

The Fallon

WOOD DUCK PROJECT

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A unique study of waterfowl in an oasis in the desert of Nevada with large potential to answer in-depth questions about waterfowl management



EXECUTIVE SUMMARY

At the writing of this report, the Fallon Wood Duck project is beginning its eleventh year. While the project has grown and the amount of high quality data is impressive, there are other components of the project which have been gaining large amounts of attention. That is, the general public coming to interact and help with the project. Over the past number of years hundreds of individuals and contributing 1000's of volunteer hours annually (>350 people and >3700 hours in 2012) have come out to support the project. One graduate student completed his Master's degree in December 2011 and another PhD student has started. The Fallon Wood Duck project is now much more than just studying a lightly harvested duck with little management concern, but rather an intense study which for the last ten years has shown the ability to follow marked wild animals in ways not previously accomplished, especially in studies of ducks. Approximately 800 new wood ducks are banded annually with a similar number of older birds encountered each year. Studies of wild animals are frequently limited by the ability to follow marked individuals throughout their lifetimes, but this project is one of the great exceptions. Given the limitation for many of these

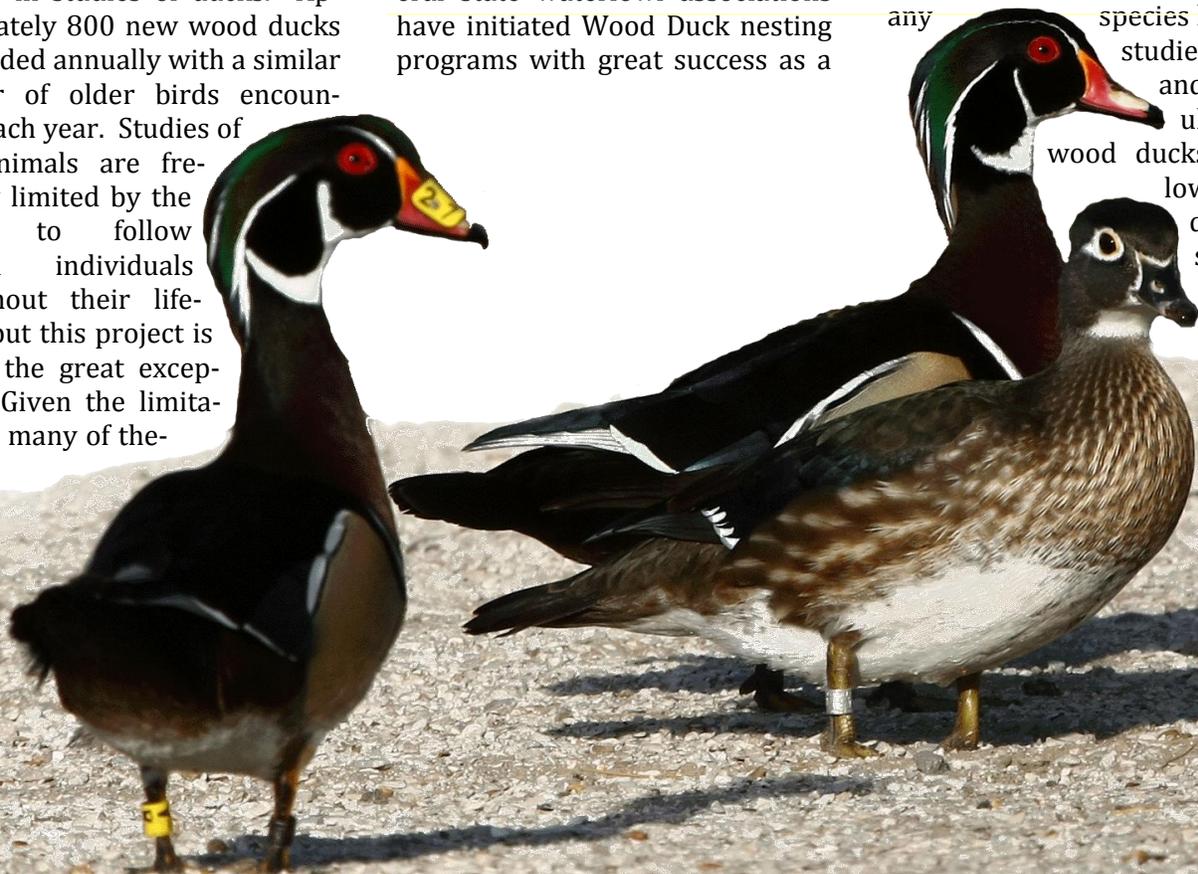
other studies to follow marked individuals, many population models attempting to explain population dynamics must make assumptions (sometimes many). Therefore, the Nevada Wood Duck project has great potential to learn a lot about processes that regulate wild animal populations. This report is written for a wide variety of audiences with the goal of providing information of interest to scientists and the general public.

PROJECT HISTORY

Little was known about Wood Ducks in Nevada with some local opinion suggesting less than 20 pairs in the State. Wood Ducks are a lightly harvested species with current harvest estimates averaging about 400 birds per year within the state of Nevada (USFWS 2012). Wood Ducks nest in cavities, especially man-made nesting structures, which make them an easy species to study and monitor because of less time involved in searching for nests. Several state waterfowl associations have initiated Wood Duck nesting programs with great success as a

tool to introduce the public to wildlife issues, management, and research. The primary goal of this project is to understand survival, reproductive success, recruitment of juveniles into the breeding population, effects of harvest, and associations with habitat types and land management. These goals are addressed by using a combination of marked individuals with unique tags (such as standard and coded legbands and webtags), with subsequent encounters of those individuals (recaptures, resightings, and hunter reports), and monitoring nesting effort. This project is unique because the potential for an intense capture-recapture-recovery is high. This population is relatively isolated from other Wood Duck populations and the habitat Wood Ducks use in and around Fallon, Nevada, is relatively limited which will increase the likelihood of large number of captures and recaptures of those individuals. The potential exists to study this population of ducks in ways no other duck populations of any

species have been studied to date and this population of wood ducks will allow us to develop a study design that can





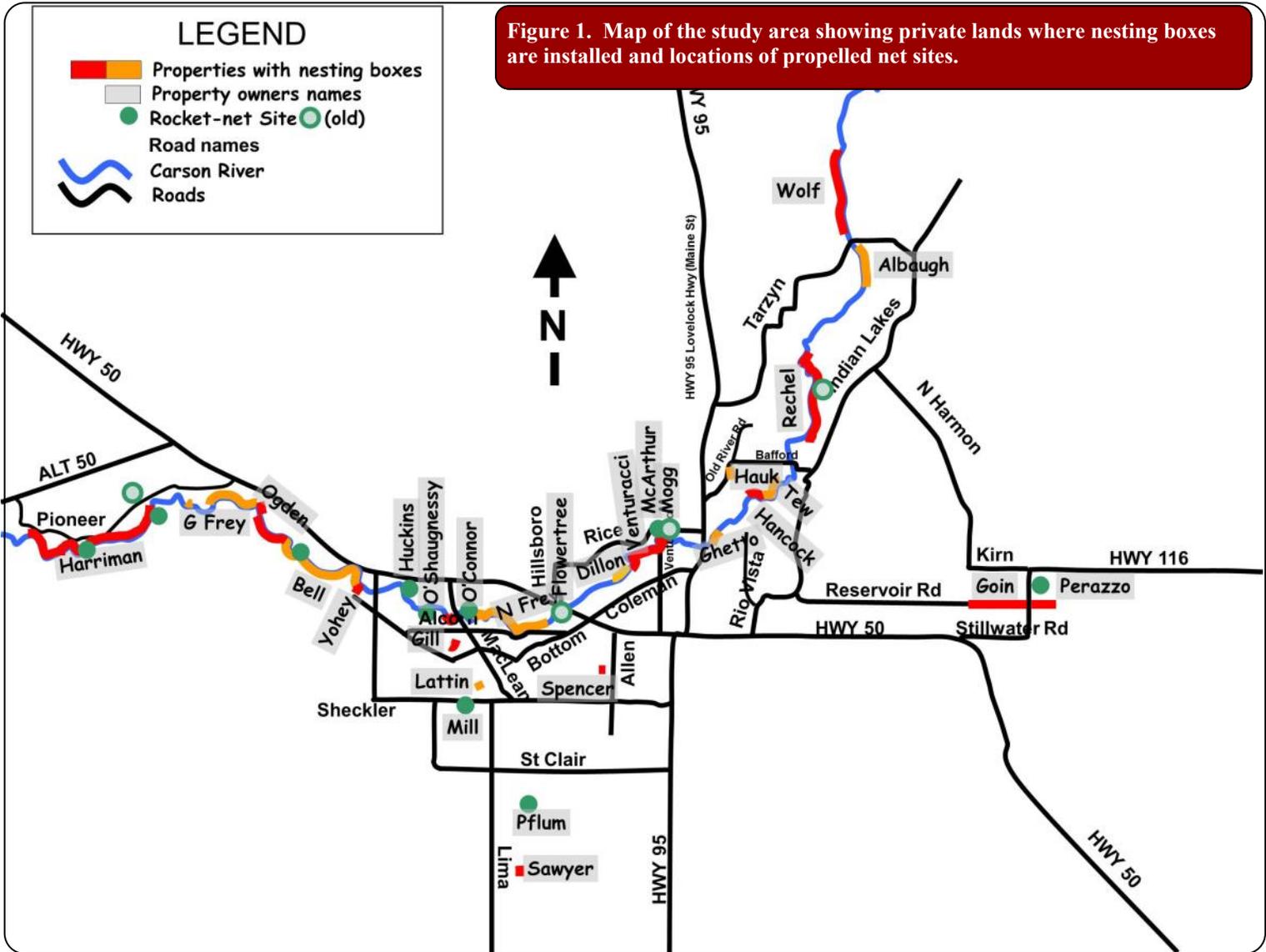
Western Screech Owls use nesting boxes as winter roost sites and occasionally as nests.

be applied to other species and population of ducks in North America. A key question in the waterfowl research community is when mortality is occurring and

when in the annual cycle natural mortality or recruitment is being compensated by harvest. This study has the potential to be a model system for understanding population dynamics of ducks, and most importantly, the understanding of effects of harvest on waterfowl populations.

This project originally began in 1991 by Steve and Roxanne Davis of Fallon, NV. Roxanne organized a women's chapter of Ducks Unlimited and used the funds from this organization to buy 100 plastic Wood Duck nest boxes. Steve installed these boxes immediately in various locations near the Fallon area. Discussions began in 2003 about initiating a nesting and banding program on Wood Ducks in the Fallon area and these efforts began that year. Beginning in

2004, Nevada Waterfowl Association became involved and an effort was initiated to mark ducklings on the day of hatch. More boxes have been added to the nest monitoring project every year to the present. Through the 2006 field season, this project was carried out by 3 volunteers with logistical support provided by Stillwater NWR and by donations from the Nevada Waterfowl Association. A substantial grant was awarded for this project in 2006 by the Nevada Department of Wildlife through the Heritage Grant program. This grant permitted hiring a full time technician to work on the project and to install 30 radio transmitters on Wood Ducks beginning in spring 2007, and subsequently the grant was renewed for the 2008 and 2009 field seasons. Beginning with



A LIST OF METHODS NO LONGER USED ON THE PROJECT

PLASTICINE BANDS – These were full size metal bands full of clay and attached to day-old ducklings which as the duckling grows, the clay erodes and leaves a full size band which is easy to report by hunters. We experienced mortality with these bands in 2007 and replaced their use with webtags.

I-BUTTONS – I-buttons are small temperature data loggers which we used to monitor nest attendance. We used these from 2005 through 2010 (6 field seasons) on a large sample of nests. We discontinued use of these as we collected a large amount of data and reduced workload.

NEST BOXES AT CERTAIN PROPERTIES – We used to have nesting boxes upstream of Diversion Dam at the Mori Ranch, but use was low, therefore we moved boxes to a different property in 2005. We also removed boxes immediately upstream of the Lovelock Highway in 2005 for the same reason.

RADIO TELEMETRY – We installed 40 VHF subcutaneous radio transmitters in 2007 and 2008 to follow individuals to monitor mortality, mortality sources, and movement patterns. We had difficulty in following radios and switched to coded tarsal bands with much larger success. We did identify the primary predators of adult Wood Ducks as raccoons (70%), house cats (15%), raptors (2%), and unknown (13%).

NASAL SADDLES – We used nasal saddles from 2008 through 2010 to mark Wood Ducks so that we could identify individuals without having to capture them by using binoculars or spotting scopes. Because Wood Ducks prefer to stay in the water, this marking technique allowed identification while in the water. While we detected no adverse effects of these markers (Nicolai and Olson 2009), we did not collect a lot of data due to these markers and discontinued their use.

the 2009 field season, a masters level graduate student was added to the project to oversee field work and to analyze data. This student completed his MS in September 2011. A new student began working on the project in March 2012. Thus this project also is providing educational opportunities for students interested in wildlife ecology and management. This project has evolved into a cooperative project between the public, the U.S. Fish and Wildlife Service, Nevada Department of Wildlife, Nevada Waterfowl Association, Delta Waterfowl, and the University of Nevada Reno.

This project has grown over time and this report provides information on the current structure of the project. A side bar in this report is a list of past components of the project and an explanation of why these methods are no longer used.

METHODS AND RESULTS

All work on this project

occurs on private property (Fig 1).

Nesting

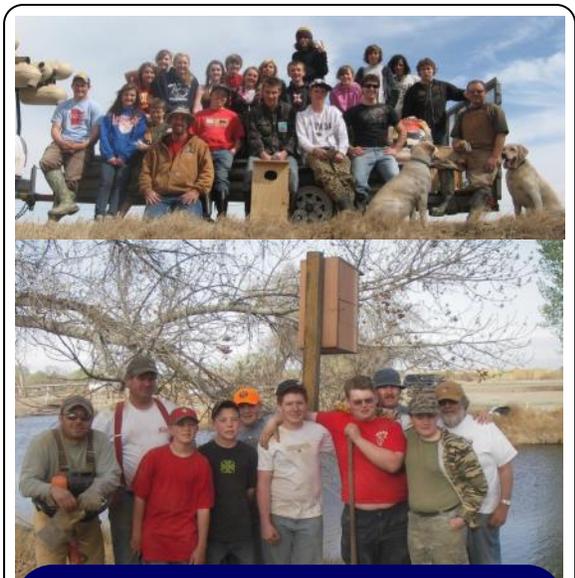
Installation of nesting boxes

Approximately 344 nesting boxes have been installed through 2012 (Table 1). Nesting boxes were either directly purchased by Ducks Unlimited (Fallon Ladies Chapter) or Nevada Waterfowl Association, or built by Reno High School students and local Eagle Scouts. Ninety-eight percent of boxes are mounted on metal poles to reduce predation and to aid in monitoring of boxes. Boxes have been installed from immediately below the Diversion Dam to the Wolf Dam (Fig 1). Currently, 70% of the Carson River has nesting boxes every 50 yards. All boxes are near either the Carson River, oxbow lakes near the river, isolated ponds, drains, or delivery ditches (Fig 1). Boxes are placed near overhead cover to reduce effects of sun exposure which may cause elevated tem-

peratures. Seventy-five percent of boxes are constructed of wood (both cedar and plywood) and the remainder are plastic boxes (www.cattailproducts.com). Recent analyses in this project show that wood ducks prefer the wood boxes to plastic ones at a 3:1 ratio (Olson unpubl.) and plastic boxes will no longer be installed even though they require less annual maintenance (cedar boards experience dryrot whereas plywood boxes have held up extremely well). Boxes are checked prior to the beginning of nesting season for maintenance and to place fresh wood shavings (late February to early March). Landowners are encouraged to contact us if they have boxes that they would like to be included in this project.

Monitoring of nesting boxes

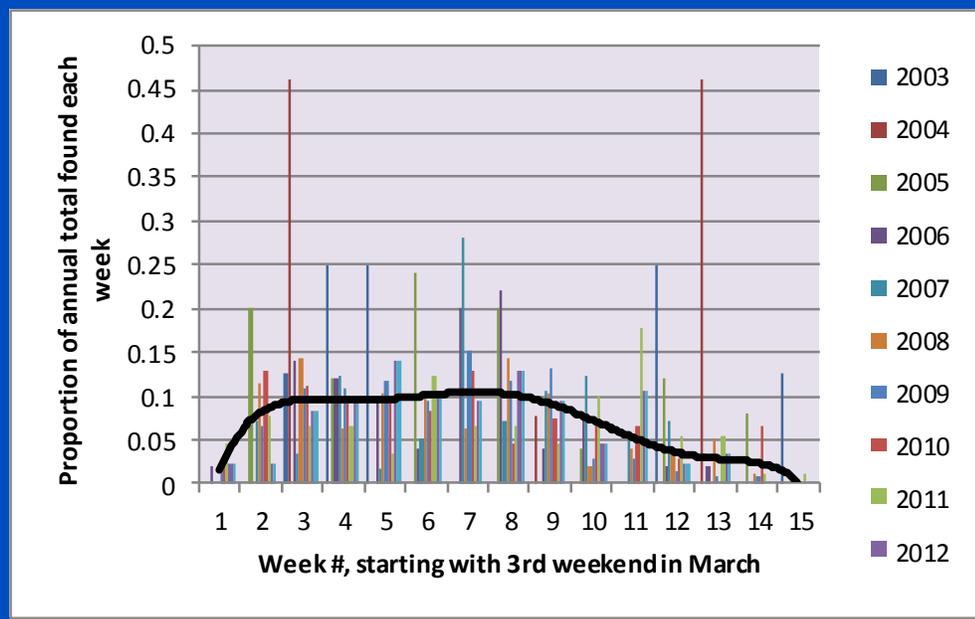
Nesting typically starts the 2nd week of March. Each Saturday beginning with the 3rd Saturday in March, all nest boxes are checked for new nests. Nest box checks continue until no new nests are found (typically 4th Saturday in June; 15 weeks in total; figure 2). Weekly, this effort uses a small group of undergraduate students



Youth groups involved with the project. Top picture is Reno High School students led by Scott Huber who built and installed >100 boxes over 3 years (top picture). Bottom picture is a Sparks Boy Scout troop led by Bernard Lund in which 85 boxes were built and installed.

from UNR, hunters, and local Junior and Senior High students. When a nest is found, species using box and number of eggs is recorded. European Starling nests and eggs are removed at all visits. Species found using nesting boxes include Wood Duck, European Starling, American Kestrel, Western Screech Owl, Northern Flicker, and Ash-throated Flycatcher. When an active nest is found, red flagging tape is tied to the metal pole so that the nest is not disturbed during subsequent Saturday nest search episodes. Wood Ducks nests require approximately 38 days to hatch after the first egg is laid. After nests are found, they are monitored each Wednesday until their final fate is determined by trained biologists to capture and mark the attending adult, measure eggs, monitor success, and mark hatched ducklings. At hatch, all egg membranes and remaining eggs are collected and stored for future genetic analysis (see below). From 2003 through 2012, 671 Wood Duck nests have

FIGURE 2. Graph showing annual nest initiation dates as a proportion of all nests found annually. Dark line shows overall pattern.



been recorded, in which 7199 eggs have been laid, 352 of nests hatched at least one duckling resulting in 2744 hatched Wood Ducks (Table 1).

Nesting hens

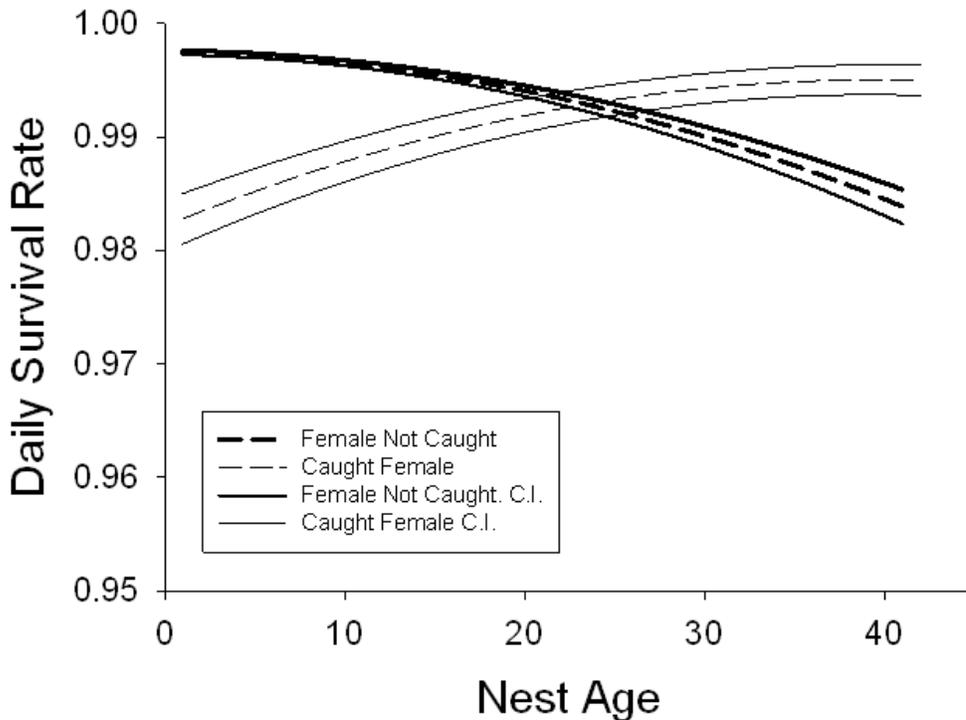
Of the 671 nests found, 467 (70%; Table 1) had the hen captured and

identified. These 467 hens comprised 290 unique individuals, 38 of which were hens that hatched out of Fallon wood duck project boxes (these were known due to webtagging efforts; Table 1). One-hundred and seventeen records of hens nesting beyond their initial

Table 1. Summary of nest box use and productivity, and encounters of associated attending hens from 2003-2012. Nesting information includes annual and total numbers of number of boxes monitored, number of nests found, number of nests which hatched, number of eggs laid, and number of eggs hatched. Nesting hen summary identifies each hen as either a first time nester, or a returning nester. First time nesters can either have no marker or were marked prior to their first encounter at a nest (band and/or webtag). Returning hens, by definition, were banded and encountered at a nest in a previous year and may or may not have a webtag. All webtags tallied in this table were initially installed on their day of hatch in a box as part of this project.

Nesting Information					Nesting Hen - Marked Status at initial annual nest capture									
# Boxes	# Nests	# Hatched Nests	# Eggs Laid	# Hatched Eggs	New					Returns			GRAND TOTAL	
					No Markers	Banded, no webtag	Webtag Only	Banded, with webtag	TOTAL	Bands only	Bands and webtag	TOTAL		
45	8	6	54	48	4					4				4
53	13	11	136	97	8	2				10	2		2	12
76	25	19	253	160	8	3				11	8		8	19
132	50	24	507	213	22	3				25	11		11	36
242	57	34	543	251	21	12		2		35	14		14	49
257	99	36	1002	275	17	16	1	2		36	25		25	61
338	137	74	1632	580	34	34	3	1		72	26	1	27	99
341	108	60	1234	399	4	28		9		41	33	2	35	76
340	89	41	964	363	6	16	1	8		31	22	2	24	55
344	85	47	874	358	3	11	1	10		25	26	5	31	56
344	671	352	7199	2744	127	125	6	32	290	167	10	177	467	

FIGURE 3. Results of modeling daily nest survival as a function of nest age and whether hen was disturbed during incubation.



year have been recorded, with one individual documented nesting 7 consecutive years (2005-2011). A total of 29 nesting hens have been shot and reported by hunters. Survival of hens that use our nesting boxes was lower during the breeding season (53-83%) than the rest of the year (77-92%) even with predator-proof boxes (Olson 2011, Olson et al. *in reviewA*).

Nest Success

Given that nesting boxes are checked weekly (similar to many waterfowl research projects), concerns have arisen concerning the effects of biologists disturbing hens frequently. Steve Olson examined effects of human disturbance on nest survival (Olson 2011, Olson et al. *in reviewB*). Hens are not always at the nest box when found or when monitored, and records are kept whether she was present or not for each visit. Steve found that biologists do increase abandonment for nests where the hen was present during the early part of incubation; and that daily survival rates for nests in which

the hen was present increased throughout incubation. In the long run, whether hens were disturbed or not, they succeeded at the same rate; hens which were not disturbed abandoned their nests later than the ones which were disturbed (Figure 3). Steve found that across years, nesting success was 66% each year from 2004 through 2010. This result is highly unusual as typically nest success varies dramatically or remains at low levels across years in other waterfowl studies. This is probably a result of our nesting boxes

being mounted on predator proof metal poles. An explanation for nest success below 100% is probably due to behaviors of hens when they compete for nesting boxes with other wood ducks or other birds. This behavioral effect on nest success is a new idea and lends support to the idea that super high values of nest success may not be possible for some waterfowl species, even when predator management is used.

Capturing Wood Ducks

To study marked animals, they must first be captured, then marked with some type of marker that identifies unique individuals. A combination of capture and marking techniques are used to be able to follow marked individuals throughout the complete annual cycle and their lifetimes. Trapping and reading tarsal bands occurs year round (Nicolai 2010).

As a side note, >3000 mallards have been banded incidentally to wood ducks during the project. While not a focus of this study, these bandings contribute to banding goals for the Nevada component of national mallard banding goals.

Propelled nets

Rocketnets, air cannons, and whoosh nets are used to propel large nets over groups of wood ducks that are attracted by bait (typically whole corn). Attempts have been made to spread capture

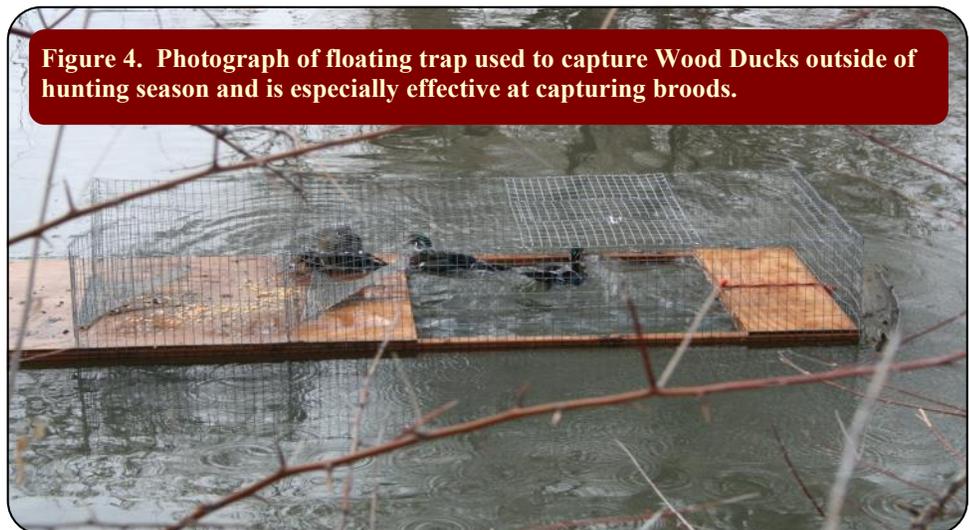


Figure 4. Photograph of floating trap used to capture Wood Ducks outside of hunting season and is especially effective at capturing broods.

Table 2. Numbers of new bands, unique recaptures, and unique resights by month from 2003 through December 2012. Within each month, each individual can only be tallied once with new>recap> resight.

MONTH	2003		2004		2005		2006		2007		2008			2009			2010			2011			2012			GRAND TOTAL
	new	recap	new	recap	new	recap	new	recap	new	recap	new	recap	resight													
January									39		56	20		162	100	18	47	46	30	51	51	53	69	125	106	
February			7	2	12	3	44		215	23	113	96		52	109	58	121	156	51	39	61	53	82	146	88	
March			63	11	24	7	114	27	82	54	140	107	8	65	102	66	89	159	46	42	48	90	47	144	187	
April	7		16	7	16	3	6	3	87	20	30	25	24	125	81	113	24	44	78	27	40	110	89	160	181	
May	53		4		71		10		91	6	22	7	11	63	61	74	1	5	41	33	43	43	18	21	124	
June	1	4	20		13		9		116	3	18	7	39	105	58	93	19	19	15	34	38	18	28	42	80	
July	19								43	5	57	44	4	76	46	38	58	36	15	51	9	11	47	41	28	
August	1					1	8	1	68	15	137	45	16	107	62	31	69	30	7	137	31	13	73	46	25	
September	19						8	1	33	10	136	35		30	15	26	132	48	4	161	49	23	45	10	20	
October							7	1						40	19	4	86	56	2	67	45	44	4	5	5	
November																	29	23	1	39	35	15	6	1		
December																	14	20	18	29	29	58				
TOTAL	New	100	110	136	206	774	709		825		689			689		710			710		508					4767
	Recap		4	20	14	33	136		653		642			642		479			479		741					3108
	Resight								102		521			521		308			308		531				844	2306

sites across the study site (Fig 1). Propelled nets are used year round with greatest success during the fall, winter, and spring months.

Float Traps

Float traps are used in smaller or overgrown areas where propelled nets are not feasible. These traps are approximately 2 feet in width and 7 feet long with a wire cage on top and two funnel entrances that are baited with corn (Fig 4). These traps are easily and frequently moved among trap sites. These traps are used throughout the non-hunting period (February through September) and are especially effective at catching broods during summer.

Nest box captures

Two methods are used to capture Wood Ducks in the nesting box: 1) by hand, and 2) by use of a nest trap. Catching Wood Ducks by hand is simple; at each visit, a plug is inserted into the nest box hole and either the incubating hen or hatching ducklings are gently removed from the nest. The nest box trap looks very similar to a normal wooden nest box, but has a treadle-type floor that allows a visiting hen Wood Duck to fall into a chute into a darkened catch crate

which is checked daily (Blums et al. 2000).

Marking Wood Ducks

Several different marking techniques have been used to follow marked individuals, two of which have been discontinued in use with this project (plasticine bands and nasal saddles). Currently, standard aluminum leg bands, coded plastic tarsal bands, and webtags are used to mark individuals.

Metal Bands

Standard aluminum bands are inscribed with either a 8 or 9 digit unique number, the 1-800-327-BAND toll-free number and the www.reportband.gov website

address so that hunters or people who find the band can report it to the US Geological Survey Bird Banding Laboratory in Laurel, Maryland. These can be applied to Wood Ducks at about 4 weeks of age. From 2003 through December 2012, 4767 metal bands have been attached to Wood Ducks in the Fallon, Nevada area (Table 2). Because the inscriptions on metal bands are small, marked individuals have to be physically recaptured to determine their identity. Of these original bandings, 3108 individuals have been physically captured across months and years following their initial release (Table 2). One marked bird was

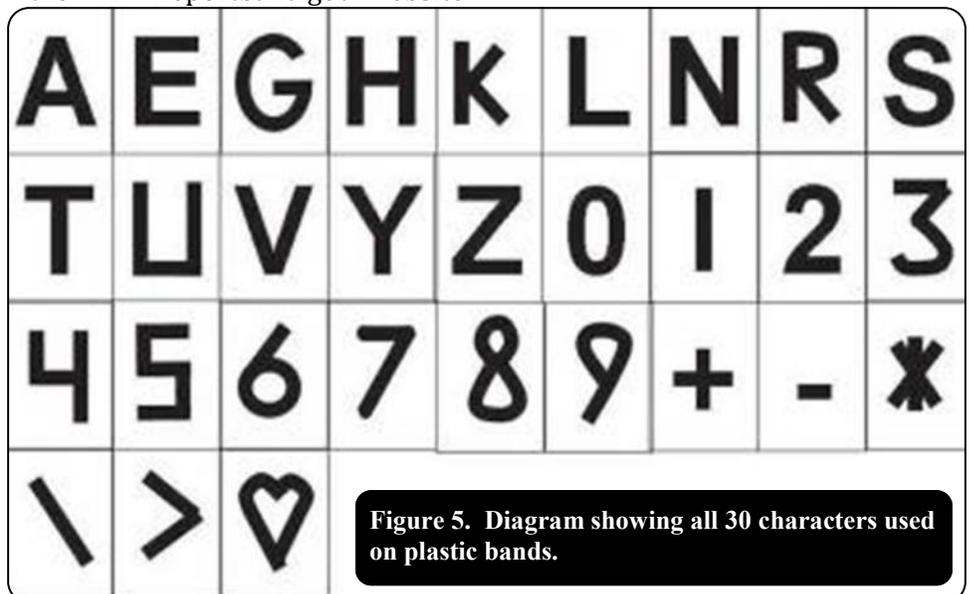


Figure 5. Diagram showing all 30 characters used on plastic bands.

Figure 6. Photograph showing combinations of metal and plastic tarsal bands applied to all Wood Ducks older than 5 weeks. These colors, from left to right are: black, yellow, and aqua.



recaptured away from Fallon as part of a standard banding operation in Ladd Marsh Wildlife Area near LaGrande, Oregon in July 2010. Six wood ducks marked elsewhere have been captured in Fallon, including: 4 which were originally banded in Sacramento Valley, California, and 2 near Yakima, Washington.

Coded Plastic Tarsal Bands

Coded plastic tarsal bands are approximately 1cm tall and have three repeats of a two-digit code read from the bottom up. A combination of 30 numbers, letters, and symbols are engraved on these bands (Fig 5). Nine hundred unique combinations are possible using these codes with a single background color of plastic. Use of coded plastic bands began in 2008 and 3505 of these bands have been applied through December 2012 using yellow (n=833; black characters), black (n=882; white characters), aqua (n=853; black letters), red (n=881; white letters), and white (n=55; blue letters) background colors (Fig 4). Future plans are to use green, blue, and other colors. These coded bands can be applied to Wood Duck duckling at approximately 5 weeks of age and are installed on the opposite leg from the metal band. Use of these bands allows us to identify marked individuals with-

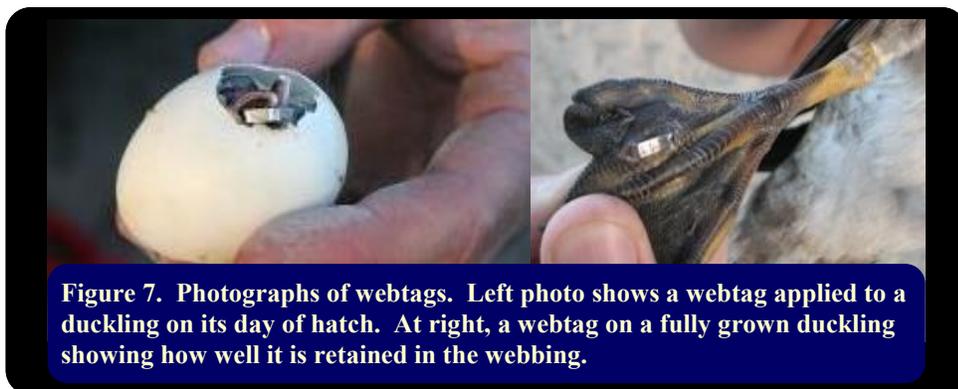


Figure 7. Photographs of webtags. Left photo shows a webtag applied to a duckling on its day of hatch. At right, a webtag on a fully grown duckling showing how well it is retained in the webbing.

out having to physically capture them by using spotting scopes from as far away as 100 yards while Wood Ducks exit the water to roost in trees or to feed on grain. By using coded tarsal bands, 2305 additional monthly encounters of marked individuals have been obtained, thus adding immensely to our dataset (Table 2). In addition, one resight of a marked individual was obtained in Verdi, NV in March 2011, one resight near Yuba City, CA in April, 2011, and one additional resight in Rexsburg, ID in May 2012.

Webtags

Webtags are a tag originally developed for in-

stalling in the gill plates of fish (Alliston 1975) and basically are a small staple with a stamped set of unique numbers. Webtags are used as markers for Wood Ducks when they are too small to hold a standard metal legband. From 2005 through December 2012,

Figure 8. Advertisement in a recent Nevada Department of Wildlife waterfowl hunting regulations pamphlet informing hunters how to report webtags.

ATTENTION WOOD DUCK HUNTERS

A research project is currently underway to study wood ducks in western Nevada. At hatch, a webtag is attached to ducklings. This webtag resembles a small staple with engraved numbers and is attached in the webbing of a foot. Reports of wood ducks with a webtag are extremely valuable to researchers. If you harvest a wood duck with a webtag, please contact Chris Nicolai by phone at (775) 784-6393 or e-mail at Chris_Nicolai@fws.gov.



Chris Nicolai by phone at (775) 784-6393 or e-mail at Chris_Nicolai@fws.gov.

FIGURE 9. HOW ARE WOOD DUCKS MEASURED?

Seven different measurements are collected each time a Wood Duck is captured or when hunters bring in harvested birds. These measures allow analyses which controls for body size when examining weight. For example, two 200 pound people have different body conditions if one happens to be 5 foot tall while the other is 6 feet tall. From left to right, top to bottom, measures are: tarsus, culmen, total head, 9th primary, wing chord, body, and weight.



on July 1 of their second calendar year of life. For all Wood Ducks encountered following departure of nesting boxes, they are assigned to gender based on reproductive organs or wing coloration.

Greater than 7000 morphological measures have been collected on 4591 unique individuals throughout their lifetimes. Recent analyses by Justin Duke et al (2013) show that tarsus length (a surrogate for body size) is usually the smallest for nesting birds, increasing for shot, retrapped, and resighted individuals, and largest for initially captured birds.

Genetic Sample Collections

At the time a metal band is attached to an individual, ~15 auxiliary and flank feathers are collected from each individual and temporarily store in paper envelopes. At the conclusion of a nesting event in nesting boxes, genetic samples are collected from each egg. For hatched eggs, this is the remaining membrane. For unhatched eggs, remaining eggs are broken and samples of material which contain blood are collected. All genetic samples are inventoried and stored in ethanol storage tubes and frozen for future studies. Currently, >3400 unique individual feather samples and 1700 egg samples are in storage. Genet-

ic analyses will be conducted in the future to examine questions related to intra-specific brood parasitism, demographics of parasitic laying hens, paternal effects, and retention of mates across years.

HARVEST

General Information

Waterfowl hunting season frameworks in Nevada are frequently 107 days long with a 7 duck per day bag limit with no restrictions on Wood Ducks. Waterfowl season in Churchill County, NV typically begins in mid-October and concludes in late January. Harvest surveys conducted by USFWS (USFWS 2012) show that Nevada on average harvests 400

Figure 10. Map of hunting recovery locations for wood ducks banded in the Fallon, Nevada area from 2003-2012. Color coded points are summarized by 10-minute blocks of latitude and longitude. One recovery from extreme NE Texas is not represented.

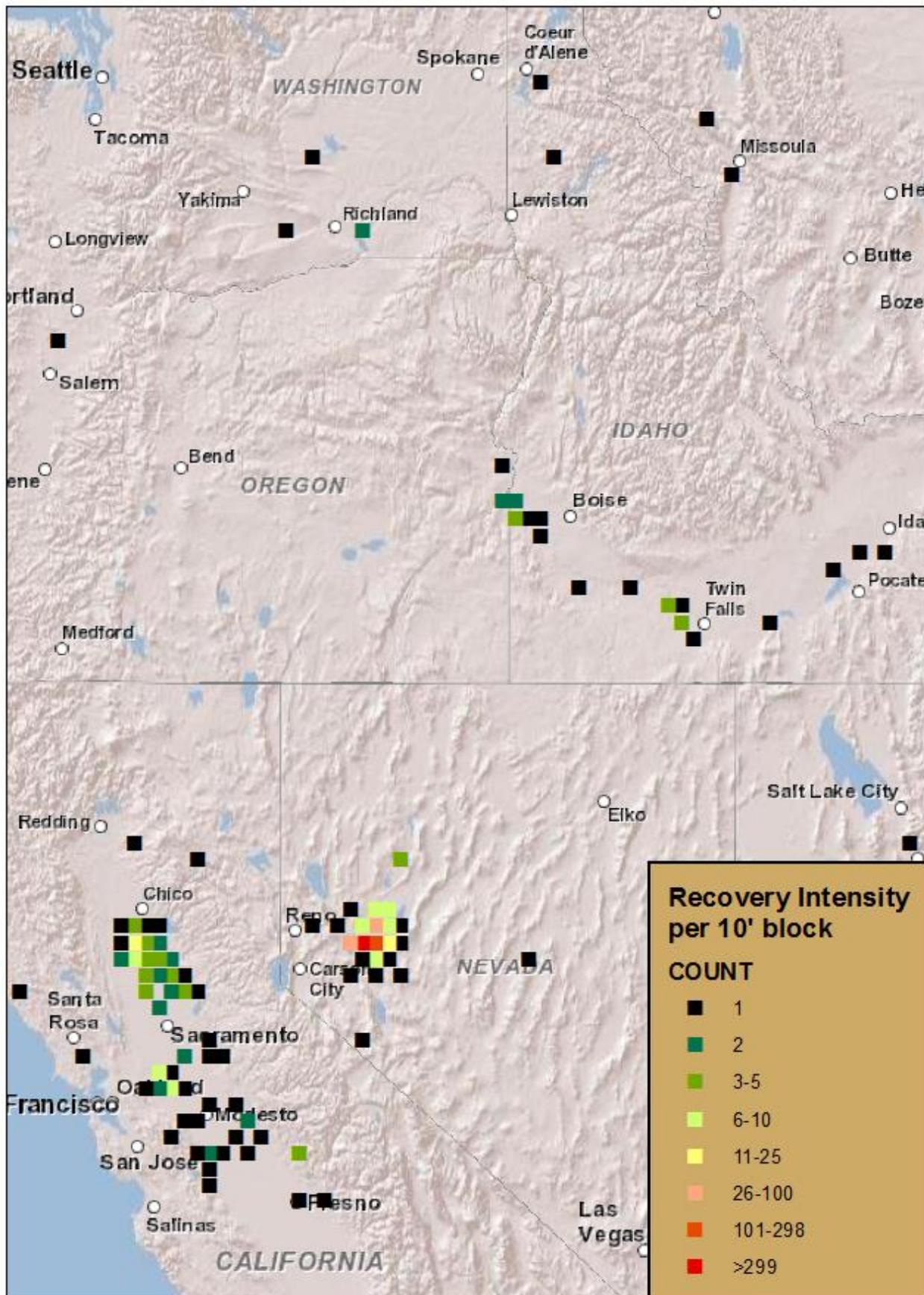
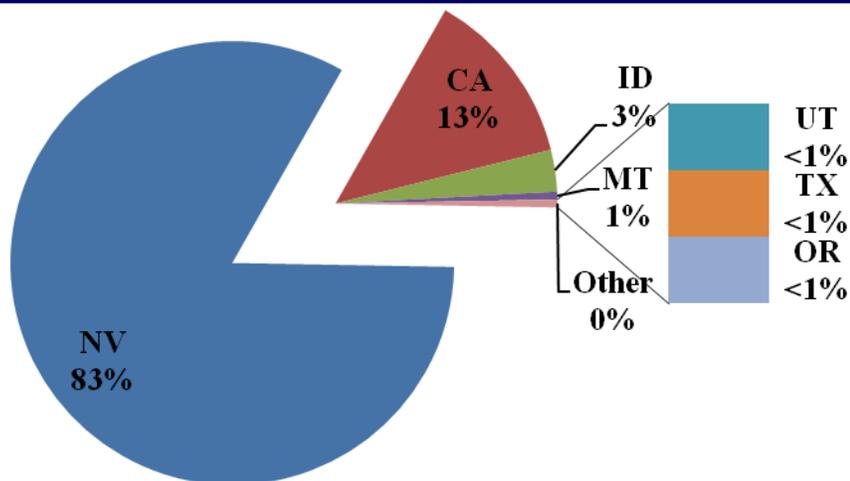


FIGURE 11. Pie chart showing proportion of harvest among states for Wood Ducks banded in Fallon from 2003-2012. A total of 767 shot and reported bands are included.



Wood Ducks or less than one-half of a percent of total duck harvest in Nevada. From the 2003/2004 through 2012/2013 waterfowl seasons, 787 banded Wood Ducks have been shot and reported by hunters distributed among the following states: Nevada (n = 633; 81%), California (n = 117; 15%), Idaho (n = 24; 3%), Montana (n = 2; <1%), Oregon (n = 4; <1%), Texas (n = 1; <1%), Utah (n = 1; <1%), and Washington (n = 4; <1%) (Fig 10). Ninety-nine percent of the Nevada harvest occurs in Churchill County, NV (Fig 10).

Wood Duck hunting in Churchill County, Nevada occurs almost completely on private lands. Therefore it may be difficult for waterfowl hunters wanting to harvest Wood Ducks to gain access. Recent estimates of statewide numbers of waterfowl hunters in Nevada have varied from 3212 to 4525 hunters during the course of this study (2003 through 2010; mean = 3983; Espinosa et al. 2010). Of these statewide hunters, approximately 57% (2270) hunt ducks in Churchill County annually (Espinosa et al. 2010).

From the 787 band recovery reports, 767 have names associated with each recovery. These 767 recoveries represent a total of

346 different hunters (varies from 2 to 82 different hunters annually). A total of 150 band reports with names were associated with recoveries outside of Nevada and are represented by 149 unique individuals (one California hunter has reported 2 bands). For Nevada-specific recoveries from 2003-2012, a total of 617 band recoveries were reported by 197 unique people and varies from 2 to 58 different people annually. Of the hunters reporting banded Wood Ducks in Churchill County, Nevada, 60% of hunters who reported bands only reported one band from 2003-2012; these single recovery hunters account for 19% of

all Nevada recoveries. Fifty percent of the Nevada recoveries come from 17 individuals. This pattern of harvest distribution among hunters is very unique (99% of harvest away from Nevada comes from hunters who show up in our sample only once compared to 19% in Nevada). These results show that a large proportion of Wood Duck harvest in Churchill County, NV is not driven by hunters who rarely target Wood Ducks (i.e., typical waterfowl hunter), but rather harvest is driven by a small number of hunters (n = 17 hunters) who target wood ducks and account for 50% of the harvest of Wood Ducks in Churchill County, Nevada.

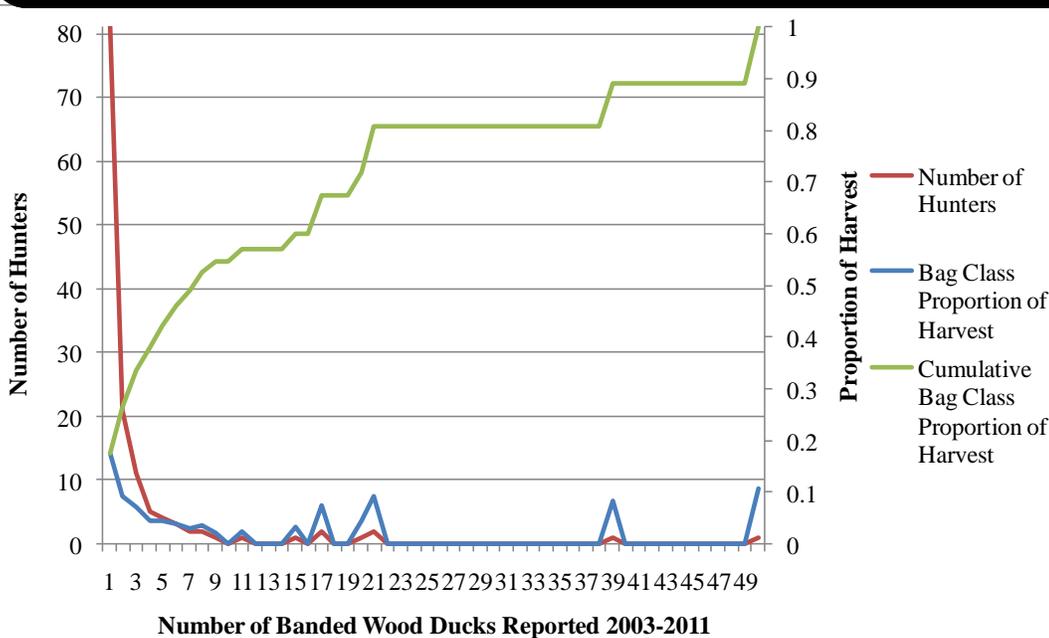
Harvest Experiment

Waterfowl harvest managers have been requesting a study to examine the relationship between harvest and sustainable population management (Sedinger and Herzog 2012). This question has not been addressed due to the difficulties of providing an experimental approach to separate the effects of harvest from population dynamics. The stabilized regulations experiment in the 1980's was a continental experiment to provide information for this question. However, the experiment was not fully carried out as North



Hunters measuring Wood Ducks they shot

FIGURE 12. Graph showing number of hunters which have reported varying numbers of banded Wood Ducks harvested in Churchill County from 2003 through 2010 (red line). The blue line represents the product of the number of hunters and the number in each class of number reported. The green line shows cumulative harvest across numbers reported by each individual. The main point with this graph is that of the 139 hunters which have reported banded Wood Ducks in the Fallon area, 11 individual hunters account for 50% of the harvest.



effects of harvest from environmental drivers of population dynamics.

The current focus of the Fallon wood duck project is the harvest experiment (see Nicolai 2011). The project proposed in 2011 to induce variation in harvest rate across years to obtain both high levels of harvest (>20%) and extremely low levels of harvest (<10%). Data collected before 2011 allows for a third, moderate treatment (between 10% and 20% harvest rates). This experiment was the initial purpose of an annual information meeting (referred to as the “spaghetti feed”). The process of beginning this

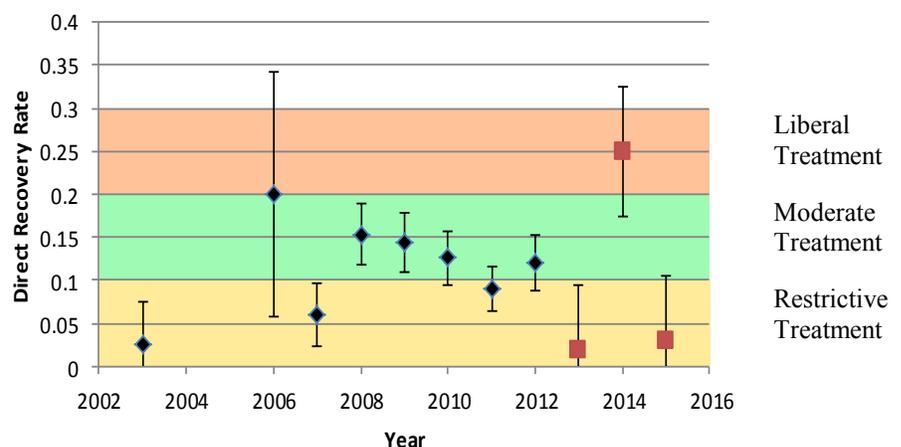
American duck population declined substantially due to the drought of the mid-1980’s. Currently, waterfowl harvest management is carried out in a conservative fashion in that it is unclear how harvest drives population dynamics. For example, the continental pintail population has shown a marked decline and management has responded such that harvest of pintails is currently extremely conservative although Rice et al (2010) showed that harvest restrictions implemented in the 1980’s have not produced an increase in annual survival. There is a great need in the waterfowl management community to address the questions regarding effects of waterfowl harvest (Sedinger and Herzog 2012).

As mentioned in the previous section (Harvest – General Information), the Fallon wood duck project provides a unique situation to address the impacts of harvest on waterfowl population dynamics. While the project is fre-

quently criticized for studying a species so few Nevadans harvest, wood ducks provide an excellent surrogate for nearly all waterfowl species in North America for examining this important management question. The ability to track individuals throughout their lifetimes and have a highly localized population provides an excellent laboratory for disentangling the

experiment included talking to the public, then the Washoe and Churchill County Advisory Boards for the Management of Wildlife, and finally to the Nevada Wildlife Commission. For the 2011-2012 waterfowl hunting season, the Nevada Wildlife Commission reduced the daily bag for wood ducks in Churchill County to only one per day in an attempt to obtain har-

FIGURE 13. Graph showing recovery rate \pm 95% CI for wood ducks banded in Fallon, Nevada from 2003– 2012. Colored regions show the three treatment levels prescribed for the harvest experiment. Values for 2013-2015 are hypothetical and are coded with red symbols.



vest rates <10%. For the 2012-2013 waterfowl season, the daily bag returned to 7 wood ducks per day and it was encouraged for hunters to hunt wood ducks more often and landowners to allow more people to access their properties.

In the years preceding the harvest experiment, harvest varied between 9% and 15% (fig 13). In the 2011-12 hunting season, harvest dropped to 9%. In the 2012-13 season, harvest was 13% (Figure 13). As outlined in Nicolai (2011), the experiment is to include two replicates of the harvest level treatments. The proposal is to have the 2013-14 season be another restrictive year and the 2014-15 season be another liberal year. As seen in figure 13, the seasons of 2011-12 and 2012-13 did not fully meet the prescribed treatment levels and it is hoped that future discussions will provide input into how these goals can be more accurately met.

OUTREACH AND TRAINING

Extensive efforts to include as many members of the community as possible have provided opportunities to interact with this project through hands-on experience, community service, and presentations.

Hundreds of undergraduate students from the Wildlife Program at UNR have been involved with the project. The bulk of them have come out each September beginning in 2007 as part of a field trip to learn how to capture, mark, and process waterfowl. Many students in this class have become very involved the following spring helping to search for nests. One graduate student worked on the project and used the data collected to satisfy partial requirements to earning her PhD. Currently, one Master's student (Steve Olson) has completed his thesis using the Wood Duck dataset. Steve currently works for USFWS – Division of Migratory Bird



Photographs from 2007 through 2011 (top to bottom) of the UNR Junior level wildlife class field trip to learn waterfowl capture and marking techniques led by Dr. Kelley Stewart. Landowners like Larry and Trini O'Shaughnessey contribute in multiple ways to the project by allowing access to their property, maintaining bait sites, and providing an excellent opportunity to learn.

Management as the Assistant Pacific Flyway Representative.

Secondary students from both Reno and Fallon have been very active in building nesting boxes. Reno High School students constructed and even came out and installed >100 nesting boxes in the springs of 2009, 2010, and 2013. Three Eagle Scouts and their troops have used the project to satisfy their requirements to become Eagle Scouts.

A spaghetti feed has been held each summer in Fallon as a way to bring everyone who has an interest in the Wood Duck project together. Invitations are sent to biologists, landowners, waterfowl hunters, and law enforcement officers. The plan in the future is to use an annual information dinner as a way to communicate to the Fallon community progress and new information about the project.

Many landowners participate in the project beyond just providing access to their properties. Some maintain baiting sites to facilitate captures. Others read bands from their kitchen windows and report their sighting to be used in analyses.

Many presentations have been made to Reno and Fallon High Schools, Fallon rotary club, University of Nevada Reno wildlife classes, and Lahontan Audubon Society. Professional presentations have been made at the 2009 and 2013 North American Duck Symposiums and the 2012 Pacific Flyway Study Committee.

Given the year round nature of the project to capture wood ducks, the project has also been used as a training opportunity for other waterfowl biologists throughout the west. In 2012, a two-day rocket net training and safety class was taught in Fallon.

CONCERNS

A key concern has emerged in the last few years regarding a phenomenon in which bird bands

have become a trophy item. Waterfowl bands have been a treasured item for a lucky hunter for many decades. However, in the last decade, a heightened value has emerged in association with waterfowl bands. However, in some cases, a monetary value has been associated with bands as a market exists for the sale and purchase of harvested waterfowl bands. In most cases, the method of obtaining these bands is completely legal, there are, however, many cases where almost any means necessary will be employed to obtain banded birds including baiting, shooting out of season, shooting before or after hours, and trespassing (all illegal and rumored to be occurring in this project). It is locally known that hunters are targeting Wood Ducks for their bands and in some cases, some hunters travel great distances to the Fallon area to target Wood Ducks due to the high proportion of banded birds in the population. While this practice is typically very legal, it would benefit the project if peer pressure and knowledge of the Fallon Wood Duck project would encourage reporting of bands and less than ethical behavior. Informed hunters could make a huge contribution by communicating with their peers to report their bands. Landowners in the Fallon area would also benefit the project by talking with hunters accessing their property about reporting their bands and following ethical hunter etiquette.

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