers, and W. Tozer. 1980. Studies on the toxicity of *Bacillus thuringiensis* var. *israelensis* against organisms found in association with mosquito larvae. California Mosquito and Vector Control Association Proceedings and Papers 48:33-36.
- Goddard, L.B., A.E. Roth, W.K. Reisen, and T.W. Scott. 2002. Vector competence of California mosquitoes for West Nile virus. Emerging Infectious Diseases 8(12): 1385-1391.
- Hanowski, J. M., G. J. Niemi, A. R. Lima, and R. R. Regal. 1997. Do mosquito control treatments of wetlands affect red-winged blackbird (*Agelaius phoeniceus*) growth, reproduction, or behavior? Environmental Toxicology and Chemistry 16(5):1014-1019.
- Heitmeyer, M. E. 1988. Body composition of female mallards in winter in relation to annual cycle events. Condor 90:669-680.
- Hershey, A. E., A. R. Lima, G. J. Niemi, and R. R. Regal. 1998. Effects of *Bacillus thuringiensis israelensis* (Bti) and methoprene on non-target macroinvertebrates in Minnesota wetlands. Ecological Applications 8:41-60.
- Hill, I.R., J.L. Shaw, S.J. Maund, F. Heimbach, P. Leeuwangh, and P. Matthiesen, eds. 1994. Review of the aquatic field tests with pyrethroid insecticides. Lewis Publishers, Boca Raton, Florida
- Horst, M.N., and A.N. Walker. 1999. Effects of the pesticide methoprene on morphogenesis and shell formation in the blue crab *Callinectes sapidus*. Journal of Crustacean Biology 19: 699-707.
- Jackson, J. K., R.J. Horowitz, and B.W. Sweeny. 2002. Effects of *Bacillus thuringiensis israelensis* on black flies and nontarget macroinvertebrates and fish in a large river. Transactions of the American Fisheries Society 131:910-930.
- Lacey, L.A., and Mulla, M.S. 1990. Safety of *Bacillus thuringiensis* var. *israelensis* and *Bacillus sphaericus* to non-target organisms in the aquatic environment. In Laird, M., L.A. Lacey, E.W. Davidson, eds. *Safety of microbial insecticides*. CRC Press.
- Lee, B. M., and G. I. Scott. 1989. Acute toxicity of temephos, fenoxycarb, diflubenzuron, and methoprene and *Bacillus thuringiensis* var. *israelensis* to the mummichog (*Fundulus heteroclitus*). Bulletin of Environmental Contamination and Toxicology 43:827-832.

- McKenney, C.L., Jr., and D.M. Celestial. 1996. Modified survival, growth, and reproduction in an estuarine mysid (*Mysidopsis bahia*) exposed to a juvenile hormone analogue through a complete life cycle. *Aquatic Toxicology* 35:11-20.
- Merritt, R. W., E. D. Walker, M. A. Wilzbach, K. W. Cummings, and W. T. Morgan. 1989. A broad evaluation of Bti for black fly (Diptera: Simuliidae) control in a Michigan River: Efficacy, carry, and non-target effects on invertebrates and fish. *Journal of the American Mosquito Control Association* 5:397-415.
- Millam, D.C., J.L. Farris, and J.D. Wilhide. 2000. Evaluating mosquito control pesticides for effect on target and nontarget organisms. *Mosquito News* 40:619-622.
- Miller, M. R. 1987. Fall and winter foods of northern pintails in the Sacramento Valley, California. *Journal of Wildlife Management* 51:405-414.
- Miura, T., and R.M. Takahashi. 1973. Insect development inhibitors. 3. Effects on nontarget aquatic organisms. *Journal of Economic Entomology* 66(4):917-922.
- Miura, T., Takahashi, R. M.; and Mulligan, F.S. 1980. Effects of the bacterial mosquito larvicide *Bacillus thuringiensis* stereotype H-14 on selected aquatic organisms. *Mosquito News* 40:619-622.
- Mulla, M.S. 1992. Activity, Field Efficacy, and Use of *Bacillus thuringiensis israelensis* against Mosquitoes. Pp. 134-160 in de Barjac, Hugette and Donald J. Sutherland, eds. *Bacterial Control of Mosquitoes and Blackflies: Biochemistry, Genetics, and Applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus**. Kluwer Academic.
- New York State Department of Health. No date. Appendix C-1, Technical data on mosquito adulticides. www.health.state.ny.us/nysdoh/westnile/final/c1/table2.html
- Niemi, G. J., A. E. Hershey, L. Shannon, J. M. Hanowski, A. Lima, R. P. Axler, and R. R. Regal. 1999. Ecological Effects of Mosquito Control on Zooplankton, Insects, and Birds. *Environmental Toxicology and Chemistry* 18(3):549-559.
- Siegel, Joel P., and J. A. Shaddock. 1992. Mammalian safety of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Pp. 202-217 in de Barjac, Hugette and Donald J. Sutherland, eds. *Bacterial control of mosquitoes and blackflies: biochemistry, genetics, and applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus**. Kluwer Academic.
- Siegfried, B.D. 1993. Comparative toxicity of pyrethroid insecticides to terrestrial and aquatic insects. *Environmental Toxicology and Chemistry* 12:1683-1689.
- Su, T., and M.S. Mulla. 1999. Microbial agents *Bacillus thuringiensis* ssp. *israelensis* and *Bacillus sphaericus* suppress eutrophication, enhance water quality, and control mosquitoes in microcosms. *Environmental Entomology* 28:761-767.

Tomlin, C. 1994. The Pesticide Manual. Farnham: British Crop Protection Council/Cambridge: Royal Society of Chemistry.

Urban, J. D., and N.J. Cook. 1986. Standard evaluation procedure: Ecological risk assessment. U. S. EPA. Office of Pesticide Programs. Hazard Evaluation Division.

U.S. EPA. 1991. Re-registration eligibility document. Isopropyl (2E, 4E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate (Referred to as methoprene). List A. Case 0030. Office of pesticide Programs. Special Review and Registration Division.

U.S. EPA. 2000. Ecotoxicity online database. Division of Environmental Fate and Effects. Office of Pesticide Programs.

U.S. Fish and Wildlife Service. 1984. Acute toxicity rating scales. Research Information Bulletin No. 84-78.

WHO. Undated. Data sheet on pesticides no. 47. Methoprene. World Health Organization. Food and Agriculture Organization.
http://www.inchem.org/documents/pds/pds/pest47_e.html

Wipfli, M.S., R.W. Merritt. And W.W. Taylor. 1994. Low toxicity of the blackfly larvicide *Bacillus thuringiensis* var. *israelensis* to early stages of brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and steelhead trout (*Oncorhynchus mykiss*) following direct and indirect exposure. Canadian Journal of Fisheries and Aquatic Science 41:1451-1458.

Zoecon. 2000. MSDS Altosid Liquid Larvicide Concentrate

Mandatory Re-Evaluation Date (provide month and year):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)

2014 Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement

_____ Categorical Exclusion and Environmental Action Statement

X Environmental Assessment and Finding of No Significant Impact

_____ Environmental Impact Statement and Record of Decision

Refuge Determination:

Prepared by: Pamela L. Williams 9/30/04
(Signature) (Date)

Refuge Manager/
Project Leader
Approval: [Signature] 9/30/04
(Signature) (Date)

Concurrence

Refuge Supervisor: David G. Paulini 9/30/04
(Signature) (Date)

Regional Chief,
National Wildlife
Refuge System: Crawford D. Bohan 9/30/04
(Signature) (Date)

Acting California/Nevada
Operations Manager [Signature] 9-30-04
(Signature) (Date)

Appendix E.
Species Lists

Species Lists: Kern Refuge

Birds

ORDER ANSERIFORMES (SWANS, GEESE & DUCKS)

ANATIDAE (WATERFOWL FAMILY)

Aix sponsa (wood duck)
Anas acuta (northern pintail)*
Anas americana (American wigeon)*
Anas crecca (green-winged teal)*
Anas cyanoptera (cinnamon teal)*
Anas clypeata (northern shoveler)*
Anas discors (blue-winged teal)
Anas penelope (Eurasian wigeon)
Anas platyrhynchos (mallard)*
Anas strepera (gadwall)*
Anser albifrons (greater white-fronted goose)
Aythya affinis (lesser scaup)
Aythya americana (redhead)*
Aythya collaris (ring-necked duck)*
Aythya marila (greater scaup)
Aythya valisineria (canvasback)*
Branta bernicla (brant)
Branta canadensis (Canada goose)
Bucephala albeola (bufflehead)
Bucephala clangula (common goldeneye)
Bucephala islandica (barrow's goldeneye)
Chen caerulescens (snow goose)
Chen rossii (Ross' goose)
Cygnus columbianus (tundra swan)
Dendrocygna bicolor (fulvous whistling-duck)
Lophodytes cucullatus (hooded merganser)
Mergus merganser (common merganser)
Mergus serrator (red-breasted merganser)
Oxyura jamaicensis (ruddy duck)*

ORDER APODIFORMES (SWIFTS & HUMMINGBIRDS)

APODIDAE (SWIFT FAMILY)

Chaetura vauxi (Vaux's swift)

TROCHILIDAE (HUMMINGBIRD FAMILY)

Archilochus alexandri (black-chinned hummingbird)
Calypte anna (Anna's hummingbird)*
Calypte costae (Costa's hummingbird)
Selasphorus rufus (rufous hummingbird)
Stellula calliope (calliope hummingbird)

ORDER CAPRIMULGIFORMES (GOATSUCKERS)

CAPRIMULGIDAE (GOATSUCKER FAMILY)

Chordeiles acutipennis (lesser nighthawk)
Phalaenoptilus nuttallii (common poorwill)

ORDER CHARADRIIFORMES (SHOREBIRDS)

CHARADRIIDAE (PLOVER FAMILY)

Charadrius alexandrinus (snowy plover)
Charadrius montanus (mountain plover)
Charadrius semipalmatus (semipalmated plover)
Charadrius vociferus (killdeer)*
Pluvialis squatarola (black-bellied plover)

RECURVIROSTRIDAE (STILT & AVOCET FAMILY)

Himantopus mexicanus (black-necked stilt)*
Recurvirostra americana (American avocet)*

SCOLOPACIDAE (SANDPIPER FAMILY)

Actitis macularia (spotted sandpiper)
Arenaria interpres (ruddy turnstone)
Calidris acuminata (sharp-tailed sandpiper)
Calidris alpina (dunlin)
Calidris bairdii (Baird's sandpiper)
Calidris canutus (red knot)
Calidris himantopus (stilt sandpiper)
Calidris mauri (western sandpiper)
Calidris melanotos (pectoral sandpiper)
Calidris minutilla (least sandpiper)
Calidris pusilla (semipalmated sandpiper)
Catoptrophorus semipalmatus (willet)
Gallinago gallinago (common snipe)
Heteroscelus incanus (wandering tattler)
Limnodromus griseus (short-billed dowitcher)
Limnodromus scolopaceus (long-billed dowitcher)

Limosa fedoa (marbled godwit)
Numenius americanus (long-billed curlew)
Numenius phaeopus (whimbrel)
Phalaropus lobatus (red-necked phalarope)
Phalaropus tricolor (Wilson's phalarope)
Tringa flavipes (lesser yellowlegs)
Tringa melanoleuca (greater yellowlegs)
Tringa solitaria (solitary sandpiper)

LARIDAE (JAEGER, GULL, & TERN FAMILY)

Chlidonias niger (black tern)
Larus argentatus (herring gull)
Larus californicus (California gull)
Larus delawarensis (ring-billed gull)
Larus philadelphia (Bonaparte's gull)
Sterna antillarum (least tern)
Sterna caspia (Caspian tern)*
Sterna forsteri (Forster's tern)
Sterna hirundo (common tern)

ORDER CICONIIFORMES (HERONS, IBIS, & NEW WORLD VULTURES)

ARDEIDAE (HERON FAMILY)

Ardea alba (great egret)
Ardea herodias (great blue heron)*
Botaurus lentiginosus (American bittern)*
Bubulcus ibis (cattle egret)*
Butorides virescens (green heron)
Egretta caerulea (little blue heron)
Egretta thula (snowy egret)*
Ixobrychus exilis (least bittern)
Nycticorax nycticorax (black-crowned night-heron)*

CATHARTIDAE (NEW WORLD VULTURE FAMILY)

Cathartes aura (turkey vulture)

THRESKIORNITHIDAE (IBIS FAMILY)

Plegadis chihi (white-faced ibis)*

ORDER COLUMBIFORMES (DOVES)

COLUMBIDAE (DOVE FAMILY)

Columba livia (rock dove)
Zenaida macroura (mourning dove)*

ORDER CORACIIFORMES (KINGFISHERS)

Alcedinidae (Kingfisher Family)
Ceryle alcyon (belted kingfisher)

ORDER CUCULIFORMES (CUCKOOS, ROADRUNNER & ANIS)

CUCULIDAE (CUCKOO FAMILY)
Geococcyx californianus (greater roadrunner)

ORDER FALCONIFORMES (FALCONS)

ACCIPITRIDAE (EAGLE, KITE & HAWK FAMILY)

Accipiter cooperii (Cooper's hawk)
Aquila chrysaetos (golden eagle)
Buteo jamaicensis (red-tailed hawk)*
Buteo lagopus (rough-legged hawk)
Buteo lineatus (red-shouldered hawk)
Buteo regalis (ferruginous hawk)
Buteo swainsoni (Swainson's hawk)*
Circus cyaneus (northern harrier)*
Elanus leucurus (white-tailed kite)*
Haliaeetus leucocephalus (bald eagle)
Pandion haliaetus (osprey)

FALCONIDAE (FALCON FAMILY)

Falco columbarius (merlin)
Falco mexicanus (prairie falcon)
Falco peregrinus (peregrine falcon)
Falco sparverius (American kestrel)*

ORDER GALLIFORMES (GROUSE, TURKEY, & QUAIL)

ODONTOPHORIDAE (QUAIL FAMILY)

Callipepla californica (California quail)

PHASIANIDAE (GROUSE FAMILY)

Phasianus colchicus (ringed-neck pheasant)*

ORDER GRUIFORMES (RAILS, LIMPKIN & CRANES)

RALLIDAE (RAIL FAMILY)

Fulica americana (American coot)
Gallinula chloropus (common moorhen)
Porzana carolina (sora)
Rallus limicola (Virginia rail)

GRUIDAE (CRANE FAMILY)

Grus canadensis (sandhill crane)

ORDER PASSERIFORMES (PERCHING BIRDS)

TYRANNIDAE (FLYCATCHER FAMILY)

Contopus cooperi (olive-sided flycatcher)
Contopus sordidulus (western wood-pewee)
Empidonax difficilis (Pacific-slope flycatcher)
Empidonax hammondi (Hammond's flycatcher)
Empidonax oberholseri (dusky flycatcher)
Empidonax traillii (willow flycatcher)
Empidonax wrightii (gray flycatcher)

Myiarchus cinerascens (ash-throated flycatcher)
Pyrocephalus rubinus (vermillion flycatcher)
Sayornis nigricans (black phoebe)*
Sayornis saya (Say's phoebe)
Tyrannus verticalis (western kingbird)*

LANIIDAE (SHRIKE FAMILY)
Lanius ludovicianus (loggerhead shrike)*

VIREONIDAE (VIREO FAMILY)
Vireo cassinii (Cassin's vireo)
Vireo gilvus (warbling vireo)

CORVIDAE (JAY & CROW FAMILY)
Corvus corax (common raven)*
Corvus brachyrhynchos (American crow)
Nucifraga columbiana (Clark's nutcracker)

ALAUDIDAE (LARK FAMILY)
Eremophila alpestris (horned lark)

HIRUNDINIDAE (SWALLOW FAMILY)
Petrochelidon pyrrhonota (cliff swallow)*
Hirundo rustica (barn swallow)*
Riparia riparia (bank swallow)
Stelgidopteryx serripennis (northern rough-winged swallow)
Tachycineta bicolor (tree swallow)
Tachycineta thalassina (violet-green swallow)

AEGITHALIDAE (BUSHTIT FAMILY)
Psaltriparus minimus (bushtit)

TROGLODYTIDAE (WREN FAMILY)
Cistothorus palustris (marsh wren)*
Salpinctes obsoletus (rock wren)
Troglodytes aedon (house wren)
Thryomanes bewickii (Bewick's wren)

REGULIDAE (KINGLET FAMILY)
Regulus calendula (ruby-crowned kinglet)
Regulus satrapa (golden-crowned kinglet)

SYLVIIDAE (GNATCATCHER FAMILY)
Polioptila caerulea (blue-gray gnatcatcher)

TURDIDAE (THRUSH FAMILY)
Sialia mexicana (western bluebird)
Catharus guttatus (hermit thrush)
Catharus ustulatus (Swainson's thrush)
Turdus migratorius (American robin)
Ixoreus naevius (varied thrush)

MIMIDAE (MOCKINGBIRD & THRASHER FAMILY)
Mimus polyglottos (northern mockingbird)*
Oreoscoptes montanus (sage thrasher)
Toxostoma redivivum (California thrasher)

STURNIDAE (STARLING FAMILY)
Sturnus vulgaris (European starling)

MOTACILLIDAE (WAGTAIL & PIPIT FAMILY)
Anthus rubescens (American pipit)

BOMBYCILLIDAE (WAXWING FAMILY)
Bombycilla cedrorum (cedar waxwing)
Bombycilla garrulus (bohemian Waxwing)

PARULIDAE (WARBLER FAMILY)
Dendroica coronata (yellow-rumped warbler)
Dendroica nigrescens (black-throated gray warbler)
Dendroica occidentalis (hermit warbler)
Dendroica petechia (yellow warbler)
Dendroica townsendi (Townsend's warbler)
Geothlypis trichas (common yellowthroat)
Oporornis tolmiei (MacGillivray's warbler)
Vermivora celata (orange-crowned warbler)
Vermivora ruficapilla (Nashville warbler)
Wilsonia pusilla (Wilson's warbler)

THRAUPIDAE (TANAGER FAMILY)
Piranga ludoviciana (western tanager)

EMBERIZIDAE (TOWHEE & SPARROW FAMILY)
Calamospiza melanocorys (lark bunting)
Junco hyemalis (dark-eyed junco)
Melospiza georgiana (swamp sparrow)
Melospiza lincolni (Lincoln's sparrow)
Melospiza melodia (song sparrow)*
Passerella iliaca (fox sparrow)
Passerculus sandwichensis (savannah sparrow)
Pipilo maculatus (spotted towhee)
Pooecetes gramineus (vesper sparrow)
Spizella passerina (chipping sparrow)
Zonotrichia atricapilla (golden-crowned sparrow)
Zonotrichia leucophrys (white-crowned sparrow)

CARDINALIDAE (GROSBEAK & BUNTING FAMILY)
Guiraca caerulea (blue grosbeak)
Pheucticus melanocephalus (black-headed grosbeak)
Passerina amoena (Lazuli bunting)

ICTERIDAE (BLACKBIRD & ORIOLE FAMILY)

Agelaius phoeniceus (red-winged blackbird)*
Agelaius tricolor (tricolored blackbird)*
Euphagus cyanocephalus (Brewer's blackbird)*
Icterus bullockii (Bullock's oriole)*
Icterus cucullatus (hooded oriole)
Molothrus ater (brown-headed cowbird)*
Quiscalus mexicanus (great-tailed grackle)*
Sturnella neglecta (western meadowlark)*
Xanthocephalus xanthocephalus (yellow-headed blackbird)*

FRINGILLIDAE FAMILY (FINCH FAMILY)

Carpodacus mexicanus (house finch)
Carduelis pinus (pine siskin)
Carduelis psaltria (lesser goldfinch)
Carduelis tristis (American goldfinch)

PASSERIDAE (OLD WORLD SPARROW FAMILY)

Passer domesticus (house sparrow)*

ORDER PELECANIFORMES (PELICANS & CORMORANTS)

PELECANIDAE (PELICAN FAMILY)

Pelecanus erythrorhynchos (American white pelican)

PHALACROCORACIDAE (CORMORANT FAMILY)

Phalacrocorax auritus (double crested cormorant)

ORDER PICIFORMES (WOODPECKERS)

PICIDAE (WOODPECKER FAMILY)

Colaptes auratus (northern flicker)
Melanerpes formicivorus (acorn woodpecker)
Picoides nuttallii (Nuttall's woodpecker)*
Picoides pubescens (downy woodpecker)

ORDER PODICIPEDIFORMES (GREBES)

PODICIPEDIDAE (GREBE FAMILY)

Aechmophorus clarkii (Clark's grebe)*
Aechmophorus occidentalis (western grebe)*
Podiceps auritus (horned grebe)
Podiceps grisegena (red-necked grebe)*
Podiceps nigricollis (eared grebe)*
Podilymbus podiceps (pied-billed grebe)*

ORDER STRIGIFORMES (OWLS)

TYTONIDAE (BARN OWL FAMILY)

Tyto alba (barn owl)*

STRIGIDAE (OWL FAMILY)

Asio flammeus (short-eared owl)*
Asio otus (long-eared owl)*
Bubo virginianus (great horned owl)*
Otus kennicottii (western screech-owl)
Athene cunicularia (burrowing owl)*

Asterisk (*) indicates breeding records for the Refuge

Mammals

ORDER ARTIODACTYLA

BOVIDAE (CATTLE & SHEEP FAMILY)

Bos taurus (cattle)

ORDER CARNIVORA (CARNIVORES)

CANIDAE (DOG FAMILY)

Canis latrans (Coyote)

Vulpes macrotis nutica (San Joaquin kit fox)

FELIDAE (CAT FAMILY)

Felis rufus (bobcat)

MUSTELIDAE (WEASEL FAMILY)

Spilogale gracilis (western spotted skunk)

Mephitis mephitis (striped skunk)

Mustela frenata (long-tailed weasel)

Taxidea taxus (badger)

PROCYONIDAE (RACCOON FAMILY)

Procyon lotor (raccoon)

ORDER CHIROPTERA

MOLOSSIDAE (FREE-TAILED BAT FAMILY)

Eumops perotis (western mastiff bat)

Tadarida brasiliensis (Mexican free-tailed bat)

ORDER INSECTIVORA

SORICIDAE (SHREW FAMILY)

Sorex ornatus relictus (Buena Vista Lake shrew)

TALPIDAE (MOLE FAMILY)

Scapanus latimanus (broad-footed mole)

ORDER LAGOMORPHA

LEPORIDAE (RABBIT & HARE FAMILY)

Lepus californicus (black-tailed jackrabbit)

Sylvilagus audubonii (desert cottontail)

ORDER MARSUPIALIA

DIDELPHIDAE (MARSUPIAL FAMILY)

Didelphis virginiana (Virginia opossum)

ORDER RODENTIA

SCIURIDAE (SQUIRREL FAMILY)

Spermophilus beecheyi (California ground squirrel)

GEOMYIDAE (POCKET GOPHER FAMILY)

Thomomys bottae (Botta's pocket gopher)

HETEROMYIDAE (POCKET MICE & KANGAROO RATS FAMILY)

Chaetodipus californicus (California pocket mouse)

Dipodomys heermanni (Heermann's kangaroo rat)

Dipodomys nitratoides nitratoides (Tipton's kangaroo rat)

Perognathus inornatus (San Joaquin pocket mouse)

MURIDAE (RATS & MICE FAMILY)

Microtus californicus (California vole)

Mus musculus (house mouse)

Ondatra zibethicus (muskrat)

Onychomys torridus (southern grasshopper mouse)

Reithrodontomys megalotis (western harvest mouse)

Reptiles and Amphibians

LIZARDS

Gambelia sila (blunt-nosed leopard lizard)

Phrynosoma coronatum (coast horned lizard)

Uta stansburiana elegans (California side-blotched lizard)

Cnemidophorus tigris (western (California) whiptail)

SNAKES

Pituophis catenifer catenifer (Pacific gopher snake)

Lampropeltis getula californiae (California (common) kingsnake)

Rhinocheilus lecontei lecontei (western long-nosed snake)

Tantilla hobartsmithi (southwestern black-headed snake)

Crotalus viridis oreganus (western (northern Pacific) rattlesnake)

Arizona elegans occidentalis (California glossy snake)

Thamnophis sirtalis (common garter snake)

AMPHIBIANS

Pseudacris regilla (pacific treefrog)

Spea hammondi (western spadefoot toad)

Rana catesbeiana (bullfrog)

Invertebrates

CLASS INSECTA

ORDER COLEOPTERA (BEETLES AND WEEVILS)

CARABIDAE (GROUND BEETLES)

Carabidae (ground beetle)

DRYOPIDAE (LONG-TOED WATER BEETLES)

CURCULIONIDAE (WEEVILS)

Curculionidae spp. (weevils)

DYTISCIDAE (PREDACEOUS DIVING BEETLES)

Agabus disintegratus

Hygrotus spp.

Laccophilus decipiens

Rhantus gutticollis

Thermonectus basillaris (yellow-spotted water beetle)

HYDROPHILIDAE (WATER SCAVENGER BEETLES)

Berosus ingeminatus

Tropisternus lateralis

Paracymus sp.

ORDER COLLEMBOLA (SPRINGTAILS)

ISOTOMIDAE

Isotomurus palustris

ORDER DIPTERA (FLYS)

SUBORDER BRACHYCERA

DOLICHOPODIDAE (long-legged flies)

EPHYDRIDAE (shore flies)

Ephydra sp.

CHIRONOMIDAE (water midges)

Chironomus decorus (midge)

Chironomus stigmaterus (midge)

Cricotopus spp. (midge)

Goeldichironomus holoprasinus (midge)

Paralauterborniella subcineta (midge)

Paratendipes albimanus (midge)

Tanypus grodhausi (midge)

CULICIDAE (MOSQUITOES)

Culex erythrothorax

Culex pipiens

Culex tarsalis

Ochlerotatus dorsalis

Ochlerotatus melanimon

Ochlerotatus nigromaculis

Aedes vexans

SYRPHIDAE (hover and flower flies)

Eristalis sp.

Helophilus sp.

ORDER EPHEMEROPTERA (MAYFLIES)

BAETIDAE

Centroptilum spp.

ORDER HEMIPTERA

SUBORDER HETEROPTERA (true bugs)

CORIXIDAE

Corisella inscripta

NOTONECTIDAE (WATER BOATMAN)

Notonecta unifasciata (single-banded back swimmer)

HOMOPTERA (TREEHOPPERS, APHIDS, SCALE INSECTS)

APHIDAE (aphids)

CIXIIDAE (cixiid planthoppers)

DELPHACIDAE (delphacid planthoppers)

CICADELLIDAE

Draeculacephala mollipes (leafhopper)

ORDER LEPIDOPTERA (BUTTERFLIES & MOTHS)

ARCTIIDAE (TIGER MOTHS)

Apantesis proxima (Mexican tiger moth)

Melipotis jucunda hadeniformis

GEOMETRIDAE (INCH WORMS & LOOPER MOTHS)

Pero macdunnoughi (McDunnough's leaf wing)

Pero meskaria

Semiothisa irrotata irrotata

Synchlora aerata liquoraria

LASIOCAMPIDAE (TENT CATERPILLARS)

Malacosoma disstria

MICROLEPIDOPTERA (SMALL MOTH FAMILY)

Achyra occidentalis
Agriphila attenuata
Amyeloides transitella
Archips argyrospila
Bactra verutana chrysea
Comadia suaedivora
Crambus sperryellus
Ephesiodes gilvescentella
Epiblema strenuana
Euchromius californicalis
Euchromius ocellus
Galleria mellonella
Hellula rogatalis
Homoeosoma electellum
Hulstia undulatella
Lipographis truncatella
Mimoschinia rufofascialis
Nomophila nearctica
Ostrinia penitalis
Platynota stultana
Saucrobotys futilalis inconcinnalis
Suleima helianthana
Udea profundalis

NOCTUIDAE (CUTWORM MOTHS)

Abagrotis barnesi
Acontia coquillettii
Acontia sedata cacola
Agrotis gravis
Agrotis ipsilon
Agrotis subterranea
Amphipyra brunneatra
Apamea cinefacta cenefacta
Apamea cuccilliformis
Autographa californica
Bagisara buxea
Catabena lineolata
Catacola irene
Conochares acutus
Copibryophila angelica
Dargida procinta
Euuxoa olivia
Euuxoa selenis
Euuxoa silens
Heliothis phloxiphagus
Heliothis virescens
Heliothis zea (corn earworm)
Orthosia ferrigera
Peridroma saucia
Platyperigea extima
Protorthodes alfkeni
Protorthodes perforata

Protorthodes texana concors
Proxenus mindara
Pseudaletia unipuncta
Rynchagrotis exertistigma
Schinia mortua
Scotogramma deffessa
Spaelotis havilae
Spodoptera exigua
Spodoptera praefica
Stibadium spumosum
Trichocosmia inornata
Trichocosmia drasteroides
Trichoclea antica
Trichoclea decepta
Tridepia nova
Trichoplusia ni (cabbage looper)

SPHINGIDAE (HAWKMOTH FAMILY)

Hyles lineata (white-lined sphinx)
Manduca sexta (Carolina sphinx)
Pachysphinx occidentalis (big poplar sphinx)

ORDER ODONATA (DRAGONFLIES AND DAMSELFLIES)

AESHNIDAE (DARNER DRAGONFLIES)

Aeshna interrupta (variable darner)
Anax junius (common green darner)

COENAGRIONIDAE (NARROWWINGED DAMSELFLIES)

Ischnura perparva

LIBELLULIDAE (SKIMMER DRAGONFLIES)

Libellula comanche (Comanche skimmer)
Sympetrum (Tarnetrum) corruptum (variegated meadowhawk)

CLASS BRANCHIOPODA (FAIRY SHRIMP AND WATER FLEAS)

ORDER BRANCHIOPODO

Eulimnadia thompsonii (clam shrimp)
Phyllopod (tadpole shrimp)

TRIOPSIDAE

Triops longicaudatus (tadpole shrimp)

ORDER COPEDOA

EUCOPEDOA

Copepods spp.

CLASS OSTRACODA

ORDER PODOCOPIDA

CYLINDROLEBERIDAE

Cypridopsis spp. (seed shrimp)

CLASS GASTROPODA

ORDER LIMNOPHILA

PLANORBIDAE

Gyraulus spp. (orb snail)

Physa spp. (pouch snail)

Plants

AIZOACEAE (ICE PLANT FAMILY)

Sesuvium verrucosum (western sea-purslane)

ALISMATACEAE (WATER-PLANTAIN OR ARROWHEAD FAMILY)

Echinodorus berteri (burhead)

Sagittaria longiloba (lance-lobed tulle potato)

AMARANTHACEAE (PIGWEED FAMILY)

Amaranthus albus (tumbleweed, white amaranth, tumble pigweed)

APIACEAE (CARROT FAMILY)

Conium maculatum (poison hemlock)

ASCLEPIADACEAE (MILKWEED FAMILY)

Asclepias fascicularis (narrow-leaf milkweed)

ASTERACEAE (SUNFLOWER FAMILY)

Aster subulatus (slender aster)

Cirsium crassicaule (slough thistle)

Cirsium vulgare (bull thistle)

Gnaphalium palustre (everlasting, cudweed)

Grindelia camporum (gumplant)

Helianthus annuus (sunflower)

Hemizonia pungens (common spikeweed)

Isocoma acradenia (pale-leaf golden bush)

Lactuca serriola (prickly lettuce)

Lasthenia californica (California goldfields)

Lasthenia chrysantha (alkali goldfields)

Lasthenia fremontii (Fremont's goldfield)

Lessingia spp. (wooly asters)

Psilocarphus brevissimus (short woolly-heads)

Silybum marianum (sow thistle)

Sonchus oleraceus (common sow thistle)

Xanthium strumarium (cocklebur)

BORAGINACEAE (BORAGE FAMILY)

Amsinckia menziesii (fiddleneck)

Heliotropium curassavicum (wild heliotrope)

Plagiobothrys leptocladus (alkali plagiobothrys)

BRASSICACEAE (MUSTARD FAMILY)

Capsella bursa-pastoris (shepherd's purse)

Guillenia lasiophylla (California mustard)

Lepidium dictyota (alkali pepper-grass)

Sisymbrium irio (desert mustard, London-rocket)

Tropidocarpum gracile (slender tropidocarpum)

CARYOPHYLLACEAE (PINK FAMILY)

Spergularia atrosperma (sand-spurrey)

CHENOPODIACEAE (GOOSEFOOT FAMILY)

Allenrolfea occidentalis (idoine bush)

Atriplex argenta (silverscale saltbush)

Atriplex coronata (crownscale)

Atriplex lentiformis (quail bush)

Atriplex polycarpa (saltbush)

Atriplex spinifera (saltbush)

Bassia hyssopifolia (five-hook Bassia)

Monolepis nuttalliana (poverty plant)

Salsola tragus (Russian-thistle, tumbleweed)

Suaeda moquinii (bush-seepweed)

CONVOLVULACEAE (MORNING-GLORY FAMILY)

Cressa truxillensis (alkali weed)

CRASSULACEAE (STONECROP FAMILY)

Crassula connata (pygmy-weed)

CUSCUTACEAE (DODDER FAMILY)

Cuscuta spp. (dodder)

CYPERACEAE (SEDGE FAMILY)

Cyperus eragrostis (no common name)

Cyperus erythrorhizos (red-rooted cyperus)

Cyperus odoratus (fragrant flatsedge)

Eleocharis macrostachya (common spike-rush)

Scirpus acutus (hardstem bulrush)

Scirpus americanus (Olney's bulrush)

Scirpus robustus (alkali bulrush)

Scirpus saximontanus (Rocky Mountain rush)

EUPHORBIACEAE (SPURGE FAMILY)

Chamaesyce ocellata (Contura Creek spurge)

Eremocarpus setigerus (turkey mullein)

FABACEAE (LEGUME FAMILY)

Astragalus didymocarpus (two-seeded milk-vetch)

Lotus purshianus (Spanish clover)

Lotus wrangelianus (calf lotus)

Medicago polymorpha (California burelover)

Melilotus indicus (sourclover)

FRANKENIACEAE (FRANKENIA FAMILY)

Frankenia salina (alkali heath)

GERANIACEAE (GERANIUM FAMILY)

Erodium cicutarium (red-stemmed filaree)

HYDROPHYLLACEAE (WATERLEAF FAMILY)

Phacelia ciliata (blue flower)

JUNCACEAE (RUSH FAMILY)

Juncus balticus (baltic rush)

Juncus bufonius (toad rush)

LAMIACEAE (MINT FAMILY)

Stachys albens (white hedge-nettle)

LILIACEAE (LILY FAMILY)

Dichelostemma capitatum (blue dick or wild hyacinth)

LYTHRACEAE (LOOSESTRIFE FAMILY)

Ammania coccinea (long-leaved (narrow) ammania)

Lythrum californicum (California loosestrife)

MALVACEAE (MALLOW FAMILY)

Eremalche parryi (Parry's mallow)

Malva parviflora (cheeseweed, bull mallow)

Malvella leprosa (alkali-mallow)

MARSILEACEAE (MARSILEA OR WATER CLOVER FAMILY)

Marsilea vestita (hairy pepperweed, hairy water clover)

ONAGRACEAE (EVENING PRIMROSE FAMILY)

Camissonia campestris (field primrose)

Ludwigia peploides (water primrose)

PAPAVERACEAE (POPPY FAMILY)

Eschscholzia californica (California poppy)

Platystemon californicus (cream cups)

POACEAE (GRASS FAMILY)

Avena spp. (oats)

Bromus arizonicus (Arizona brome)

Bromus hordeaceus (soft brome)

Bromus madritensis (foxtail brome)

Crypsis schoenoides (swamp timothy)

Crypsis vaginiflora (prickle grass)

Cynodon dactylon (Bermuda grass)

Deschampsia danthonioides (annual hairgrass)

Distichlis spicata (salt grass)

Echinochloa colona (jungle grass, small barnyard grass)

Echinochloa crus-galli (wild millet, watergrass, barnyard grass)

Glyceria grandis (American mannagrass)

Hordeum depressum (low barley)

Hordeum murinum ssp. *gussoneanum* (Mediterranean barley)

Hordeum vulgare (common barley)

Leptochloa fascicularis (bearded sprangletop)

Leymus triticoides (alkali rye)

Oryza sativa (rice)

Paspalum distichum (knot grass)

Poa annua (annual bluegrass)

Polypogon monspeliensis (annual beardgrass)

Puccinellia simplex (alkali grass)

Sporobolus airoides (alkali sacaton)

Vulpia bromoides (six weeks grass)

Vulpia microstachys (few flowered fescue)

Vulpia myuros (foxtail fescue)

POLEMONIACEAE (PHLOX FAMILY)

Gilia tricolor ssp. *diffusa* (birds's eye gilia)

POLYGONACEAE (BUCKWHEAT FAMILY)

Polygonum argyrocoleon (Persian knotweed)

Polygonum lapathifolium (willow-knotweed, nodding smartweed)

Rumex crispus (curly dock)

Rumex salicifolius (willow dock)

Rumex violascens (Mexican dock)

PORTULACACEAE (PURSLANE FAMILY)

Calandrinia ciliata (red maids)

RANUNCULACEAE (BUTTERCUP OR CROWFOOT FAMILY)

Delphinium recurvatum (recurved larkspur)

Myosurus sessilis

SALICACEAE (WILLOW FAMILY)

Populus fremontii (Fremont cottonwood)

Salix gooddingii (Gooding's black willow)

SCROPHULARIACEAE (FIGWORT FAMILY)

Bacopa eisenii (water-hyssop)

Castilleja exserta (purple owl's-clover)

Castilleja attenuatus (valley tassels)

Mimulus guttatus (common monkeyflower)

Triphysaria eriantha (butter 'n' eggs)

Verbascum thapsus (wooly mullein)

Veronica peregrina (purslane speedwell)

SOLANACEAE (NIGHTSHADE FAMILY)

Physalis lanceifolia (lance-leaved ground cherry)

Solanum americanum (small flowered nightshade)

Solanum elaeagnifolium (silverleaf-nettle, bull nettle)

Solanum sarrachoides (nightshade)

TAMARICACEAE (TAMARISK FAMILY)

Tamarix aphylla (athel)

Tamarix chinensis (salt cedar)

Tamarix gallica (summer tamarisk)

TYPHACEAE (CATTAIL FAMILY)

Typha angustifolia (narrow-leaved cattail)

URITICACEAE (NETTLES)

Urtica dioica ssp. *holosericea* (stinging nettle)

VERBENACEAE (VERVAIN FAMILY)

Verbena bracteata (bracted verbena)

ZANNICHELLIACEAE (HORNED-PONDWEED FAMILY)

Zannichellia palustris (horned-pondweed)

Species Lists: Pixley Refuge

Birds

ORDER ANSERIFORMES (SWANS, GEESE & DUCKS)

ANATIDAE (WATERFOWL FAMILY)

Anas acuta (northern pintail)
Anas americana (American wigeon)
Anas crecca (green-winged teal)
Anas clypeata (northern shoveler)
Anas cyanoptera (cinnamon teal)
Anas platyrhynchos (mallard)
Anas strepera (gadwall)
Anser albifrons (greater white-fronted goose)
Aythya americana (redhead)
Aythya collaris (ring-necked duck)
Branta canadensis (Canada goose)
Bucephala albeola (bufflehead)
Chen caerulescens (snow goose)
Chen rossii (Ross' goose)
Oxyura jamaicensis (ruddy duck)

ORDER CAPRIMULGIFORMES (GOATSUCKERS)

CAPRIMULGIDAE (GOATSUCKER FAMILY)

Chordeiles acutipennis (lesser nighthawk)

ORDER CHARADRIIFORMES (SHOREBIRDS)

CHARADRIIDAE (PLOVER FAMILY)

Charadrius vociferus (killdeer)
Charadrius montanus (mountain plover)
Pluvialis squatarola (black-bellied plover)

RECURVIROSTRIDAE (STILT & AVOCET FAMILY)

Himantopus mexicanus (black-necked stilt)
Recurvirostra americana (American avocet)

SCOLOPACIDAE (SANDPIPER FAMILY)

Actitis macularia (spotted sandpiper)
Calidris alpina (dunlin)
Calidris mauri (western sandpiper)
Calidris minutilla (least sandpiper)
Gallinago gallinago (common snipe)
Limnodromus scolopaceus (long-billed dowitcher)

Numenius americanus (long-billed curlew)
Numenius phaeopus (whimbrel)
Tringa flavipes (lesser yellowlegs)
Tringa melanoleuca (greater yellowlegs)

LARIDAE (JAEGER, GULL, & TERN FAMILY)

Chidonias niger (black tern)
Larus delawarensis (ring-billed gull)
Sterna forsteri (Forster's tern)

ORDER CICONIIFORMES (HERONS, IBIS, & NEW WORLD VULTURES)

ARDEIDAE (HERON FAMILY)

Ardea alba (great egret)
Ardea herodias (great blue heron)
Bubulcus ibis (cattle egret)
Egretta thula (snowy egret)
Nycticorax nycticorax (black-crowned night-heron)

CATHARTIDAE (NEW WORLD VULTURE FAMILY)

Cathartes aura (turkey vulture)

THRESKIORNITHIDAE (IBIS FAMILY)

Plegadis chihi (white-faced ibis)

ORDER COLUMBIFORMES (PIGEONS & DOVES)

COLUMBIDAE (PIGEON & DOVE FAMILY)

Columba livia (rock dove)
Zenaidura macroura (mourning dove)

ORDER CUCULIFORMES (ANIS, CUCKOOS, & ROADRUNNERS)

CUCULIDAE

Geococcyx californianus (greater roadrunner)

ORDER FALCONIFORMES (DIURNAL BIRDS OF PREY)

ACCIPITRIDAE (EAGLE, KITE & HAWK FAMILY)

Accipiter cooperii (Cooper's hawk)
Aquila chrysaetos (golden eagle)
Buteo jamaicensis (red-tailed hawk)
Buteo lineatus (red-shouldered hawk)
Buteo regalis (ferruginous hawk)
Buteo swainsoni (Swainson's hawk)
Circus cyaneus (northern harrier)
Elanus leucurus (white-tailed kite)

FALCONIDAE (FALCON)

Falco columbarius (merlin)
Falco sparverius (American kestrel)
Falco peregrinus (peregrine falcon)

ORDER GALLIFORMES (GROUSE, TURKEY, & QUAIL)

PHASIANIDAE (GROUSE FAMILY)

Phasianus colchicus (ringed-neck pheasant)

ORDER GRUIFORMES (RAILS, LIMPKIN & CRANES)

RALLIDAE (RAIL FAMILY)

Fulica americana (American coot)

GRUIDAE (CRANE FAMILY)

Grus canadensis (sandhill crane)

ORDER PASSERIFORMES (PERCHING BIRDS)

TYRANNIDAE (FLYCATCHER FAMILY)

Empidonax difficilis (Pacific-slope Flycatcher)
Myiarchus cinerascens (ash-throated flycatcher)
Sayornis nigricans (black phoebe)
Tyrannus verticalis (western kingbird)

LANIIDAE (SHRIKE FAMILY)

Lanius ludovicianus (loggerhead shrike)

CORVIDAE (JAY & CROW FAMILY)

Aphelocoma californica (western scrub-jay)
Corvus brachyrhynchos (common crow)
Corvus corax (American raven)

ALAUDIDAE (LARK FAMILY)

Eremophila alpestris (horned lark)

HIRUNDINIDAE (SWALLOW FAMILY)

Petrochelidon pyrrhonota (cliff swallow)
Tachycineta bicolor (tree swallow)

ATEGITHALIDAE (BUSHTIT FAMILY)

Psaltriparus minimus (bushtit)

TROGLODYTIDAE (WREN FAMILY)

Cistothorus palustris (marsh wren)
Troglodytes aedon (house wren)

REGULIDAE (KINGLET FAMILY)

Regulus calendula (ruby-crowned kinglet)

TURDIDAE (THRUSH FAMILY)

Catharus guttatus (hermit thrush)
Turdus migratorius (American robin)

MIMIDAE (MOCKINGBIRD & THRASHER FAMILY)

Mimus polyglottos (northern mockingbird)

STURNIDAE (STARLING FAMILY)

Sturnus vulgaris (European starling)

MOTACILLIDAE (WAGTAIL & PIPIT FAMILY)

Anthus rubescens (American pipit)

PARULIDAE (WARBLER FAMILY)

Dendroica coronata (yellow-rumped warbler)
Dendroica nigrescens (black-throated gray warbler)
Vermivora celata (orange-crowned warbler)
Vermivora ruficapilla (Nashville warbler)
Wilsonia pusilla (Wilson's warbler)

EMBERIZIDAE (TOWHEE & SPARROW FAMILY)

Junco hyemalis (dark-eyed junco)
Melospiza lincolni (Lincoln's sparrow)
Melospiza melodia (song sparrow)
Passerella iliaca (fox sparrow)
Passerculus sandwichensis (Savannah sparrow)
Pipilo maculatus (spotted towhee)
Spizella passerine (chipping sparrow)
Zonotrichia atricapilla (golden-crowned sparrow)
Zonotrichia leucophrys (white-crowned sparrow)

CARDINALIDAE (GROSBEAK & BUNTING FAMILY)

Guiraca caerulea (blue grosbeak)
Passerina amoena (Lazuli bunting)
Pheucticus melanocephalus (black-headed grosbeak)

ICTERIDAE (BLACKBIRD & ORIOLE
FAMILY)

Agelaius phoeniceus (red-winged blackbird)
Agelaius tricolor (tricolored blackbird)
Icterus bullockii (Bullock's oriole)
Molothrus ater (brown-headed cowbird)
Sturnella neglecta (western meadowlark)
Xanthocephalus xanthocephalus (yellow-headed
blackbird)

FRINGILLIDAE (FINCH FAMILY)

Carduelis lawrencei (Lawrence's goldfinch)
Carduelis psaltria (lesser goldfinch)
Carduelis tristis (American goldfinch)
Carpodacus mexicanus (house finch)

**ORDER PELECANIFORMES (TROPICBIRDS,
BOOBIES, PELICANS, CORMORANTS, ANHINGA
& FRIGATEBIRDS)**

PELECANIDAE (PELICANS)

Pelecanus erythrorhynchos (white pelican)

ORDER PICIFORMES (WOODPECKERS)

PICIDAE (WOODPECKER FAMILY)

Colaptes auratus (northern flicker)
Picoides pubescens (downy woodpecker)

ORDER PODICIPEDIFORMES (GREBES)

PODICIPEDIDAE (GREBE FAMILY)

Podiceps nigricollis (eared grebe)
Podilymbus podiceps (pied-billed grebe)

ORDER STRIGIFORMES (OWLS)

STRIGIDAE (OWL FAMILY)

Athene cunicularia (burrowing owl)
Bubo virginianus (great horned owl)

Mammals

ORDER CARNIVORA (CARNIVORES)

CANIDAE (DOG FAMILY)

Canis latrans (coyote)

Vulpes macrotis mutica (San Joaquin kit fox)

MUSTELIDAE (WEASEL FAMILY)

Spilogale gracilis (western spotted skunk)

Mephitis mephitis (striped skunk)

Taxidea taxus (badger)

Mustela frenata (long-tailed weasel)

PROCYONIDAE (RACCOON FAMILY)

Procyon lotor (raccoon)

ORDER CHIROPTERA

MOLOSSIDAE (FREE-TAILED BAT FAMILY)

Eumops perotis (western mastiff bat)

Tadarida brasiliensis (Mexican free-tailed bat)

ORDER INSECTIVORA

SORICIDAE (SHREW FAMILY)

Sorex ornatus (ornate shrew)

TALPIDAE (MOLE FAMILY)

Scapanus latimanus (broad-footed mole)

ORDER LAGOMORPHA

LEPORIDAE (RABBIT & HARE FAMILY)

Lepus californicus (black-tailed jackrabbit)

Sylvilagus audubonii (desert cottontail)

ORDER RODENTIA

SCIURIDAE (SQUIRREL FAMILY)

Ammospermophilus nelsoni (San Joaquin antelope squirrel)

Spermophilus beecheyi (California ground squirrel)

GEOMYIDAE (POCKET GOPHER FAMILY)

Thomomys bottae (Botta's pocket gopher)

HETEROMYIDAE (POCKET MICE & KANGAROO RATS FAMILY)

Dipodomys heermanni (Heermann's kangaroo rat)

Dipodomys nitratooides (San Joaquin kangaroo rat)

Perognathus inornatus (San Joaquin pocket mouse)

MURIDAE (RATS & MICE FAMILY)

Microtus californicus (California vole)

Mus musculus (house mouse)

Ondatra zibethicus (muskrat)

Peromyscus maniculatus (deer mouse)

Reithrodontomys megalotis (western harvest mouse)

Reptiles and Amphibians

LIZARDS

Gambelia sila (blunt-nosed leopard lizard)

Phrynosoma coronatum (coast horned lizard)

Uta stansburiana elegans (California side-blotched lizard)

Cnemidophorus tigris (western (California) whiptail)

SKINKS

Eumeces gilberti (Gilbert's skink)

SNAKES

Pituophis catenifer catenifer (Pacific gopher snake)

Lampropeltis getula californiae (California (common) kingsnakes)

Rhinocheilus lecontei lecontei (western long-nosed snake)

Tantilla hobartsmithi (southwestern black-headed snake)

Crotalus viridis oreganus (western (northern Pacific) rattlesnake)

AMPHIBIANS

Pseudacris regilla (Pacific treefrog)

Bufo boreas halophilus (western (California) toad)

Spea hammondi (western spadefoot toad)

Rana catesbeiana (bullfrog)

Invertebrates

CLASS INSECTA

ORDER DIPTERA (GNATS, MOSQUITOES, & TRUE FLIES)

CULICIDAE (MOSQUITOES)

Culex erythrothorax
Culex pipiens
Culex tarsalis
Ochlerotatus dorsalis
Ochlerotatus nigromaculis
Aedes vexans

ORDER LEPIDOPTERA (BUTTERFLIES & MOTHS)

ARCTIIDAE (TIGER MOTH FAMILY)

Apantesis proxima (harnessed tiger moth)
Tetanolita palligera

GEOMETRIDAE (INCH WORM AND LOOPER MOTH FAMILY)

Lobocleta lanceolata
Orthonama obstipata
Perizoma custodiata
Pero meskaria
Pero modesta
Semiothisa neptaria neptaria

MICROLEPIDOPTERA (SMALL MOTH FAMILY)

Achyra occidentalis
Agriphila attenuata
Bactra verutana chrysea
Comadia suaedivora
Diasticitis fracturalis
Euchromius ocellus
Eucosma biplagata
Homoeosoma electellum
Lipographis truncatella
Mimoschinia rufofascialis
Nomophila nearctica
Phycitodes albatella mucidella
Plutella xylostella (diamond back or cabbage moth)
Platynota stultana (omnivorous leaf roller)
Suleima baracana
Tinea pallescentella

NOCTUIDAE (CUTWORM MOTH FAMILY)

Acontia coquillettii
Agrotis ipsilon
Agrotis venerabilis arida
Amphipoea lunata
Apamea cenefacta cenefacta
Autographa californica (alfalfa looper)
Caenurgina crassiuscula
Chorizagrotis auxiliaris
Copibryophila angelica
Euxoa pallipennis
Euxoa olivia
Euxoa serricornis
Heliothodes fasciatus
Heliothis zea (corn earworm)
Homoglaea californica
Peridroma saucia
Proxenus mindara
Pseudaletia unipuncta
Pseudorthosia variabilis
Rynchagrotis exertistigma
Scotogramma deffessa
Spodoptera exigua
Spodoptera praefica
Trichoclea antica
Trichoclea decepta
Trichocosmia inornata
Trichoplusia ni (cabbage looper)
Tridepia nova
Xestia adela

SPHINGIDAE (HAWKMOTH FAMILY)

Manduca sexta (tobacco hornworm moth)
Hyles lineata (white-lined sphinx)

CLASS BRANCHIOPODA (FAIRY SHRIMP AND WATER FLEAS)

ORDER ANOSTRACA

BRANCHINECTIDAE (FAIRY SHRIMP FAMILY)

Branchinecta lindahli (versatile fairy shrimp)
Branchinecta lynchi (vernal pool fairy shrimp)
Branchinecta mackini (alkali fairy shrimp)

Plants

APIACEAE (CARROT FAMILY)

Eryngium vaseyi (coyote thistle)

ASCLEPIADACEAE (MILKWEED FAMILY)

Asclepias fascicularis (narrow-leaf milkweed)

ASTERACEAE (SUNFLOWER FAMILY)

Chaenactis sp. (pincushion)

Chamomilla suaveolens (pineapple weed)

Hemizonia pallida (Kern tarweed)

Hemizonia pungens (common spikeweed)

Heterotheca grandiflora (telegraph weed)

Isocoma acradenia (pale-leaf golden bush)

Lasthenia californica (California goldfields)

Lasthenia chrysantha (alkali goldfields)

Lasthenia fremontii (Fremont's goldfields)

Lasthenia minor (goldfields)

Psilocarphus brevissimus (woolly-heads)

Senecio vulgaris (common groundsel)

BORAGINACEAE (BORAGE FAMILY)

Amsinckia menziesii (fiddleneck)

Amsinckia tessellata (checker fiddleneck)

Heliotropium curassavicum (wild heliotrope)

Plagiobothrys leptocladus (alkali plagiobothrys)

Plagiobothrys stipitatus (common vernal pool allocary)

BRASSICACEAE (MUSTARD FAMILY)

Capsella bursa-pastoris (shepherd's purse)

Lepidium acutidens (alkali pepperwort)

Lepidium dictyotum (alkali pepper-grass)

Tropidocarpum gracile (slender tropidocarpum)

CALLITRICHACEAE (WATER-STARWORT FAMILY)

Callitriche marginata (water-starwort)

CARYOPHYLLACEAE (PINK FAMILY)

Herniaria cinerea (grey herniaria)

Spergularia atrosperma (sand-spurrey)

Spergularia marina (salt sand-spurrey)

CHENOPODIACEAE (GOOSEFOOT FAMILY)

Allenrolfea occidentalis (idoine bush)

Atriplex lentiformis (big saltbush)

Atriplex polycarpa (allscale)

Atriplex rosea (redscale)

Chenopodium sp. (goosefoot)

Salsola tragus (Russian-thistle)

Suaeda moquinii (sea-blite)

CONVOLVULACEAE (MORNING-GLORY FAMILY)

Cressa truxillensis (alkali weed)

CRASSULACEAE (STONECROP FAMILY)

Crassula aquatica (water pigmy-weed)

Crassula connata (pigmy-weed)

CUCURBITACEAE (GOURD FAMILY)

Cucurbita sp. (gourd)

CUSCUTACEAE (DODDER FAMILY)

Cuscuta spp. (dodder)

CYPERACEAE (SEDGE FAMILY)

Eleocharis macrostachya (common spike-rush)

EUPHORBIACEAE (SPURGE FAMILY)

Chamaesyce ocellata (Contura Creek spurge)

Ermocarpus setigerus (turkey mullein)

FABACEAE (LEGUME FAMILY)

Astragalus didymocarpus (two-seeded milk-vetch)

Lotus wrangelianus (calf lotus)

Lupinus bicolor (bicolor lupine)

Lupinus microcarpus var. *densiflorus* (chick lupine)

Medicago polymorpha (California burelover)

Trifolium depauperatum var. *amplectens* (pale sackclover)

Trifolium gracilentum (pinpoint clover)

Trifolium oliganthum (few flower clover)

FRANKENIACEAE (FRANKENIA FAMILY)

Frankenia salina (alkali heath)

GERANIACEAE (GERANIUM FAMILY)

Erodium brachycarpum (filaree)

Erodium cicutarium (red-stemmed filaree)

HYDROPHYLLACEAE (WATERLEAF FAMILY)

Nemophila menziesii (baby blue eyes)

JUNCAGINACEAE (ARROWGRASS FAMILY)

Lilaea scilloides (flowering quillwort)

LAMIACEAE (MINT FAMILY)

Trichostema lanceolatum (vinegar weed)
Trichostema ovatum (San Joaquin bluecurls)

LILIACEAE (LILY FAMILY)

Dichelostemma capitatum (blue dick or wild hyacinth)

MALVACEAE (MALLOW FAMILY)

Eremalche parryi (Parry's mallow)
Malvella leprosa (alkali mallow)

MARSILEACEAE (MARSILEA OR WATER CLOVER FAMILY)

Pilularia americana (American pillwort)

ONAGRACEAE (EVENING PRIMROSE FAMILY)

Camissonia campestris (field primrose)

PAPAVERACEAE (POPPY FAMILY)

Eschscholzia californica (California poppy)
Platystemon californicus (cream cups)

PLANTAGINACEAE (PLANTAIN FAMILY)

Plantago elongata (coast plantain)

POACEAE (GRASS FAMILY)

Avena (oats)
Bromus diandrus (ripgut brome)
Bromus hordeaceus (soft brome)
Bromus madritensis ssp. *rubens* (foxtail brome)
Cynodon dactylon (Bermuda grass)
Deschampsia danthonioides (hairgrass)
Distichlis spicata (salt grass)
Hordeum depressum (low barley)
Hordeum marinum ssp. *gussoneanum* (mediterranean barley)
Hordeum marinum ssp. *glaucum* (glaucous barley)
Hordeum marinum ssp. *leporinum* (farmer's foxtail, hare barley)
Lolium multiflorum (Italian ryegrass)
Poa annua (annual bluegrass)
Polypogon monspeliensis (annual beardgrass)
Puccinellia simplex (alkali grass)
Schismus arabicus (Mediterranean grass)
Sporobolus airoides (alkali sacaton)
Vulpia microstachys (few flowered fescue)
Vulpia myuros (foxtail fescue)

POLEMONIACEAE (PHLOX FAMILY)

Gilia tricolor (birds's eye gilia)
Linanthus liniflorus (flax-flowered linanthus)
Linanthus dichotomus (evening snow)

PORTULACACEAE (PURSLANE FAMILY)

Calandrinia ciliata (red maids)

POLYGONACEAE (BUCKWHEAT FAMILY)

Hollisteria lanta (false spikeflower)
Polygonum sp. (knotweed)

RANUNCULACEAE (BUTTERCUP OR CROWFOOT FAMILY)

Delphinium parryi (San Bernardino larkspur)
Delphinium recurvatum (recurved larkspur)
Myosorus minimus (common mousetail)
Myosorus sessilis (tiny mousetail)

SALICACEAE (WILLOW FAMILY)

Salix laevigata (red willow)

SCROPHULARIACEAE (FIGWORT FAMILY)

Castilleja attenuata (valley tassels)
Castilleja exserta (purple owl's-clover)
Collinsia bartsiiifolia (white blue eyed mary)
Triphysaria eriantha (butter 'n' eggs)
Veronica peregrina (purslane speedwell)

TAMARICACEAE (TAMARISK FAMILY)

Tamarix ramosissima (salt cedar)

Appendix F.
Budget Proposal

Budget Proposal for Kern Refuge

<i>Project Title</i>	<i>Priority</i>	<i>Start Year</i>	<i>Completion Year</i>	<i>Duration (years)</i>	<i>Operational Cost for Startup (thousands)</i>	<i>Average Annual Cost (thousands)</i>	<i>15-year Total Cost (thousands)</i>	<i>Staffing (FTE/Grade)</i>	<i>RONs</i>
<i>Projects Using Existing Staff and Funding</i>									
Plant 15 acres of riparian vegetation along canals surrounding unit 14	M	2004	2008	4	3.0	3.0	15.0	.05/GS-9	n/a
Restore 440 acres of valley sink scrub vegetation in unit 13.	L	2008	2012	4	31.0	35.0	171.0	.04/GS-9 .04/WG-9	n/a
Prepare a grassland management plan	M	2006	2006	1	-	6.0	6.0	.10/GS-11	n/a
Prepare land protection plan which evaluates alternatives for protecting, enhancing, and linking southern San Joaquin Valley wetlands and associated uplands	H	2002	2005	2	n/a	5.0	15.0	.07/GS-12	n/a
Construct or rehabilitate 9 new blinds in units 5 and 6.	M	2005	2006	2	1.0	4.5	10.0	.06/GS-7 .04/WG-9	n/a
Construct and maintain two photo blinds	L	2005	2018	13	2.0	.3	6.0	-	-
Develop and implement a visitor services plan	M	2008	2009	2	1.0	2.0	5.0	.03/GS-11	n/a
Conduct habitat management studies to determine how best to manage natural lands to enhance habitat for Buena Vista Lake shrew.	L	2008	2011	4	2.0	15.0	62.0	.25/GS-9	n/a
Establish partnerships with educational institutions and local organizations	L	2006	2018	12	2.0	2.0	26.0	.04/GS-9	n/a
Develop educational materials	M	2008	2018	11	3.0	2.0	25.0	.07/GS-11	n/a
Develop new interpretive signs and displays and new refuge brochure	M	2008	2013	6	21.0	3.0	39.0	.05/GS-9	n/a
Develop kiosk, boardwalk, and enhance pond at refuge entrance	M	2004	2006	2	13.0	2.0	17.0	.08/WG-9 .05/GS-9	n/a
Rehabilitate units 7,7b and 8 and manage as seasonal wetland	M	2004	2018	15	78.0	1.0	93.0	.04/WG-6	n/a
Encourage and provide opportunities for research by other agencies, universities, and institutions	L	2006	2018	13	-	3.2	41.6	.05/GS-11	n/a
Develop a friends group for the refuge	L	2007	2015	9	8.0	3.0	37.0	.05/GS-9	n/a

<i>Project Title</i>	<i>Priority</i>	<i>Start Year</i>	<i>Completion Year</i>	<i>Duration (years)</i>	<i>Operational Cost for Startup (thousands)</i>	<i>Average Annual Cost (thousands)</i>	<i>15-year Total Cost (thousands)</i>	<i>Staffing (FTE/Grade)</i>	<i>RONS</i>
Purchase general and refuge specific displays for use at fairs, shows, and festivals	M	2004	2018	15	5.0	1.0	20.0	-	n/a
Implement a pro-active cultural resource management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.	L	2009	2018	10	20.0	5.0	70.0	.25/GS-11	n/a
Develop, in partnership with the Tribes and other preservation partners, a program for the interpretation of cultural resources of the Refuge.	L	2009	2018	10	10.0	1.0	20.0	.25/GS-11	n/a
Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).	L	2009	2010	2	3.0	3.0	9.0	.05/GS-11	n/a
<i>Projects that Require New Staff and/or Funding</i>									
Reduce salt cedar cover on the Refuge by 90 percent over the next 10 years	M	2005	2014	10	120.0	50.0	620.0	0.7/WG-9 0.7/WG-6	97012
Rehabilitate unit 14 and manage as new 1,200 acre moist soil unit	H	2004	2018	15	300.0	18.0	570.0	.35/WG-9	97007 97004
Expand aerial surveys of waterfowl and ground surveys of shorebirds, waterbirds, and raptors	H	2005	2018	14	25.0	45.0	655.0	.5/GS-7	98004
Hire a full time outdoor recreation planner (shared with Pixley Refuge)	M	2008	2018	11	15.0	27.0	317.0	0.5/GS-9	00004
Implement Poso Creek flood water management agreement developed with adjacent land owners	M	2007	2018	12	207.0	10.0	337.0	.10/GS-13	98001
Construct and maintain a new tour route around unit 7	M	2006	2018	13	183.0	6.0	261.0	.01/WG-9	97013

Budget Proposal for Pixley Refuge

<i>Project Title</i>	<i>Priority</i>	<i>Start Year</i>	<i>Completion Year</i>	<i>Duration (years)</i>	<i>Operational Cost for Startup (thousands)</i>	<i>Average Annual Cost (thousands)</i>	<i>15-year Total Cost (thousands)</i>	<i>Staffing (FTE/Grade)</i>	<i>RONS</i>
<i>Projects Using Existing Staff and Funding</i>									
Conduct habitat management studies to determine how best to manage natural lands for Tipton's kangaroo rat and blunt-nosed leopard lizard	M	2007	2010	4	13.0	15.0	63.0	.25/GS-9	n/a
Seek approval for and prepare a land protection plan which evaluates opportunities for protection of blocks of habitat for Tipton kangaroo rat between and around Pixley Refuge and Allensworth Ecological Reserve	H	2006	2008	2	n/a	5.0	10.0	.07/GS-12	n/a
Maintain and enhance riparian area.	M	2005	2018	14	3.0	3.0	45.0	.05/WG-8	n/a
Plant and maintain 10 acres of riparian habitat along the service ditch and Deer Creek	L	2006	2008	3	3.0	1.0	6.0	.02/WG-9	n/a
Prepare grassland management plan	M	2006	2006	1	1.0	6.0	7.0	.10/GS-11	n/a
Develop 272-acre Turkey Tract into grain and pasture unit	H	2007	2018	12	86.0	2.0	110.0	.02/WG-9	n/a
Expand aerial surveys of waterfowl and ground surveys of shorebirds, waterbirds, and raptors	H	2005	2018	14	1.0	8.0	113.0	.06/GS-9	n/a
Develop and implement a visitor services plan	L	2006	2007	2	1.0	2.0	5.0	.03/GS-9	n/a
Develop and maintain a pullout and interpretive displays at the Turkey Tract grain and pasture unit	L	2006	2018	13	40.0	3.0	79.0	.01/GS-9	n/a
Establish partnerships with educational institutions and local organizations	L	2007	2018	12	1.0	2.0	25.0	.04/GS-9	n/a
Develop educational materials	L	2007	2018	12	3.0	2.0	23.0	.07/GS-11	n/a
Develop new interpretive signs and displays and new refuge brochure	L	2006	2012	7	21.0	3.0	42.0	.05/GS-9	n/a
Develop a friends group for the refuge	M	2006	2015	10	7.0	3.0	37.0	.05/GS-9	n/a
Encourage and provide opportunities for research by other agencies, universities, and institutions	L	2005	2018	14	-	3.2	44.8	.05/GS-11	n/a

<i>Project Title</i>	<i>Priority</i>	<i>Start Year</i>	<i>Completion Year</i>	<i>Duration (years)</i>	<i>Operational Cost for Startup (thousands)</i>	<i>Average Annual Cost (thousands)</i>	<i>15-year Total Cost (thousands)</i>	<i>Staffing (FTE/Grade)</i>	<i>RONs</i>
Conduct archeological surveys prior to initiating projects that may disturb historic or archeological sites	H	2004	2018	15	5.0	2.0	35.0	.03/GS-11	n/a
Work with the State Historic Preservation Office and universities to document and interpret any discovered sites	M	2005	2018	14	2.0	2.0	30.0	.05/GS-9	n/a
<i>Projects that Require New Staff and/or Funding</i>									
Hire a full time outdoor recreation planner (shared with Kern Refuge)	M	2008	2018	11	15.0	27.5	317.0	0.5/GS-9	00004
Expand surveying and monitoring for special status species. Prepare an inventory and monitoring plan	H	2008	2018	11	25.0	53.0	608.0	1.0/GS-7	97002
Conduct law enforcement patrols of known cultural resources sites	M	2005	2018	14	1.0	1.0	15.0	.02/GS-9	03003

Appendix G.
References

- Arguelles, M.R. 1983. Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. U.S. Fish and Wildlife Service.
- Barbour, M.B. Pavlik, F. Drysdale, and S. Lindstrom. 1991. California vegetation: diversity and change. *Fremontia* 19(1):3-12.
- Barnum, D.A. and N.H. Euliss. 1991. Impacts of changing irrigation practices on waterfowl habitat use in the southern San Joaquin Valley, California. *California Fish and Game*. 77:10-21.
- Beedy, E.C. 1989. Draft habitat suitability index model, Tricolored blackbird (*Agelaius tricolor*). Prepared by Jones & Stokes Associates for U.S. Bureau of Reclamation, Sacramento, CA.
- Beedy, E.C. and W.J. Hamilton III. 1997. Tricolored blackbird status update and management guidelines. September. (Jones and Stokes Associates, Inc 97-099). Sacramento, CA. Prepared for U.S. Fish and Wildlife Service and California Department of Fish and Game, Sacramento, CA.
- Bloom, P.H. 1980. The status of the Swainson's hawk in California. 1979. U.S. Department of the Interior, Bureau of Land Management, Sacramento. Proj. W-54-R-12, Job II-8. Final Report. 42pp.
- Brown, L., and D. Amadon. 1968. *Eagles, hawks, and falcons of the world*, 2 vols. Country Life Books, London. 945pp.
- California Department of Fish & Game (CDFG). 2001. *The status of rare, threatened, and endangered animals and plants of California, Annual report for 2000*. California Department of Fish and Game. Sacramento, CA. 226pp.
- California Department of Food and Agriculture. 2002. Resource Directory. Sacramento, California.
- Caudill, J. 2003. *2001 National and State Economic Impacts of Wildlife Watching: Addendum to the 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation*. U.S. Department of the Interior, Fish & Wildlife Service, Division of Economics, Arlington, Virginia.
- Caudill, J and E. Henderson. 2003. *Banking on Nature 2002: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*. U.S. Department of the Interior, Fish & Wildlife Service, Division of Economics, Arlington, Virginia.
- Cook, Sherburne F. 1960. Colonial Expeditions to the Interior of California: Central Valley. 1800-1820. *University of California Anthropological Records*. 16(4):131-292. Berkeley.
- Craighead, J.J., and F.C. Craighead, Jr. 1956. *Hawks, owls, and wildlife*. Stackpole Books, Harrisburg, PA. 443pp.
- DeLong, A. K. 2002. Managing visitor use and disturbance of waterbirds — a literature review of impacts and mitigation measures — prepared for Stillwater National Wildlife Refuge. Appendix L (114 pp.) in Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision (Vol. II). Dept. of the Interior, U.S. Fish and Wildlife Service, Region 1, Portland, OR.
- Dunkle, S.W. 1977. Swainson's hawk on the Laramie Plains, Wyoming. *Auk* 94:65-71.
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The birder's handbook: a field guide to the natural history of North American birds*. Simon and Schuster, New York, NY. 785pp.
- Eldridge, J. 1992. Management of habitat for breeding and migrating shorebirds in the Midwest. Fish and Wildlife Leaflet 13.2.14. Washington, DC.

- Elliott, W.W. (1883). *History of Tulare County, California; with illustrations*. San Francisco, CA: Wallace W. Elliott & Company.
- Engler, J. 1993. Letter to Dr. Denton Belk regarding samples of invertebrates taken from Pixley NWR.
- Euliss, N.H. and S.W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *J. Wildl. Manage.* 51:724-732.
- Fages, Pedro. 1937. *A historical, Political, and Natural Description of California, by Pedro Fages, Soldier of Spain [1774]*. Translated by Herbert I. Priestley. Berkeley: University of California Press. (Reprinted: Ballena Press, Ramona, Calif., 1972.)
- Fredrickson, L. and F. Reid. 1988. *Waterfowl Use of Wetland Complexes*. Fish and Wildlife Leaflet No. 13.2.1
- Garrett, K., and J. Dunn. 1981. *Birds of southern California*. Los Angeles Audubon Society. 408pp.
- Germano, D., G. Rathbun, and L. Saslaw. 2001. Managing exotic grasses and conserving declining species. *Wildlife Society Bulletin.* 29:551-559.
- Grayson, D.K. 1985. Identification of Mineralized Bone. Appendix 2 in Breschini, G.S., T. Haversat, and M.J. Moratto; 1985 Archaeological Survey and Testing for the Kern Tile Drain Research Project. Kern National Wildlife Refuge, Northern Kern County, California. Infotec Research, Inc.
- Grinnel, J., and A.H. Miller. 1944. The distribution of the birds of California. *Pacific Coast Avifauna*, 27. 608pp.
- Hamilton, J.G. 1997. Changing perceptions of pre-European grasslands in California. *Madroño* 44:311-333.
- Holland, R. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento, California.
- Hoover, R.F. 1938. New Californian plants. *Leaf. West. Bot.* 2:130-131.
- Howard, A.D. 1979. *Geological History of California*. Berkeley, California. University of California Press.
- Hunter, L. 1997. Swainson's hawk gains new protection. U.S. Fish and Wildlife Service, Washington, D.C., *Endangered Species Bulletin*, Volume XXII, No. 6.
- Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California. In: California riparian systems: ecology, conservation, and productive management. R. E. Warner and K. M. Hendrix (eds). University of California Press Ltd. London, England.
- Kelly, P.A., E. Cypher, D.F. Williams, and C.E. Uptain. 2000. Habitat management plan: San Joaquin kangaroo rats (*Dipodomys nitratoides*) on Naval Air Station, Lemoore. Prepared for Naval Air Station, Lemoore, CA.
- Kerpez, T.A. and Smith, N.S. 1987. Saltcedar control for wildlife habitat improvement in the Southwestern United States. *USFWS Res. Publ.* 169.
- Latta, Frank. 1949. *Handbook of Yokuts Indians*. Bakersfield, Calif.: Kern County Museum.
- Lovich, J.E. and R.G. de Govenain. 1998. Salt cedar invasion in desert wetlands of the southwestern United States: ecological and political implications. Pp. 447-467 in Majumdar, S.K. et al., eds. *Ecology of wetlands and associated systems*. Pennsylvania Academy of Sciences.
- Martin, D.C. 1973. Selected aspects of burrowing owl ecology and behavior. *Condor* 75: 446-456.

- MBCC (Migratory Bird Conservation Commission) 1958. Minutes of March 11, 1958 meeting. Washington, D.C.
- The Nature Conservancy. 2001. *Element Steward Abstract for Salt Cedar*. The Nature Conservancy, Arlington, VA.
- PG&E Progress. (1970). Lakes of California. (October), 8. Pacific Gas and Electric
- Polite, C. 2000a. Burrowing Owl, (*Athene cunicularia*), California's Wildlife, Volume II: Birds, Report B269 (Updates from Zeiner, D.C., W.F. Laudenslayer, Jr., and M. White, Eds., 1988 - 1990), California Department of Fish and Game, Sacramento.
- Polite, C. 2000b. Swainson's Hawk, (*Buteo swainsoni*), California's Wildlife, Volume II: Birds, Report B121 (Updates from Zeiner, D.C., W.F. Laudenslayer, Jr., and M. White, Eds., 1988 - 1990), California Department of Fish and Game, Sacramento.
- Polite, C. and J. Pratt. 2000. Peregrine Falcon (*Falco peregrinus*), California's Wildlife, Volume II: Birds, Report B129 (Updates from Zeiner, D.C., W.F. Laudenslayer, Jr., and M. White, Eds., 1988 - 1990), California Department of Fish and Game, Sacramento.
- Preston, W.L. 1981. *Vanishing landscapes; land and life in the Tulare Basin*. Berkeley, California: University of California Press.
- Remsen, J.V., Jr. 1978. Bird species of special concern in California. California Department of Fish and Game, Sacramento. Wildlife Management Administration. Report No. 78-1. 54pp.
- Riddel, Francis A., and William H. Olsen. 1969. An Early Man Site in the San Joaquin Valley, California. *American Antiquity* 34(2):121-130.
- Riparian Habitat Joint Venture. 2000. Riparian bird conservation plan.
- Robertson, J.M. 1929. Some observations on the feeding habits of the burrowing owl. *Condor* 31:38-39.
- Rosenberg, K.V., R.D. Ohmart, W.C. Hunter, and B.W. Anderson. 1991. *Birds of the lower Colorado River Valley*. University of Arizona Press, Tucson.
- Ryder, R.A., and D.E. Manry. 1994. White-faced ibis (*Plegadis chihi*). In *The Birds of North America*, No. 130 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union, Washington, D.C.
- Scott, Shirley L., Editor. 1987. *Field Guide to the Birds of North America, Second Edition*, National Geographic Society. The National Geographic Society, Washington, D.C.
- San Joaquin Valley Drainage Program. 1990. *Fish and Wildlife Resources and Agricultural Drainage in the San Joaquin Valley, California: Volume II*. Sacramento, CA.
- Souza, M. 1998. In brochure entitled Burrowing Owl, Natural History and Conservation in California. San Luis Obispo Fish and Game Fines Commission. National Fish and Wildlife Foundation.
- Taylor, D., and D.H. Wilken. 1993. Atriplex. Pp. 501-505, in *The Jepson Manual: higher plants of California* (J.C. Hickman, ed.). Univ. California Press, Berkeley, 1400pp.
- Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland municipal airport. *Condor* 73:177-192.
- Trask, M.M. 1989. Plant communities of the Pixley National Wildlife Refuge. Prepared for the U.S. Fish & Wildlife Service. California Polytechnic State University. San Luis Obispo, CA.

- Uptain, C., W.A. Clark, and S.M. Juarez. 1985. Mark-recapture population estimates and visitation indices for the blunt-nosed leopard, *Gambelia silus*, at Pixley National Wildlife Refuge. U.S. Fish and Wildlife Service, Delano, CA, Contract Nos. 10181-9810-3(js) and 10181-4672-4, 34 pp. + Appendices.
- U.S. Census Bureau. 2003. Census 2000 Summary File 3. Washington, DC.
- U.S. Fish and Wildlife Service (Service). 1961. Kern National Wildlife Refuge Master Plan. Delano, CA.
- 1978. *Concept plan for waterfowl wintering habitat preservation, Central Valley California, Priority Category 4*. USFWS, Portland, OR. 116 pages.
- 1991. *Annual narrative report, calendar year 1991*. Kern National Wildlife Refuge Complex. Delano, CA.
- 1982. *Migratory bird disease contingency plan*. Kern National Wildlife Refuge Complex. Delano, CA.
- 1994. Endangered and threatened wildlife and plants; determination of endangered status for the Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and the Vernal Pool Tadpole Shrimp; and threatened status for the Vernal Pool Fairy Shrimp. 59 FR 48136.
- 1995. Fish and Wildlife Species: Wildlife Fact Sheets. Bald Eagle, <http://species.fws.gov>.
- 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.
- 1999a. *Endangered and threatened wildlife and plants: proposed threatened status for the mountain plover*. 60 FR 30.
- 1999b. Fish and Wildlife Species: Wildlife Fact Sheets. Peregrine Falcon, <http://species.fws.gov>.
- 2000. *Endangered and threatened wildlife and plants: proposed endangered status for the Buena Vista Lake Shrew*. 65 FR 106.
- Wallace, W.J. (1978). "Northern Valley Yokuts," in *California*, vol. 8 of *Handbook of North American Indians*; pp 462-470.
- Werschkull, G.D., F.T. Griggs, and J.M. Zaninovich. 1984. Tulare Basin Protection Plan. The California Nature Conservancy.
- Zarn, M. 1974. Burrowing owl (*Speotyto cunicularia hypugaea*). U.S. Department of Interior, Bureau of Land Management, Washington, D.C. Technical Note No. 250. 25pp.

Appendix H.
Glossary

Acre-feet (AF). An acre-foot of water is the amount of water required to cover 1 acre of land to a depth of 1 foot; it is the equivalent of 325,851 gallons.

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels.

Alkalinity. Refers to the extent to which water or soils contain soluble mineral salts. Waters with a pH greater than 7.4 are considered alkaline.

Alluvium. Clay, sand, or other sediment that is gradually deposited by moving water (see also alluvial-fan).

Alternatives. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (1) A reasonable way to fix the identified problem or satisfy the stated need. (40 CFR 150.2) (2) Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (Draft Service Manual 602 FW 1.5).

Animal Unit Month (AUM). The amount of forage necessary to maintain one 1,000-pound animal for one month.

Aquatic. Pertaining to water, in contrast to land. Living in or upon water.

Aquatic Habitat. The physical, chemical, and vegetative features that occur within the water of lakes, ponds, reservoirs, rivers, irrigation canals, and other bodies of water.

Aquifer. An underground layer of porous rock, sand, or gravel containing large amounts of water.

Artifact. An object made by humans; usually in reference to primitive tools, vessels, weapons, etc.

Basin. A depressed area with little or no surface water; an area where water flows in, but where surface water does not flow out.

Biodiversity (biological diversity). Refers to the full range of variability within and among biological communities, including genetic diversity, and the variety of living organisms, assemblages of living organisms, and biological processes. Diversity can be measured in terms of the number of different items (species, communities) and their relative abundance, and it can include horizontal and vertical variability. The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Biological Control. The use of organisms or viruses to control weeds or other pests.

Biological Integrity. Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities.

Carcinogenic. Any substance that produces or causes cancer.

Carnivore. An animal that kills and eats other animals.

Categorical Exclusion (CE, CX, CATEX, CATX). A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR. Code of Federal Regulations.

Community: The combined populations of all organisms in a given area, and their interactions. For example, the frogs, fish, algae, cattails, and lily pads in a backyard pond make up a community.

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the refuge (Draft Service Manual 603 FW 3.6).

Comprehensive Conservation Plan (CCP). A document that describes the desired future conditions of the refuge or planning unit; and provides long-range guidance and management direction to accomplish the purposes of the refuge, helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates.

Concern. See Issue.

Cultural Resource. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples) of an area. It includes historical, archaeological and architectural significant resources.

Cultural Resource Inventory. A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview. A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Easement. A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity. The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions.

Ecosystem. The sum of all interacting parts of the environment and associated ecological communities within a particular area; an ecological system. Many levels of ecosystems have been recognized. Very few, if any ecosystems are self-contained; most influence, or are influenced by, components or forces outside the system. For administrative purposes, we have designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

Effect. A change in a resource, caused by a variety of events including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

Emergent Vegetation. Rooted, aquatic plants that have most of their vegetative (nonroot) parts above water.

Endemic Species. Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Endangered Species. Any species that is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. Endangered species are afforded protection under the Act as amended and under various State laws for State-listed species.

Environmental Assessment (EA). A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Environmental Health. Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment

Ethnography. The branch of anthropology that deals descriptively with specific cultures, especially those of non-literate peoples.

Evapotranspiration. The collective processes by which water is transferred from the surface of the earth, including from the soil and the surface of water-bodies (through evaporation) and from plants (through transpiration).

Exotic and Invading Species.(Noxious Weeds). Plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insects or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Fallow. Allowing land that normally is used for crop production to lie idle.

Finding of No Significant Impact (FONSI). A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Flyway. A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

Foraging. The act of feeding; another word for feeding.

Forbs. Herbaceous dicotyledonous plants.

Fragmentation. The process of reducing the size and connectivity of habitat patches.

GIS. Geographic Information System. Refers to such computer mapping programs as ArcView, ArcInfo, ERDAS, etc.

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

Grain. A single, hard seed of a cereal grass.

Habitat. Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Integrated Pest Management (IPM). Methods of managing undesirable species, such as weeds, including education; prevention, physical or mechanical methods or control; biological control; responsible chemical use; and cultural methods.

Invertebrate. Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

Irrigation Drainwater. Ideally, subsurface water which flows from irrigated land and generally transports higher concentrations of dissolved salts than the water applied to the land.

Irrigation Return Flow. Water which reaches surface drainage by overland flow or through groundwater discharge as a result of applied or natural irrigation.

Issue. Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition.

Migratory Bird. A bird that seasonally moves between geographic areas. Birds that migrate south of Mexico for the winter are considered neotropical migrants.

Mitigation. To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

Moist-Soil. A process where water is drawn down intentionally or naturally to produce mudflats (i.e., moist soil) that are required for germination of many desirable plants.

National Environmental Policy Act (NEPA). An act which encourages productive and enjoyable harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and atmosphere, to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality (CEQ). Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (from 40 CFR 1500).

National Wildlife Refuge (Refuge or NWR). A designated area of land or water or an interest in land or water within the system, including national wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas (except coordination areas) under the Service jurisdiction for the protection and conservation of fish and wildlife. A complete listing of all units of the Refuge System may be found in the current “Report of Lands Under Control of the U.S. Fish and Wildlife Service.”

National Wildlife Refuge System, Refuge System, or System. Various categories of areas that are administered by the Secretary for the conservation of fish and wildlife, including species that are threatened with extinction; all lands, waters, and interest therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management or waterfowl production areas.

Native Species. Species that normally live and thrive in a particular ecosystem.

NEPA. National Environmental Policy Act of 1969.

No Action Alternative. An alternative under which existing management would be continued.

Objective. A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Make objectives attainable, time-specific, and measurable.

Plant Community. An assemblage of plant species of a particular composition. The term can also be used in reference to a group of one or more populations of plants in a particular area at a particular point in time; the plant community of an area can change over time due to disturbance (e.g., fire) and succession.

Playa. A shallow basin where water collects and is evaporated.

Population: All the members of a single species coexisting in one ecosystem at a given time.

Preferred Alternative. This is the alternative determined (by the decision maker) to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management. The Service's selected alternative at the Draft CCP stage.

Prescribed Fire. The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, , etc., that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

Priority Public Uses. Compatible wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

Proposed Action. The Service's proposed action for Comprehensive Conservation Plans is to prepare and implement the CCP.

Public Involvement. A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public Scoping. See public involvement.

Purposes of the Refuge. "The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit." For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge.

Raptor. A bird of prey, such as a hawk, eagle, or owl.

Refuge. Short of National Wildlife Refuge.

Refuge Operating Needs System (RONS). The Refuge Operating Needs System is a national database that contains the unfunded operational needs of each refuge. We include projects required to implement approved plans and meet goals, objectives, and legal mandates.

Refuge Purposes. The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, a refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

Refuge Revenue Sharing Program or RRSP. Proves payments to counties in lieu of taxes using revenues derived from the sale of products from refuges.

Salinity. An expression of the amount of dissolved solids in water.

Shorebirds. Long-legged birds, also known as waders, belonging to the Order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Sound Professional Judgement. A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Administration Act and other applicable laws.

Species. A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Step-Down Management Plan. A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives.

Strategy. A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

Threatened Species. Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a threatened species in the Federal Register by the Secretary of the Interior. Threatened species are afforded protection under the Endangered Species Act of 1973.

Upland. An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

Vernal Pool. Seasonally flooded depressions found on ancient soils with an impermeable layer such as a hardpan, claypan, or volcanic basalt. The impermeable layer allows the pools to retain water much longer than the surrounding uplands; nonetheless, the pools are shallow enough to dry up each season. Vernal pools often fill and empty several times during the rainy season. Only plants and animals that are adapted to this cycle of wetting and drying can survive in vernal pools over time.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates.

Waterfowl. A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Watershed. The entire land area that collects and drains water into a river or river system.

Wilderness Review. The process we use to determine if we should recommend Refuge System lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the refuge to identify lands and waters that meet the minimum criteria for wilderness. The study evaluates all values (ecological, recreational, cultural), resources (e.g., wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not we will recommend the area for designation as wilderness.

Wildfire. A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildlife. All nondomesticated animal life; included are vertebrates and invertebrates.

Wildlife-Dependent Recreational Use. "A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation." These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. We also will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence.

Appendix I.
List of Preparers

*List of Planning Team
Members and Persons
Responsible for Preparing
this Document*

Jack Allen	Former Wildlife Biologist, Kern Refuge Complex
Jeanne Clark	Editor, Classic Communications
Jihadda Govan	Deputy Project Leader, Kern Refuge Complex
David Hardt	Project Leader, Kern Refuge Complex
Charles Houghten	Chief, Division of Refuge Planning, Region 1
Kay KierHaggenjos	Writer/Editor, Division of Refuge Planning, Region 1
Leslie Lew	Refuge Planner, CA/NV Refuge Planning Office
Loretta McCorkle	Former Writer/Editor, CA/NV Refuge Planning Office
Mark Pelz	Refuge Planner / GIS Analyst, CA/NV Refuge Planning Office
Mike Ritter	Former Deputy Project Leader, Kern Refuge Complex
Richard Smith	Conservation Planner, CA/NV Refuge Planning Office
Nick Stanley	Assistant Refuge Manager, Pixley Refuge
Pam Williams, PhD.	Wildlife Biologist, Kern Refuge Complex

Appendix J.
Updated Land Protection Plan:
Pixley National Wildlife Refuge

Land Protection Plan

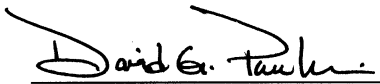
*Pixley National Wildlife Refuge
Tulare County, California*

Prepared by:

U.S. Fish & Wildlife Service
2800 Cottage Way, W-1916
Sacramento, CA 95825

September 2004

Approved by:



1/31/05

Acting

Manager
California/Nevada Operations
U.S. Fish & Wildlife Service

Date

Table of Contents

Pixley National Wildlife Refuge.....	J-1
Tulare County, California	J-1
Introduction	J-1
Project Description.....	J-1
Purpose and Goals of the Pixley NWR	J-2
Endangered Species.....	J-2
Migratory Birds.....	J-2
Biodiversity	J-2
Visitor Services	J-2
Proposed Action and Objectives	J-2
Threats to and Status of the Resource to be Protected.....	J-2
Willing Seller Policy.....	J-3
Habitat Protection Methods	J-3
Conservation Easements.....	J-3
Fee Title Acquisition.....	J-4
Land Protection Priorities within the Approved Refuge Boundary.....	J-4
Map Sheets 1 – 5.....	J-5 to J-9
Table 1. Pixley NWR Tracts.....	J-11 to J-28

Land Protection Plan

Pixley National Wildlife Refuge Tulare County, California

Introduction

This draft Land Protection Plan outlines resource protection needs and priorities, and habitat protection methods the U.S. Fish and Wildlife Service (Service) would use for acquiring land within the approved refuge boundary of the Pixley National Wildlife Refuge (Refuge) in Tulare County, California. The Pixley Master Plan developed in 1984 evaluated the environmental effects of an approved Refuge boundary of 10,308 acres. Of these 10,308 acres, 6,389 acres are owned in fee title by the Service. This land protection plan identifies fee title, conservation and agricultural easements, cooperative agreements, or memorandum of understanding as means of acquiring appropriate native or naturalized lands out of the approximate remaining 3,919 acres within the approved Refuge boundary. The purposes of the Refuge include conservation and protection of migratory birds and threatened and endangered species.

There are numerous landowners within the approved Refuge boundary. Nothing in this plan constitutes an offer to purchase private property, or an usurpation of the authority of the State of California, Tulare County or any other jurisdiction to regulate land use within the approved Refuge boundary. This plan is intended to guide subsequent land protection activities to the availability of funds and other constraints. To complement this plan, the Comprehensive Conservation Plan includes management objectives, goals, and strategies for the Refuge.

Project Description

Pixley Refuge is surrounded by agricultural lands that support a growing dairy industry. Interstate 99 is 9 miles to the east and State Highway 43 is 3 miles to the west; both run north and south and are connected by Avenue 56 which is approximately 2 miles south of the Pixley Refuge. The closest towns are Alpaugh, 8 miles to the west with a population of 900, and Earlimart, 8 miles to the east with a population of 900. Approximately 30 miles north of Pixley Refuge on Interstate 99 are the cities of Tulare, Visalia, and Hanford, which have a combined population of approximately 167,750.

Historically, the southern San Joaquin Valley was a vast sea that as recently as one hundred years ago covered at least 800 square miles in Tulare, Kings, and Kern Counties. Rivers and streams flowed from the Sierra Nevada Mountains to the east of the valley and lush wetlands, riparian corridors, and lake basins were common. The largest lake basin, Tulare Lake, served as an endpoint and lowest point in the valley for this system and outflow to the ocean via the Sacramento-San Joaquin Delta to the north occurred in flood years.

The Refuge is located in the southern San Joaquin Valley, with portions of the Refuge lying within the historic Tulare Lake Bed. Vegetation is of the Valley grassland association, with some riparian plants along Deer Creek. The Refuge ranges from 200 feet msl to 260 feet msl. About 950 acres of the Refuge have been developed for wintering and migrating waterfowl. Agriculture, including grazing and intensely managed water, primarily for irrigating crops the valley have altered the area .

The southern San Joaquin Valley is now characterized by a patchwork of agricultural fields, orchards, and vineyards connected to, and dependent on, a network of water districts and water delivery canals. Native wetlands are virtually nonexistent because the water has been diverted for agricultural purposes. When flooding occurs, historic lake basins, marshes, streams, and rivers, although converted to agricultural lands, carry the majority of the water through the valley. However, sheet flooding across urban and upland areas is common.

From 1976 to 1980, 70 percent of habitat used by the endangered blunt-nosed leopard lizard had been lost to urbanization and agriculture. Other species dependent on upland habitat such as the San Joaquin kit fox and Tipton kangaroo rat, both endangered species, have suffered fates similar to the blunt-nosed leopard lizard. Range contraction, lack of corridors, and competition with introduced species continue to adversely impact these animals.

Today, the Refuge represents one of the largest blocks of contiguous uplands in the southern San Joaquin Valley. Resident, migratory, and threatened and endangered species as well as native plants continue to use these lands throughout the year. While some of these species also occur on and use private property, their last stronghold in the southern San Joaquin Valley may be the Refuge.

Purpose and Goals of the Pixley NWR

The purpose for Refuge is to provide wintering habitat for migratory birds and protect and provide habitat for the threatened and endangered species that are found on the Refuge. Threatened and endangered species found on the Refuge include the blunt-nosed leopard lizard, Tipton kangaroo rat, San Joaquin kit fox, and the vernal pool fairy shrimp.

The following goals of the Refuge reflect the core mission of the U.S. Fish and Wildlife Service to protect wildlife resources of national importance while providing opportunities for the public to appreciate and enjoy the natural heritage of the area.

Endangered Species

Protect, preserve, and restore alkali sink scrub, saltbush scrub, iodine bush scrub and grassland habitats in the southern San Joaquin Valley to contribute to the recovery plan goals for the San Joaquin kit fox, blunt-nosed leopard lizard, and Tipton kangaroo rat.

Migratory Birds

Provide high quality wintering and migratory habitat for migratory birds in the southern San Joaquin Valley, with an emphasis on waterfowl, sandhill cranes, and other waterbirds.

Biodiversity

Restore and maintain a representative example of Tulare Basin grassland and riparian habitat on Pixley Refuge.

Visitor Services

Provide visitors with wildlife-dependent recreation, interpretation, and education opportunities which foster an appreciation and understanding of Pixley Refuge's unique wildlife and plant communities.

Proposed Action and Objectives

The Service approved the 1984 Pixley Master Plan, which allowed for an expanded 10,308 acre Refuge boundary. The Service is updating this Land Protection Plan as part of the Comprehensive Conservation Planning process in order to clarify our acquisition priorities. This Land Protection Plan identifies different ways to protect and provide habitat and secure corridors between the refuge and other conservation areas within the valley.

Threats to and Status of the Resource to be Protected

Native or naturalized lands in the Southern San Joaquin Valley very often provide good wildlife habitat and may support endangered species including the blunt-nosed leopard lizard, Tipton kangaroo rat, San Joaquin kit fox, and the threatened vernal pool fairy shrimp. Not only will native or naturalized lands provide habitat for threatened and endangered species it will also provide habitat for other native wildlife as well. Much of the habitat in the Southern San Joaquin Valley including land within and adjacent to the approved Refuge boundary has been converted for intensive agricultural use. These uses include row crops, orchards, and vineyards, but currently the largest threat to native habitat in the area is dairies.

These operations require large tracts of land to support the primary dairy facility as well as additional land to provide feed. Presently, there are at least nine dairies and supporting agricultural lands located either within or adjacent to the existing refuge and the approved Refuge boundary. With large tracts of land currently for sale within and adjacent to the approved Refuge boundary, conversion of additional native and naturalized lands to dairies is likely.

Willing Seller Policy

Service policy is to acquire lands only from willing participants under general authorities such as the Fish and Wildlife Act of 1956, the Endangered Species Act, the Migratory Bird Conservation Act, and the Refuge Recreation Act. Landowners within the approved Refuge boundary who do not wish to sell their property or any other interest in their property are under no obligation to enter into negotiations or to sell to the Service.

The Service, like other federal agencies, has been given the power of eminent domain, which allows the use of condemnation to acquire lands and other interest in land for the public good. This power, however, is rarely used and is not expected to be used in this project. The Service usually acquires land from willing participants and is not often compelled to buy specific habitats within a specific time frame.

In all cases the Service is required by law to offer 100 percent of fair-market value for lands to be purchased as determined by an approved appraisal that meets professional standards and federal requirements.

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, landowners who sell their property to the Service are eligible for certain benefits and payments which include:

- Reimbursement of reasonable moving and related expenses or certain substitute payments.
- Replacement housing payment under certain conditions.
- Relocation assistance services to help locate replacement housing/farm/or business.
- Reimbursement of certain necessary and reasonable expenses incurred in selling real property to the Federal Government.

Habitat Protection Methods

A variety of habitat protection methods can be used to conserve the natural resources of the Pixley NWR within its approved refuge boundary. These methods range from the acquisition of land by the Service in fee title, conservation and agricultural easements, cooperative agreements, or memorandum of understanding. Using these efforts to protect native habitats within the approved refuge boundary will assist in the recovery of native plant and wildlife population in the Southern San Joaquin Valley.

On lands owned and managed by public agencies, cooperative agreements and coordinated planning/management efforts, including shared resources could be used to conserve natural resources within the approved refuge boundary. The Service could also acquire fee title, conservation or agricultural easements, long-term leases, and/or cooperative agreements with willing public agencies and willing landowners through purchase, donation, transfer, exchange, or written agreement.

Conservation Easements

Conservation easements provide the Service the opportunity to manage lands for their fish and wildlife habitat values. The easement would preclude uses inconsistent with the Refuges management objectives. In effect, the landowner transfers certain development and management rights the Service for management purposes as specified in the easement. Property taxes would remain the responsibility of the landowner.

Easement would likely be useful when (1) most, but not all, of the private landowner's uses are compatible with the Refuge's management objectives, and (2) the current owner desires to retain

ownership of the land and continue compatible uses under the terms mutually agreed to in the easement.

Land uses that are normally restricted under the terms of a conservation easement include, but are not limited to:

- Development rights (residential, industrial, etc.)
- Alteration of the area's natural topography
- Uses adversely affecting the area's flora and fauna
- Private hunting and fishing leases
- Public access rights
- Alteration on natural water regime

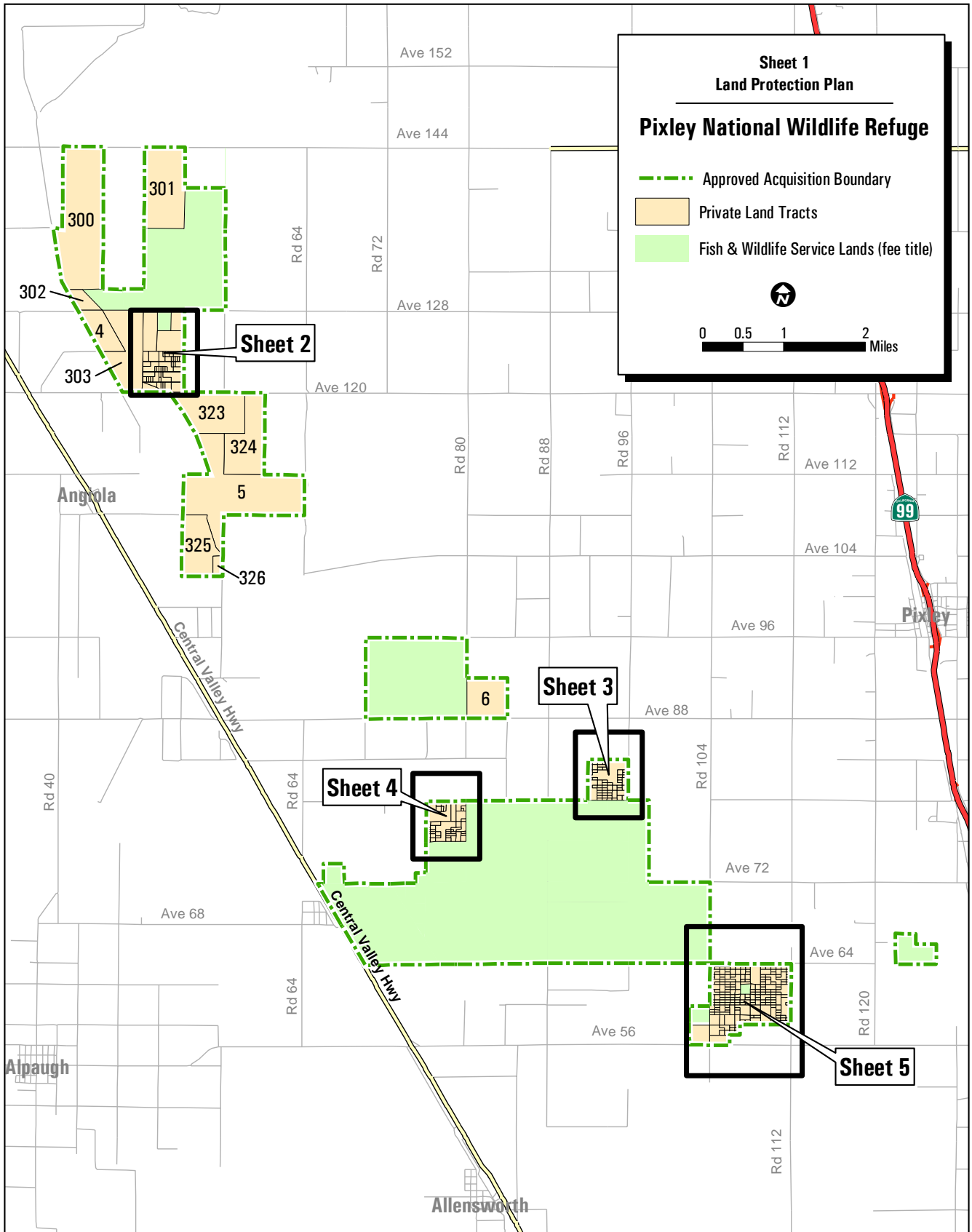
Fee Title Acquisition

The Service acquires land by outright purchase (fee title) when (1) the land's fish and wildlife resources require permanent protection that is not otherwise available, (2) the land is needed for development associated with public use, (3) a pending land use could otherwise harm fish and wildlife resources, or (4) purchased is the most practical and economical way to assemble small tracts into a manageable unit. Fee title acquisition transfers all property rights owned by the landowner, including mineral and water rights, to the Federal government. A fee title interest may be acquired by purchased, donation, exchange, or transfer.

Land Protection Priorities within the Approved Refuge Boundary

Map Sheets 1 through 5 show the tracts within the approved acquisition boundary. The Service has prepared a table (see Table 1) that lists landowners, assessor parcel numbers, acreage and priority for acquisition should the property owner be willing to sell and funding become available. The Service would seek acquisition by fee title or conservation easements of all or part of the lands within the approved Refuge boundary.

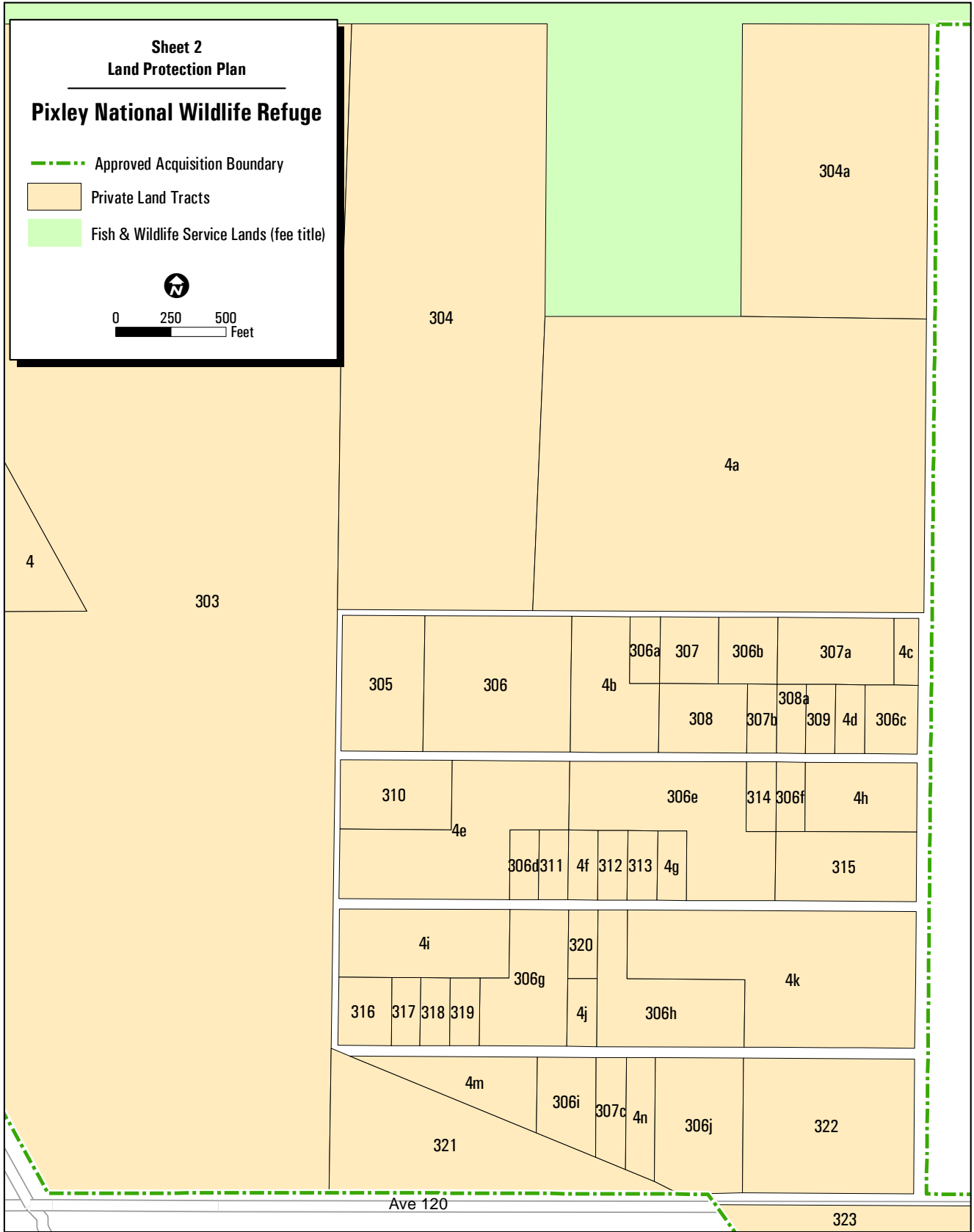
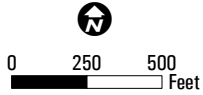
Each tract is assigned a priority for land protection/acquisitions varying from high to low priority. High priority is designated with a 1, identifying lands that are native upland habitat and connect existing endangered species habitats. Lowest in priority are lands designated with a 3 within the approved refuge boundary that have been developed for some type of agricultural use such as a dairy, row crops, and orchards.



Sheet 2
Land Protection Plan

Pixley National Wildlife Refuge

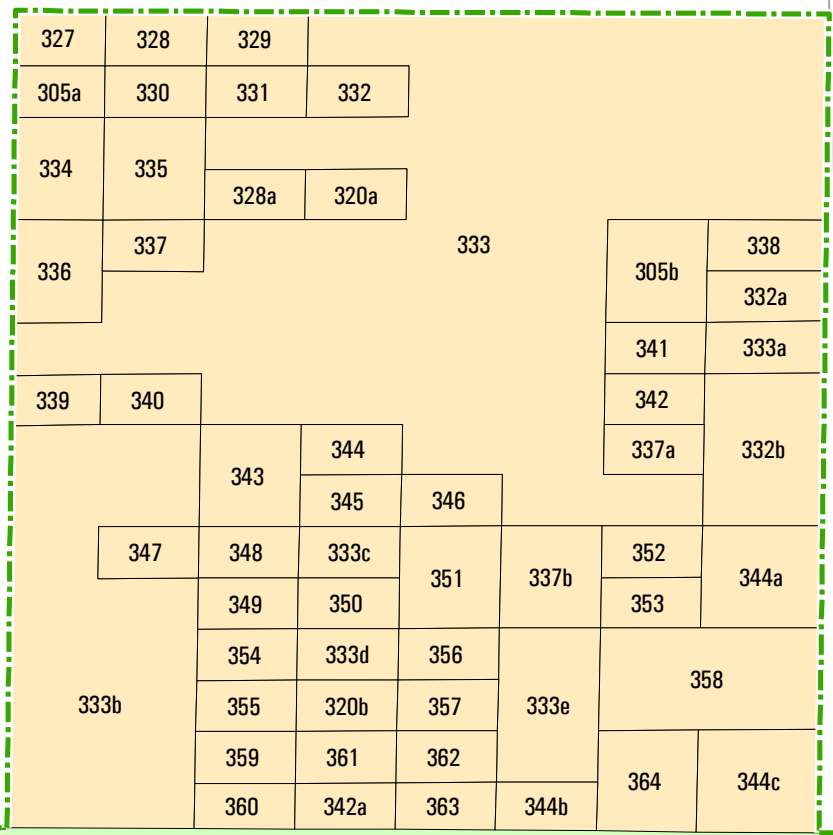
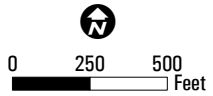
- Approved Acquisition Boundary
- Private Land Tracts
- Fish & Wildlife Service Lands (fee title)



Sheet 3
Land Protection Plan

Pixley National Wildlife Refuge

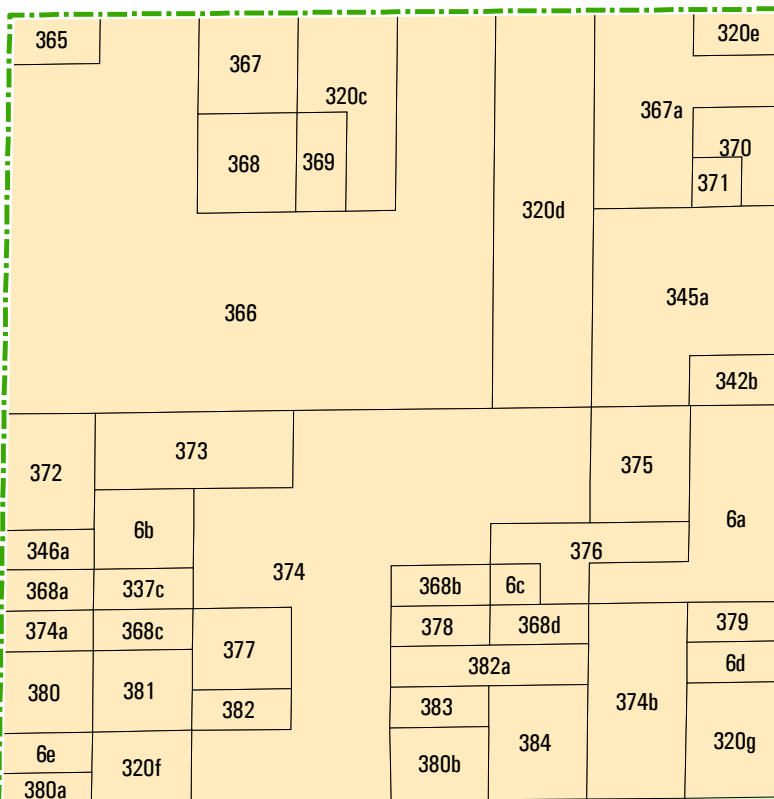
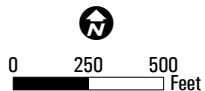
- Approved Acquisition Boundary
- Private Land Tracts
- Fish & Wildlife Service Lands (fee title)



Sheet 4
Land Protection Plan

Pixley National Wildlife Refuge

- Approved Acquisition Boundary
- Private Land Tracts
- Fish & Wildlife Service Lands (fee title)



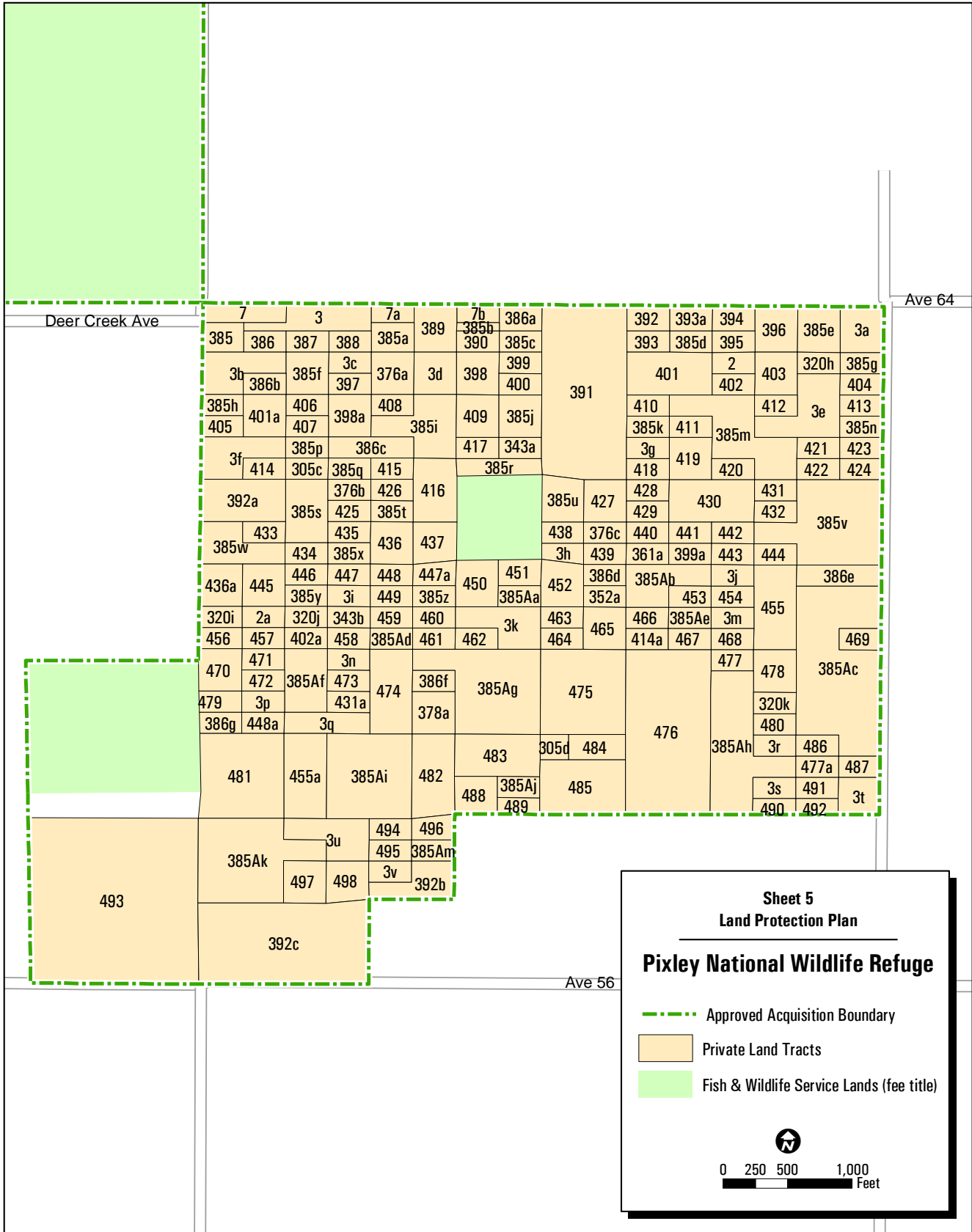


Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreeage</u>	<u>Priority</u>
CALIF STATE OF UNIVERSITY			
2			1
	322-170-003	1.25	
2a			1
	322-050-001	1.25	
TULARE COUNTY OF			
3			1
	322-080-011	1.25	
	322-080-007	0.50	
	322-080-010	1.25	
3a			1
	322-170-008	2.50	
3b			1
	322-080-001	1.25	
	322-080-003	1.25	
	322-080-004	1.25	
3c			1
	322-080-013	1.25	
3d			1
	322-090-001	2.50	
3e			1
	322-170-011	1.25	
	322-180-008	1.25	
	322-180-007	2.50	
3f			1
	322-070-003	2.50	
	322-070-001	1.25	
3g			1
	322-150-008	1.25	
3h			1
	322-140-003	1.25	
3i			1
	322-050-010	1.25	
3j			1
	322-200-004	1.25	
3k			1
	322-120-014	1.25	
	322-120-012	2.50	
3m			1
	322-200-002	1.25	
3n			1
	322-040-012	1.25	
3p			1
	322-040-001	1.25	
3q			1
	322-040-011	1.25	
	322-040-015	1.25	
3r			1
	322-220-005	1.25	
3s			1
	322-220-001	1.25	
3t			1
	322-220-010	2.50	
3u			1
	322-020-008	2.50	
	322-020-004	1.25	

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
3v			1
	322-020-011	1.25	
LOWER TULE RIVER IRRIGATION DISTRIC			
4			1
	291-060-020	93.15	
4a			1
	293-030-005	26.66	
	293-030-004	26.70	
4b			1
	293-280-004	1.84	
	293-280-005	1.92	
	293-280-003	1.00	
4c			1
	293-280-016	0.75	
4d			1
	293-280-014	1.00	
4e			1
	293-280-028	1.91	
	293-280-026	1.92	
	293-280-029	5.59	
4f			1
	293-280-032	1.00	
4g			1
	293-280-022	1.00	
4h			1
	293-280-017	3.65	
4i			1
	293-270-003	5.50	
4j			1
	293-270-005	1.00	
4k			1
	293-270-009	9.34	
	293-270-008	1.00	
	293-270-010	1.87	
	293-270-012	1.70	
	293-270-011	1.00	
4m			1
	293-270-018	3.34	
4n			1
	293-270-015	1.69	
ANGIOLA WATER DIST			
5			1
	293-250-011	211.38	
	293-230-001	320.96	
	293-240-003	161.26	
	293-220-007	38.93	
PIXLEY IRRIGATION DISTRICT			
6			1
	313-150-007	158.18	
6a			1
	313-090-023	1.00	
	313-090-022	4.91	
6b			1
	313-090-012	1.00	
	313-090-015	1.00	

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
6c			1
	313-090-019	0.50	
6d			1
	313-090-025	1.00	
6e			1
	313-090-005	1.00	
DEER CREEK STORM WATER DIST			
7			1
	322-080-017	1.52	
7a			1
	322-090-004	0.75	
7b			1
	322-090-009	0.75	
BAYOU VISTA FARMS WEST			
300			1
	291-050-018	26.65	
	291-050-020	3.30	
	291-040-008	315.30	
	291-050-024	233.91	
KNEVELBAARD DAIRIES			
301			3
	293-040-035	317.88	
M CURTI & SONS A CALIF CORP			
302			1
	291-050-007	62.22	
LANTINO GEORGE K & MARILYN J (CO-TR			
303			3
	291-060-021	243.39	
BOSMAN DAIRY			
304			1
	293-030-001	26.66	
	293-030-006	26.66	
304a			1
	293-030-003	26.66	
N R L L INC			
305			1
	293-280-001	5.27	
305a			1
	313-190-009	1.25	
305b			1
	313-190-029	2.50	
305c			1
	322-070-012	1.25	
305d			1
	322-010-016	1.00	
TEXAS CO			
306			1
	293-280-002	9.40	
306a			1
	293-280-006	1.00	
306b			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	293-280-009	1.85	
306c			1
	293-280-015	1.71	
306d			1
	293-280-027	0.95	
306e			1
	293-280-021	8.68	
306f			1
	293-280-019	1.00	
306g			1
	293-270-004	4.69	
306h			1
	293-270-007	5.66	
306i			1
	293-270-017	2.44	
306j			1
	293-270-014	5.51	
HAURY MARION E (EST OF)			
307			1
	293-280-007	1.84	
307a			1
	293-280-013	3.67	
307b			1
	293-280-010	1.00	
307c			1
	293-270-016	1.50	
KVILHAUG RONALD & CHARLOTTE (CO-TRS)			
308			1
	293-280-008	2.87	
308a			1
	293-280-011	1.00	
SARVAK KENNETH E			
309			1
	293-280-012	1.00	
CONCORDIA COLLEGE CORP			
310			1
	293-280-030	3.63	
MC KINNEN MALCOLM A			
311			1
	293-280-031	1.00	
JCH FAMILY LIMITED PTNSHP			
312			1
	293-280-024	1.00	
NOONAN DANIEL T (TR)			
313			1
	293-280-023	1.00	
MAIER MARIE AUBREY (EST OF)			
314			1
	293-280-020	1.00	
CHILDS JAMES C JR			
315			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreege</u>	<u>Priority</u>
	293-280-018	4.61	
MOLINE WILLIAM G & JOANN M			
316			1
	293-270-001	1.71	
VIERA ANGEL H			
317			1
	293-270-023	1.00	
CRAVEN TED			
318			1
	293-270-022	1.00	
NICHOLSON LILLIAN			
319			1
	293-270-021	1.00	
JOHNSTON DAVID R			
320			1
	293-270-006	1.00	
320a			1
	313-190-021	1.25	
320b			1
	313-180-003	1.25	
320c			1
	313-100-007	3.75	
320d			1
	313-100-009	10.00	
320e			1
	313-100-011	1.25	
320f			1
	313-090-003	2.00	
320g			1
	313-090-026	3.00	
320h			1
	322-170-012	1.25	
320i			1
	322-050-004	1.25	
320j			1
	322-050-014	1.25	
320k			1
	322-210-001	1.25	
WHEAT DAVID B			
321			1
	293-270-019	12.50	
CHIER RICHARD C ET AL			
322			1
	293-270-013	10.85	
WESTRA RICHARD D & MARY			
323			3
	293-260-003	82.91	
	293-260-004	80.00	
	293-010-003	79.32	
PACHECO & ASSOCIATES			
324			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	293-010-009	160.17	
	293-010-008	79.30	
WEGER HOWARD O & M JANE (CO-TRS)			
325			1
	293-200-003	60.00	
	293-220-006	122.31	
CORCORAN MOTOR TRANSPORT INC			
326			1
	293-200-004	20.00	
BISHOP MARTHA ELIZABETH			
327			1
	313-190-010	1.25	
BAKER BETTYE C			
328			1
	313-190-011	1.25	
328a			1
	313-190-014	1.25	
MANLOVE WILLIE M			
329			1
	313-190-017	1.25	
MUELLER MARGARET (EST OF)			
330			1
	313-190-012	1.25	
KAPETAN MARC N			
331			1
	313-190-016	1.25	
CURL E D & LILLIE M			
332			1
	313-190-019	1.25	
332a			1
	313-190-024	1.25	
332b			1
	313-180-032	2.50	
	313-190-026	1.25	
HOWARD MARION O			
333			1
	313-190-003	2.50	
	313-190-022	20.00	
	313-190-018	1.25	
	313-190-030	2.50	
	313-180-030	1.25	
	313-180-045	3.66	
	313-190-006	1.25	
	313-190-001	20.00	
333a			1
	313-190-025	1.25	
333b			1
	313-180-012	2.50	
	313-180-044	6.25	
	313-180-009	5.00	
	313-180-011	5.00	

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
333c			1
	313-180-020	1.25	
333d			1
	313-180-004	1.25	
333e			1
	313-180-047	3.75	
THE WHEELER TRUST			
334			1
	313-190-008	2.50	
RINGGOLD REGINA			
335			1
	313-190-013	2.50	
BENSON KESIAH			
336			1
	313-190-007	2.50	
BENNETT WILLIS W			
337			1
	313-190-002	1.25	
337a			1
	313-180-031	1.25	
337b			1
	313-180-046	2.50	
337c			1
	313-090-011	1.00	
ATLEY MAE E			
338			1
	313-190-023	1.25	
CHENOWETH DOROTHY M ET AL			
339			1
	313-190-005	1.25	
ALLEN LOUISE H			
340			1
	313-190-004	1.25	
HIRATA AILEEN A			
341			1
	313-190-028	1.25	
ELY WILMA E (TR)			
342			1
	313-190-027	1.25	
342a			1
	313-180-001	1.25	
342b			1
	313-100-015	1.25	
PACIFIC COAST LAND CO LTD			
343			1
	313-180-017	2.50	
343a			1
	322-100-009	1.25	
343b			1
	322-050-011	1.25	

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
CALLAN JOHN T			
344			1
	313-180-018	1.25	
344a			1
	313-180-033	2.50	
344b			1
	313-180-037	1.25	
344c			1
	313-180-035	2.50	
DARETTE ALFRED & THELMA			
345			1
	313-180-019	1.25	
345a			1
	313-100-014	8.75	
HARVEY GEORGE C & ETHEL L			
346			1
	313-180-023	1.25	
346a			1
	313-090-013	1.00	
ABILA CRESPIAN & HELEN			
347			1
	313-180-013	1.25	
LARSEN NEILS C ET AL			
348			1
	313-180-016	1.25	
BAILEY ROBERT T & PHYLLIDA C (TRS)			
349			1
	313-180-015	1.25	
HERBERT DORIS			
350			1
	313-180-021	1.25	
ATOR MARK L & KATHY D			
351			1
	313-180-022	2.50	
WALDRON ROBERT C JR			
352			1
	313-180-029	1.25	
352a			1
	322-130-006	2.50	
FRASER JOYCIE E			
353			1
	313-180-028	1.25	
WELLS GLEN R			
354			1
	313-180-005	1.25	
MILLER M M TR ET AL			
355			1
	313-180-006	1.25	
SMITH DONNIE L & SANDRA M (CO-TRS)			
356			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	313-180-040	1.25	
GRAHAM CHARLOTTE			
357			1
	313-180-041	1.25	
RODENBORN W A ET AL			
358			1
	313-180-034	5.00	
BERTRAM RUDOLPH F JR			
359			1
	313-180-007	1.25	
ASHLOCK ANNA			
360			1
	313-180-008	1.25	
RUIZ REBECA			
361			1
	313-180-002	1.25	
361a			1
	322-140-012	1.25	
TANAKA DEE ANN KEIKO			
362			1
	313-180-042	1.25	
WRIGHT ED			
363			1
	313-180-043	1.25	
KIDD EDYTHE (EST OF)			
364			1
	313-180-036	2.50	
PARKER RANDALL J & AUDREY			
365			1
	313-100-003	1.25	
THE SAMUEL A WHITE & ESTHER M WHITE			
366			1
	313-100-001	25.00	
	313-100-002	8.75	
	313-100-008	5.00	
GONZALEZ PEDRO & ROGELIA			
367			1
	313-100-004	2.50	
367a			1
	313-100-010	6.25	
BETTENCOURT MARY L			
368			1
	313-100-005	2.50	
368a			1
	313-090-010	1.00	
368b			1
	313-090-018	1.00	
368c			1
	313-090-008	1.00	
368d			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	313-090-030	1.00	
VELASCO RICHARD & JANET			
369			1
	313-100-006	1.25	
RAMSEY DONALD F (TR)			
370			1
	313-100-012	2.00	
CALLAN THOMAS J & GLADYS ANN (TR)			
371			1
	313-100-013	0.62	
MILLER IRVIN J & AFTON F (TRS)			
372			1
	313-090-014	2.92	
HUBER LARRY D			
373			1
	313-090-016	2.82	
WHITE SAM A & ESTHER M			
374			1
	313-090-035	2.00	
	313-090-034	19.73	
374a			1
	313-090-009	1.00	
374b			1
	313-090-037	4.00	
	313-090-036	1.00	
TOROSIAN DERON P & ISABEL			
375			1
	313-090-021	2.91	
OLIVER LEO			
376			1
	313-090-020	2.50	
376a			1
	322-090-002	2.50	
376b			1
	322-060-007	1.25	
376c			1
	322-140-001	1.25	
HAYES GLENNA S (TR)			
377			1
	313-090-001	2.00	
ALMA INVESTMENT COMPANY			
378			1
	313-090-031	1.00	
378a			1
	322-010-008	2.50	
CAREY HELEN J (TR)			
379			1
	313-090-024	1.00	
MC FARLANE CLIFFORD S			
380			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	313-090-006	2.00	
380a			1
	313-090-004	1.00	
380b			1
	313-090-033	2.00	
RIPPY LOIS N			
381			1
	313-090-007	2.00	
COSTA ANDREW & RENE			
382			1
	313-090-002	1.00	
382a			1
	313-090-029	2.00	
THOMAS EVANGELINE			
383			1
	313-090-032	1.00	
SCHMOKER LAVON ELBERT & NYO ROMA (T			
384			1
	313-090-028	3.00	
BECK NANCY I			
385			1
	322-080-005	1.75	
385a			1
	322-090-003	1.75	
385Aa			1
	322-120-011	1.25	
385Ab			1
	322-130-014	3.75	
385Ac			1
	322-220-008	1.25	
	322-210-007	10.00	
	322-200-014	1.25	
	322-200-013	5.00	
385Ad			1
	322-120-003	1.25	
385Ae			1
	322-130-010	1.25	
385Af			1
	322-040-016	3.75	
385Ag			1
	322-010-020	11.25	
385Ah			1
	322-210-004	1.25	
	322-210-003	2.50	
	322-220-013	6.25	
385Ai			1
	322-030-003	5.00	
	322-010-006	5.00	
385Aj			1
	322-010-002	1.25	
385Ak			1
	322-020-023	11.25	
385Am			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	322-020-022	26.25	
385b			1
	322-090-008	0.50	
385c			1
	322-090-011	1.25	
385d			1
	322-160-005	1.25	
385e			1
	322-170-007	2.50	
385f			1
	322-080-015	2.50	
385g			1
	322-170-009	1.25	
385h			1
	322-070-005	1.25	
385i			1
	322-100-012	5.00	
385j			1
	322-100-008	2.50	
385k			1
	322-150-002	1.25	
385m			1
	322-150-004	1.25	
	322-180-015	6.25	
385n			1
	322-180-010	1.25	
385p			1
	322-070-013	1.25	
385q			1
	322-070-011	1.25	
385r			1
	322-100-010	2.50	
385s			1
	322-060-014	3.75	
385t			1
	322-110-003	1.25	
385u			1
	322-140-005	2.50	
385v			1
	322-190-009	11.25	
385w			1
	322-060-013	3.75	
385x			1
	322-060-010	1.25	
385y			1
	322-050-007	1.25	
385z			1
	322-120-008	1.25	
DE MONTE LEO & VIVIAN (TR)			
386			1
	322-080-008	1.25	
386a			1
	322-090-010	1.25	
386b			1
	322-080-002	1.25	
386c			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	322-070-010	1.25	
	322-100-004	1.25	
386d			1
	322-130-005	1.25	
386e			1
	322-200-007	2.50	
386f			1
	322-010-009	1.25	
386g			1
	322-040-003	1.25	
DUNLAP JOSEPH PHILIP			
387			1
	322-080-009	1.25	
UPTEGROVE JOHN			
388			1
	322-080-012	1.25	
ALFORD MARTHA JUNE			
389			1
	322-090-015	2.50	
CHAMBERLAIN ORA N			
390			1
	322-090-007	1.25	
BIMAT ROBERT E			
391			1
	322-160-001	10.00	
	322-150-001	10.00	
COCHRAN DONALD W & IVA L			
392			1
	322-160-003	1.25	
392a			1
	322-060-004	5.00	
392b			1
	322-020-013	2.50	
	322-020-012	1.25	
392c			1
	322-020-018	5.00	
	322-020-001	10.00	
	322-020-019	2.50	
	322-020-020	2.50	
KIENTZ FRANCIS J & GENEVIEVE B			
393			1
	322-160-002	1.25	
393a			1
	322-160-004	1.25	
BERGER IRVING & ADELE ET AL			
394			1
	322-170-005	1.25	
EELLS ERNEST ROBERT			
395			1
	322-170-004	1.25	
RUNDQUIST ARLENE (HEIR JAKE MODEL)			

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
396			1
	322-170-006	2.50	
PALMER BEN H			
397			1
	322-080-014	1.25	
LIEBEL LEO W SR (TR)			
398			1
	322-090-014	2.50	
398a			1
	322-070-009	2.50	
JOHNSON ROBERT L & JUDIE B			
399			1
	322-090-012	1.25	
399a			1
	322-140-011	1.25	
MAYER DIETER			
400			1
	322-090-013	1.25	
WALKENHORST JOHN W & RENEE			
401			1
	322-160-006	5.00	
401a			1
	322-070-006	2.50	
CH-FIRST BAPTIST CHURCH			
402			1
	322-170-002	1.25	
402a			1
	322-050-013	1.25	
DARETTE ALFRED & THELMA			
403			1
	322-170-001	2.50	
HAMBURGER VICTOR & ESTHER			
404			1
	322-170-010	1.25	
JONES WILHELMINA B			
405			1
	322-070-004	1.25	
EMERSON JON S			
406			1
	322-070-008	1.25	
DRIGGERS MICHAEL A & MARY			
407			1
	322-070-007	1.25	
ARMSTRONG NETTIE			
408			1
	322-100-005	1.25	
SMITH MABEL WREN (EST OF)			
409			1
	322-100-007	2.50	

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
WOOD JAMES D 410	322-150-003	1.25	1
DIX THOMAS H 411	322-150-005	1.25	1
O'BRIEN LINDA KAY 412	322-180-006	1.25	1
MOORE OSCAR W (TR) 413	322-180-009	1.25	1
STALLINGS HAROLD L SR & ELENORA K 414	322-070-002	1.25	1
414a	322-130-012	1.25	1
FINOCHIO ANTHONY & MAXINE C 415	322-100-003	1.25	1
AAGAARD PAUL M & MARJORIE A (TRS) 416	322-100-002	1.25	1
	322-100-005	1.25	
POWELL KATHLEEN C 417	322-100-011	1.25	1
ALSING RUDI A 418	322-150-007	1.25	1
CAVETTE SUSAN (EST OF) 419	322-150-006	2.50	1
WERNLI EMIL W 420	322-180-003	1.25	1
JONES JAMES H & ISABELLE 421	322-180-014	1.25	1
TURNER CHARLES A (TR) 422	322-180-013	1.25	1
CLEMENS CHARLES E 423	322-180-011	1.25	1
DAWSON WILLIE T 424	322-180-012	1.25	1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreege</u>	<u>Priority</u>
KOOP VICTORY MARIE 425	322-060-008	1.25	1
DUNLAP JOSEPH P ET AL 426	322-110-004	1.25	1
ELMORE JOHN E JR (TR) 427	322-140-006	2.50	1
DYER NELL & GEO (ESTS OF) 428	322-140-008	1.25	1
MC DOUGALL FLORENCE L 429	322-140-007	1.25	1
ABERNATHY DAVID P & NANCY S (TRS) 430	322-140-009 322-190-005	2.50 2.50	1
WALTON KRIS J 431	322-190-007	1.25	1
431a	322-040-014	1.25	1
CH-HEBREW EVANGELIZATION SOCIETY IN 432	322-190-006	1.25	1
MALLET KATHERINE A 433	322-060-001	1.25	1
SPRINGER LUCY E 434	322-060-011	1.25	1
POPE F W 435	322-060-009	1.25	1
GODKIN CECIL E & BEATRICE 436	322-110-002	2.50	1
436a	322-050-005	2.50	1
SWARTZ A 437	322-110-001	2.50	1
CORK MARY L 438	322-140-004	1.25	1
COVEY W L DR 439			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	322-140-002	1.25	
KOONS WILMA R 440			1
	322-140-013	1.25	
BAHN WILLIAM E 441			1
	322-140-010	1.25	
WARD EMMA K 442			1
	322-190-004	1.25	
WELTY CHRISTOPHER D 443			1
	322-190-003	1.25	
AESPURO RICARDO LUIS 444			1
	322-190-002	1.25	
BRIDGES JAN MICHAEL (TR) 445			1
	322-050-006	2.50	
KROSSCHELL THOMAS D 446			1
	322-050-008	1.25	
BENTON MAX D & JUDITH L 447			1
	322-050-009	1.25	
447a			1
	322-120-007	1.25	
MANZ KATHERINE J 448			1
	322-120-006	1.25	
448a			1
	322-040-002	1.25	
SATCHELL NORMAN H & LOIS A (TRS) 449			1
	322-120-005	1.25	
TUTEUR THERESA 450			1
	322-120-009	2.50	
BARNHART THOMAS M & L S 451			1
	322-120-010	1.25	
EASTER SEALS SOUTHERN CALIFORNIA IN 452			1
	322-130-004	2.50	
BREWER CLAUD C & LILLIE M 453			1
	322-130-009	1.25	
THOMPSON M IRENE & SARAH L			

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
454			1
	322-200-003	1.25	
KENDALL MARGARET			
455			1
	322-200-005	5.00	
455a			1
	322-030-002	5.00	
HERRMANN RUSSELL			
456			1
	322-050-003	1.25	
WALKER RUSSELL F & MARY			
457			1
	322-050-002	1.25	
VAN SICKLE GARFIELD			
458			1
	322-050-012	1.25	
FISCHER BESSIE			
459			1
	322-120-004	1.25	
PETERS HAROLD			
460			1
	322-120-001	1.25	
DREW ANNIE ET AL			
461			1
	322-120-002	1.25	
JENKINS EVA E			
462			1
	322-120-013	1.25	
WELLS RUTH D			
463			1
	322-130-003	1.25	
SMALDINO LOUIS & MARGARET I (TRS)			
464			1
	322-130-002	1.25	
ROBERTS JACK D			
465			1
	322-130-001	2.50	
GRANT JOHN			
466			1
	322-130-013	1.25	
MONDRAGON JOAN M			
467			1
	322-130-011	1.25	
HORTON BARBARA C			
468			1
	322-200-001	1.25	
GREIN GORDON M			
469			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	322-200-010	1.25	
KISER STEVEN WILLIAM 470			1
	322-040-005	2.50	
WANDREI EARL L 471			1
	322-040-007	1.25	
AHMED IQBAL 472			1
	322-040-006	1.25	
DE LORETO EDWARD & JILL (TRS) 473			1
	322-040-013	1.25	
LINDGREN EDNA MAE (TR) 474			1
	322-010-007	5.00	
FREDRICKSON ADA B (SUCCESSOR TRUSTE 475			1
	322-010-012	10.00	
BARBIAN WILBUR L & VIRGINIA L (TR B 476			1
	322-010-014	10.00	
	322-010-013	10.00	
GREIN GEORGE ARTHUR 477			1
	322-210-005	1.25	
477a			1
	322-220-007	1.25	
COWAN RALPH & RUBY 478			1
	322-210-006	2.50	
CONNER ROBERT LOUIS 479			1
	322-040-004	1.25	
HARPER ALTA 480			1
	322-210-002	1.25	
DUNCAN JUNE 481			1
	322-030-001	10.00	
MOORE TOM 482			1
	322-010-005	5.00	
MACK C E 483			1
	322-010-001	5.00	
EAQUINTA ANN (TR) 484			1

Table 1. Pixley NWR Tracts.

<u>Owner / Tract #</u>	<u>APN #</u>	<u>Acreage</u>	<u>Priority</u>
	322-010-018	2.00	
BUS & PROF EX INC SALT LAKE CI 485			1
	322-010-019	7.00	
KELLER & HOLT (TRS) 486			1
	322-220-006	1.25	
MC LAIN GARY 487			1
	322-220-009	1.25	
HANNAKER ETHEL B 488			1
	322-010-004	2.50	
HORN FRED W & MARY L 489			1
	322-010-003	1.25	
PICHLER AVANELL 490			1
	322-220-002	1.25	
CRIDER ELMER GORDON 491			1
	322-220-012	1.25	
KALLSEM MAVIS CORKERY 492			1
	322-220-011	1.25	
RAMIREZ JOSE & MERCEDES 493			1
	322-240-006	40.00	
NEAT ANNA 494			1
	322-020-009	1.25	
NEWHOUSE ROBERT M (TR) 495			1
	322-020-010	1.25	
GUILFORD ELSIE H 496			1
	322-020-015	1.25	
VAN ELSWYK EVELYN BECK 497			1
	322-020-024	2.50	
ALKURDI MOHAMED & DIANE 498			1
	322-020-007	2.50	

Appendix K.
Fire Management Plan

The Department of the Interior (DOI) fire management policy requires that all refuges with vegetation that can sustain fire must have a Fire Management Plan that details fire management guidelines for operational procedures and values to be protected/enhanced. The Fire Management Plan (FMP) for the Kern NWRC provides guidance on preparedness, prescribed fire, wildland fire, and prevention. Values considered in the Fire Management Plan include protection of Refuge resources and neighboring private properties, effects of burning on refuge habitats/biota, and firefighter safety. Refuge resources include properties, structures, cultural resources, trust species including endangered, threatened, and species of special concern, and their associated habitats. The Fire Management Plan will be reviewed periodically to ensure that the fire program is conducted in accordance and evolves with the U.S. Fish and Wildlife Service (USFWS) mission and the Kern NWRC's goals and objectives.

Major components of the Kern National Wildlife Refuge Complex's Fire Management Plan include:

- Updated policy for prescribed fires at the Kern National Wildlife Refuge Complex (NWRC).
- Implementation of Complex objectives identified in the Final Comprehensive Conservation Plan.
- Format changes under the direction of Fire Management Handbook (Release Date 6/1/00).

The FMP was written to provide guidelines for appropriate suppression and prescribed fire programs at the Kern NWRC, which includes the Kern and Pixley National Wildlife Refuges. Prescribed fire may be used to reduce fuels, restore the natural processes and vitality of ecosystems, improve wildlife habitat, remove or reduce non-native species and noxious weeds and /or conduct research.

This Fire Management Plan addresses the use of prescribed fire to manage wetland vegetation in seasonal marshes and moist soil wetlands. Prescribed fire will not occur in upland habitats used by threatened and endangered species and therefore is not addressed in this plan.

Wildland fires that may threaten or occur in upland habitats will be contained/controlled from existing roads and levees. New firebreaks will not be created through upland habitat.

There are no year-round fire-funded personnel located at Kern NWRC. The Zone Fire Management Officer, located at San Luis NWRC, provides fire management oversight for the Complex. A seasonal engine crew based at Kern NWR is funded cooperatively through the Service and the Bureau of Land Management (BLM). Initial attack operations may be conducted in cooperation with the Lost Hills Fire Station, Kern County Fire Department, Tulare County Fire Department, and Bakersfield BLM.

Copies of the plan are available for review at the Kern National Wildlife Refuge Complex, 10811 Corcoran Road, Delano, California, 93215.