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Effects of Fire on Yuma Clapper Rails and California Black Rails

2004 Annual Report

Photo by Peter LaTourette

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Effects of Fire on Yuma Clapper Rails and California Black Rails
2004 Annual Report

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by

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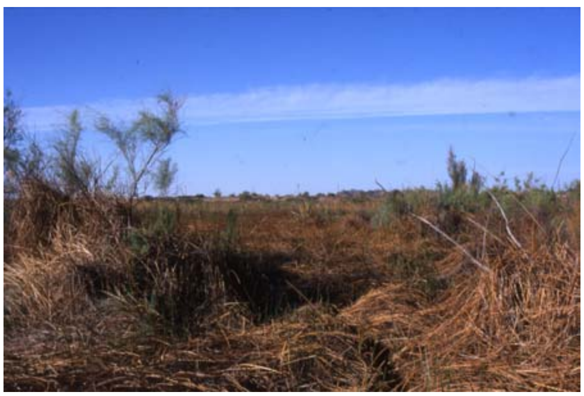
Executive Summary

Populations of Yuma clapper rails (*Rallus longirostris yumanensis*) and California black rails (*Laterallus jamaicensis coturniculus*) are thought to be declining in North America. One of the main causes of the declines is habitat degradation and loss. Habitat along the lower Colorado River in Arizona and California and south of the Salton Sea in California lacks early successional growth thought to be beneficial to these rail species. Habitat also contains an excess of decadent vegetation from past years growth. Historically catastrophic spring floods scoured marshes in these areas removing decadent vegetation and encouraging early succesional growth. In the absence of these floods, prescribed fire has been proposed as a management tool to rid the marshes of decadent vegetation and encourage early successional growth. Although this will increase the health of the wetland there are conflicting opinions on its effect on Yuma clapper rails and California black rails. This project has used fire in an experimental framework to examine the effect fire has on both of these rare species. It also examined the effects of fire on the abundance of prey items (arthropods and crayfish) and the vegetative composition and density within burn and control marshes. Results from the third year of an 8-year study show an increase in Yuma clapper rail abundance and California black rail abundance in 52.9% (9 of 17) and 81.8% (9 of 11) of marshes respectively. Information from the data collection of vegetative composition and prey abundance have not yet been analyzed. This project will evaluate one potential "on-the-ground" conservation technique that could be implemented by management agencies on a large scale to achieve the goals of the Lower Colorado River Multi-species Conservation Plan. If fire continues to prove effective in increasing rail abundance it has the potential to de-list and sustain California black rails and Yuma clapper rails throughout a large portion of their range. Analysis in this report represents preliminary summary results from the third year of an 8-year study. Further data collection and analysis will be conducted over the next 5 years to further improve the results of the study.

Introduction

There are 9 subspecies of clapper rail (*Rallus longirostris*) in North America (Eddleman and Conway 1998) of which all 3 western subspecies are considered endangered by the U.S. Fish and Wildlife Service. The Yuma clapper rail (*R. l. yumanensis*) exists in fresh water marshes along the Gila River in Arizona, along the lower Colorado River in Arizona, California, and Nevada, in the Colorado River Delta in Mexico, and along the southern end of the Salton Sea in the Imperial Valley of California. The subspecies is considered endangered in California (California Department of Fish and Game 1989) and threatened on the list of Wildlife of Special Concern in Arizona (Arizona Game and Fish Department, In Prep.). Ninety percent of the U.S. population is thought to exist in only two marsh complexes: marshes along the southern end of the Salton Sea and marshes around Imperial Dam (Conway et al 1993, Eddleman and Conway 1998). Number of birds detected on annual multi-agency surveys for the subspecies declined annually from 1993-2002. Degradation and loss of habitat are thought to be the main factors contributing to this apparent decline and yet many 'undisturbed' marshes in the region are not occupied by rails. To ensure long-term persistence of the subspecies, we need to have effective management and mitigation activities that improve habitat quality and benefit Yuma clapper rail populations.

The California black rail (*Laterallus jamaicensis coturniculus*) is one of five subspecies of black rail found throughout North America and is considered state threatened in California (California Department of Fish and Game 1989), endangered on the list of Wildlife of Special Concern in Arizona (Arizona Game and Fish Department, In Prep), and federally endangered in Mexico. Black rails are also considered a species of National Conservation Concern by the U.S. Fish and Wildlife Service (2002), are on the Audubon Society's "*Watchlist*", and were once a Category 1 "candidate" species for federal listing under the Endangered Species Act (U. S. Dept. of Interior 1989). The lower Colorado River is one of three areas remaining with a moderate breeding population of California black rails (Evens et al. 1991, Conway et al. 2001). California black rails have declined in the lower Colorado River region; Evens et al. (1991) estimated a 30% decrease from 1973 to 1989 and Conway et al. (2001) reported that numbers continued to decline between 1989 and 2001. Habitat loss and degradation have been suggested as the major cause of this decline (Conway et al. 2001, Evens et al. 1991). Hence, active on-the-ground habitat restoration efforts to specifically benefit California black rails on the lower Colorado River should begin now in an effort to recover populations and prevent federal ESA listing.


Decadent vegetation and encroachment of woody vegetation once managed by spring floods is threatening the health of rail habitat

Habitat protection and habitat improvement via marsh restoration are the most common suggestions (Eddleman et al. 1994, Eddleman and Conway 1998) for halting declines of both Yuma clapper rails and California black rails. Along the lower Colorado River, wetland habitat was once ephemeral and managed naturally by large spring floods that scoured and rejuvenated wetlands. Today, measures to control floods and retain water have all but eliminated these stochastic events. Due to these restrictions, wetlands are being encroached upon by woody vegetation and large amounts of decedent vegetation are building up from past years growth. There is also a lack of early successional vegetation, thought to be beneficial to rails (Conway 1990, Conway et al. 1993). Prescribed fire has been suggested as a management tool in areas with decadent emergent vegetation to simulate historical floods (Conway et al. 1993,) and reduce the above threats to rail habitat. Studies in other areas have shown that fire improves the health of wetland habitat by slowing the encroachment of woody vegetation (Burkman 1993, Smith 2000, Wright and Bailey 1982) and reducing decadent vegetation from past years growth (Smith 2000, Vogl 1973). Fire also encourages early successional growth in marshes. Although this will improve wetland health, the effects of fire on Yuma clapper rail and California black rail are unknown. Opinions on the effect of fire on these rare species are conflicting. The management tool has been suggested repeatedly (Conway et al. 1993, Eddleman and Conway 1998, Conway and Eddleman 2000) as a possible method to restore Yuma clapper rail populations in the absence of major seasonal flooding events. Others have suggested that fire might also be an effective management tool to improve habitat conditions for California black rail (Repking 1975). However, others have expressed concern that fire might be detrimental to black rails. Todd (1980) cautioned that regrowth of three-square bulrush (*Scirpus pungens [*formerly *S. olneyii]*) may not occur fast enough and may be eliminated completely by fire. California black rails are strongly associated with *S. pungens* in the lower Colorado River region (Conway et al. 2001) and areas with three-square bulrush may burn hotter and re-growth may occur at a slower pace compared to cattail in the wetter portions of a marsh (Todd 1980). Despite these repeated suggestions and conflicting opinions, no research has been done to examine the efficacy of using prescribed fire as a management tool for these rare birds. The major objective in this project was to rigorously test the efficacy of prescribed fire as a possible management tool to restore habitat conditions and increase local populations of these two rare birds. We used an experimental framework to test the usefulness of prescribed fire to enhance rail habitat. If fire proves beneficial, the next step will be to determine how frequently a marsh will need to be burned to maintain healthy populations of both species. If in fact fire proves beneficial to these species, its use has the potential to de-list the species and sustain their populations. It may also have many secondary benefits that include positive effects on other marsh inhabitants and reduced risk of catastrophic wildfires that may pose a risk to human property and life. Due to recent declines in both Yuma clapper rail and California black rail populations and the current threats to their habitat through degradation and loss, discovering and implementing a management tool such as this as soon as possible is of the utmost importance.

This project also addresses the goals of the Lower Colorado River Multi-species Conservation Plan (LCR MSCP). Both the Yuma clapper rail and California black rail are considered priority species of concern in the LCR MSCP and goals for both species include the enhancement of existing habitat, restoration of unsuitable habitat, and the establishment of additional breeding locations on the lower Colorado River. This project will evaluate one potential "on-the-ground" conservation technique that could be implemented by management agencies on a large scale to achieve the goals of the LCR MSCP.

Methods

Prescribed fire at Imperial National Wildlife Refuge Ag Field conducted by BLM and USFWS fire crews

We used standardized call-broadcast surveys to estimate relative marsh bird abundance in 4 types of study marshes: 1) marshes recently burned by wild fire, 2) marshes recently burned by prescribed fire, 3) marshes scheduled to receive a prescribed burn in the near future, and 4) control marshes (Appendix I). We also conducted surveys at additional marshes to obtain pre-burn information in the case of an incidental wildfire. Surveys were conducted during mornings and evenings from Mar-Jul of each year. Morning surveys occurred between one half-hour before sunrise until 10am on days without rain and when wind speeds did not exceed 10 mph (16 km/h). Evening surveys occurred between 5:00 pm until dusk (one half-hour after sunset). Based on previous marsh bird survey work in the region, conditions during most (99%) mornings are favorable for surveys (i.e., without too much wind) whereas 42% of evenings are too windy for surveys (Conway et al. 2001). All surveyors took hearing tests (Audiograms) to check their ability to hear bird vocalizations. When possible, surveys are conducted in both of the two years preceding a burn and at least 3 years post burn with 3-5 replicate surveys each year. Survey methods are based on previous studies of marsh bird survey methods (Conway et al. 1993; Conway and Gibbs 2001, 2005; Conway et al. 2001, 2004) and generally follow those used in a national marsh bird monitoring program (Conway 2005, Conway and Timmermans 2004). All surveys were conducted at pre-determined points along established survey routes. The location of all survey points are marked on the ground with wooden stakes and we used a handheld GPS unit to locate and re-mark points if markers were destroyed or missing. This ensured that all replicate surveys were conducted at the exact same location during each replicate survey. Using this study design, our final analysis when the project is completed will include many independent replicate burns with both temporal (pre- and post-burn) and spatial (burn and control marshes) controls which will produce a rigorous evaluation of fire effects on rails.

In addition to estimating relative marsh bird abundance, we are also measuring changes in vegetative composition and abundance of potential rail food in burned areas. Each year, we visually estimated the percent coverage of each wetland plant species within a 50 meter radius of each survey point. We sampled terrestrial insects within a subset of our study marshes during June of each year using 21.6 x 27.9 cm (8½ x 11 inch) sticky traps along parallel transects that bisect the marsh. At 15 m intervals along each transect, we established sampling stations where we stapled two sticky traps to a wooden stake such that the bottom touched the substrate (water or mud) and we placed a third sticky trap horizontally on some residual vegetation at water level. Sticky traps were collected after 10 days in the field. We counted the number of individuals of each morpho-species on each sticky trap using a microscope in a lab at the University of Arizona once the field season was complete. We also recorded water depth, % dead vegetation, plant species composition, and relative plant density at each insect collection station. We recorded the location of these stations with a GPS receiver to assure all replicate collections and measurements are taken in the same location. We also measured relative abundance of crayfish (*Procambarus clarkii* and *Orconectes virilis*) at a subset of insect collection stations using baited minnow traps as suggested by Acosta and Perry (2000). We baited traps with raw hotdogs and visited traps after 2-3 days. We identified species for all crayfish captured, and measured and sexed each one prior to release. We obtained USFWS permits to conduct call-broadcast surveys for Yuma Clapper Rails (permit # TE039466-0). We also obtained the necessary permits from the Institutional Animal Care and Use Committee at the University of Arizona.

Results

In total, we have conducted 12,212 point-count surveys at 1072 survey points from 2001 to 2004 (Table 1). Summed across the 4 years, we have recorded 1818 detections of California black rails and 4105 detections of Yuma clapper rails (these numbers do not represent number of individuals but rather number of detections recorded during all replicate surveys). We also detected American bitterns (*Botaurus lentiginosus*), American coots (*Fulica americana*), common moorhens (*Gallinula chloropus*), least bitterns (*Ixobrychus exilis*), pied billed grebes (*Podilymbus podiceps*), soras (*Porzana carolina*), and Virginia rails (*Rallus limicola*) during our surveys (Table 1). Although our initial prescribed burn (and its associated control marshes) in North Mittry Lake in February 2003 was subsequently consumed by a 324 hectare wildfire in March 2003, the remainder of our planned burns have been a success. We are currently monitoring post-burn marsh bird abundance in 11 marshes that have received prescribed burns and 7 marshes that have experienced wildfire (including the Mittry Lake prescribed burn subsequently consumed by the wildfire). We are working with BLM and USFWS fire teams who plan to burn 2 more of our study marshes in January/February 2005. We have been working regularly and effectively with these interagency fire teams to identify and plan additional experimental burns as part of the study. We are currently monitoring Yuma clapper rail populations along 17 transects in burned marshes, of which 9 (52.9%) have shown an overall increase in Yuma clapper rail populations in the post-burn years (in the 1-2 years following the burn) (Appendix II). Of those 9 transects where clapper rail numbers have increased following the burn, 5 (55%) have shown a greater increase in numbers than at least one of the two paired control (unburned) marshes. California black rails are showing similar population changes; 9 (81.8%) of 11 transects in burned marshes have shown an overall increase in numbers of black rails in the post-burn years (Appendix II). Of the 9 transects that have shown an increase, 5 (55%) have shown a greater increase in numbers than at least one of the two paired control plots. California black rails were not detected

Post burn vegetation at West Pond wildfire site approximately 5 months after the fire on 6 of the transects being monitored in burned marshes. Because many of the marshes burned recently (2003 and 2004) we have not yet collected enough post-burn data on rail abundance to show the full effect of fire on these two species.

We have recorded plant species composition at all survey points since surveys began in 2001. We have collected 1923 sticky traps and the associated vegetation and water depth information at 303 sampling stations in 4 burn and 4 control marshes since 2002 (Table 2). We have captured and measured crayfish at 120 sampling stations (Table 2). Analysis of vegetation and prey abundance information have not yet been completed. Insects collected are currently being enumerated and identified but the process is time consuming.

Table 1. Number of points surveyed and number of birds detected per year.

Year	# Point-count surveys	# Points	# BLRA	# CLRA	# AMBI	# AMCO	# COMO	# LEBI	# PBGR	# SORA	# VIRA
2001	1086	577	96	238	NA	76	NA	316	23	33	309
2002	2008	525	174	658	NA	1829	134	1078	763	54	678
2003	3553	706	689	749	NA	2082	1220	1747	1426	89	987
2004	5564	855	859	2460	20	NA	2921	2716	2682	370	1011

Table 2. Number of insect and crayfish sampling stations surveyed per year.

Year	# insect sampling stations	# crayfish sampling stations	# marshes with insect/crayfish sampling
2002	118	44	1
2003	236	90	4
2004	287	120	8

Future Analysis and Objectives

All the results presented above are preliminary summary results from the third year of an 8-year study. More detailed analysis will occur as the project progresses and a detailed statistical analysis will be completed at the end of the study. We will continue to conduct surveys at all burn and control marshes in the spring and summer of 2005 through 2008.

This study is designed to evaluate a management tool that, if effective, has the ability to increase rail populations and perhaps allow the Yuma clapper rail to be removed from the Endangered Species List. We will also be able to evaluate the effect of fire on other marsh bird species that are considered rare in other regions of North America also due to habitat degradation and loss. This multi-species approach will allow us to evaluate whether prescribed fire has positive effects on one species while being detrimental to others. Conflicting opinions on the use of fire as a management tool for marsh birds have existed for many years. This study will help to provide the scientific proof needed so that if proven effective, managers can confidently implement fire as a management tool along the Lower Colorado River.

Acknowledgments

This project is truly a multi-agency collaborative effort and a model for successful partnerships in research and conservation. The project is funded by U.S. Bureau of Reclamation, Joint Fire Science Program, Sonoran Joint Venture, Imperial National Wildlife Refuge, and USGS/USFWS Science Support Program. Imperial National Wildlife Refuge provided temporary field housing, field vehicles, and a boat for our field personnel; we thank Ken Edwards, Greg Birkenfeld, Jackie Ferrier, and Guy Wagner for their support and assistance. Havasu National Wildlife Refuge provided temporary field housing and use of a boat; we thank Greg Wolf, John Earle, Jack Allen, and Aimee Haskew for their support and assistance. Sonny Bono Salton Sea NWR provided temporary field housing and a vehicle; we thank Chris Schoneman, Dan Marquez, Todd Stefanic, Charlie Pelizza. Bureau of Reclamation, Boulder City provided a boat for our field surveys and we thank Greg Finnegan for assistance with the boat and trailer, and Barb Raulston and John Swett for assistance with funding and coordination. Lin Piest of Arizona Game and Fish Department helped initiate the project in the first place, and also helped with crayfish and invertebrate sampling in the field and persisted in making the initial Mittry Lake burn a success. Carl Olsen from the University of Arizona Entomology Museum provided assistance and training in identification of invertebrates. Mark Kaib from USFWS Albuquerque provided advice and assistance. Charlie Sanchez and Sam Spiller helped obtain funding for the project. BLM and USFWS fire crews planned and conducted all of the prescribed fires. Mike Behrens, David Repass, Chris Wilcox, Curtis Heaton, Dave Daniels, Butch Wilson and all the other fire crews associated with the interagency fire teams were instrumental in conducting the fires (without which the project would be impossible). Chris Sulzman, Mike Vamstad, Rick Keck, Paul Sweet, Sian Wallace, Amy Stabler, Cara Stutzman, Nick Bartok, Eric Meyer, Roberta Montano assisted with surveys. David Kohrs, Aaron Keller, and Cheryl Carnes assisted with identifying insects on sticky traps.

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Appendix I: Burn Locations

Prescribed burn marshes and their paired control marshes.

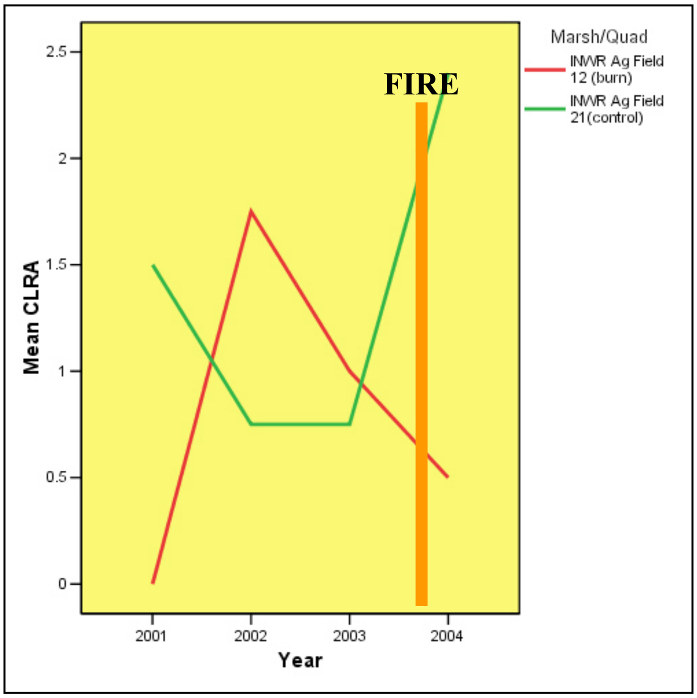
Burn Marsh	Date Burned	Size of Burn (ha)	Land Owner-ship	Paired Control Marsh
N. Mittry Lake (pts 39-54)	21 Feb 2003	20	BLM/AGFD	Mittry Lake, South Dredge Ramp (pts 1-29)
Imperial NWR housing marsh (pts 1-7)	20 Feb 2003	4	USFWS	Painted Desert Trail (pts1-6) Martinez Lake (pts 1-29)
Imperial NWR (field 11/10, pts 1-6)	20 Feb 2003	7	USFWS	Imperial NWR (field 16, pts 1-8)
Imperial NWR (field 12, pts 1-4)	7 Mar 2004	9	USFWS	Imperial NWR (field 21, pts 1-8)
Imperial NWR (field 13, pts 1-8)	2005	4	USFWS	Imperial NWR (field 17, pts 1-9)
Imperial NWR (field 14, pts 1-11)	2006	8	USFWS	Imperial NWR (field 28, pts 1-4) Imperial NWR (field 10, pts 1-2)
Island Lake – Imperial NWR (pts 1-19)	4 Feb 2004	242	USFWS	Taylor Lake Clear Lake Butler Lake McAllister Lake
Triangle – Imperial NWR (pts 1-10)	Feb 2005		USFWS	
Water Tower Marsh (pts 1-10)	2005		BOR/BLM	Squaw Lake shore (pts 1-12)
Imperial Dam Rd Marsh A (pts 1-7)	2005		BOR/BLM	Imperial Dam Rd Marsh B (pts 1-8)
Imperial Dam Rd Marsh C (pts 1-9)	2005		BOR/BLM	Senator Wash shore (pts 30-37)
Imperial Dam Rd Marsh D (pts 1-6)	2005		BOR/BLM	Hurricane Ridge marsh (pts 1-5)
Willow Lake - Havasu NWR (pts B1-14)	9 Nov 2001	113	USFWS	Willow Lake (pts C1-15)
Upper Goose Lake - Havasu NWR (pts B1-9)	22 Feb 2003	62	USFWS	Upper Goose Lake (pts C1-11)
No Name Lake - Havasu NWR (pts B1-19)	Nov 2003	46	USFWS	Beal Lake (pts C1-13)
Whiskey Slough - Havasu NWR (pts B1-6)	Jan 2005		USFWS	Whiskey Slough (pts C1-7)
Reidman 3 - SSNWR (pts 1-6)	13 Feb 2002	8	USFWS	Reidman 4 (pts 1-3)
Hazard 6 - SSNWR (pts 1-8)	Mar/Apr2002	11	USFWS	Hazard 7 (pts 1-6)
B-1 pond (pts 1-11)	TBA		USFWS	A-1 pond (pts 1-9)
Hazard 10 – SSNWR (pts 1-6)	TBA		USFWS	Hazard 10A
Union Pond - SSNWR (pts 1-6)	Jan/Feb 2001	4	USFWS	Headquarters B pond (1-4)
Hazard 11 – SSNWR (pts 1-3)	TBA		USFWS	Bruchard Bay (pts 1-6)

Incidental burn marshes and their paired control marshes.

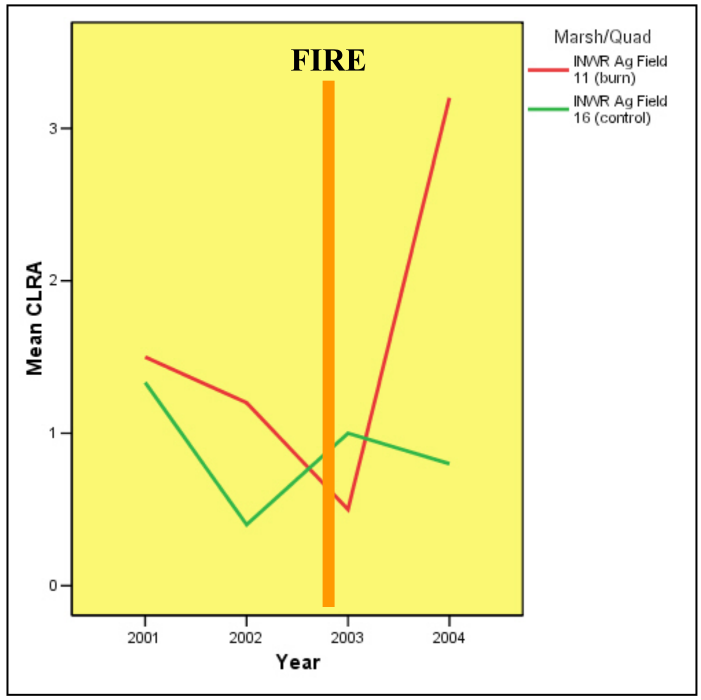
Study Site	Date Burned	Size of Burn (ha)	Land Owner-ship	Paired Control Sites
North Mittry Lake (pts 1-54)	12 Mar 2003	~324	BLM/AGFD	Hidden Shores (pts 1-66) South of Dredge Ramp (pts 1-29)
South Mittry Lake (pts 1-14)	2 Apr 2002		BLM/AGFD	Arizona Channel (pts 31-49)
Mission Wash (points 13-19)	29 Mar 2001	38	Ft. Quechan Tribe	East Pond (pts 1-8)
Mission Wash (points 1-12)	Jun 2001		Ft. Quechan Tribe	All-American/Senator's Wash (pts 1-14)
West Pond (points 1-19)	29 Jan 2002	10	BOR	West Pond (pts 26-46) Hidden Shores Marsh (pts 1-23)
Draper Lake (point 1)	8 Aug 2001	81	USFWS	Cibola1 (pt 1) Cibola2 (pts 1-2)
Ferguson Lake (YCR pts 1-15) (BLRA pts 1-32)	29 Feb 2000	83	BLM/USFWS	YCR controls: Martinez Lake (pts 1-29) BLRA controls: Squaw Lake (pts 13-18) S. Squaw Lake (pts 1-5) Deer Island (pts 1-15) AC (pts 1-30)

Appendix II: Trends in Abundance of Yuma Clapper Rails

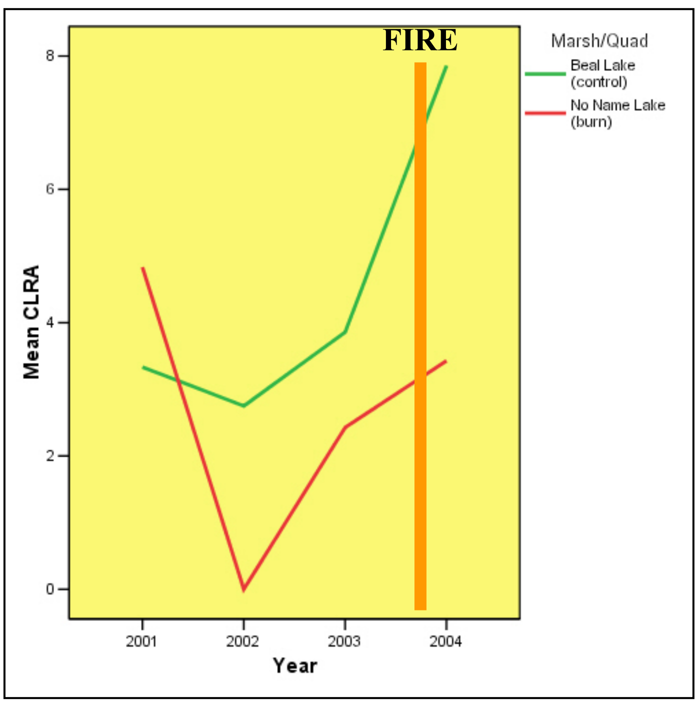
Imperial NWR Ag. Field 12



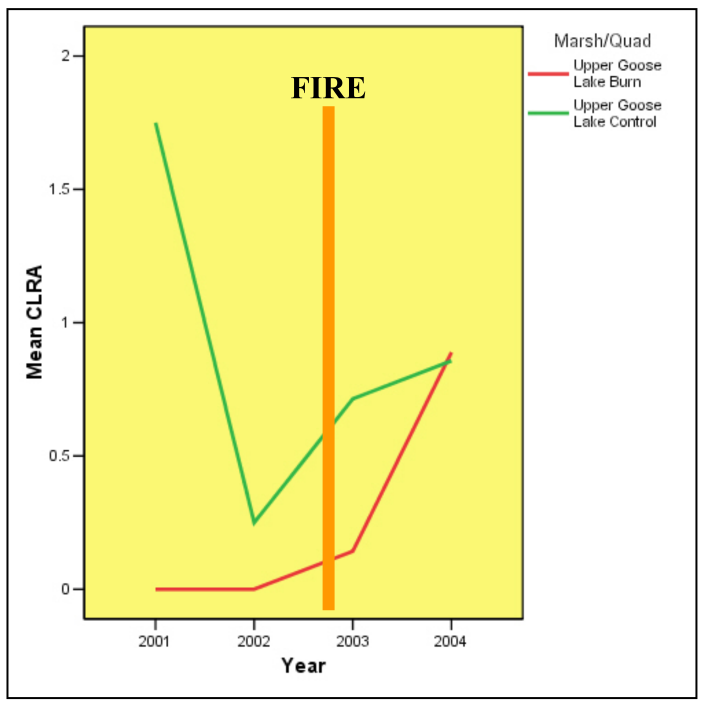
Imperial NWR Ag. Field 11



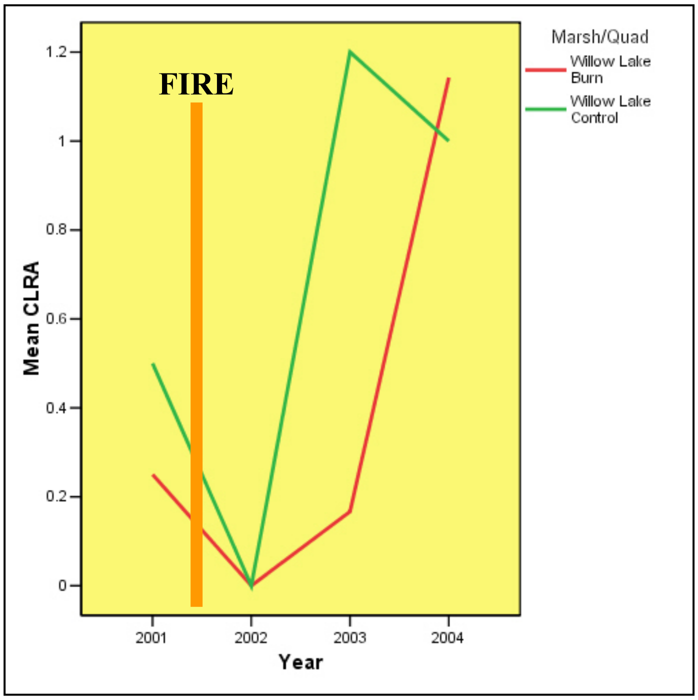
No Name Lake (Havasu NWR)



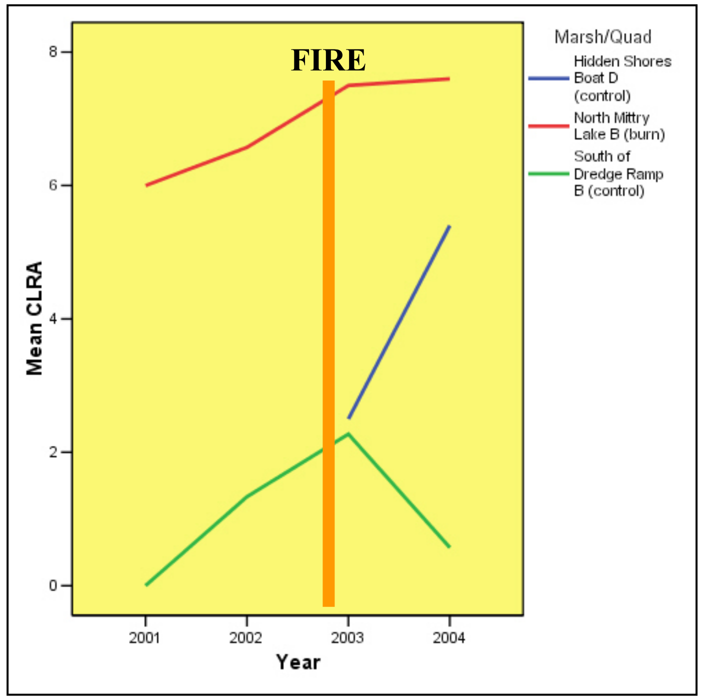
Upper Goose Lake (Havasu NWR)



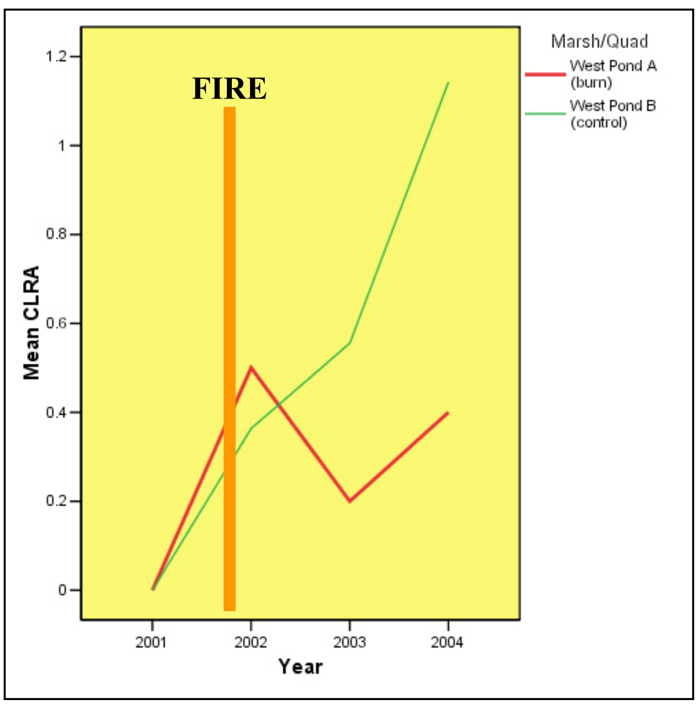
Willow Lake (Havasu NWR)



North Mittry Lake B

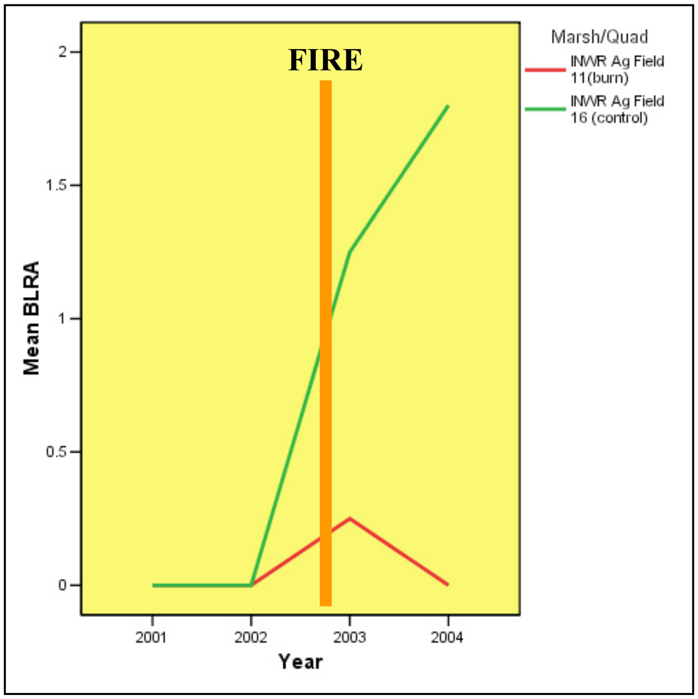


West Pond

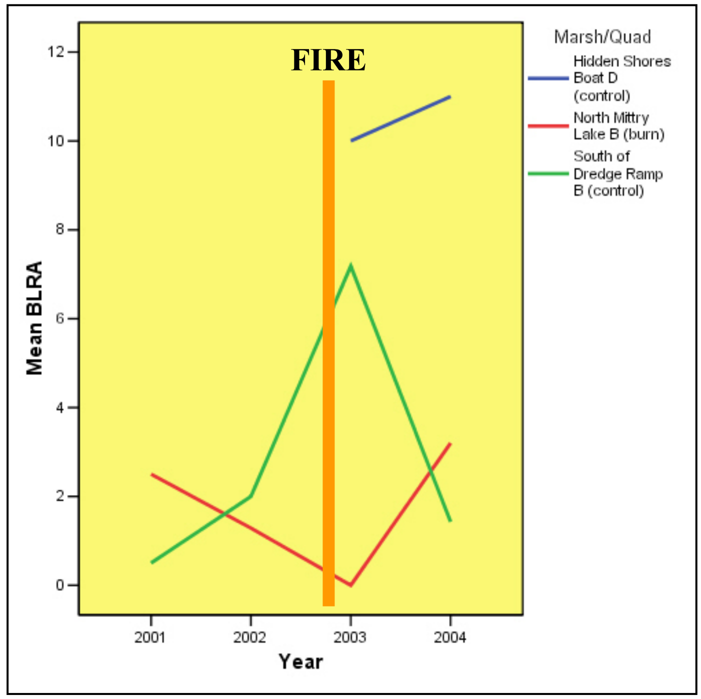


Appendix III: Trends in Abundance of California Black Rail

INWR Ag. Field 11



North Mittry Lake B



West Pond