Nevada Department of Wildlife

Greater Sandhill Crane Colt Survival in Northeastern Nevada

Research Project Status Report

2008

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This project receives funding support through a grant provided by the United States Fish & Wildlife Service.

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Greater Sandhill Crane Colt Survival in Northeastern Nevada

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Abstract: We monitored nest success, nest density, and colt pre-fledging survival for Greater Sandhill Cranes in Elko County, Nevada. Nest success was determined by monitoring eight nests located at the inception of the study in late May. Of those eight nests, six produced colts. Pairs of cranes were documented by vehicle and helicopter, making it possible to configure a map depicting core breeding habitat in Northeastern Nevada. Fourteen greater sandhill cranes (*Grus Canadensis tabida*) were radio-equipped in northeastern Nevada to determine colt survival rates as well as the factors that determine these rates. Of the fourteen cranes that were fitted with transmitters, five were adults and nine were colts. The adults were fitted with radio telemetry to allow monitoring by cooperators when the birds arrive at their winter grounds on the Lower Colorado River. Of the 38 colts that we documented, only eight survived to fledging. Known and speculated causes of mortality were drowning, coyotes, raptors, trampling by a cow and siblicide. We speculate that nest success is high while colt survival is very low. Colt production seems to be much higher on areas were coyotes occur in low densities like Secret Creek, where four out of five colts fledged, but much lower on places like Ruby Marsh where only one out of sixteen colts survived to fledging.

INTRODUCTION

The Greater Sandhill Crane is one of six subspecies of Sandhill crane found in North America. Within the Pacific Flyway, several populations of cranes are recognized under specific management plans. Cranes that breed in northeastern Nevada are relegated to the Lower Colorado River Valley (LCRV) population and are managed by the *Pacific Flyway's Management Plan for the Greater Sandhill Crane Population Wintering Along the Lower Colorado River Valley*. This plan is currently under revision and will contain a research element that directs the Flyway to improve its knowledge of the population's distribution and abundance. This study and a concomitant study by Arizona Game & Fish Department (AGF) on winter habitat along the Colorado River (summarized following) should provide some additional information to answer these questions. Data gathering priorities included:

1) Locate and map breeding pairs and their nesting territories,
2) Locate and map nest sites,
3) monitor hatching success,
4) Locate, capture and monitor survival of hatchlings,
5) Document causes of colt mortalities.

Other accomplishments sought included:

6) Marking adults and juveniles at suspected staging areas, and
7) Coordinating this project with the AGF project in Arizona, coordinating marked bird flyers for public areas within the known winter range to increase auxiliary marker observation reports.

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The LCRV crane population reproduces northwest Nevada is considered the smallest population of greater sandhill cranes in North America. In 1984 and 1985, Marcus S. Rawlings (Nevada Department of Wildlife) marked 23 cranes captured at two staging areas within summer range in Ruby and Lamoille Valleys, Elko County, Nevada (Rawlings, 1987). Additionally, 26 cranes were captured at the Lund, Nevada spring stopover in the springs of 1985 and 1986. Different colored markers and marker codes on patagial streamers were applied to the wings of the captured cranes and observations were recorded throughout the then known range of this population. These findings contributed to a better understanding of the population's distribution and key habitats. Fall age ratio surveys were also conducted from 1977 to 1983 to determine the percentage of young in the population (Rawlings, 1987). Aerial surveys of cranes using helicopters were made in June to determine nesting bird distribution. During June 7-9, 1999 aerial and ground surveys were conducted to determine breeding population trends as part of the long term survey on sandhill cranes (Tomlinson, Bradley, Neel, 1999). The highest breeding pair density in northeast Nevada was found in Ruby Valley followed by Independence Valley and the Upper North Fork Drainage. Huntington Valley and Lamoille Valley also hosted considerable numbers of breeding pairs.

Littlefield (1995) described crane nesting habitat and predation relationships at Malheur NWR. Ivey and Scheuering (1997) published findings from a crane colt mortality study in Oregon. Both of these studies provide a foundation for this study in Nevada. Conclusions and questions that emerge from this study may be correlated with the findings in those publications.

This study is in collaboration with a marking and monitoring project conducted within the population's migration terminus along the Colorado River in Arizona. Mike Ingralde (AZ DF&G) will be directing this project, which is designed to mark a larger number of cranes where the birds concentrate in higher densities and to follow the movements of these banded and/or instrumented birds. The research is funded through a Webless Migratory Game Bird Research Grant administered by the USFWS. This substantially larger grant allows AGF to purchase and monitor three solar-charged platform transmitter terminals (PTTs) which will be attached to cranes captured in Arizona. Information downloaded from the satellite transmitters will help depict the individual cranes' migration patterns. The AGF will also apply federal bands and affix auxiliary bands using color and character schemes differing from the auxiliary bands placed on cranes in Nevada. Band recovery data along with the satellite tracking will help determine the breeding range fidelity of cranes wintering on the Colorado River. It is expected that this information will further managers' understanding of the distinct population status of the LCRV by determining what percentage of cranes wintering in the Lower Colorado River Valley return to breeding range in Nevada compared to how many select breeding habitat delineated for the Rocky Mountain Population of Greater Sandhill Cranes. Additionally, sight records and/or satellite tracking confirming marked cranes documented elsewhere within the currently defined winter range of the LCRV will help to confirm the Rawlings findings.

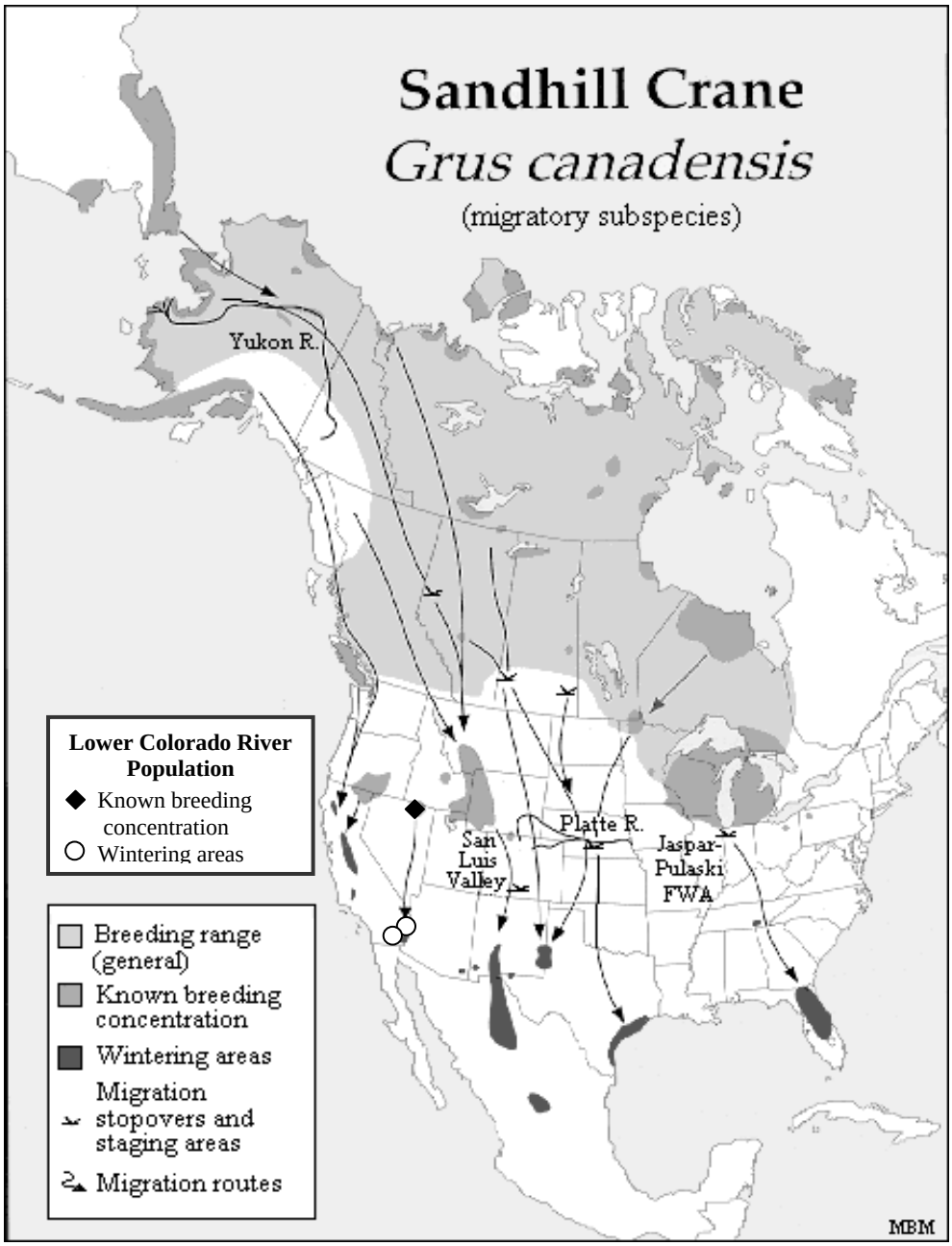
The Pacific Flyway Council recommended and the Service's Regulations Committee endorsed the initiation of a limited hunt for LCRV cranes in Arizona. The goal of the hunt will be a limited harvest of six cranes within a January 2009 hunting season. Arizona will issue permits to hunters and require mandatory check in of all harvested cranes. To limit disturbance of wintering cranes, Arizona will restrict the hunt to a 3-day hunt period. Arizona will coordinate with the refuges along the Colorado River to ensure that they comply with their administrative requirements to submit plans to initiate a new hunt by January 2009. Presently, Arizona has

identified its WMA near Buckeye in Southern Yuma County, which is within the Gila River unit of the survey area, for this three-year experimental hunt. This will be a three year experimental hunt. Although the number of hunt permits is small, some band recovery information could be gleaned from this action.

STUDY AREA AND METHODS

Northwest Nevada study site

This year's initial effort was directed at locating pairs, nests and colts within the currently identified important crane breeding habitat in Elko, White Pine, and Eureka Counties. The study site ranged as far North as Duck Valley, and as far south as RLNWR. Additionally, the study area extended east to the Boise Ranch near Jackpot, NV and as far west as Battle Mountain, Nevada. Figure 1 depicts currently defined breeding ranges of sandhill crane populations in North America (modified from North American Crane Working Group). The LCRV is the object of this study.



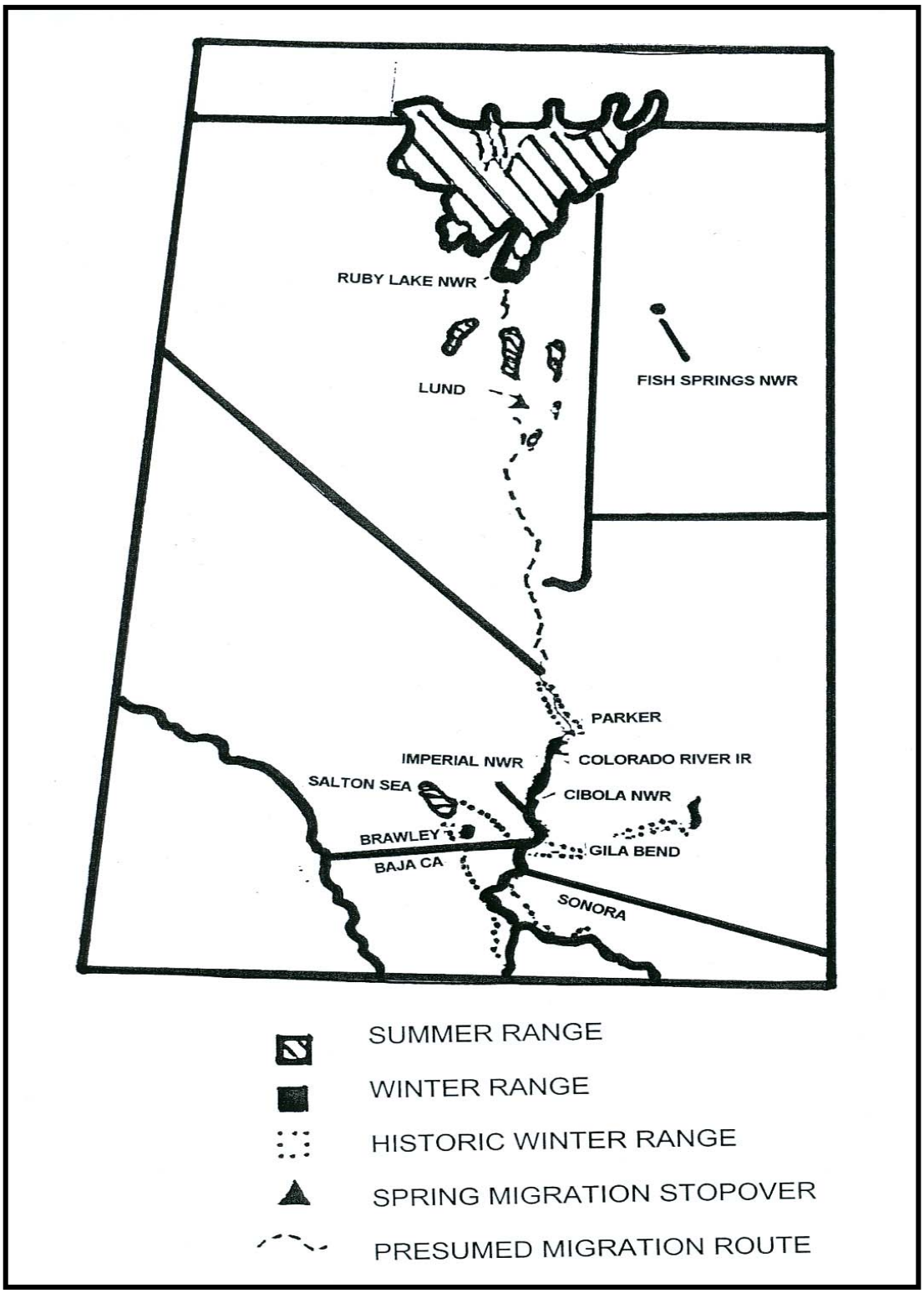


Figure 2. Currently defined winter and breeding range of the Lower Colorado River Valley Population.

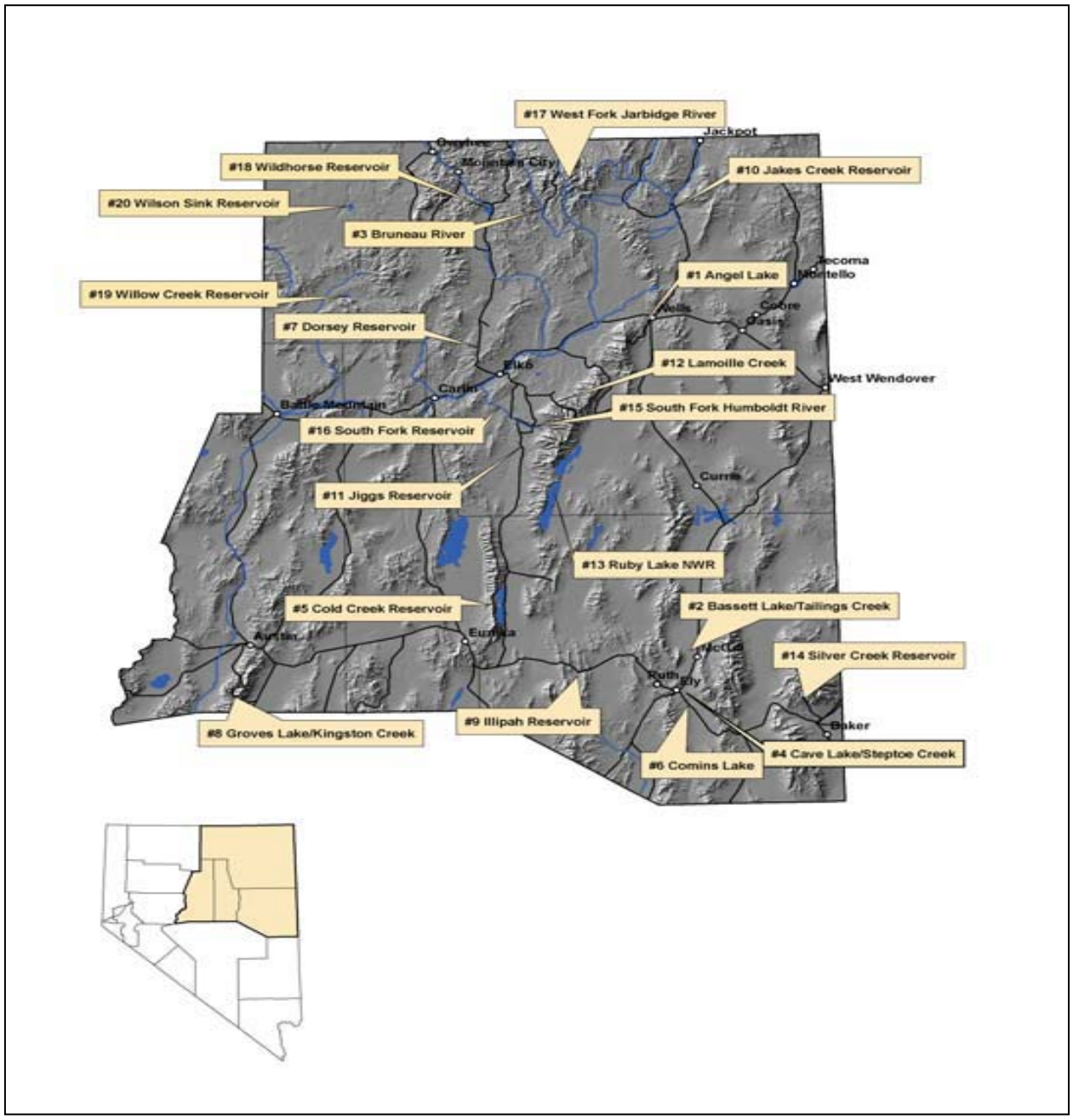


Figure 3. Map of the study area including most of the major watersheds, major roads and the county boundaries. The author and other research participants utilized paved highways to access most valleys where breeding pairs had been identified in previous NDOW surveys. Secondary roads and roads within private lands allowed vehicular access to points where personnel could make observations without disturbing the birds.

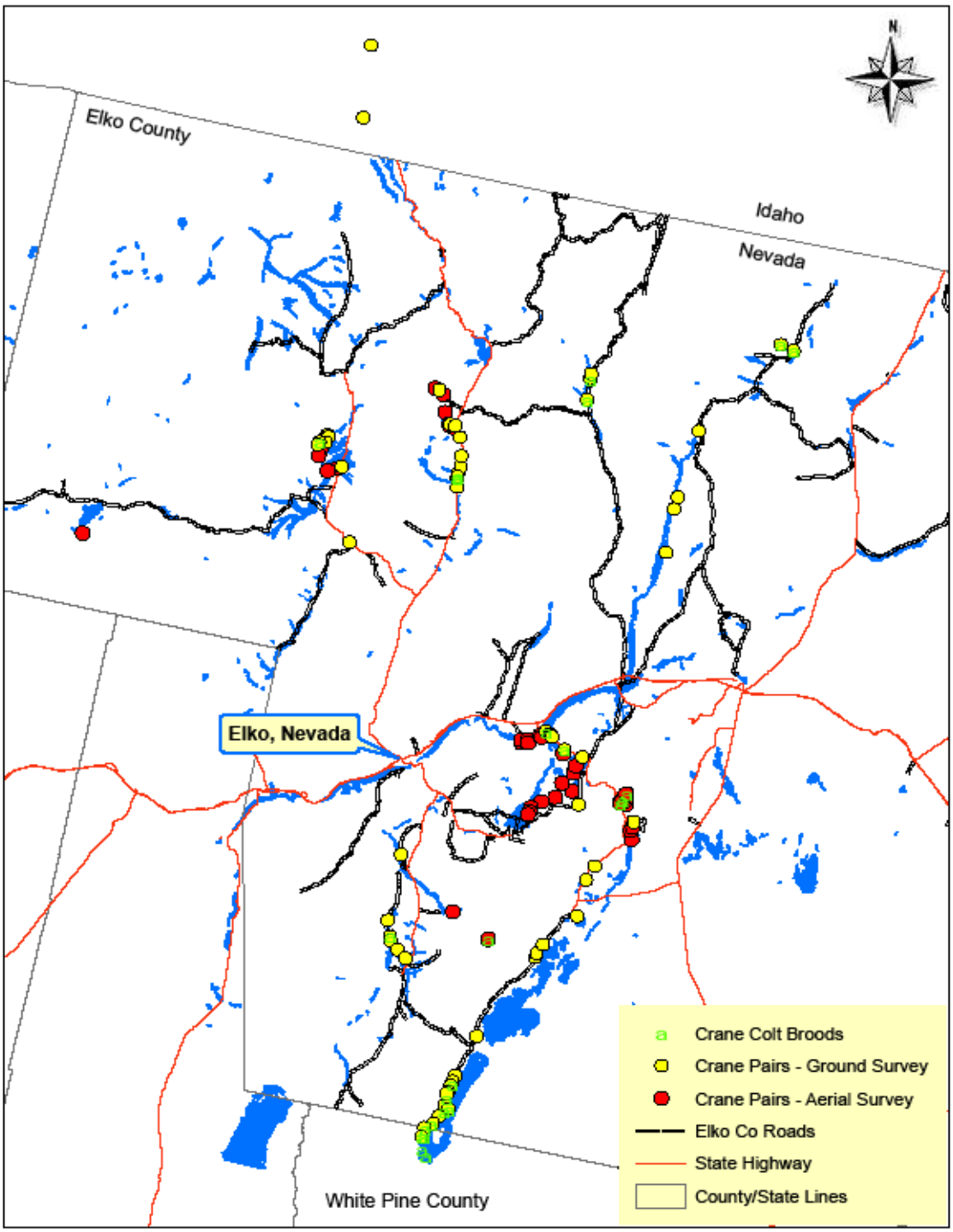


Figure 4. The northeast Nevada study area and depicts locations of breeding crane pairs observed from vehicles during the first two weeks of field survey in yellow. Red dots indicate aerial observations derived from an NDOW helicopter survey. Distribution is generally clumped and areas that have ideal breeding habitat characteristics lacked breeding pairs during this initial field season. Colt locations are plotted with a green square (gray, un-bordered in black & white).

Field methods

Cranes were located from the ground through the use of binoculars and spotting scope. Observation intervals were not consistent as the amount of time watching an adult subject varied depending upon whether the subject was alone or was paired and whether the single or pair displayed behavior indicative of a proximal nest, hatchling or colt. Crane and nest locations were recorded as to Universal Transverse Mercator (UTM) coordinates using a hand-held Global Position System (GPS) device. Any behavior suggestive of pair bonding or production was described within field notes. Non-breeding groups were similarly documented. Once a colt was observed, subsequent monitoring occurred weekly. NDOW biologist Pete Bradley provided sightings he made June 9-11 incidental to his ferruginous hawk survey. NDOW conducted raptor surveys using a Bell Jet Ranger 206 helicopter within a portion of the study area. The author was allowed to participate in this flight and documented all crane observations within field notes.

We attempted to trap cranes using several methods, but only two were successful. To capture flightless colts, one member of the capture team remained at an observation post to follow the movements of the target while indicating to a pursuer via hand signal and radio where the bird could be found. This was practical considering how adept colts were at using cover to elude pursuers. It was observed that prostrate colts were unlikely to move within its concealment even as handlers reached down to grasp them. This capture method worked where the colts were found in relatively short hay. Located colts were docile but handlers placed a restraint on them. A federal aluminum band was placed on the colt's right tibiotarsus above the knee and a 3.2cm tall, white, PVC band engraved with a two-digit alpha-numeric code was placed upon the opposite tibiotarsus. A short-term, 9-gram VHF (Advanced Telemetry Systems; Isanti, MN) radio was cemented to the PVC band. Nine VHF radios were utilized for this study.

The second practical capture methodology involved the deployment of a rocket-net over cranes attracted by corn bait. This site was at a rye field on RLNWR and was selected because of the comparatively high abundance as the flocks began to stage late in August and September. A total of three shots were attempted, resulting in the capture of a total of five adult cranes. We affixed the federal band and auxiliary bands as previously described and mounted short-term VHF radios to 13 cranes. These transmitters had been purchased for application to colts, but as the study evolved and the number of colt study subjects diminished, a decision was made to place the remaining radio inventory upon captured adults, juveniles and fledged colts in so that that the signals could provide some monitoring benefit to the winter range researchers

In July, field personnel attempted to nightlight cranes several times but were only successful in capturing a single colt.

Due to poor sample sizes, a statistical analysis of the capture efforts, to attempt to extrapolate production rates or distribution, could not be performed. Correlations between fledging colts and bird movements were observed and documented. Colts surviving to fledgling status tended to depart their parents' breeding territories with them in the third and fourth week of June.

Table 1. Nevada sandhill crane banding results - 2008									
Location:		Northeastern Nevada							
Band Prefix:		1048			**Band serial:** 51001 to 51040				
Bander:		Mike Laca			**Auxiliary marker**: PVC tarsal band – white with blue characters				
Fed.	Aux.	Age		Sex		UTM			
Band #	Marker	L	AHY	U	Band Site Name	E	N	Date	Freq.
51001		X		X	Bruneau River South	623861	4607252	June 18	
51002	2 over 1	X		X	Ruby Valley NWR	628342	4449951	June 20	165.798
51003	2 over 2	X		X	Ruby Valley NWR	628342	4449951	June 20	165.785
51004	2 over 5	X		X	Ruby Valley NWR	625372	4442356	June 20	165.870
51005	2 over 3	X		X	Huntington Creek	612877	4478447	June 22	165.912
51006	2 over 4	X		X	Huntington Creek North	608018	4484833	June 30	165.853
51007	2 over 9	X		X	Huntington Creek North	608018	4484833	June 30	165.836
51008	2 over E	X		X	Secret Creek	650012	4522790	July 1	165.845
51009	2 over 8	X		X	Secret Creek	650263	4522415	July 8	165.925
51013	2 over 6	X		X	Secret Creek	651246	4523433	July 8	165.885
51010	2 over U		X	X	Ruby Valley NWR			Aug 12	none
51020	2 over N		X	X	Ruby Valley NWR			Aug 13	159.967
51012	2 over 0		X	x	Ruby Valley NWR	628672	4451473	Sept. 13	159.746
51015	2 over R		X	X	Ruby Valley NWR			Sept. 13	159.4754
51016	2 over ♡		X	X	Ruby Valley NWR			Sept. 13	159.3948

RESULTS

This study commenced too late in the breeding season as evidenced that there were already colts on the ground in May and very few nests were encountered thereafter. Out of the eight nests found, six had hatched colts. One of the unsuccessful nests was depredated and the adult pair had attempted to make a second nest in a beaver pond farther down the creek. This subsequent nest was also unsuccessful in producing a colt, again due to predation. Another nest with one egg was located on an islet in the middle of the south fork of the Owyhee River and later was speculated to have washed away with the rising river.

Colt survival to fledging was very poor in some areas like RLNWR where only one out of 16 observed colts survived to the end of the field season (pre-migration). At Secret Creek, researchers documented five colts and watched four of these birds survive to fledging. Overall survival in the entire study area was poor with only eight colts surviving out of 38 colts documented. Auxiliary bands and transmitters did not become available until early June, thus efficacy in monitoring colt survival and movements suffered. By that time there were only 12 colts left to band and the capture crew was able to band ten of them (Table 1).

The only surviving colt fledged at Ruby Lake flew with its parents to a rye field at the other end of the marsh. In some instances, this action may have been prompted by ranchers cutting their hay. In other instances, some cranes remained on their breeding territories as of September 9th, which was the time of year when flock staging was beginning. At least one colt did not partake of the exodus - Pete Bradley located a marked/instrumented colt in the exact location where it was banded. The correlation of good habitat and forage may be a determinant in the decision to abandon territories before staging (see Questions section).

Observed and speculated mortality fates are described as follows:

Observed: One colt was killed by a coyote in Ruby Valley (direct observation). It is speculated that RLNWR has such a poor colt survival rate due to high coyote predation. This is supported by anecdotal accounts of coyote numbers observed incidental to field activities. Anecdotally, places where coyotes were found in much lower densities like Secret Creek had higher, near total survival rates for colts. RLNWR's Jeff Mackay has been tracking survival of colts and trumpeter swan cygnets for many years at RLNWR. He hypothesizes that this is an issue and is currently preparing a proposal to test this hypothesis through targeted coyote removal (pers. comm.).

Speculated: One colt was banded in the RLNWR and was then found dead before being scavenged the day after it was banded. It appears that this bird drowned given the location and position of its carcass. Ivey and Scheuering (1997) noted that drowning is a natural mortality factor but may result from the disturbance of having a transmitter attached to its leg. Other causes of speculated mortality were raptor predation, mammalian predation (N=16) and trampling by a cow (N=1). One speculated mortality source that lacks any evidence to support said speculation is siblicide. However, this could be one of the more significant causes of mortality when there are two colts hatched from the same nest. When crane pairs had two colts the colt that was much larger than its sibling survived while the smaller colt was found dead or disappeared. This occurred in every observed example except on, wherein both colts survived. Observers never personally witnessed one colt kill another, but this should be something to watch for in the following field seasons.

DISCUSSION

The initial findings reveal that the number of breeding cranes within the northeastern Nevada study site was much lower than NDOW had expected, based upon previous ground & aerial survey findings and based upon the increasing number of wintering birds within the defined winter range of this population (per Pacific Flyway Study Committee). This latter information essentially prompted this study and the AGF study since questions about the relationship between wintering numbers and cranes seen on summer breeding habitat has always vexed the PFSC. The following is an excerpt from their 1995 management plan:

> "Counts on the winter range are currently employed to monitor the population trend. However, validity of winter counts are uncertain. A cooperative survey conducted on November 22, 1994 located a total of 2,024 LCRVP cranes. That survey probably represents the most comprehensive winter survey. Most observations of marked birds have been within the defined wintering range (Appendix A). In January 1986, a search for marked birds was conducted at the Gila River area, Cibola NWR, CRIR and in the Brawley area, 61% of the cranes marked on Nevada summer ranges were observed on identified LCRVP winter range. Only cranes marked at the Lund stopover have been observed outside the defined LCRVP winter range (Appendix A). Only 30%+ of the LCRVP wintering population has been located on Nevada summer range. This discrepancy suggests several possibilities, including; a) the summer range of the LCRVP includes a larger area than previously believed, b) the summer ranges of the LCRVP, RMP and Central Valley Population (CVP), or RMP and LCRVP are not mutually exclusive, c) there is only one population of western greater sandhill cranes, subpopulations of which utilize distinct wintering areas and/or d) summer ranges are distinct and at least some mixing of populations occurs during migration and on winter ranges."

The survey strategy for this study was directed at that habitat that exhibited the proper characteristics necessary to support a breeding territory and had supported breeding pairs based upon past NDOW surveys. Observers made attempts to circumvent terrain features that hindered distant observation by utilizing ranch roads, observing from hill tops and walking the ground to get another angle on a stretch of pasture or wetland. The helicopter survey afforded a broader search pattern over areas that had been viewed from the ground and other areas that had not been surveyed. However, it must be acknowledged that some survey bias always exists. Even with these un-quantified biases, field assistants made attempts to locate cranes within approximately 75% of the principal, defined breeding areas. Approximately 450 cranes were documented, but of this number, the total of unique individuals is not confirmed.

It is suspected that the abundance of coyotes in Ruby Valley, particularly within the RLNWR is contributing to low pre-fledging survival rates of crane colts. Littlefield (2003) noted that higher nesting success on the Malheur NWR occurred during years when some predators (primarily coyotes) were removed. Similarly, the Malheur population fledged more young, exhibited lower colt mortality rates and higher annual recruitment under similar circumstances. This study did not make an attempt to quantify coyote or any other predator densities, rather it attempted to document mortality causes to provide supporting data for future predation management projects should these be pursued in an effort to improve LCRV crane productivity.

QUESTIONS:

1. How often are colts found alone? What is the duration of their solitude?
2. If a colt is accompanied by one or more parent, is its survival improved where the adult or pair engages an approaching predator?
3. Is colt vulnerability to predation directly correlated with the height of the vegetative cover in which the colt moves?
4. Can the study attempt to ascertain predator densities within the study site?
5. Are their management applications that can be utilized to mitigate mortality?
6. Are captures and marking having a mortality affect upon cranes?
7. What is the extent of siblicide?
8. What is pre-fledging survival?
9. Is nest success a limiting factor for this population? Is nest success related to habitat variables?

TECHNICAL RECOMMENDATIONS FOR FUTURE WORK

1. <u>Covering the ground</u>. The immensity of study area makes it difficult to adequately locate and monitor cranes using a single vehicle and observer, particularly during a crucial time period like late April to early June when colts are hatching and can be captured and banded.
   <u>Proposed Solutions</u>:
   a. Utilize other NDOW seasonal employees that are available in late April for finding nests.
   b. Employ more seasonal assistants for colt monitoring throughout the summer.
   c. Locate additional transportation.
   d. Apply more radios and purchase another receiver.

2. <u>Private lands access</u>. Another drawback to this study is that most of the breeding habitat exists on private ground where permission to gain access must be secured. Most landowners want to be contacted each time activities are to occur on their land. This is burdensome if the landowner is not present when activities are to occur.

Proposed Solutions:

a. Notify landowners in March of the impending field activities.
b. Make an effort in May to directly contact each landowner to establish a relationship.
c. Field assistants to maintain a log of phone numbers and email address in order to make every attempt to make contact before entering their property.
d. Develop a "hold harmless" form that releases them of liability for any accident that occurs involving field assistants on their land.
e. This form should include a table that documents the dates when visitation took place. This should be shared with the landowner at the end of the field season.

3. Timely delivery of necessary materials. The initial year of this project was plagued with administrative burdens that inhibited the purchase of needed items such as bands and radios during the initial month of work. Bands, optics and other material are now on hand to prevent this problem in 2009 & 2010. Budget authorization and contractual issues also presented delays to the implementation of this project. The primary research assistant (author) is in place for the subsequent years, but new field assistants may be hired if necessary.

   Proposed Solutions:

   a. Establish grant process in January with USFWS.
   b. Evaluate potential to us Webless Migratory Game Bird grant dollars to fund project expansion.
   c. Initiate NDOW documents immediately thereafter.
   d. Establish Mike Laca as an NDOW seasonal employee rather than a contractor.
   e. Use grant dollars and work with UNR to establish another research assistant under Laca. Also evaluate the need to provide more personnel at key times during the field season.
   f. Purchase additional optics and other equipment this and other research assistants.
   g. Order and purchase transmitters in February.

4. Rocket net. The rocket net capture crew did not have the resources to use this tool to capture cranes when at optimal times. Equipment and rocket charges had to be borrowed from the wood duck project (partially funded and equipped by NDOW), but that project has its own timing issues and these items may not be available during optimal capture windows. As an aside, discharging rockets in the dry conditions in Ruby Valley created a fire hazard. In two instances, the discharged rockets ignited dry vegetation, which diverted the trap crews' attention away from the birds toward the higher priority of putting out the fires. This led to the indirect death of one crane that aspirated while struggling against its entanglement. Crane behavior also was not conducive to this methodology. Some adult cranes demonstrated the strength to walk out of the net before handlers arrived. On occasion, domineering behavior by aggressive cranes kept others from entering the shot zone. Trappers also speculate that the proximity of other food sources diminished the cranes' dependence upon the bait.

   Proposed Solutions:

   a. Have at least one fully functional rocket net available at the Elko office by July 1.
   b. Wet those areas of dry vegetation that could be ignited by the rockets.
   c. Need to order rocket net charges.

5. Helicopter surveys. It is not necessary to use a helicopter for the purpose of locating cranes. The data collected from the ground was very similar to the data collected from the air.

However, if aerial (helicopter or fixed wing) surveys are being conducted within the study area, participants should be requested to document any crane sightings incidental to their primary efforts.

6. Volunteers. The need to enlist volunteers to assist field assistants during the ensuing field seasons could be valuable, particularly if seasonal employees attached to the Game division or other Divisions cannot be made available during crucial time periods such as colt inventory and capture and flighted bird capture on staging grounds.
   Proposed Solutions:
   a. Coordinate with NDOW's Volunteer Coordinator Kim Toulouse to determine the availability of Elko-based volunteers.
   b. Prepare a work schedules for volunteers that places them with research assistants and NDOW personnel.

7. Transmitters. The size of the transmitters affixed to the PVC bands and their trailing antennae may be a hindrance. If the decision is to continue to monitor instrumented colts, then it is advised that a much smaller transmitter be deployed. The 9 gram transmitters obtained from UNR worked well on an auxiliary band. The second group of transmitters was twice the size and the units were difficult to affix to an auxiliary band.
   Proposed Solutions:
   a. Use only 9-gram transmitters for colts.
   b. If placing radios on adult birds or adult-sized colts captured on staging areas is still integral to this study, then some alternate means of attachment should be considered.

8. Other trapping methods. It was not scientifically measured but the adults demonstrated an approach proximity threshold that seemed somewhat consistent. The cranes would fly off into the darkness, length of flight unknown, to avoid pursuers. This is a manpower-intensive effort and the authors enlisted the assistance several students from the UNR sage grouse lab for this endeavor.

ACKNOWLEDGEMENTS

This study was funded by an initial $19,200 grant administered by the United States Fish & Wildlife Service (USFWS or Service). Subsequent funding support is committed for the ensuing field seasons of 2009 and 2010. The grant supports one research assistant (author) the first and ensuing field seasons. Additional paid assistance will be considered for years two and three, though NDOW provides assistance with its own seasonal personnel and field biologists. Equipment and materials are underwritten by the grant. The Service's Ruby Lake National Wildlife Refuge (RLNWR) provides a vehicle and technical and field assistance, while the fuel is paid through the grant.

We would like to thank Bobby Jones, Jeff Mackay, and Chris Nicolai for helping capture and band the few cranes we were able to get this first year. Without the help provided by these three, we would have never been able to capture any adults or colts. Jeff Mackay was also of great assistance by providing telemetry training and helping with this research paper and its maps. I would like to thank Pete Bradley for help in Elko and doing follow up telemetry observations when Mike Laca had to go back to school. We would also like to thank Curt Kleist, Jim Sedinger, Mark Atkinson, Joe Doucette, Norv Dallin, and Eric Blomberg for help during the project.

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APPENDIX I – Photo Records

Author with a colt prepared for release.

A colt displaying the auxiliary PVC marker.

This restraint was made from denim jean remnants to hold the colds wings motionless to prevent injury. A hood (not shown) covers the head to calm the bird and the feet are bundled with electrical tape to dissuade kicking.

Left: June 18, 2008. Field assistant Robert Jones holds the first colt captured in the study. Only a Federal band is affixed.
Right: Jones releases a colt later in the project. Note both the Federal band and auxiliary marker.

Author processes one colt while another lies in restraint.

Left to right: Kurt Kleist (Nevada wood duck project, volunteer to this project), author, and Jeff Mackay with the first adult crane caught with the rocket net at Ruby Lake National Wildlife Refuge.

APPENDIX II - Crane Colt Survival Study – Budget Tracking						
Item		**Units**		**Unit Cost**	**Budget Total**	**Actual Exp.**
Plastic Tarsal Bands (Spinner Plastics)		300	bands	$1.50	$450	**$495**
Short-term VHF Radios (ATS)		10		$100	$1,000	**$2,060**
Aerial Survey	NDOW Helicopter	0	hours	$300	*$300*	***Flights not charged***
	Contract Helicopter	0	hours	$900	*$900*	
	NDOW Cessna (1)	3	hours	$290	$870	
Vehicle (provided by Ruby Lake NWR)					-0-	**-0-**
Fuel (2)		495	gal	$3.90	$1,930	**$953**
ATV & Trailer (provided by NDOW)					-0-	**-0-**
Equipment	Spotting Scope + tripod & mount	1		$900	$900	**$687**
	Binoculars (uses personal pair)	0	pair	-0-	-0-	**-0-**
	Hand-held VHF Receiver (CSI)	1		$695	$750	**$702**
	Yagi Antenna (ATS)					**$130**
	GPS hand-held unit.	1		$298		borrowed
	Federal Express (ship USGS receiver)					**$29**
	Net Gun (NDOW)	1		-0-	-0-	**Not used**
	Catch Pole (NDOW)	1		-0-	-0-	
	Hip Boots (uses personal pair)	0		$78	$78	**$0**(uses own)
Salary	Conservation Aid Series	14	40	$23.61[1]	$13,222	
	Kelly Services[2]	654 hrs		$21.25		**$13,855**
Total initial budget(w/o PTTs, includes NDOW Fixed Wing):					$19,200	
Expenditures through Oct 20, 2008 [3]:						**$18,911**

[1] Initially intended to pay as Con Aid, but overhead costs were excessive.
[2] By contract, Kelly Services pays Laca's salary and charges an overhead cost.
[3] $289 remaining; however, one Fed Ex charge and some fuel receipts still pending.

APPENDIX III - Estimated project costs for 2009 field season.								
Cat.	Item	Units #		$	TOTAL	In-Kind NDOW	UNR	RLNWR
Short-term radios (Advanced Telemetry Systems)		30	radios	$210	$6,300			
Vehicles	#1. Jeep Cherokee	1		$12,000				$12,000
	#2. NDOW truck TBA - exclusive to project	1		$12,000		$12,000		
	#3. trucks assigned to assisting NDOW personnel	3		$2,000		$6,000		
	ATV & trailer	2		$750		$1,500		
Fuel	Project coded	1500	gallons	$4.25	$6,375			
	NDOWprogram general	250				$1,063		
Equipment	Spotting scope, tripod & window mount	2		$500	$1,000			
	Binoculars	6	pair	$400	$2,400			
	Additional VHF receivers	2		$700	$1,400			
	Hand-held GPS	3		$300	$900			
	Hip boots	4		$85	$340			
	Motorola short-range handi-talkies	3	pair	$225	$675			
Personnel	Graduate Student (Mike Laca)	1		$22,000	$22,000			
	Technicians (full-time, unit is per month cost for 1)	3	$1,500	$4,500	$13,500			
	NDOW Consv. Aids (1 @ 4 weeks @ $13/hr)	4	weeks	$520		$2,080		
	NDOW Consv. Aids (3 @ 2 weeks @ $13/hr)	6	weeks	$520		$3,120		
	NDOW Nongame Biologist	2	weeks	$1,500		$3,000		
	NDOW Game Staff Biologist	3	weeks	$1,800		$5,400		
	UNR Academic Advisor Oversight	1	weeks	$2,500			$2,500	
	RLNWR Assistance	2	weeks	$1,800				$3,600
Food & Lodging	NDOW Trailer at Elko office for 3 personnel	12	weeks	$100		$1,200		
	Housing @ RLNWR for 2 personnel	12	weeks	$100				$1,200
	Food for UNR personnel				$1,000			
	Per diem for NDOW personnel					$750		
				TOTALS:	**$55,890**	$36,113	$2,500	$16,800
				Less USFWS small grant:	**-$19,200**			
				WMGBR GRANT REQUEST:	**$36,690**			
				Same cost estimates for 2010 field season:	**$36,690**	$36,113	$2,500	$16,800
				Project totals for April 2009 - October 2010:	**$92,580**	**$72,226**	**$5,000**	**$33,600**