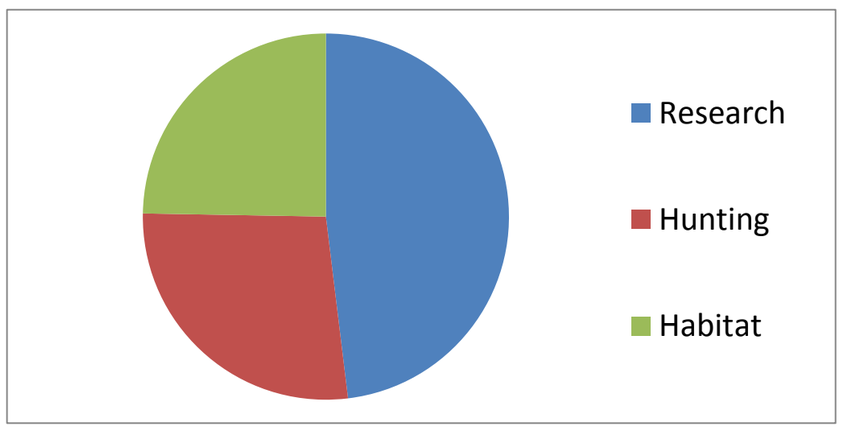
# California Department of Fish and Wildlife

# FY 2016-2017

# Upland Game Bird Stamp Account Grant Proposals

# Contents

| Unique Project Number | Organization (Alphabetical) | Proposal Title | Proposal Amount | Year 1 request | Project Duration | Proposal Category |
|---|---|---|---|---|---|---|
| 1 | CWA | Badger Almond Public Hunt Program | $15,610.00 | $15,610.00 | 1 year | Hunting |
| 2 | CWA | Houchin Unit Upland Restoration | $57,604.63 | $57,604.63 | 1 year | Habitat |
| 3 | CWA | Llano Seco Unit Upland Restoration, Free Roam Phase I | $52,116.60 | $52,116.60 | 1 year | Habitat |
| 4 | CWA | Llano Seco Unit Upland Restoration, Free Roam Phase II | $50,113.20 | $50,113.20 | 1 year | Habitat |
| 5 | DWU | Development of Upland Game Bird Habitat | $295,280.97 | $98,426.99 | 3 years | Hunting |
| 6 | GBRG | Range expansion and habitat associations of White-tailed Ptarmigan in the Sierra Nevada Mountains. | $16,936.00 | $16,936.00 | 1 year | Research |
| 7 | GBRG | Use of bioacoustic monitoring to study vocalization behavior and space use by male Ring-necked Pheasants in areas managed for Tri-colored Blackbirds. | $39,836.80 | $39,836.80 | 1 year | Research |
| 8 | GBRG | Use of fecal DNA to determine the sex ratio and abundance of Sierra Sooty Grouse. | $60,684.00 | $60,684.00 | 1 year | Research |
| 9 | Humboldt | Ruffed Grouse Trend Monitoring Design and Implementation | $55,020.00 | $55,020.00 | 1 year | Research |
| 10 | NWTF | Influences of Hunting on Movements of Male Wild Turkeys During Spring | $23,484.50 | $23,484.50 | 1 year | Research |
| 11 | NWTF | Knoxville WA Water for Wildlife | $17,240.42 | $17,240.42 | 1 year | Habiat |
| 12 | PF | Grizzly Island Wildlife Area Pheasant Habitat Project | $36,740.00 | $36,740.00 | 1 year | Habitat |
| 13 | PF | New Technologies to Evaluate Band-Tailed Pigeon Mineral Site Use and Increased Disease Surveillance | $66,500.00 | $42,850.00 | 2 years | Research |
| 14 | QF | Central and Southern Upland Game Developed Water Structure Inventory and Master Data Base Creation | $76,862.00 | $38,431.00 | 2 years | Habitat |
| 15 | QF | Monitoring of Pheasant population vital rates AND SPACE USE in the Central Valley and Klamath Basin, California | $62,617.00 | $62,617.00 | 1 year | Research |
| 16 | QF | Upland Game Developed Water Structure Reconstruction and Maintenance | $36,124.00 | $36,124.00 | 1 year | Habitat |
| 17 | SCI-Orange | Mojave National Preserve Youth Quail Hunt and BLM Land Wildlife Guzzlers Restoration | $48,729.00 | $16,243.00 | 3 years | Hunting |
| 18 | SWS | Ecological study of wild turkey (Meleagris gallopavo) in San Diego County | $107,050.00 | $84,750.00 | 2 years | Research |
| 19 | WEI | Developing and implementing a population assessment survey to examine impacts of forest change on forest galliforms in California: a pilot study | $203,266.00 | $87,174.00 | 2 years | Research |
| | | **Total proposals = 19** | **$1,321,815.12** | **$892,002.14** | | |




| | |
|---|---|
| **Research** | $635,394.30 |
| **Hunting** | $359,619.97 |
| **Habitat** | $326,800.85 |

# Upland Game Bird Account Project Proposal

**1. Project Title:** CWA Badger Almond Public Hunt Program

**2. Amount Requesting:** $15,610

**3. Organization:** California Waterfowl Association, Tax ID 94-1149574
**Name:** Jeff Smith, Hunt Program Coordinator
**Phone:** (530) 305-9234
**Email:** jsmith@calwaterfowl.org
**Contract Authorization:** John Carlson, President (916) 648-1406

**4. Introduction: Hunter Opportunity**

California hunting license sales have dropped steadily from 767,149 in 1970 to 266,220 in 2015. A leading cause of this drop is the loss of hunting opportunities and access. To help reverse this trend and to recruit, retain, and reintroduce hunters to the field California Waterfowl Association (CWA) developed a program based upon the Department of Fish and Wildlife's lottery system for hunting on public lands. Through CWA's relationship with private landowners, the program has created access to private lands and has been identified as the California Waterfowl Hunt Program. The program has grown steadily over the past seven years and now includes over 40 individual properties encompassing over 50,000 acres. Since the inception, over 5,000 hunters have participated in the program with hundreds of landowners and volunteers providing in-kind services (hosting, guiding hunts, etc.) and access to high quality hunting opportunities to the general public. The program currently hosts waterfowl, pheasant, dove, turkey, and pig hunts. In addition to providing opportunities to the general public, specialty hunts cater to families, youth (apprentice), women, mobility impaired hunters and veterans. Applicants have an extensive variety of hunts to choose from which include access to some of the most prestigious and exclusive hunting properties in the country. Hunt locations range from the Klamath Basin in northern California to San Jacinto Valley in southern California.

In the spring of 2014, through a Wildlife Conservation Board (WCB) Grant, CWA acquired 2,200+ acres in Kern County. The acreage is made up of two separate properties known as the Houchin and the Badger Almond parcels and is collectively referred to as Goose Lake. The Badger Almond property is in need of habitat restoration and development of infrastructure before it can be fully utilized for waterfowl hunting, but has hosted successful dove hunts over the past two years.

Since 2014, 650 hunters have hunted on Badger Almond and Houchin. The proposal requests funding to help offset the substantial operating costs of running an upland game public hunt program on Badger Almond. We anticipate more than 140 people will enjoy time upland game hunting as part of the Badger Almond Hunt Program.

**5. Project Description:**

Goose Lake is one of three Regional Conservation and Education Centers CWA owns throughout the state. The priority use of Goose Lake is to host a wide variety of Hunting Heritage Program events including environmental education, youth, family, veteran, and general hunts through controlled and managed public access.

The proposed 2017 project will fund the installation of three wildlife guzzlers on Badger Almond. The installation of the three guzzlers will provide vital aid to upland bird survival. We propose a stocking program of 500 pheasants throughout the regular pheasant hunting season. We will host 14 hunt days in the fall reaching 10-15 hunters per date. Hunters will be provided with hunt map on specific hunt zones and past hunter success. During shoot days, hunters will be allowed to harvest dove in addition to pheasants. The hunt will be advertised as a combo pheasant and dove hunt with the main focus on the pheasant hunt.

CWA will handle reservations and liability waivers through the well-established CWA Hunting Heritage program. Hunters are chosen through a random lottery process administered by a third party. CWA provides professional staff, including a Hunt Program Coordinator and the necessary supervisory and support staff to administer all aspects of the hunt program, including but not limited to general correspondence, advertising, habitat management, hunting preparation, hosting hunts, accounting, invoicing, reporting, etc. CWA has a well-established track record, fiscal policies and procedures to effectively administer and manage this very successful hunt program.

The hunt program at Badger Almond will consist of fourteen hunt periods (Wednesday and Saturday) from November - December. Each hunt period will include five hunting parties of two (may consist of three hunters if one or more hunters are juniors). These hunt periods will accommodate more than 140 hunters.

How the Application Process Works:

- All applicants apply via a secured application webpage on calwaterfowl.org.
- Each hunt application has a small processing fee. There is only one application per hunt, per person rule to allow a variety of applicants an unforgettable hunting experience.
- After the hunt winner and guest(s), pay the $25 hunter access fee and completes the liability forms, CWA then sends the hunt details to the hunting party.
- Hunter access fees are waived for all junior hunters.
- Each hunter fills out liability forms via online and the day of the hunt.
- Applicants are not required to be CWA members.
- CWA supplies liability insurance up to $1,000,000 Common Cause and $3,000,000 Aggregate.

CWA will advertise and promote the pheasant and dove hunt program as public hunting opportunities through direct mailers to California hunters, CWA magazine (18,000+ members), outdoor magazines including Western Outdoor News, and submitting local press releases to local news outlets. These outreach efforts will educate hunters about the new public hunting opportunities at CWA's Goose Lake properties.

## 6. Expected Benefits:

This project will provide 14 hunt days reaching 140+ hunters directly and several thousand hunters indirectly through advertisement and educational routes, all to help recruit, retain, and reintroduce hunters to the field and reverse the downward trend in hunting license sales. The leading cause in the drop of hunting license sales is the loss of hunting opportunities. This pheasant release proposal will help to continue providing additional high quality upland game hunting opportunities to the general public. The wildlife guzzlers will improve the quality of the upland birds and benefit wildlife.

## 7. Itemized Budget:

| Upland Game Bird Account Project Proposal | | | | | | |
|---|---|---|---|---|---|---|
| | | **Location** | | | | |
| **Project Title:** | **2017 CWA Badger Almond Public Hunt Program** | **Goose Lake, Kern County CA** | | | | |
| | | | | | | |
| **Budget Line Item #** | **Work/Item Description** | **Count** | **Units** | | **Cost/Unit** | **CDFW Grant Funding** |
| | | | | | | |
| **MATERIALS:** | | | | | | |
| 1 | Pheasants | 500 | Per | @ | $18.00 | $9,000.00 |
| 2 | Wildlife Guzzlers | 3 | Per | @ | $950.00 | $2,850.00 |
| | **Materials Subtotal** | | | | | **$11,850.00** |
| | | | | | | |
| **CONSTRUCTION** | | | | | | |
| 3 | Guzzler Installation | 3 | Per | @ | $200.00 | $600.00 |
| | **Construction Subtotal** | | | | | **$600.00** |
| | | | | | | |
| **OPERATING EXPENSES:** | | | | | | |
| 4 | Mileage | 2000 | miles | @ | $0.58 | $1,160.00 |
| 5 | Misc. Materials and Supplies (Mailers, Advertisements, News Letters, etc.) | 1 | Lump Sum | @ | $2,000.00 | $2,000.00 |
| | **Operating Subtotal** | | | | | **$3,160.00** |
| **PROJECT COST:** | | | | | | **$15,610.00** |
| | | | | | | |
| 6 | **TOTAL UPLAND GAME BIRD STAMP GRANT REQUEST** | | | | | **$15,610.00** |


CALIFORNIA WATERFOWL
Hunting for a Better California

**California Waterfowl Association**
**Badger Almond Goose Lake Property**
**926 Acres**

# Upland Game Bird Account Project Proposal

**1. Project Title:** CWA Houchin Unit Upland Restoration

**2. Amount Requested:** **$57,604.63**

**3. Organization:** California Waterfowl Association
**Name:** Jon Pickett, Tulare Basin Regional Biologist
**Phone #:** (916) 662-5776
**Email:** jpickett@calwaterfowl.org
**Contract Authorization:** John Carlson, 1346 Blue Oaks Blvd, Roseville CA 95678; (916) 648-1406

**4. Introduction:** California hunting license sales have dropped steadily from 767,149 in 1970 to 266,220 in 2015. A leading cause of this drop is the loss of hunting opportunities and access. To help reverse this trend and to recruit, retain, and reintroduce hunters to the field, California Waterfowl Association (CWA) developed a program based upon the Department of Fish and Wildlife's lottery system for hunting on public lands. Through CWA's relationship with private landowners, the program has created access to private lands and has been identified as the California Waterfowl Hunt Program. The program has grown steadily over the past seven years and now includes almost 40 individual properties encompassing over 50,000 acres. Since the inception, over 5,000 hunters have participated in the program with hundreds of landowners and volunteers providing in-kind services (hosting, guiding hunts, etc.) and access to high quality hunting opportunities to the general public. The program currently hosts waterfowl, pheasant, dove, turkey, and pig hunts. In addition to providing opportunities to the general public, specialty hunts cater to families, youth (apprentice), women, mobility impaired hunters and veterans. Applicants have an extensive variety of hunts to choose from which include access to some of the most prestigious and exclusive hunting properties in the country. Hunt locations range from the Klamath Basin in northern California to San Jacinto Valley in southern California.

In the spring of 2014, through a Wildlife Conservation Board (WCB) Grant, CWA acquired 2,200+ acres in Kern County. The acreage is made up of two separate properties known as Houchin and Badger Almond, and collectively referred to as Goose Lake. The Badger Almond property is undergoing a habitat restoration project which began in 2015 and upon completion will have the capabilities to host waterfowl hunts, however, the property has had the opportunity to host successful dove hunts over the past two years. The Houchin property has hosted two successful waterfowl hunting season since 2014 with 610 people partaking in the hunts. An additional 40 hunters have successfully partaken in dove hunts on both Badger Almond and Houchin. It is estimated that the identified enhancement efforts will allow CWA's hunt program to increase public hunting opportunities by as many as 10 hunters per day on designated hunt days. In a region that is limited in its public hunting opportunities with no public upland game bird access, this project will significantly lay the foundation for allowing the public to enjoy an upland game bird hunting experience.

We are proposing to develop 75 acres (currently fallow agriculture) adjacent to established seasonal wetland habitat units and upland winter wheat. The two established winter wheat fields (planted December 2014), specifically developed for nesting waterfowl and upland game birds, hosted numerous successful dove hunts and provided tremendous nesting habitat for waterfowl. Of the proposed acreage, 59 of the 75 acres do not have the conveyance to receive irrigation water due to the lack of infrastructure. The fields currently have very little to no habitat value for upland bird species nor does it provide a quality area for public hunting opportunities.

**5. Project Description:** This project will develop 75 acres of irrigatable upland habitat adjacent to established seasonal wetlands and an established winter wheat field (31 acres), which was recently refurbished to allow for farming. These 75 acres will provide upland nesting and foraging habitat for pheasants, doves, quail, and other wildlife on CWA's Houchin Unit. The site will be divided into three independent units, which will provide flexibility for annual management supporting wildlife needs and management desires. All 3 units will have independent irrigation and drainage capabilities. The 3 units will be leveled and borders constructed with new water control inlets and outlet structures installed to provide timely irrigation and drainage capabilities. A new 1,550' water delivery pipeline will be installed extending an existing

water pipeline into Unit 1 and Unit 2, thus allowing independent irrigations of the 54 acres. The 16 acre, Unit 3, can currently be irrigated through the 31 acre upland unit currently planted to wheat.

Independent irrigations will allow Unit 1 and Unit 2 to be successfully planted and managed annually as "Food Plots" and will be planted with such crops as winter wheat, milo, corn, sudan grass or millet. These units can also be planted in the early spring with safflower/sunflower which will require little to no irrigation, depending upon precipitation. The food plots will supplement food resources for all upland game birds.

Unit 3, the "Perennial Grass Planting", will be leveled to allow for irrigations and establishment and maintenance into the future. The ability to irrigate this unit will come from new water control structures and perimeter ridges and drain structures helping to establish the perennial grasses regardless of precipitation. The grasses will provide a dependable tall stature nesting cover complex with year round benefits. Part of the establishment will include the spraying of undesirable weeds such and thistles and mustard during the first two years. Controlling weeds will help establishment progress more rapidly.

The development of Units 1-3 will create 75 acres of new manageable habitat, bringing the available upland habitat hunting opportunity to 106 acre of intensively managed food plot and perennial grasses. These improvements will contribute greatly to the overall hunting experience which is available on the 1,531 acres that is available for the public to hunt at Houchin.

CWA will handle reservations and liability waivers through the well-established CWA Hunting Heritage program. Hunters are chosen through a random lottery process administered by a third party. CWA provides professional staff, including a Hunt Program Coordinator and the necessary supervisory and support staff to administer all aspects of the hunt program, including but not limited to general correspondence, advertising, habitat management, hunting preparation, hosting hunts, accounting, invoicing, reporting, etc. CWA has a well-established track record, fiscal policies and procedures to effectively administer and manage this very successful hunt program.

The hunt program, which was first administered on this site during the 2014/15 hunt season, has expanded to host 39 hunts on Wednesday, Saturday Sunday during the 2015-2016 hunt season.

How the Application Process Works:

- All applicants apply via a secured application webpage on calwaterfowl.org.
- Each hunt application has a small processing fee. There is only one application per hunt, per person rule to allow a variety of applicants an unforgettable hunting experience.
- After the hunt winner and guest(s), pay the $25 hunter access fee and completes the liability forms, CWA then sends the hunt details to the hunting party.
- Hunter access fees are waived for all junior hunters.
- Each hunter fills out liability forms via online and the day of the hunt.
- Applicants are not required to be CWA members.
- CWA supplies liability insurance up to $1,000,000 Common Cause and $3,000,000 Aggregate.

CWA will advertise and promote the 1,531 acres as public hunting opportunities through direct mailers to California hunters, CWA magazine (18,000+ members), outdoor magazines including Western Outdoor News, and submitting local press releases to local news outlets. These outreach efforts will educate hunters about the new public hunting opportunities at CWA's Goose Lake properties.

**6. Expected Benefits:** A leading cause in the drop of hunting license sales is the loss of hunting opportunities. The 1,531 acres of newly opened hunting grounds at the Goose Lake properties will increase hunting opportunities, benefiting hunters located in southern California and in and around the southern end of the great central valley, where quality hunting opportunities are extremely limited. This project adds opportunity and will reach 300-500 hunters directly, and several thousand hunters indirectly through advertisement and educational routes. The development of the identified 75 acres will significantly increase upland food resources for doves, pheasants and quail while also improving nesting cover for production of ground nesting birds.

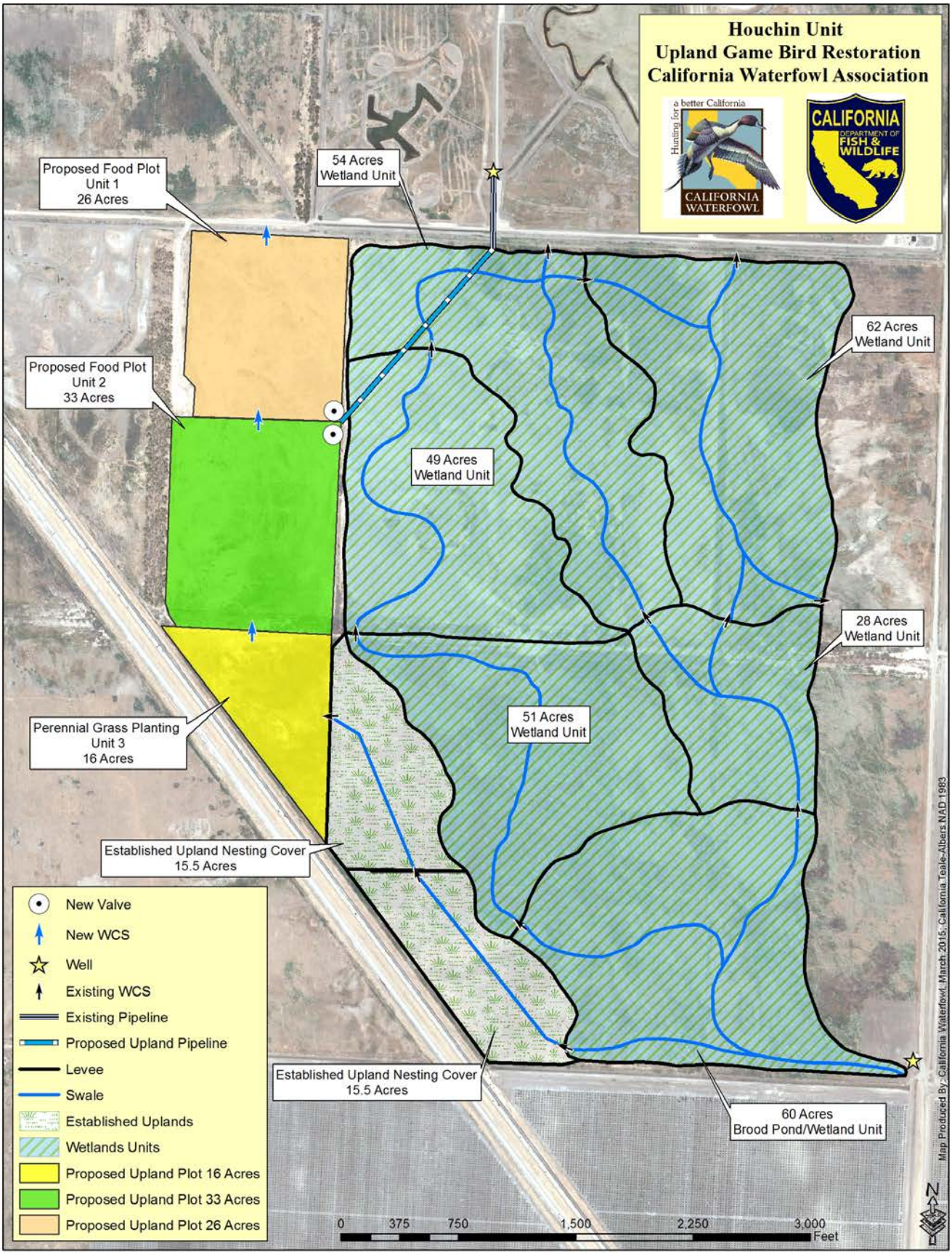
This project will allow CWA staff the ability to intensively manage the uplands and associated wetland habitat as an integrated management complex. Expected benefits will include an increase in yields of planted food plots and perennial upland nesting cover, annually developed by CWA staff, which will enhance foraging resources and production for all bird species. Water management will allow supplies to be used efficiently and help to enhance the results of irrigations and plant establishment. In addition, dominating weed species will be replaced by plants that are managed to maximize upland game bird benefits. Project results will ultimately improve nesting, foraging, rearing and over wintering habitat, which should result in greater pheasant, dove, and quail populations and ultimately more hunter opportunities. All of the proposed 75 acres are within the 1,531 acres open to the public for hunting through the CWA Hunt Program.

# Upland Game Bird Stamp Proposal 2016

| Budget Line Item # | Project Title: CWA Houchin Unit Upland Restoration<br>Work/Item Description | Location: CWA Houchin Unit, Kern County CA<br>Count | Units | | Field #(s): Houchin Unit<br>Cost/Unit | Total |
|---|---|---|---|---|---|---|
| **MATERIALS:** | | | | | | |
| 1 | 1,550' 12" PVC Pipe with 2 Valves | 1,550 | ft | @ | $5.50 | $8,525.00 |
| 2 | 15" HDPE Pipe | 30 | ft | @ | $9.00 | $270.00 |
| 3 | 3x4 Structures for Water Control | 1 | ea | @ | $350.00 | $350.00 |
| 4 | Rice Box | 2 | ea | @ | $150.00 | $300.00 |
| 5 | Perennial Grass Mix - 20 lbs/ac | 320 | lbs | @ | $3.75 | $1,200.00 |
| 6 | Grain Seed - 100 lbs/ac | 5,900 | lbs | @ | $0.40 | $2,360.00 |
| | **Materials Subtotal** | | | | | **$13,005.00** |
| **CONSTRUCTION:** | | | | | | |
| 7 | 1,550' of 12" PVC Pipe Installation | 1,550 | ft | @ | $5.50 | $8,525.00 |
| 8 | Earthwork-Field Contouring | 10,000 | cyd | @ | $1.50 | $15,000.00 |
| 9 | Rows and Boarders | 8 | hr | @ | $95.00 | $760.00 |
| 10 | Pipe and Weir Installation | 1 | ea | @ | $800.00 | $800.00 |
| 11 | Weir and Pipe Delivery | 1 | L/S | | | $500.00 |
| 12 | Spraying for Broadleaf Control (Food Plot 1x) | 54 | ac | @ | $50.00 | $2,700.00 |
| 13 | Spraying for Broadleaf Control (Perennial Grasses 3X) | 48 | ac | @ | $50.00 | $2,400.00 |
| 14 | Field Prep/Planting Grain Seed | 54 | ac | @ | $45.00 | $2,430.00 |
| 15 | Field Prep/No Till Drill - Seeding Perennial Grass | 16 | ac | @ | $45.00 | $720.00 |
| | **Construction Subtotal** | | | | | **$33,835.00** |
| **PERSONNEL SERVICES:** | | | | | | |
| 16 | Senior Biologist | 40 | hours | @ | $32.00 | $1,280.00 |
| 17 | Associate Biologist | 60 | hours | @ | $25.00 | $1,500.00 |
| 18 | Hunt Program Coordinator | 100 | hours | @ | $25.00 | $2,500.00 |
| 19 | Benefits Salaried Staff | | | @ | 34% | $1,795.20 |
| 20 | Hunt Program Assistant | 200 | hours | @ | $17.00 | $3,400.00 |
| 21 | Benefits Temporary Staff | | | | 16% | $544.00 |
| | **Personnel Subtotal** | | | | | **$11,019.20** |
| **OPERATING EXPENSES:** | | | | | | |
| 22 | Mileage | 2,250 | miles | @ | $0.575 | $1,293.75 |
| 23 | Miscellaneous (materials, supplies, etc.) | | | | | $125.00 |
| 24 | Hunt Program Misc.(Mailers, Advertisement, etc.) | | | | | $2,000.00 |
| 25 | Hunt Program Application Software License | 1 | License | @ | $2,500.00 | $2,500.00 |
| | **Operating Subtotal** | | | | | **$5,918.75** |
| **OVERHEAD:** | | | | | | |
| 26 | DFG Paid Overhead (6%) | | | | | $3,826.68 |
| 27 | CWA Paid Overhead (8%) | | | | | $5,102.24 |
| | **Overhead Subtotal** | | | | | **$8,928.91** |

| | | |
|---|---|---|
| **PROJECT COST:** | | **$72,706.86** |
| **PARTNERSHIP CONTRIBUTIONS:** | | |
| *28* | *CWA Paid Overhead (8%)* | *$5,102.24* |
| *29* | *CWA Hunt Program Contribution* | *$10,000.00* |

## TOTAL UPLAND GAME BIRD STAMP GRANT REQUEST $57,604.63


Houchin Unit
Upland Game Bird Restoration
California Waterfowl Association
Proposed Food Plot Unit 1 26 Acres
54 Acres Wetland Unit
62 Acres Wetland Unit
Proposed Food Plot Unit 2 33 Acres
49 Acres Wetland Unit
28 Acres Wetland Unit
Perennial Grass Planting Unit 3 16 Acres
51 Acres Wetland Unit
Established Upland Nesting Cover 15.5 Acres
Established Upland Nesting Cover 15.5 Acres
60 Acres Brood Pond/Wetland Unit
New Valve
New WCS
Well
Existing WCS
Existing Pipeline
Proposed Upland Pipeline
Levee
Swale
Established Uplands
Wetlands Units
Proposed Upland Plot 16 Acres
Proposed Upland Plot 33 Acres
Proposed Upland Plot 26 Acres
0 375 750 1,500 2,250 3,000 Feet
N
Map Produced By: California Waterfowl, March 2015, California Teale-Albers NAD 1983

# Upland Game Bird Account Project Proposal

**1. Project Title:** UBBWA Llano Seco Unit Upland Restoration, Free Roam Phase I

**2. Amount Requested:** $52,116.60

**3. Organization:** California Waterfowl Association
**Name:** Chadd Santerre, Wetland Programs Supervisor
**Phone #:** (916) 275-0983
**Email:** csanterre@calwaterfowl.org
**Contract Authorization:** John Carlson, 1346 Blue Oaks Blvd, Roseville Ca 95678 (916) 648-1406

**4. Introduction:** The proposed restoration effort will improve 92 acres of upland nesting cover on the Upper Butte Basin Wildlife Area's, Llano Seco Unit. The restoration effort will develop a robust stand of dependable perennial grasses associated with the remaining historic sloughs which are inundated throughout the year. The area is dominated by star thistle and short stature annual grasses, which provide limited cover and resources for upland nesting and foraging bird species. The ability to develop a complex of perennial grasses establishing desirable year-round cover will increase the nesting potential and production of desired upland bird species. The perennial grasses will also provide improved fall and winter thermal cover thus helping elevate survival.

This identified free roam area provides roughly 60% of the upland game bird hunting opportunities for the public on the Llano Seco Unit. The last four seasons averaged ±2,400 public hunters at the Llano Seco Unit. The hunters who only selected to hunt upland bird species numbered ±74, with an estimated +300 hunting both waterfowl and upland game species at the same time. Dove hunters during this same time averaged 183 participants. Improvements to habitat conditions will help to improve hunting conditions for the general public on this acreage.

**5. Project Description:** The 92 acres of proposed perennial grasses will be associated with the wildlife area's historic sloughs that offer a year round upland/wetland interface, providing a source of invertebrate rich habitat, ideal for rearing several bird species. We have budgeted for mowing and then multiple diskings which will only be undertaken if a prescribed burn is not accomplished. Burning is the preferred method of preparing the field since it saves significant cost by reducing tractor time and also helps to remove a portion of the existing weed seeds. The project would also work on the removal of thick stands of Himalayan blackberry and fig trees which are a problem along the sloughs. Minor earthwork is projected to help clean up any debris or residual piles of dirt that are fostering the growth of undesirable plants. In some cases filling in holes and smoothing out old ridges will help to make the area safer for the public and allow maintenance equipment to travel over the landscape more efficiently.

The uplands will be prepared prior to the first rains of fall. Approximately two/three weeks following the first rain and once the annual rye grass and other annual plants have germinated an all spectrum herbicide will be sprayed to kill these competing species. Following (±2 weeks) the spraying a no-till drill will be used to plant the DFW approved perennial grass mix. Part of the establishment will include the spraying of undesirable weeds such as thistles, blackberry and mustard as needed during the first two years. Controlling weeds will help establishment progress more rapidly.

The restoration of manageable units has been a priority for the Department of Fish and Wildlife (DFW) and California Waterfowl (CWA) staff. Similar projects have proven to help increase waterfowl and upland game bird production on the UBBWA Little Dry Creek Unit and Gray Lodge Wildlife Areas, which have undergone substantial planting efforts. DFW and CWA found a total of 49 nests in the (planted) perennial grass uplands within Field 117 (107 acres, planted in 2014) and 118 (82 acres, planted in 2010) in the spring of 2015 at the Little Dry Creek Unit. This was the first year of nest searching as part of a multi-year effort looking at perennial grasses and nesting success. DFW and CWA nest searching crews will be surveying these and other sites over the next several years to collect data on success of both pheasant and waterfowl.

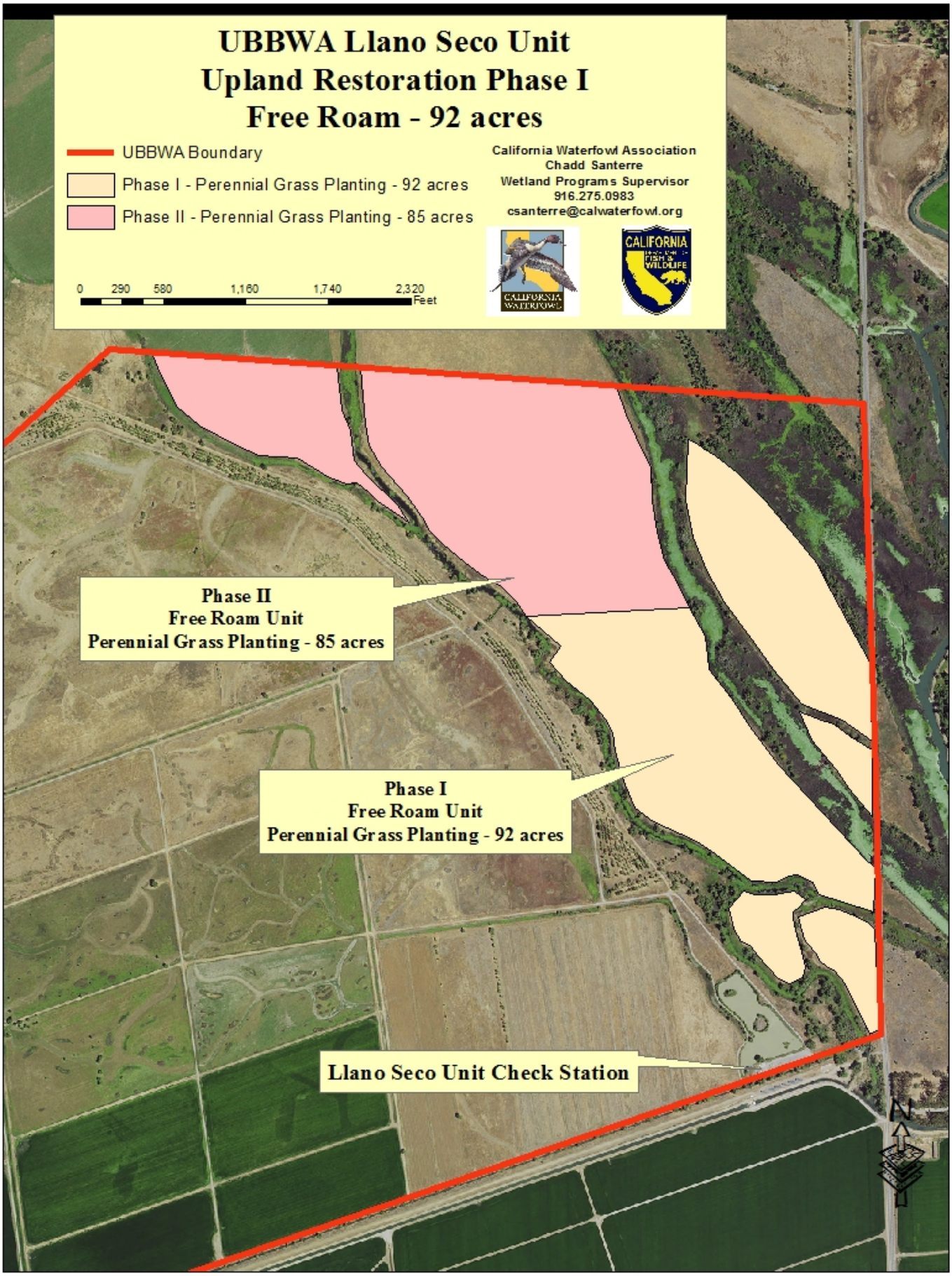
The development of this proposed project was completed by DFW and CWA staff working closely together to identify the site specific needs and the development of solutions to improving these fields. The implementation of this project would be coordinated by CWA with approval of DFW staff on the final design and at the completion of the implemented project. California Waterfowl successfully undertakes between 65-85 projects a year with a construction budget of $5.5-$7.5M on public and private lands throughout the California.

**6. Expected Benefits:** Benefits will include an increase in structure and thickness of cover which will translate into improved nesting conditions and an anticipated increase in production. Dominating weed species will be replaced by grasses that are managed to maximize upland game bird benefits. Project results will ultimately improve nesting cover, foraging, juvenile rearing and overall wintering habitat, which should result in higher pheasant and possibly turkey populations and ultimately more hunter opportunities. The fields will also have a life expectancy of at least 20 years and possibly longer if managed correctly with periodic mowing or burning to enhance growth and remove thatch. All of the fields are within the hunt zone of the wildlife area and will provide enhanced hunting opportunity for the public.

## Upland Game Bird Stamp Proposal 2016
## UBBWA Llano Seco Unit Upland Restoration, Free Roam Phase I

| **Project Title:** | **UBBWA Llano Seco Unit Free Roam Restoration** | **Location** **Llano Seco Unit** | | | **Field #(s)** **Free Roam** | |
|---|---|---|---|---|---|---|
| **Budget Line Item #** | **Work/Item Description** | **Count** | **Units** | | **Cost/Unit** | |
| **CONSTRUCTION:** | | | | | | |
| **1** | Field Contouring/Earthwork | 2,000 | cyds | @ | $2.00 | $4,000.00 |
| 2 | Field Prep and Seeding | 92 | ac | @ | $150.00 | $13,800.00 |
| 3 | Perennial Grass Mix - 20 lbs/ac | 1,840 | lbs | @ | $6.00 | $11,040.00 |
| 4 | Spraying for Broadleaf Control (3 Times) | 276 | ac | @ | $55.00 | $15,180.00 |
| | **Construction Subtotal** | | | | | **$44,020.00** |
| **PERSONNEL SERVICES:** | | | | | | |
| 5 | Senior Biologist | 40 | hours | @ | $32.00 | $1,280.00 |
| 6 | Associate Biologist | 80 | hours | @ | $25.00 | $2,000.00 |
| 7 | Benefits Salaried Staff | | | @ | 34% | $1,115.20 |
| | **Personnel Subtotal** | | | | | **$4,395.20** |
| **OPERATING EXPENSES:** | | | | | | |
| 8 | Mileage | 1,160 | miles | @ | $0.540 | $626.40 |
| 9 | Miscellaneous (materials, supplies, etc.) | | | | | $125.00 |
| | **Operating Subtotal** | | | | | **$751.40** |
| **OVERHEAD:** | | | | | | |
| 10 | DFG Paid Overhead (6%) | | | | | $2,950.00 |
| 11 | CWA Paid Overhead (8%) | | | | | $3,933.33 |
| | **Overhead Subtotal** | | | | | **$6,883.32** |
| **PROJECT COST:** | | | | | | **$56,049.92** |
| **PARTNERSHIP CONTRIBUTIONS:** | | | | | | |
| *12* | *CWA Paid Overhead (8%)* | | | | | *$3,933.33* |

**TOTAL UPLAND GAME BIRD STAMP GRANT REQUEST** **$52,116.60**


UBBWA Llano Seco Unit
Upland Restoration Phase I
Free Roam - 92 acres
UBBWA Boundary
Phase I - Perennial Grass Planting - 92 acres
Phase II - Perennial Grass Planting - 85 acres
0 290 580 1,160 1,740 2,320
Feet
California Waterfowl Association
Chadd Santerre
Wetland Programs Supervisor
916.275.0983
csanterre@calwaterfowl.org
Phase II
Free Roam Unit
Perennial Grass Planting - 85 acres
Phase I
Free Roam Unit
Perennial Grass Planting - 92 acres
Llano Seco Unit Check Station
N

# Upland Game Bird Account Project Proposal

**1. Project Title:** UBBWA Llano Seco Unit Upland Restoration, Free Roam Phase II

**2. Amount Requested:** $50,113.20

**3. Organization:** California Waterfowl Association
**Name:** Chadd Santerre, Wetland Programs Supervisor
**Phone #:** (916) 275-0983
**Email:** csanterre@calwaterfowl.org
**Contract Authorization:** John Carlson, 1346 Blue Oaks Blvd, Roseville Ca 95678 (916) 648-1406

**4. Introduction:** The proposed restoration effort will improve 85 acres of upland nesting cover on the Upper Butte Basin Wildlife Area's, Llano Seco Unit and is a continuation of the Phase I project that is proposed. Both the Phase I and the Phase II proposals could be conducted independently or at the same time. The restoration effort will develop a robust stand of dependable perennial grasses associated with the remaining historic sloughs which are inundated throughout the year. The area is dominated by star thistle and short stature annual grasses, which provide limited cover and resources for upland nesting and foraging bird species. The ability to develop a complex of perennial grasses establishing desirable year-round cover will increase the nesting potential and production of desired upland bird species. The perennial grasses will also provide improved fall and winter thermal cover thus helping elevate survival.

This identified free roam area provides roughly 60% of the upland game bird hunting opportunities for the public on the Llano Seco Unit. The last four seasons averaged ±2,400 public hunters at the Llano Seco Unit. The hunters who only selected to hunt upland bird species numbered ±74, with an estimated +300 hunting both waterfowl and upland game species at the same time. Dove hunters during this same time averaged 183 participants. Improvements to habitat conditions will help to improve hunting conditions for the general public on this acreage.

**5. Project Description:** The 85 acres of proposed perennial grasses will be associated with the wildlife area's historic sloughs that offer a year round upland/wetland interface, providing a source of invertebrate rich habitat, ideal for rearing several bird species. We have budgeted for mowing and then multiple diskings which will only be undertaken if a prescribed burn is not accomplished. Burning is the preferred method of preparing the field since it saves significant cost by reducing tractor time and also helps to remove a portion of the existing weed seeds. The project would also work on the removal of thick stands of Himalayan blackberry and fig trees which are a problem along the sloughs. Minor earthwork is projected to help clean up any debris or residual piles of dirt that are fostering the growth of undesirable plants. In some cases filling in holes and smoothing out old ridges will help to make the area safer for the public and allow maintenance equipment to travel over the landscape more efficiently.

The uplands will be prepared prior to the first rains of fall. Approximately two/three weeks following the first rain and once the annual rye grass and other annual plants have germinated an all spectrum herbicide will be sprayed to kill these competing species. Following (±2 weeks) the spraying a no-till drill will be used to plant the DFW approved perennial grass mix. Part of the establishment will include the spraying of undesirable weeds such as thistles, blackberry and mustard as needed during the first two years. Controlling weeds will help establishment progress more rapidly.

The restoration of manageable units has been a priority for the Department of Fish and Wildlife (DFW) and California Waterfowl (CWA) staff. Similar projects have proven to help increase waterfowl and upland game bird production on the UBBWA Little Dry Creek Unit and Gray Lodge Wildlife Areas, which have undergone substantial planting efforts. DFW and CWA found a total of 49 nests in the (planted) perennial grass uplands within Field 117 (107 acres, planted in 2014) and 118 (82 acres, planted in 2010) in the spring of 2015 at the Little Dry Creek Unit. This was the first year of nest searching as part of a multi-year effort looking at perennial grasses and nesting success. DFW and CWA nest searching crews will be surveying these and other sites over the next several years to collect data on success of both pheasant and waterfowl.

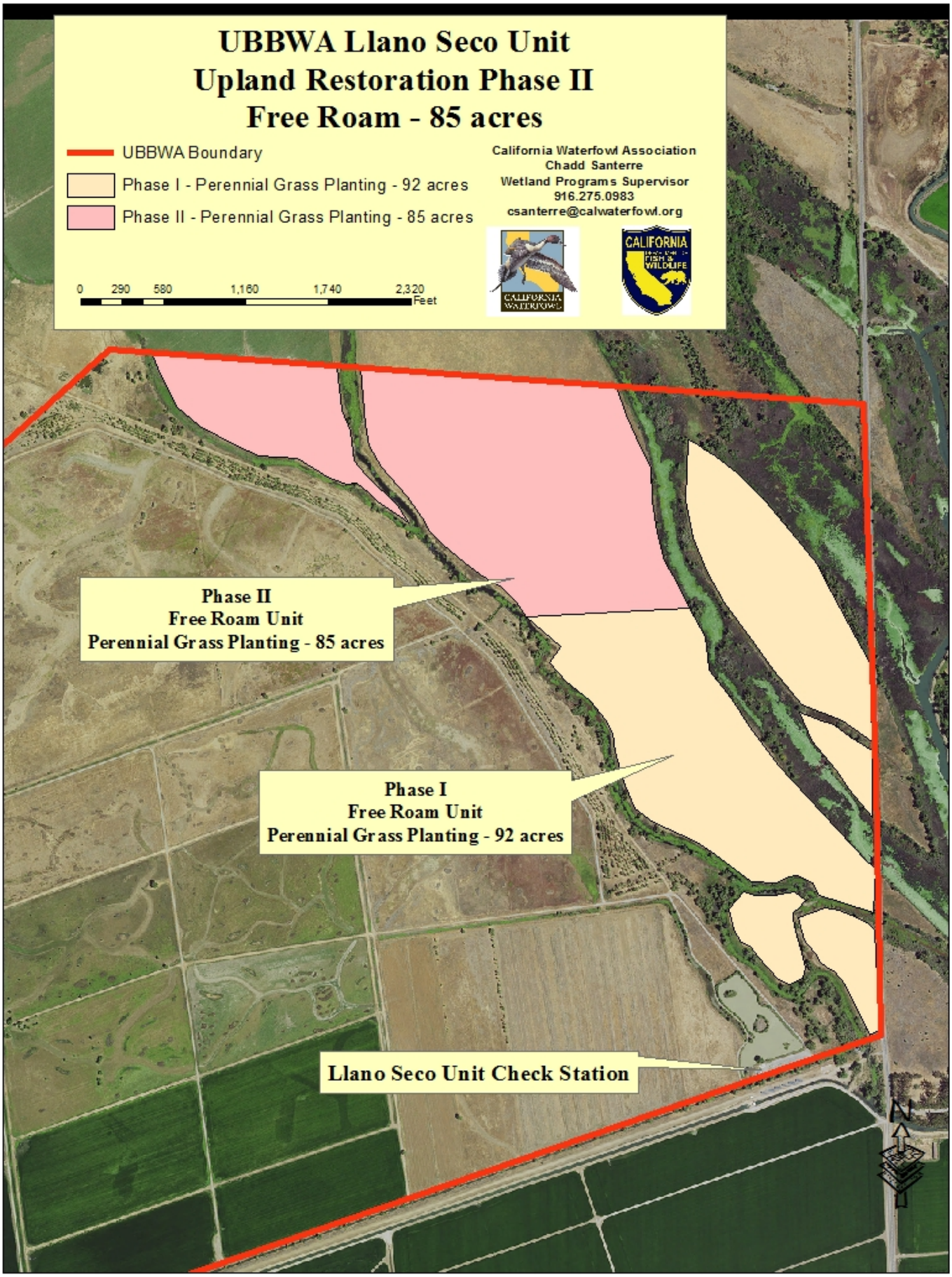
The development of this proposed project was completed by DFW and CWA staff working closely together to identify the site specific needs and the development of solutions to improving these fields. The implementation of this project would be coordinated by CWA with approval of DFW staff on the final design and at the completion of the implemented project. California Waterfowl successfully undertakes between 65-85 projects a year with a construction budget of $5.5-$7.5M on public and private lands throughout the California.

**6. Expected Benefits:** Benefits will include an increase in structure and thickness of cover which will translate into improved nesting conditions and an anticipated increase in production. Dominating weed species will be replaced by grasses that are managed to maximize upland game bird benefits. Project results will ultimately improve nesting cover, foraging, juvenile rearing and overall wintering habitat, which should result in higher pheasant and possibly turkey populations and ultimately more hunter opportunities. The fields will also have a life expectancy of at least 20 years and possibly longer if managed correctly with periodic mowing or burning to enhance growth and remove thatch. All of the fields are within the hunt zone of the wildlife area and will provide enhanced hunting opportunity for the public.

## Upland Game Bird Stamp Proposal 2016
## UBBWA Llano Seco Unit Upland Restoration, Free Roam Phase II

| Upland Game Bird Stamp Proposal 2016 | | | | | | |
|---|---|---|---|---|---|---|
| **Project Title:** | **UBBWA Llano Seco Unit Free Roam Restoration** | **Location** **Llano Seco Unit** | | | **Field #(s)** **Free Roam** | |
| **Budget Line Item #** | **Work/Item Description** | **Count** | **Units** | | **Cost/Unit** | |
| **CONSTRUCTION:** | | | | | | |
| **1** | Field Contouring/Earth Work | 2,000 | cyds | @ | $2.00 | $4,000.00 |
| 2 | Field Prep and Seeding | 85 | ac | @ | $150.00 | $12,750.00 |
| 3 | Perrenial Grass Mix - 20 lbs/ac | 1,700 | lbs | @ | $6.00 | $10,200.00 |
| 4 | Spraying for Broadleaf Control (3 Times) | 276 | ac | @ | $55.00 | $15,180.00 |
| | **Construction Subtotal** | | | | | **$42,130.00** |
| **PERSONNEL SERVICES:** | | | | | | |
| 5 | Senior Biologist | 40 | hours | @ | $32.00 | $1,280.00 |
| 6 | Associate Biologist | 80 | hours | @ | $25.00 | $2,000.00 |
| 7 | Benefits Salaried Staff | | | @ | 34% | $1,115.20 |
| | **Personnel Subtotal** | | | | | **$4,395.20** |
| **OPERATING EXPENSES:** | | | | | | |
| 8 | Mileage | 1,160 | miles | @ | $0.540 | $626.40 |
| 9 | Miscellaneous (materials, supplies, etc.) | | | | | $125.00 |
| | **Operating Subtotal** | | | | | **$751.40** |
| **OVERHEAD:** | | | | | | |
| 10 | DFG Paid Overhead (6%) | | | | | $2,836.60 |
| 11 | CWA Paid Overhead (8%) | | | | | $3,782.13 |
| | **Overhead Subtotal** | | | | | **$6,618.72** |
| **PROJECT COST:** | | | | | | **$53,895.32** |
| **PARTNERSHIP CONTRIBUTIONS:** | | | | | | |
| *12* | *CWA Paid Overhead (8%)* | | | | | *$3,782.13* |

**TOTAL UPLAND GAME BIRD STAMP GRANT REQUEST $50,113.20**


UBBWA Llano Seco Unit
Upland Restoration Phase II
Free Roam - 85 acres
UBBWA Boundary
Phase I - Perennial Grass Planting - 92 acres
Phase II - Perennial Grass Planting - 85 acres
0 290 580 1,160 1,740 2,320
Feet
California Waterfowl Association
Chadd Santerre
Wetland Programs Supervisor
916.275.0983
csanterre@calwaterfowl.org
CALIFORNIA
FISH & WILDLIFE
Phase II
Free Roam Unit
Perennial Grass Planting - 85 acres
Phase I
Free Roam Unit
Perennial Grass Planting - 92 acres
Llano Seco Unit Check Station
N

DESERT WILDLIFE Unlimited, Inc.
P. O. Box 1338
BRAWLEY, CA 92227

California Department of Fish and Wildlife
Chief, Wildlife Branch
ATTN: UGBA Grant Proposal
1812 9th Street
Sacramento, CA 95811

**1. Project Title**

Development of Upland Game Bird Habitat

**2. Amount Requested**

Project Year 2017 to 2018 $115,53799
Project Year 2018 to 2019 $115,537.99
Project Year 2019 to 2020 $115,537.99

**3. Applicant Contact Information**

Desert Wildlife Unlimited, Inc.
Tax I.D. Number: 95-3639343
Contact Persons:

| | |
|---|---|
| Norm Wuytens | Res. 760-344-4444 |
| | FAX: 760-344-4412 |
| | E-mail: norm_norm@sbcglobal.net |
| Leon Lesicka | Res. 760-344-2793 |
| | Cell: 760-275-3953 |
| | E-mail: none |

**4. Introduction**

a. Project Type

Hunter Opportunities

Included in the program are 21 individual sites provided by Imperial Irrigation District (IID). These sites range from 35 acres to 140 acres in size. Grain crops (wheat and/or safflower) provide feed which attracts the birds.

b. Background

The vast majority of the Southern California population resides in the coastal communities which provide very limited hunting opportunities. The natural location is the farming area of Imperial Valley. However most farmers post their fields during the season for various reasons: littering, crop damage, liability, etc.

c. Objective

The goal is to continually increase our project size for additional hunters. The objective is always to provide a safe environment and successful result for male, female, young, and old hunters. On opening day of dove season last year (Sept., 2015), even though it was a week day, we experienced a count in excess of 1400 hunters. There has never been a hunting accident in our program area; including all sites there are over 20 miles of perimeter. In addition we also plant pheasants for the pheasant season; and this habitat also attracts quail.

**5. Project Description**

a. Location

All sites are around the town of Niland, CA.
CDF&W and DWU distribute maps which are also available online.

b. Staffing Requirements

Norm Wuytens is available almost daily in the area. His work is volunteer except for management and there are no other staff members other than what CDF&W might send during the hunting season.

c. Contractors or Sub-contractors

None

d. Implementation

Work is almost continuous year round: Tillage, seed row preparation, planting, irrigation, flailing, etc.

e. Materials/ equipment

Tractors, tillage equipment, planter, seed, fertilizer, irrigation water, and supplies are mostly furnished by local vendors.

f. Timeline

Tillage & planting completed during January and February
(Sometimes dependent on weather conditions)

Irrigation can begin early February and continue through May. Flailing begins mid June and is completed by August 1.

g. Explanation

Growing the crop coincides with a period of no hunting and does not interfere with any hunting activities, although hunters can observe the work being done. Flailing begins early enough to attract birds and continues prior to opening day of hunting. Small strips are always left standing for shade and many birds nest there during the summer.

h. Proof of environmental permitting compliance

None necessary

**6. Expected benefits**

Every year Desert Wildlife is adding additional habitat sites. In the past years IID has fallowed some of the sites therefore preventing those particular sites from being farmed with a habitat strip. However this year IID has allowed farming on small parcels of fallowed sites. Of the 21 sites that are provided all but one have a habitat strip; therefore providing additional excellent hunting.

**7. Budget**

Development of Upland Game Bird Habitat Budget

| | |
|---|---|
| <u>Personnel</u> | |
| Game Bird Project Manager | |
| 10 Months @ $1,500.00 per month | $ 15,000.00 |
| <u>Operating Expenses</u> | |
| Wheat Seed 21,200# @ $.38 | 8,056.00 |
| Fertilizer 52,400# @ $485/Ton | 12,707.00 |
| Fertilizer Application 262 Acres @ $24.00 | 6,288.00 |
| Irrigation Water 652 Acre feet @ $20.00 | 13,040.00 |
| Stubble Disc 262 Acres @ $45.00 | 11,790.00 |
| Triplane 262 Acres @ $25.00 | 6,550.00 |
| Seed Bed Preparation 262 Acres @ $17.50 | 4,585.50 |
| Planting 262 Acres @ $35.00 | 9,170.00 |
| Pick-Up truck mileage 5,285 @ $.52 | 2,748.20 |

| | |
|---|---|
| Grading 57 Hours @ $75.00 | 4,275.00 |
| Back-Hoe 210 Hours @ $48.00 | 10,800.00 |
| Flailing 262 Acres @ $25.00 | 6,550.00 |
| Diesel Fuel 1057 Gallons @ $1.97 | 2,082.29 |
| Total | $ 111,787.99 |
| | |
| Overhead $15,000.00 @ 25% | 3,750.00 |
| | $ 115,537.99 |

**Grant Application, Upland Game Bird Account, FY 2016/17**

1. **Project Title:** Range expansion and habitat associations of White-tailed Ptarmigan in the Sierra Nevada Mountains.

2. **Amount Requested: $16,936.00**

3. **Applicant Contact Information:** Game Bird Research Group, 12888 Neugebauer Rd., Spc 3, Stockton, CA, 95206. California Nonprofit Corporation No. 3668179, FEIN 47-1286220. Primary contact person: Dr. James Bland, 310-962-7938, gamebirdreseacrh@gmail.com. GBRG Grants Administrator: Robert Reighard, 334-354-7577, robreighard@gmail.com.

4. **Introduction:**

The White-tailed Ptarmigan (WTPT, *Lagopus leucura*) is not native to California. Seventy-two individuals from Colorado were released near Eagle Peak in the central Sierra Nevada in 1971-72 (Clarke and Johnson 1992). Expansion of the species' range is of interest to the hunting public, who tend to view expansion as additional hunting opportunities, and to environmentalists, who tend to see it as a potential threat to indigenous plant and animal communities and at odds with the preservation mandate of the National Park System. There has been no concerted effort to track the species' expansion in California. Gaines (1988), working from more-or-less informal contacts with the birdwatching community, surmised that by 1988 the species ranged from at least Matterhorn Peak (13 miles north of Tioga Pass) to Mt Ritter (15 miles south of Tioga Pass). Frederick and Gutiérrez (1992), working from agency records and personal observations, reported that by 1990 the species had expanded northward to near Carson Pass and southward to due west of Bishop. Recent records from eBird, a popular online archive of sightings by birdwatchers, suggest the species has expanded southward to Goodale Mountain, 80 miles south of Tioga Pass, but no longer occurs north of Matterhorn Peak. The current range of WTPT in California therefore covers a span of ~93 miles, or approximately 23 % of the length of the Sierra Nevada. There are no obvious geographical barriers to further expansion either northward or southward, but as-yet poorly-known environmental factors will preclude further expansion at some point.

There is little detailed knowledge on the species' habitat associations across its Sierra Nevada range. Indeed, GBRG is aware of only 3 papers published in peer-reviewed scientific journals that address WTPT ecology in California (see Literature Cited below). Frederick and Gutiérrez (1992) concluded suitable WTPT breeding habitat is limited to protected slope exposures and topographic depressions in the Sierra Nevada, due to severe summer drought and local snow-melt patterns. They compared occupied versus unoccupied habitat at two study areas near Tioga Pass, and found breeding season habitat to contain more areas of tall willow (*Salix*) and more subshrub, moss, and boulder cover than unused habitats. In the postbreeding season, topographic depressions were used within breeding territories; brooding hens used moist meadows, while flocks occupied sites with abundant boulders. WTPT habitat has not been assessed elsewhere in the Sierra Nevada, and no statewide spatially-explicit habitat model has been developed to assign relative suitability rankings.

GBRG proposes to enlist hikers and backpackers as "citizen scientists" to collect reliable location data for WTPT using the sophisticated technology possessed by anyone who owns a "smart phone." The citizen science approach has proven successful for assessing WTPT range

and habitat associations on Vancouver Island, where citizen-collected data have been shown to produce habitat suitability maps equivalent to those created from radiotelemetry data (Martin et al. 2015).

5. **Project Description:**

GBRG will subcontract Dr. James Bland, as Principal Investigator, to design and distribute posters, design the submission website, analyze and plot the data, and write required reports. GBRG has no paid employees; all research is conducted by independent subcontractors and all administrative tasks are performed by volunteer Officers and Directors. The project will begin by placing posters and information cards at major trailheads where hikers enter known and potential WTPT range. This will be done in collaboration with the respective land management agencies. Posted material will explain the purpose of the program, describe the species, instruct participants how to collect and submit observations, and inform them of additional on-line project resources. Observers will be instructed to use a smart phone to photograph any bird(s) encountered, and use a downloaded GPS application to determine geographic coordinates for the site. These procedures will eliminate misidentification of species and produce location coordinates of sufficient accuracy for future habitat suitability modeling. Participants will submit their observation data to an internet website created and maintained by GBRG (GBRG will also forward these data to CDFW's California Natural Diversity Database program and eBird). Posters and information cards will be designed and printed in May, 2017, and distributed to at least 30 trailheads between Carson Pass and Mt Whitney during May-June, 2017 (as individual trailheads become seasonally accessible by automobile). The data will be compiled, analyzed, and plotted during December, 2017.

If the first year's effort attracts sufficient submissions (>50?), GBRG will request additional UGBA funding annually for 2-4 years, or until sufficient data are collected to create a statewide spatially-explicit habitat model. A final UGBA grant will be requested to develop the model.

The materials and equipment necessary for the project include laminated posters and cards, an automobile (per mile cost), a computer and web-design software. The posters and cards are a budget line item and will be provided by an undetermined commercial printer. The automobile will be provided by the PI, with per mile cost as a budget line item. The computer and web-design software will be provided by the PI at no expense to CDFW or GBRG.

6. **Expected Benefits:**

The citizen science aspect of the project will increase public involvement in game management, and specifically increase public of awareness of WTPT in California. The location data collected will 1) enhance multiple statewide biodiversity databases, including CDFW's California Natural Diversity Database, 2) enhance hunter opportunities by illustrating relative accessibility of occupied areas, and 3) facilitate planning activities of multiple resource agencies by pinpointing occupied areas. It is unlikely that the first year's effort will result in a publishable scientific article, but a final report will be distributed to all concerned agencies.

If, over a 3- to 4-year period, the project does produce a spatially-explicit habitat suitability model, the model will provide detailed information on multi-scale habitat associations of WTPT, including how habitat composition varies from north to south. The model will also assign statistical suitability rankings across the species' California range, and identify additional areas that are suitable but not yet occupied. These future findings will be the basis for at least one scientific article.

7. **Budget:**

| **Ptarmigan Project Budget** | **Project Totals** |
|---|---|
| **Personnel** | |
| Subcontractor, Dr. James Bland, PI, 41 days @ $300/d ($37.50/hr) | $12,300.00 |
| **Total Personnel Expenses** | **$12,300.00** |
| **Operating Expenses** | |
| Printing of posters and cards (Staples; 50 posters @ $10.00 ea., 500 3"x5"cards @ $1.75 ea.) | $1,375.00 |
| **Total Operating Expenses** | **$1,375.00** |
| **Subtotal Personnel & Operating Expenses** | **$13,675.00** |
| **Other** | |
| Grant Administration (12% of Personnel & Operating Subtotal) | $1,641.00 |
| Mileage reimbursement (3,000 mi @ $0.54/mi) | $1,620.00 |
| **Total Project Cost** | **$16,936.00** |

8. **Organizational Capacity:**

GBRG is a tax-exempt corporation dedicated to studying and monitoring upland game birds. Unlike more familiar nonprofit organizations, GBRG is a non-membership corporation established for scientific purposes, and aspires to remain small, focused, and efficient. The corporation's founder and Chief Scientist, Dr. James Bland, has conducted several game bird research projects for CDFW over the past 25 years, including GBRG Sooty Grouse and Mountain Quail studies funded by UGBA grants in the 2015-16 funding cycle. GBRG's corporate documents, including Articles of Incorporation and federal and state tax-exempt certification letters, can be viewed at www.gamebirdresearch.org. GBRG has submitted additional applications for UGBA funds to study Sooty Grouse and Ring-necked Pheasant. We do have the capacity to conduct these studies simultaneously, but individual project timelines will need to be adjusted if multiple studies are funded. Per-study costs should remain as proposed.

9. **Literature Cited:**


Clarke, J. A., and R. E. Johnson. 1990. Biogeography of White-tailed Ptarmigan (*Lagopus leucurus*): Implications from an introduced population in the Sierra Nevada. *J. Biogeogr.* 17:649–656.

Clarke, J. A., and R. E. Johnson. 1992. The influence of spring snow depth on White-tailed Ptarmigan breeding success in the Sierra Nevada. *Condor* 94:622–627.

Frederick, G. P., and R. J. Gutiérrez. 1992. Habitat use and population characteristics of the White-tailed Ptarmigan in the Sierra Nevada, California. *Condor* 94:889–902.

Gaines, D. 1988. Birds of Yosemite and the East Slope. Artemisia Press, Lee Vining, CA.

Martin, K., M. Jackson, and S. Gergel. 2015. Monitoring habitat supply and effects of climate change on habitat suitability and configuration for coastal alpine ptarmigan in North America. Abstract, 16th International Grouse Symposium, Reykjavik.

**Grant Application, Upland Game Bird Account, FY 2016/17**

1. **Project Title:**. Use of bioacoustic monitoring to study vocalization behavior and space use by male Ring-necked Pheasants in areas managed for Tri-colored Blackbirds.

2. **Amount Requested: $39,836.80**

3. **Applicant Contact Information:** Game Bird Research Group, 12888 Neugebauer Rd., Spc 3, Stockton, CA, 95206. California Nonprofit Corporation No. 3668179, FEIN 47-1286220. Primary contact person: Dr. James Bland, 310-962-7938, gamebirdreseacrh@gmail.com. GBRG Grants Administrator: Robert Reighard, 334-354-7577, robreighard@gmail.com.

4. **Introduction:**

The recent development of satellite-synchronized Autonomous Recording Units (ARUs) allows researchers to analyze vocalization patterns of contiguously-spaced singing birds, as well as analyze their use of space (Blumstein et al. 2011, Mennill et al. 2012). The declining status of Ring-necked Pheasant in California is cause for concern (Fleskes et al. 2014), and ARU technology could offer an additional, cost-effective, means of monitoring pheasant populations. GBRG proposes to use ARUs to 1) analyze patterns of daily and breeding-season vocalization by male pheasants, 2) determine breeding densities of territorial males, and 3) analyze the use of space by male pheasants in relation to the configuration of Tri-colored Blackbird habitat plantings and surrounding habitat elements.

5. **Project Description:**

GBRG will subcontract Dr. James Bland, as Principal Investigator, to design and execute this study, including analysis of data and writing all required reports and publications. GBRG has no paid employees; all research is conducted by independent subcontractors and all administrative tasks are performed by volunteer Officers and Directors. The study will be conducted at an undecided state Wildlife Area or National Wildlife Refuge in the Central Valley (site choice will be determined upon consultation with CDFW). Three arrays of satellite-synchronized ARUs, comprised of four ARUs each, will be deployed in late February, 2017, in areas where pheasants are known to breed at relatively high density. The sites will reflect a diversity of habitat configurations, and include areas planted and managed for the threatened Tri-colored Blackbird (*Agelaius tricolor*). Breeding pheasants appear to be attracted to areas planted for Tri-colored Blackbird nesting habitat, but the phenomenon has not been well documented. The ARUs will be serviced weekly (download data and refresh batteries) through the end of July, 2017, and then retrieved. Data analysis will be conducted in June-August, 2017, and reports and at least one draft scientific article will be prepared in September-October, 2017.

The materials and equipment necessary for the project include 12 satellite-synchronized ARUs, D-cell batteries, an automobile (per mile cost), a computer, and software for GIS and sound location analysis. GBRG will borrow ARUs from CDFW's Upland Game Bird Program, which currently owns 13 units. D-cell batteries will be purchased by GBRG and are a budget line item. The automobile will be provided by the PI, and per mile cost is a budget line item. The computer and software will be provided by the PI at no expense to CDFW or GBRG.

6. **Expected Benefits:**

The pheasant "crow count," originally developed in the 1940s (Kimball 1949), is still commonly used as an index of pheasant abundance. Assumptions about vocalization behavior that underpin such counts are based on studies conducted primarily in the 1950s and 60s however (Giudice and Ratti 2001), when available methods were observational and semi-quantitative. With the increasing popularity of multi-species occupancy estimation by auditory monitoring, and its rapid adoption by resource agencies (Furnas and Callas 2015), a more quantitative, probabilistic, understanding of pheasant vocalization behavior is required. Such information is needed, for example, to calibrate pheasant detections by single ARUs, the typical setup for large-scale occupancy estimation.

This study will show whether bioacoustic monitoring can be a cost-effective alternative to telemetry-based pheasant studies - when and where male vocalization can serve as the unit of measure. The study will also produce a distance-decay function for the "crow" call of male pheasants.

Finally, this study will show how territorial male pheasants space themselves in relation to the configuration of Tri-colored Blackbird habitat plantings and surrounding habitat elements. It will determine, for example, whether territory densities are highest within plantings, at planting perimeters, or where certain other habitat elements abut plantings. If the responsible authorities consider ARU deployment in Tri-colored Blackbird nesting habitat to be too disruptive to the blackbirds, the study will be conducted outside blackbird habitat plantings, and the normal suite of pheasant habitat elements will be investigated.

7. **Budget:**

| **Pheasant Vocalization Behavior Project Budget** | **Project Totals** |
|---|---|
| **Personnel** | |
| Subcontractor, Dr. James Bland, PI, 5.5 mo @ $6,000/mo | $33,000.00 |
| **Total Personnel Expenses** | **$33,000.00** |
| **Operating Expenses** | |
| D-cell batteries, 500 @ $1.28 ea. | $640.00 |
| **Total Operating Expenses** | **$640.00** |
| **Subtotal Personnel & Operating Expenses** | **$33,640.00** |
| **Other** | |
| Grant Administration (12% of Personnel & Operating Subtotal) | $4,036.80 |
| Mileage reimbursement (4,000 mi @ $0.54/mi) | $2,160.00 |
| **Total Project Cost** | **$39,836.80** |

8. **Organizational Capacity:**

GBRG is a tax-exempt corporation dedicated to studying and monitoring upland game birds. Unlike more familiar nonprofit organizations, GBRG is a non-membership corporation established for scientific purposes, and aspires to remain small, focused, and efficient. The corporation's founder and Chief Scientist, Dr. James Bland, has conducted several game bird

research projects for CDFW over the past 25 years, including GBRG Sooty Grouse and Mountain Quail studies funded by UGBA grants in the 2015-16 funding cycle. In the early 90s, he established a pheasant crow call route and protocol at Tule Lake National Wildlife Refuge that was used by refuge staff through the early 2000s. GBRG's corporate documents, including Articles of Incorporation and federal and state tax-exempt certifications, can be viewed at www.gamebirdresearch.org. GBRG has submitted additional applications for UGBA funds to study Sooty Grouse and White-tailed Ptarmigan. We do have the capacity to conduct these studies simultaneously, but individual project timelines will need to be adjusted if multiple studies are funded. Per-study costs should remain as proposed.

9. **Literature Cited:**


Blumstein, D.T., Mennill, D.J., Clemins, P., Girod, L., Yao, K., Patricelli, G., Deppe, J.L., Krakhauer, A.H., Clark, C., Cortopassi, K.A., Hanser, S.F., McCowan, B., Ali, A.M., & Kirschel, A.N.G. 2011. Acoustic monitoring in terrestrial environments using microphone arrays: applications, technological considerations and prospectus. *Journal of Applied Ecology* 48: 758-767.

Fleskes, J.P., Skalos, S., Kohl, J. and Loughman, D. 2014. The Ring-necked Pheasant (*Phasianus colchicus*) in California: Current Status and Factors Possibly Related to Population Trends. U.S. Geological Survey, Western Ecological Research, Final Data Summary. 182pp.

Furnas, B.J., and R.L. Callas. 2015. Using automated recorders and occupancy models to monitor common forest birds across a large geographic region. *Journal of Wildlife Management* 79(2):325-337.

Giudice, J.H., and J.T. Ratti. 2001. Ring-necked Pheasant (*Phasianus colchicus*), The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca.

Kimball, J. W. 1949. The crowing count pheasant census. *Journal of Wildlife Management* 13:101-120.

Mennill, D.J., M. Battiston, D.R. Wilson, J.R. Foote, S.M. Doucet. 2012. Field test of an affordable, portable, wireless microphone array for spatial monitoring of animal ecology and behaviour. *Methods in Ecology and Evolution* 3:704-712.

**Grant Application, Upland Game Bird Account, FY 2016/17**

1. **Project Title:** Use of fecal DNA to determine the sex ratio and abundance of Sierra Sooty Grouse.

2. **Amount Requested: $60,684.00**

3. **Applicant Contact Information:** Game Bird Research Group, 12888 Neugebauer Rd., Spc 3, Stockton, CA, 95206. California Nonprofit Corporation No. 3668179, FEIN 47-1286220. Primary contact person: Dr. James Bland, 310-962-7938, gamebirdreseacrh@gmail.com. GBRG Grants Administrator: Robert Reighard, 334-354-7577, robreighard@gmail.com.

4. **Introduction:**

Under normal circumstances, Sooty Grouse populations tend to have balanced sex ratios (Zwickel and Bendell 2004). Unbalanced sex ratios can disrupt social structure and decrease reproductive output. Studies in British Columbia and Oregon concluded sex ratios had become unbalanced due to gender-biased hunter harvest. In British Columbia, disproportionate harvest of *females* was attributed to the movement of males, just prior to hunting season, to remote wintering areas where hunters had limited access (Zwickel 1982). In Oregon, disproportionate harvest of *males* was attributed to an abundance of roads on high-elevation ridges preferred by males (Hansen et al. 2012). Demographic attributes of California Sooty Grouse populations have never been investigated. GBRG's founder, Dr. James Bland, gathered anecdotal evidence (encounter rates) that suggests males far outnumber females in the vicinity of Pinecrest, California. In this area, and elsewhere in the Sierra Nevada, female harvest could be disproportionately high because females tend to congregate near meadows and water sources at moderate elevations during hunting season. These areas are more often accessible by roads, providing easier hunter access. Males tend to spend the hunting season alone on rugged ridges or around isolated conifer clumps near timberline. Hunters are less inclined to hunt these areas because road access is more limited, greater physical exertion is required, and encounter rates are lower. GBRG proposes to use fecal DNA analysis to develop a novel and relatively cost-effective method to estimate the size and sex ratio of Sierra Sooty Grouse populations. Fecal DNA analysis, in combination with mark-recapture analysis, has become an increasingly common approach in demographic studies (Jacob et al. 2010, Luikart et al. 2010, Tallmon et al. 2010). If Sierra Nevada populations are found to have skewed sex ratios, measures should be taken to reduce any potential gender-biasing effects of hunting.

5. **Project Description:**

GBRG will subcontract Dr. James Bland, as Principal Investigator, to design and execute the field aspects of this study, analyze the lab results, and write all required reports and publications. A second subcontractor (undetermined) will assist Dr. Bland with sample collection, and a third subcontractor (undetermined) will perform the genetic analysis. GBRG has no paid employees; all research is conducted by independent subcontractors and all administrative tasks are performed by volunteer Officers and Directors. The study will be conducted in the vicinity of Dodge Ridge Ski Resort, near Pinecrest, California, Stanislaus National Forest. Grouse feces will be collected by Dr. Bland and an assistant walking parallel 10 m x 2.5 km belt transects spaced ~100 m apart. Feces collection will be done in winter

(December-February, 2017) in a known wintering area (Bland and Gardner 2013). Sierra Sooty Grouse congregate in winter, and collection of feces from fresh snow ensures that fecal DNA will be undegraded. Feces collection will be repeated on three occasions, after each of three successive depositions of new snow. One hundred fecal samples will be collected on each occasion. If a total of 300 samples is not attained after the third collection effort, additional feces will be collected after additional snow depositions. In March, 2017, a swab of each fecal sample will be sent to a genetics laboratory for gender analysis and individual identification (e.g., Wildlife Genetics, Nelson, British Columbia). In June, 2017, mark-recapture analysis will be conducted on the lab results, in July required reports will be written, and in August at least one draft scientific publication will be written.

The materials and equipment necessary for field aspects of the project include an automobile (mileage compensation), snowshoes, sample bags and swabs, a computer, and mark-recapture software. The automobile will be provided by the PI, and mileage compensation is a budget line item. The snowshoes, sample bags and swabs, computer, and software will also be provided by the PI at no expense to CDFW or GBRG. All materials and equipment necessary for genetic analysis will be provided by the genetics lab, and are included in the per sample prices listed in the budget (based on a quote from Wildlife Genetics International).

6. **Expected Benefits:**

Determining demographic attributes of grouse populations by conventional methods requires intensive field observation, trapping, or collection of many hunter-harvested wings. In California, where Sooty Grouse densities tend to be low, these methods are not practical. This investigation will show whether fecal DNA analysis is a more cost-effective alternative. If sex ratios are found to be skewed, potentially causing reduced reproductive output, GBRG will recommend changes in hunting regulations in order to reduce potential gender-biasing effects of hunting.

7. **Budget:**

| **Sooty Grouse Fecal DNA Project Budget** | **Project Totals** |
|---|---|
| **Personnel** | |
| Subcontractor, PI, Dr. James Bland, 3.5 mo @ $6,000/mo | $21,000.00 |
| Subcontractor, Field Assistant, undetermined, 0.5 mo @ $2,400/mo | $1,200.00 |
| Subcontractor, DNA lab analysis, Wildlife Genetics Intnl (or similar), $30.00/sample for gender, $75.00/sample for individual ID, 300 samples. | $31,500.00 |
| **Total Personnel Expenses** | **$53,700.00** |
| **Operating Expenses** | **$0.00** |
| **Subtotal Personnel & Operating Expenses** | **$53,700.00** |
| **Other** | |
| Grant Administration (12% of Personnel & Operating Subtotal) | $6,444.00 |
| Mileage reimbursement (1,000 mi @ $0.54/mi) | $540.00 |
| **Total Project Cost** | **$60,684.00** |

8. **Organizational Capacity:**

GBRG is a tax-exempt corporation dedicated to studying and monitoring upland game birds. Unlike more familiar nonprofit organizations, GBRG is a non-membership corporation established for scientific purposes, and aspires to remain small, focused, and efficient. The corporation's founder and Chief Scientist, Dr. James Bland, has conducted several game bird research projects for CDFW over the past 25 years, including GBRG Sooty Grouse and Mountain Quail studies funded by UGBA grants in the 2015-16 funding cycle. In the early 90s, he established a pheasant crow call route and protocol at Tule Lake National Wildlife Refuge that was implemented by refuge staff through the early 2000s. GBRG's corporate documents, including Articles of Incorporation and federal and state tax-exempt certifications, can be viewed at www.gamebirdresearch.org. GBRG has submitted additional applications for UGBA funds to study Ring-necked Pheasant and White-tailed Ptarmigan. We do have the capacity to conduct these studies simultaneously, but individual project timelines will need to be adjusted if multiple studies are funded. Per-study costs should remain as proposed.

9. **Literature Cited:**


Hansen, M., C. A. Hagen, T. Loughin, D. Budeau, V. Coggins, and B. Reishus. 2012. Temporal changes in age and sex ratios of forest grouse harvested in northeastern Oregon. *Journal of Wildlife Management* 76: 356-362.

Jacob, G., R. Debrunner, F. Gugerli, B. Schmid, and K. Bollmann. 2010. Field surveys of capercaillie (Tetrao urogallus) in the Swiss Alps underestimated local abundance of the species as revealed by genetic analyses of non-invasive samples. Conservation Genetics 11:33–44.

Luikart, G., N. Ryman, D. Tallmon, M. Schwartz, and F. Allendorf. 2010. Estimation of census and effective population sizes: the increasing usefulness of DNA-based approaches. Conservation Genetics 11:355–373.

Tallmon, D. A., D. Gregovich, R. S. Waples, C. Scott Baker, J. Jackson, B. L. Taylor, E. Archer, K. K. Martien, F. W. Allendorf, and M. K. Schwartz. 2010. When are genetic methods useful for estimating contemporary abundance and detecting population trends? Molecular Ecology Resources 10:684–692.

Zwickel, F. C. 1982. Demographic composition of hunter-harvested blue grouse in east central Vancouver Island, British Columbia. *J. Wildl. Manage*. 46:1057-1061.

Zwickel, F. C., and J. F. Bendell. 2004. Blue Grouse: Their Biology and Natural History. NRC Research Press, Ottawa, Canada.

**Ruffed Grouse Trend Monitoring Design and Implementation**

**Amount Requested:** $55,020

**Applicant Contact Information**

Applicant: Department of Wildlife, Humboldt State University, Arcata, CA 95521

Contact Person(s): Daniel C. Barton, PhD and W. Tim Bean, PhD

Phone: (707) 826-3430 E-mail: daniel.barton@humboldt.edu

Authorized signer: Steve Karp, Director, HSU Sponsored Programs Foundation

Phone: (707) 826-4190 E-mail: karp@humboldt.edu

**Introduction**

The proposed project "Ruffed Grouse Trend Monitoring Design and Implementation" is an Upland Game Bird Account research proposal. Upland game birds are an important biological and recreationally-harvested resource in California, with more than 150,000 upland game bird stamps sold per year. Yet, many gallinaceous gamebird species are often difficult to monitor or ineffectively monitored (Sands and Pope 2010) partly due to their montane distributions and limited seasonal availability to surveys. Ruffed Grouse (*Bonasa umbellus*) in particular are an important recreationally-harvested game bird species – nearly 5,000 hunters were estimated to have engaged in Ruffed Grouse hunting in 2014-15 (Responsive Management 2015). However, the abundance, distribution, and habitat use of Ruffed Grouse are not adequately monitored by available programs, a problem recognized for over 20 years (Bland 1992).

Ruffed Grouse occur only in the far northwestern portion of California, a relatively mountainous, remote, and sparsely populated region. Ruffed Grouse were described as more widespread and fairly common locally by Grinnell and Miller (1944) but as an uncommon breeder by Yocum (1978). Habitat use of this species in California is only known from anecdotal or descriptive studies (Bland 1992). Currently, only hunter return data are available as an index of population size, trend, or distribution in this species, which could lead to apparently erroneous conclusions regarding the distribution and number of animals harvested, including highly unlikely reports of hunting and take, for example, in Los Angeles and San Bernardino counties (Responsive Management 2015). While hunter returns can clearly provide a useful index of population size and trend under some conditions, montane populations of Ruffed Grouse appear to be a species in which this is unlikely to be the case (Jones et al. 2005). We thus propose a one-year research project with development of a field-tested species distribution model and a field-validated trend monitoring program as the overarching goals.

We propose the use of available presence-only data from Breeding Bird Survey routes (Pardieck et al. 2015), museum specimens, and filtered expert reports with species distribution modeling

(SDM; Elith and Leathwick 2009) to generate a predictive model of the habitat suitability of Ruffed Grouse throughout their range in northwestern California (Objective 1). We would then use a stratified random procedure in conjunction with the SDM to generate a prospective set of representative 200 survey sites on public lands in northwestern California (Objective 2). We will collect a pilot season of drumming survey data collection using one senior field technician and two student assistants, monitoring at least 150 of the selected sites using Ruffed Grouse drumming surveys (Jones et al. 2005) and establishing drumming phenology throughout the region to economize future monitoring efforts (Objective 3). We would then use these data to evaluate site selection, sampling variance, and ultimately, provide a prospective design for a long-term trend analysis program for trend detection (i.e. determine the final sample and design needed to achieve a desired power for trend monitoring; Objective 4). Anticipated products thus include a species distribution model for Ruffed Grouse based on broad-scale plant community types, geographic, and climatic variables, one year of pilot data, and a prospective design for a cost-effective long-term monitoring program with known power.

**Project description**

The proposed project would generate a species distribution model (SDM), and conduct pilot field sampling and trend monitoring program design, covering the statewide distribution of Ruffed Grouse in California, in Del Norte, Humboldt, Mendocino, Siskiyou, Trinity, Tehama, and Shasta Counties. Proposed staffing requirements are Drs. Barton and Bean for development of the SDM, trend monitoring program design, and project management. One senior technician (or graduate student) will coordinate field data collection efforts and field data management and assist in report preparation, and two student technicians (either graduate students or advanced wildlife undergraduates) will assist in field data collection.

Barton and Bean will conduct initial data acquisition from available California sources for the SDM during summer and fall 2016. These data will include presence-only Ruffed Grouse data from the Breeding Bird Survey (at present, only 9 detections; Pardieck et al. 2015), spatially referenced western museum collections (at least 30 detections), and verified expert records from eBird (currently uncertain in number). These data, in combination with predictor variables extracted from available geographic and broad-scale plant community type, geographic (i.e. elevation, slope, and aspect), and climate layers, will be used to generate a species distribution model for Ruffed Grouse, predicting habitat suitability (Elith and Leathwick 2009) and completing Objective 1. Barton and Bean will then develop a stratification and randomization procedure in combination with access (i.e. available public ownership, road, and trail data) parameters to create an accessible and range-wide, yet randomized, sample of 200 prospective sites or ‘sample units’, completing Objective 2.

Working with the newly-hired senior technician or graduate student, we will then develop a field sampling schedule to establish a survey schedule during spring 2017, and then execute these surveys during mid-March to mid-May 2017, with assistance from two student technicians. We will use a modified version of the drumming survey protocols developed by Ammann and Ryel (1963), Jones et al. (2005), and Hansen et al. (2011) to, essentially, passively monitor for drumming male Ruffed Grouse at 150 or more roadside or trailside sample units (allowing for some sample units that may be inaccessible or unsuitable). The field sampling protocol will

consist of motorized or ambulatory travel along roads or trails to sub-sample units, at which technicians will conduct a passive 15-minute survey for ruffed grouse drumming during early morning activity hours, with 8 surveys composing each sample unit. Locations will be mapped and detection probability estimated using dual-observer and dual-visit approaches described by Jones et al. (2005) and Hansen et al. (2011) in combination with a simple removal model. We will also record detections of other upland game birds detected during surveys, particularly Mountain Quail (*Oreortyx pictus*) and Blue Grouse (*Dendragapus obscurus*), and provide these to the department. The senior technician will enter and manage field data sets, completing Objective 3. Finally, Barton and Bean will use these data to design a monitoring program within an occupancy model framework (MacKenzie and Royle 2005) and to evaluate site selection, sampling variance, and ultimately, provide a prospective design for a long-term trend analysis program for trend detection at a range of desired levels of power (answering the question of the sample size required in future monitoring to detect an annual trend in occupancy of any particular size with any particular power). These activities would complete Objective 4.

All proposed objectives will be met by the end of the 2016-17 Upland Game Bird Account grant cycle in summer 2017. All data, statistical procedures, and results will be provided to CDFW in the spirit of "open science" as part of a final report at the end of the grant period in 2017.

Funds are requested for the extensive travel that will be required for this project, which will be conducted in a rental vehicle and reimbursed use of personal vehicles (see budget for details of cost). Funding for a field laptop or tablet computer needed to assist in field data management and site selection contingencies is requested, as are funds for basic expendable field supplies (batteries, notebooks, flagging, etc.) Additional field sampling equipment (binoculars, GPS units) will be provided by the Barton lab at Humboldt State.

**Expected benefits**

The products from the proposed research include a species distribution model for Ruffed Grouse based on broad-scale plant community type, geography, and climate, one year of pilot data, and a prospective design for a cost-effective long-term monitoring program with known power. These pilot field data, in combination with the species distribution model, will also provide an opportunity to cross-validate species distribution modeling in harvested wildlife management with other techniques used for studying distributions (Royle et al. 2012). We believe the steps described are part of an innovative and likely effective, yet efficient, process for development of large-scale wildlife monitoring programs using real field data (Royle and Kery 2005). These data could also be used to cross-validate whether hunter returns do effectively index population size. We propose the information provided will be valuable for future effective decision making in management of Ruffed Grouse populations within California, which are currently of unknown status, trend, and habitat association. The data and results produced should assist in maximizing sustained hunter opportunities in the long-term, as well as potentially providing information valuable to conserving this valuable resource for non-consumptive and ecological value.

**Literature Cited**


Ammann, G. A., and L. A. Ryel. 1963. Extensive methods of inventorying ruffed grouse in Michigan. Journal of Wildlife Management 27:617-633.

Bland, J. D. 1992. A management plan for forest grouse in California. Unpublished report to California Department of Fish and Wildlife, Sacramento, California.

Elith, J., and J. R. Leathwick. 2009. Species distribution models: Ecological explanation and prediction across space and time. Annual Review of Ecology, Evolution, and Systematics 40:677-697.

Grinnellj J., and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27.

Hansen, C. P., J. J. Millspaugh, and M. A. Rumble. 2011. Occupancy modeling of ruffed grouse in the Black Hills National Forest. Journal of Wildlife Management 75:71-77.

Jones, D. C., C. A. Harper, D. A. Buehler, and G. S. Warburton. 2005. Use of spring drumming counts to index Ruffed Grouse populations in the Southern Appalachians. Proceedings of the Annual Southeast Association of Fish and Wildlife Agencies 59:135-143.

MacKenzie, D. I, and J. A. Royle. Designing occupancy studies: general advice and allocating survey effort. Journal of Applied Ecology 42:1105-1114.

Pardieck, K.L., D.J. Ziolkowski Jr., M.-A.R. Hudson. 2015. *North American Breeding Bird Survey Dataset 1966 - 2014, version 2014.0*. U.S. Geological Survey, Patuxent Wildlife Research Center <www.pwrc.usgs.gov/BBS/RawData/>.

Responsive Management. 2015. Harvest of small game, upland birds, and other wildlife in California. Report to the California Department of Fish and Wildlife. Responsive Management, Harrisonburg, VA.

Royle, J. A., and M. Kery. 2007. A Bayesian state-space formulation of dynamic occupancy models. Ecology 88:1813-1823.

Royle, J. A., R. B. Chandler, C. Yackulic, and J. D. Nichols. 2012. Likelihood analysis of species occurrence probability from presence-only data for modelling species distributions. Methods in Ecology and Evolution 3:545-554.

Sands, J. P, and M. D. Pope. 2010. A survey of galliform monitoring programs and methods in the United States and Canada. Wildlife Biology 16:342-356.

Yocum, C. F. 1978. Status of the Oregon ruffed grouse in northwestern California. California Fish and Game 64:124-127.

**Project Budget**

| **Ruffed Grouse Trend Monitoring Design and Implementation Budget** | **Project Totals** |
|---|---|
| **Personnel** | |
| Daniel Barton – 120 hr at $41.67 / hr | $ 5,001 |
| Tim Bean – 120 hr at $41.67 / hr | $ 5,000 |
| Senior Technician – 1000 hr at $12.00 / hr | $ 12,000 |
| Student Technicians (2) – 500 hr X 2 = 1000 hr at $11.00 / hr | $ 11,000 |
| Fringe expenses for personnel – 15.02% for Bean, Barton, and Senior Technician and 7.37% for Student Technicians (for OASDI, Worker's Compensation, Unemployment Insurance, and Medicare contributions) | $ 4,115 |
| **Total Personnel Expenses** | $ 37,116 |
| **Operating Expenses** | |
| Rental SUV – 2 months | $ 2,000 |
| Rental SUV fuel (enough for approx.. 5000 mi) | $ 1,200 |
| Personal Vehicle Mileage (approx.. 2500 mi) | $ 1,500 |
| Lodging for distant sampling trips (26 person-nights @ $50 / night) | $ 1,300 |
| Expendable Field Supplies (batteries, field notebooks, etc.) | $ 500 |
| Equipment: Field Laptop / Tablet Computer | $ 500 |
| **Total Operating Expenses** | $ 7,000 |
| **Subtotal Personnel & Operating Expenses** | $ 44,116 |
| Grant Administration (negotiated rate between CDFW & HSU-SPF: 25% of modified total direct costs, which here exclude costs for equipment) | $ 10,904 |
| **Total Project Cost** | $ 55,020 |

# California Department of Fish and Wildlife
# Upland Game Bird Account

1. **Project Title:** Influences of Hunting on Movements of Male Wild Turkeys During Spring

2. **Amount Requested:** $23,484.50

3. **Applicant Contact Information:** National Wild Turkey Federation, Tax ID# 57-0564993


Project Contact: Kevin Vella
CA/NV Regional Biologist
5341 Spreading Oak Ln, El Dorado, CA 95623
kvella@nwtf.net
Cell: (707) 478-7777

Authorized Signer: Ellen Lintal
Chief Financial Officer
c/o Tara Moon
P.O. Box 530, Edgefield, SC 29824-0530
elintal@nwtf.net
Office: (803) 637-7507
Fax: (803)637-9180


4. **Introduction:**

Project type: *Research*, includes scientific studies that improve knowledge of upland game species. Based off of survey data from the California Department of Fish and Wildlife, wild turkey hunter numbers during California's spring season were an estimated 29,884 in 2014. Managing hunter opportunity and hunting pressure is crucial in creating a quality hunting experience bedded with maintaining robust game populations. This is especially significant with wild turkey populations considering that the harvest of wild turkeys in the spring is the primary cause of adult mortality in males (Godwin et al. 1991, Hughes et al. 2005, Chamberlain et al. 2012). Daily movements of turkeys have not been well studied, as most research has focused on seasonal movements, dispersal, and space use (Kelley et al. 1988, Holdstock et al. 2006). Daily distances moved by males have been found to be greater in spring than other seasons (Godwin et al. 1994) and long distance daily movements could influence survival and management goals. Such daily movements are often centered on core areas of use, presumably containing critical resources important for reproduction and survival (Asensio et al. 2012). It is plausible to assume that turkeys could alter size of their core areas in response to hunting and disturbance. Beyond core areas and daily movements within, selection of roost sites could also influence survival as roosts provide protection from inclement weather and predation (Porter 1978, Kilpatrick et al. 1988). Hunting turkeys often puts hunters close to roost sites well before turkeys leave a roost, and this disturbance could influence roost site selection. When comparing the movements of Eastern male turkeys in the spring on hunted vs non-hunted days, Gross et al. (2015) discovered that turkeys moved 8% more on hunted days, and consecutive roost sites were 18% farther away on hunted vs non-hunted days. Depending upon landscape and habitat suitability, this could prove to be biologically significant. For this research project, we propose to fix male rio grande wild turkeys, as well as pursuing hunters, with GPS transmitters throughout a limited entry spring hunt program. The specific goals and objectives of this study are to use global positioning system technology (μGPS) to evaluate behavioral responses of male wild turkeys to hunters and hunting pressure, as well as to evaluate fine-scale movements of male wild turkeys prior to, during, and after spring hunting seasons. The proposed work has the potential to substantially alter current thinking in regards to how wild turkeys move, use space and habitats, and interact with anthropogenic activities such as hunting.

## 5. Project Description:

Study Area:

Upper Butte Basin Wildlife Area (UBBWA) conducts an annual spring turkey hunt on its Howard Slough and Little Dry Creek Units. According to the designated hunt plan, the first hunt in the spring begins with the youth turkey weekend (typically the third weekend in March), and allows up to 6 youth hunters each day to pursue turkeys on the Little Dry Creek Unit. The hunt then staggers to the Howard Slough Unit for the opening weekend of the general turkey season (typically the last Saturday in March), and allows for a maximum of 6 general hunters and 2 youth hunters to pursue turkeys each day throughout the weekend. This pattern oscillates back and forth between each unit throughout the season, hunting one weekend per every two weeks per unit, and allowing for a maximum of 120 hunters over the 8 weekends throughout the spring season, ending with a post-season youth hunt on the last weekend at Howard Slough. The scenario represented by this relatively low hunting pressure should be a sufficient indicator between hunted vs non-hunted days, and the possible disturbance created.

Methods:

The project proposes to fix 8 male wild turkeys with Lotek MiniTrack GPS/VHF radio transmitting backpacks on UBBWA. The backpacks measure 95mm x 33mm, and weigh from 85-105g. Turkeys will be captured in coordination with the UBBWA Manager, Environmental Scientist, Scientific Aide, Seasonal Technicians, and NWTF Regional Biologist. Turkeys will be captured using air-propelled cannon nets beginning the day after waterfowl season closes until 10 days prior to the designated season starting on the respective units. UBBWA will be providing all the capture materials. A capture plan will be written with coordination of the UBBWA Environmental Scientist. Captured turkeys will have their age, sex, weight, wing length, tarsal length, spur length, and beard length recorded at the time of capture. All captured birds will be fitted with metal leg bands. The goal will be to have 4 GPS marked male turkeys on the Howard Slough Unit, and 4 GPS marked male turkeys on the Little Dry Creek Unit. Transmitters will be setup to record one location at noon, and one location at midnight each day from the time of capture until 10 days prior to the first scheduled hunt. Once we reach the 10 day point, transmitters will switch to a greater intensity schedule, collecting one location every 15 minutes during daylight hours, and one location at midnight each day. This schedule will continue for 60 days to coincide with hunting season. After the 60 days, transmitters will continue recording one location at noon and one location at midnight until battery life is exhausted. Marked birds will be located twice weekly throughout the spring using ground triangulation and homing to check for mortality signals as well as to remotely download the data once within 500 meters of the marked individual. Once the spring hunting season begins, hunters will be presented a Garmin eTrex GPS at the check station upon arrival. Hunters will be required to keep it on their person at all times during their hunt, and return it to the check station upon departure. The GPS devices carried by the hunters will be setup to record a point every 30 seconds throughout the hunt.

Data Analysis:

Spatial data analysis will be conducted using ArcMap/GIS to evaluate basic spatial patterns. More intensive data analysis regarding hunter-related disturbances of GPS tagged individuals and prediction of movement patterns will be conducted using R (R Core Development Team 2009). In essence, many of the analyses resulting from data collection will be descriptive in the sense of detailing how birds use the landscape. It is anticipated that ArcGIS will be used to develop a number of schematics demonstrating how hunter activities affect male movements. Likewise, ArcGIS will be used to construct movement paths and estimates of space use for males during periods prior to, during, and after the spring breeding season.

| Activity/Year | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trapping and Marking | | x | x | | | | | | | | | |
| Hunter-Interface Experiments | | | x | x | x | | | | | | | |
| Breeding-Season Movements | | | x | x | x | x | | | | | | |
| General Habitat Selection | x | x | x | x | x | x | x | x | x | x | x | x |
| Project Reporting | x | | | x | | | x | | | x | | |

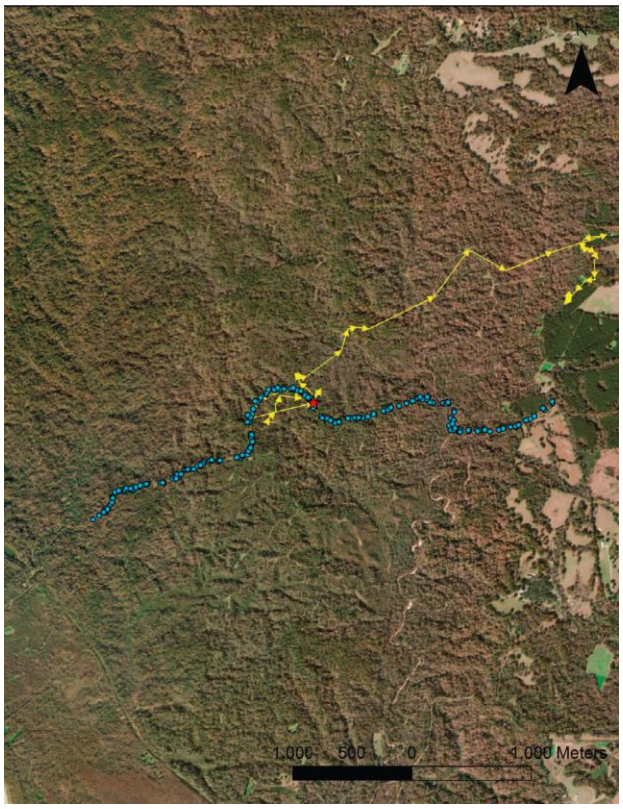



Figure 1. From Gross et al. (2015), movement paths recorded via GPS for 1 hunter and 1 male eastern wild turkey in West Feliciana Parish, Louisiana in 2013. The yellow line depicts movement path of a male wild turkey; the blue points are a hunter track log. The red star indicates where the hunter and turkey met. After the turkey interacts with the hunter, he moves 3,000m before roosting that night.


Figure 2. From Gross et al. (2015) recorded movement paths of 1 hunter and 1 male eastern wild turkey in West Feliciana Parish, Louisiana in 2013. The yellow line depicts the movement path of a male wild turkey leaving his roost (first red arrow) and moving approximately 1,200 m in 1 hour where he was killed by a stationary turkey hunter (red star). The hunter path is depicted by red locations.

## 6. Expected Benefits:

Clearly, biologists, researchers, and managers will be interested in the data collected during this study, and the potential uses of these data are endless. Results could contain very high value to managers in how they conduct their spring turkey hunting programs, while trying to couple hunter opportunity and success with quality hunting experience. Turkey hunters would also be highly interested in the movements and interactions between wild turkeys and hunters in the spring.

**7. Itemized Budget:**

| Upland Game Stamp Proposal | | | | | | |
|---|---|---|---|---|---|---|
| | | **Location** | | | | **Project Costs** |
| **LINE ITEM BUDGET FOR:** | **Male Turkey Movement** | **UBBWA** | | | | |
| **PERSONNEL (GRANTEE STAFF):** | | | | | | |
| | **Staff Title** | **Rate *** | | | **Unit** | |
| | Regional Biologist | $50.00 | per hour | @ | 40 | $2,000.00 |
| | Mileage | $0.540 | per mile | @ | 1000 | $540.00 |
| TOTAL PERSONNEL EXPENSES: | | | | | | **$2,540.00** |
| **OPERATING EXPENSE:** | | | | | | |
| **MATERIALS** | **Work/Item Description** | Count | Units | | Cost/Unit | |
| | Lotek MiniTrack GPS Pack | 8 | Backpacks | @ | $2,100.00 | $16,800.00 |
| | Download Unit | 1 | Units | @ | $3,000.00 | $3,000.00 |
| | Garmin eTrek GPS | 15 | Units | @ | $76.30 | $1,144.50 |
| TOTAL OPERATING EXPENSES: | | | | | | **$20,944.50** |
| PROJECT COST: | | | | | | **$23,484.50** |
| **SUBTOTAL PERSONNEL OPERATING EXPENSES:** | | | | | | |
| | Included in rate | | | | | $0.00 |
| | | | | | **TOTAL UPLAND STAMP GRANT REQUEST** | **$23,484.50** |

*Fringe benefit rate is included in the salary and wage rates

# California Department of Fish and Wildlife
# Upland Game Bird Account

1. **Project Title:** Knoxville WA Water for Wildlife

2. **Amount Requested:** $17,240.42

3. **Applicant Contact Information:** National Wild Turkey Federation, Tax ID# 57-0564993


Project Contact: Kevin Vella
CA/NV Regional Biologist
5341 Spreading Oak Ln, El Dorado, CA 95623
kvella@nwtf.net
Cell: (707) 478-7777

Authorized Signer: Ellen Lintal
Chief Financial Officer
c/o Tara Moon
P.O. Box 530, Edgefield, SC 29824-0530
elintal@nwtf.net
Office: (803) 637-7507
Fax: (803)637-9180


4. **Introduction:**

Project type: *Hunter opportunity*, includes habitat improvement, outreach, education and land acquisition.
While continuing to experience the most impactful drought on record in the state of California, the effects of climate change are becoming increasingly known. With rising global temperatures and severe unpredictable weather patterns, effects on wildlife habitat and suitability are constantly in question. Knoxville Wildlife Area (KWA) consists of 21,000 acres just north of Lake Berryessa in Napa County, and is dominated by oak woodlands with expansive stands of chaparral. KWA contains large tracts of high quality upland game bird habitat that supports several species, mainly California quail, wild turkey, and mourning dove, and is very popular among upland game bird hunters. However, due to KWA's location in the upper reaches of a watershed and its rugged mountainous terrain, high quality habitat becomes fragmented due to the scarcity of water for approximately 3 months of the year (September – November) during years of average precipitation. Average daily temperatures during this period at KWA typically range between a high of 90-100 degrees Fahrenheit. The current drought has only made things more difficult for wildlife on the area. This severe reduction in a limiting resource handicaps upland game bird populations, and highly limits their range expansion into otherwise very suitable habitat. Water development, whether in the form of a collection pond, developed perennial spring, or man-made guzzler, have been shown to increase upland wildlife range, and help to maximize population potential. This is especially true for upland game bird species that need free water on a daily basis during hot conditions. Due to the importance of this resource to upland game bird species on KWA, we propose to purchase and install two 1,000 gallon rainwater catchment guzzlers on areas of the wildlife area that were designated as most crucial to upland species by NWTF and CDFW biologists. The specific goals and objectives of this project are to provide year-round free water to upland game bird species, help to expand populations into otherwise water-limiting habitat, and increase hunter opportunity for upland game birds on Knoxville Wildlife Area

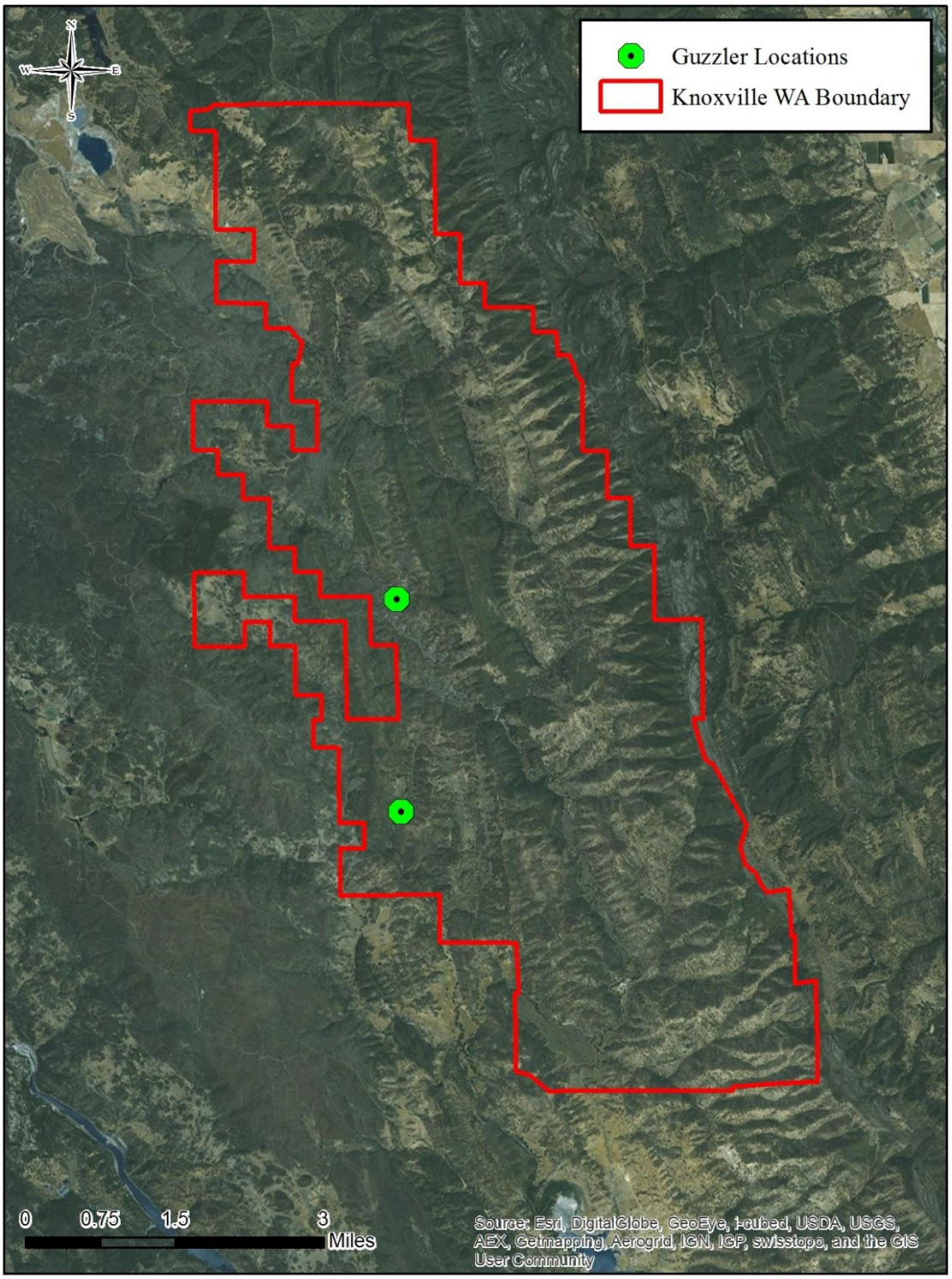
5. **Project Description:**

This project will take place on the Westside of Knoxville Wildlife Area (see map). If funded, NWTF would purchase two Dome-Top 1,000 gallon guzzlers from Rainmaker Wildlife Products. These are walk-in style guzzlers that are constructed out of a cross-link polyethylene, which creates durable protection against extreme heat and cold. Each guzzler measures 11.9' long x 5.8' wide, and 31" deep. Installation of the guzzler and collection system will be contracted out to a licensed contractor. Contractor will be selected by NWTF regional biologist through a competitive bidding process. NWTF regional biologist will oversee all project management

of the grant. Sites will be excavated with the use of a backhoe so that the guzzler will be sitting flush with the surrounding substrate. For the water collection system, we will be using elevated metal roofing installed adjacent to the guzzler, and slanted downward so that runoff will be collected into the collection ports on the guzzler (figure 1). For fire protection precautions, the collection system will be made entirely out of metal. According to NRCS standards, every square foot of collection surface will give you 0.6234 gallons of runoff per inch of rainfall. NRCS also recommends that the collection system produce 1.6 times the guzzler storage capacity on an annual basis. So, taking into account the 1,000 gallon capacity, 41 inches of annual precipitation per year (Pope Valley, CA), we would need approximately 39 sq. ft. of collection surface (1,000 X 1.6 ÷ 41 = 39). However, we want to take into account for drought years that might see as little as 20 inches of annual precipitation. That would put us needing 80 sq. ft. of collection surface (1,000 X 1.6 ÷ 20 = 80).

Figure 1. Shown here is a Rainmaker dome-top guzzler with the adjacent rainwater collection system.

Figure 2. Shown here are the two proposed guzzler location sites. The Devil's Garden site (left) and Upper Zim Zim Valley (right).




**Knoxville WA Water for Wildlife**

Knoxville Wildlife Area

## 6. Expected Benefits:

The proposed project would benefit both upland game bird species as well as upland game bird hunters. The obvious benefits to upland game birds would be year-round sources of available free water in water-limiting tracts of KWA. Water development in otherwise arid regions has been documented to help expand the range of upland game birds. These guzzlers will allow upland game birds to utilize suitable habitat that was previously unavailable to them during the hottest- driest part of the year (July-October). This could help to benefit upland game bird hunters by expanding populations more evenly across the landscape and allowing for greater hunting opportunity. Other game species that could benefit from the proposed project would be black-tailed deer, black bear, as well as a whole slew of non-game species.

## 7. Itemized Budget:

| Upland Game Stamp Proposal | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Location | | | | | Project Cost |
| LINE ITEM BUDGET FOR: | KWA Water for Wildlife | Knoxville Wildlife Area | | | | | |
| PERSONNEL (GRANTEE STAFF): | | | | | | | |
| | Staff Title | Rate * | | | Unit | | |
| | Regional Biologist | $50.00 | per hour | @ | 40 | | $2,000.00 |
| | Mileage | $0.540 | per mile | @ | 800 | | $432.00 |
| | | | | | | | **$2,432.00** |
| SUBCONTRACTOR: | Work/Item Description | Rate * | | | Unit | | |
| | Backhoe | $110.00 | per hour | @ | 16 | | $1,760.00 |
| | Supervisor | $50.00 | per hour | @ | 20 | | $1,000.00 |
| | Laborer | $20.00 | per hour | @ | 20 | | $400.00 |
| | Equipment Mobilization | $1,000.00 | per trip | @ | 2 | | $2,000.00 |
| | | | | | | | **$5,160.00** |
| TOTAL PERSONNEL EXPENSES: | | | | | | | **$7,592.00** |
| OPERATING EXPENSE: | Work/Item Description | Count | Units | | Cost/Unit | | |
| MATERIALS: | Guzzler | 2 | guzzler | @ | $2,806.75 | | $5,613.50 |
| | Shipping | 2 | ground | @ | $150.00 | | $300.00 |
| | Roofing 14" x 10.5' sheets | 16 | sheets | @ | $15.00 | per sheet | $240.00 |
| | Collection Frame | 2 | frames | @ | $300.00 | per frame | $600.00 |
| TOTAL OPERATING EXPENSES: | | | | | | | **$6,753.50** |
| PROJECT COST: | | | | | | | **$14,345.50** |
| SUBTOTAL PERSONNEL OPERATING EXPENSES: | | | | | | | |
| | Grant Administration @ | | | | | 20.18% | $2,894.92 |
| | | | | **TOTAL UPLAND STAMP GRANT REQUEST** | | | **$17,240.42** |

*Fringe benefit rate is included in the salary and wage rates

California Department of Fish & Wildlife

# Upland Game Bird Account Project Proposal

**Grant Name/Project Title**: Grizzly Island Wildlife Area Pheasant Habitat Project

**Grant Request Amount: $36,740**

**Applicant Contact Information**: Daniel P. Connelly, Pheasants Forever Inc.
7701 Tall Pine Lane, Granite Bay, CA 95746
Phone #: 702-606-6775
Email: dconnelly@pheasantsforever.org

Administrative Contact**:** Joe Moore, Pheasants Forever Inc.
1783 Buerkle Circle, St. Paul, MN 55110
Phone: 651-209-4929
Email: jmoore@pheasantsforever.org

**Issue/Problem Statement**
The current historic drought, ongoing water shortages, manpower and funding limitations have greatly reduced the ability of State Wildlife Area personnel to keep up with the development and maintenance of quality upland habitat. Many of the areas that were previously planted on a somewhat regular basis have become over-run with rank vegetation in the form of tall wheat grass (*Thinopyrum ponticum*), pickleweed (*Salicornia sp.*), creeping wild rye (*Leymus triticoides*), wild rye (*Elymus sp.*) and hemlock (*Conium maculatum*). While providing some moderate quality nesting cover these species provide little in the way of optimum brood habitat for chicks, and food production for adult birds. Grass dominant landscapes with forb components are not nearly as productive for pheasants as forb dominated landscapes with a grass component. Forbs provide much more of a "roof" over the head of foraging birds as well as creating a micro-environment that increases humidity which is critical in the production of invertebrates which are essential foe the growth of young birds.

**Project Description**
The project proposes to disk/burn, herbicide treat and plant 100-acres in each of Fields 11E and Field 10 on the Grizzly Island Wildlife Area. The plan is to plant a forb mix of Titicali, bell beans (*Vicia faba*), and purple vetch (*Vicia Americana*). The Triticali, a hybrid of the grains wheat and rye is being include not only to provide valuable food resources to adult birds but also to provide some vertical structure for the Purple Vetch to ascend to give the cover more height. This cover will be "dry land farmed", and as such will not be irrigated

Pheasant counts will be made pre and post treatment to monitor response. Counts will include but are not limited to: crow counts, brood counts and flushing counts.

**Expected Benefits**
The planted areas are expected to produce more in the way of all species of upland nesting birds, with pheasants in particular. Ducks should find these enhanced fields highly attractive for nesting. With the additional food resources and vegetative escape cover the pheasant survival rate should improve. These field have had historic goose and duck use during the winter migration period. It remains to be seen how, and to what extent, they are used by wintering waterfowl.

These fields are in the public hunting areas and should provide a high quality experience with improved hunter success for pheasants.

Additional associated benefits with providing an improved cover crop include significant positive public messaging through active management as well as, flood control and air quality contrasted to what is often viewed as unmanaged land.

A final report will be prepared at the end of the project period.

**Itemized Budget**

| | |
|---|---|
| Field Preparation-200 acres@ $22/ acre | $4,400 |
| Includes one burn@$2/acre and one disking@$20acre | |
| Herbicide treatment-200 acres@$45/acre | $9,000 |
| Planting 200 acres | |
| Seed @ $70/acre | $14,000 |
| Planting/Drilling @$30 acre | $ 6,000 |
| Subtotal | $33,400 |
| Overhead @10 | $ 3,340 |
| Total Project Cost | $36,740 |

This project is to proceed from a period of funding availability, i.e. executed contract for 12 months. As anticipated, November 1, 2016 to October 31, 2017. FY 2016. If the contract cannot be fully executed by mid-November of 2016 the seeding will be unable to be accomplished and the project will have to be carried over to the following year. It is critical to get the land prepped and seeded during early winter to take advantage of available rainfall for plant germination.

**California Department of Fish and Wildlife Region and location of proposed project:**

Region 2

California Department of Fish & Wildlife

# Upland Game Bird Account Project Proposal

## Project Title: New Technologies to Evaluate Band-Tailed Pigeon Mineral Site Use and Increased Disease Surveillance

*This project proposal must clearly identify benefits to upland game birds, upland game bird hunting opportunities, or public hunting outreach (Fish and Game Code Section 3684c).*

**Funding Request**: $66,500/ $42,850 yr. 1 & $23,650 yr. 2

**CDFG or Non-Governmental Organization project contact:**
Name: Daniel P Connelly (Pheasants Forever)
Phone #: 702-606-6775
Email: dconnelly@pheasantsforever.org

**Administrative: Joe Moore**
Phone: 651-209-4929
Email: jmoore@pheasantsforever.org

**Project start and completion dates by State Fiscal Year (July 1 – June 30):**
December 1, 2016 –September 30 2018

**California Department of Fish and Game Wildlife Region and location of proposed project:**
Statewide: All Regions that have significant Band-tailed Pigeon populations.(1,2,3,4, and 5

**Objectives**: *State how this proposed project will maintain or enhance existing upland game bird resources. Example: an additional Special Hunt, increased upland habitat acreage, opening of public land areas for upland game bird hunting opportunities, access to private lands, or resource assessments that will ensure resource perpetuation.*

Management of Pacific Coast band-tailed pigeons (*Patagioenas fasciata monilis*) has been enhanced by the development of a population index which was fully implemented in 2004 (Casazza et al 2003). This method, using mineral site counts to index band-tailed pigeon abundance, has much greater suitability than other methods to detect and monitor changes in populations (Casazza et al. 2005). This survey realized a management need identified more than 30 years ago and reiterated in the 1994 Pacific Coast band-tailed pigeon management plan (Keppie et al. 1971, West. Migratory Upland Gamebird Tech. Comm. 1994). The mineral site survey provides an index to the Pacific Coast band-tailed pigeon population and may be more tightly correlated with the true population abundance with a better understanding of the frequency of visitation of mineral sites by pigeons. Recent advancements in radio-tracking technology provide an opportunity for the validation of the survey method and expand the survey coverage area which are important to accurately extrapolate results to the Pacific Coast band-tailed pigeon population as a whole.

Since known mineral sites are not distributed uniformly throughout the species range (Figure 1) identification of new mineral sites which could be added to the survey would help to improve the

precision of the population index and better represent the distribution of band-tailed pigeons across the landscape. Due to the large potential breeding range and relatively low density of band-tailed pigeon throughout that range, systematic point- or route-based surveys, even in suspected habitat, are unlikely to provide a cost-effective means to determine important breeding areas (Casazza et al., 2005; Sanders 1999, Jeffrey 1989).

Radio-telemetry advancements such as solar powered GSM (Cellular Network) GPS transmitters can record more than 50 locations per day with GPS level accuracy. This level of data collection will provide the precise locations necessary to identify mineral sites across the west as well as determine visitation rates by pigeons to mineral sites. Although transmitter costs are higher than traditional VHF telemetry studies, GSM transmitters require much less resources in terms of personnel time and are less expensive than satellite communicating transmitters (e.g. PTT); especially for wide-ranging or migratory species.

These transmitter advancements can accurately identify winter use areas and concentration areas which may vary from year to year in response to oak mast, or other food item, production. Disease, in particular trichomonas, has been identified as a potential threat to band-tailed pigeon populations especially in winter (Girard et al. 2014). Once population concentrations are found, these areas can be monitored for disease outbreaks and allow for additional investigation of the environmental conditions that may be facilitating disease transmission/virulence.

This proposal seeks to use this new technology to address the research needs outlined by Braun (1994) and the Pacific Flyway Management Plan.

## Objectives:

(1) Utilize GSM transmitters to identify previously unknown mineral sites used by band-tailed pigeons.
(2) Determine the frequency of use of mineral sites by band-tailed pigeons.
(3) Identify wintering use areas by band-tailed pigeons to improve disease surveillance and understanding of factors affecting outbreaks.

## Background:

**Objective 1:** We propose to use GSM/GPS transmitters to determine new mineral site locations. In comparing the distribution of pigeons during the breeding season and distribution of mineral sites selected to index population change we can evaluate the relationship between sites counted and relative breeding distribution of Pacific Coast band-tailed pigeons. Currently there are no identified mineral sites in southern California and areas exist within Oregon, Washington and British Columbia that have no known mineral sites. Systematic searching for mineral sites in suitable band-tailed pigeon habitat is not feasible within the large areas where such sites may occur. Traditional VHF radio tracking is difficult and expensive for species during migration and satellite transmitters without GPS accuracy lack the precision needed to find used mineral sites. GSM/GPS transmitters provide an alternative that can be used to validate or augment the current survey protocol, and additionally inform managers on the impacts of migration on hunting opportunities.

**Objective 2:** We propose to utilize the new GSM technology to determine how often band-tailed pigeons visit mineral sites. In addition we can assess how visitation rates change over the annual

cycle. Much speculation has persisted as to how often pigeons visit mineral sites as well as if the rate of visitation changes seasonally. We will be able to definitively address this issue given the advancements in radio-telemetry technology.

**Objective 3:** We will apply the new technology to identify important wintering areas and use the distribution of radio-marked pigeons to help monitor for disease outbreaks. This is especially important during the winter period when large disease outbreaks killing thousands of pigeons can be a common occurrence.

## Methods:

We will capture band-tailed pigeons during winter using box traps baited with corn and milo. Trapping locations will be selected throughout California. We will mark up to 20 male and 20 female pigeons and they will be fitted with 10g solar GSM/GPS transmitters (n=40). Transmitters will be attached using a teflon/elastic backpack harnesses (Leonard 1998). Total weight of attached units will be less than 5% of the bird's body weight. GSM transmitters will be programmed to record locations every 30 minutes and transmitted via the cellular network every 2 hours. Duty cycle adjustments will be made based on battery voltage and can be changed as needed.

Important stopover locations during migration and potential mineral site locations will be analyzed and mapped using temporal and spatial statistics, location accuracy information, and the known distribution of mineral sites currently used by band-tailed pigeons. Ninety-nine percent of band-tailed pigeon locations are assumed to occur within 50Km of a mineral site. Most telemetry locations are much closer to mineral sites. Sixty-five percent of band-tailed pigeon locations occurred within 5Km and 90% within 9Km of the nearest mineral site in California (Figure 3, USGS, unpublished data). These trends will be incorporated into maps depicting mineral sites of high importance during migration or areas with high probability of mineral site occurrence.

## Products:

The information provided by this project will result in more appropriate application of band-tailed pigeon survey protocol, address the need for a better inventory of breeding areas and mineral sites used by band-tailed pigeons, provide insight into disease outbreaks and inform wildlife managers on the status of hunting opportunities for band-tailed pigeons within their state.

Specific Products Include:

- Website with locational data updated weekly
- USGS Open File Report detailing study results
- Peer reviewed journal articles detailing study results.

One of the real exciting aspects of this project is the advancement of the technology in the terms of satellite transmitters. Knowledge gained from this project could open up whole new avenues to studies of other similar sized upland game birds.

**Schedule:**

| | FY17 | FY18 |
|---|---|---|
| Trap and mark birds | December 2016 – April 2017 | |
| Data Acquisition | December 2016 – Sept. 2017 | October 2017 – June 2018 |
| Website Development | December 2016 – March 2017 | |
| GIS Analysis | | December 2017 – Sept 2018 |
| Progress Report/Update | March 2017 | March 2018 |
| Final Report | | September 2018 |

Some of this schedule may need to be adjusted depending upon the timing and success of the Federal Grant application.

## Budget:

**It is the intent to apply for Federal Webless Migratory Game Bird funding to secure the cost share of $60,000 in year one for the transmitters. We will use the match from the California Department of Fish and Wildlife's Upland Game Bird Stamp account in years one and two to make the grant request competitive. Without the State contribution it is unlikely that the Federal Funding could be secured.**

| Description | FY17 | FY 18 | Total | |
|---|---|---|---|---|
| Wildlife Research Biologist | 2500 | 2500 | 5000 | |
| Wildlife Biologist | 2500 | 2500 | 5000 | |
| Biological Technician | 15000 | 5000 | 20000 | |
| Truck | 3500 | 1500 | 5000 | |
| Data Acquisition $250/transmitter/year | 10000 | 10000 | 20000 | |
| Sub Total | 33500 | 21500 | 55000 | |
| Overhead | 3350 | 2150 | 5500 | |
| Transmitters (40)@$1500each | 60000* | 0 | 60000 | 0 |
| Total | 96850 | 23650 | 120,500 | |

## * Federal funding request

Figure 1. Density of mineral sites used by band-tailed pigeons is not uniform throughout the species' range. Blue shading represents area with >1 mineral site per 100 $Km^2$.

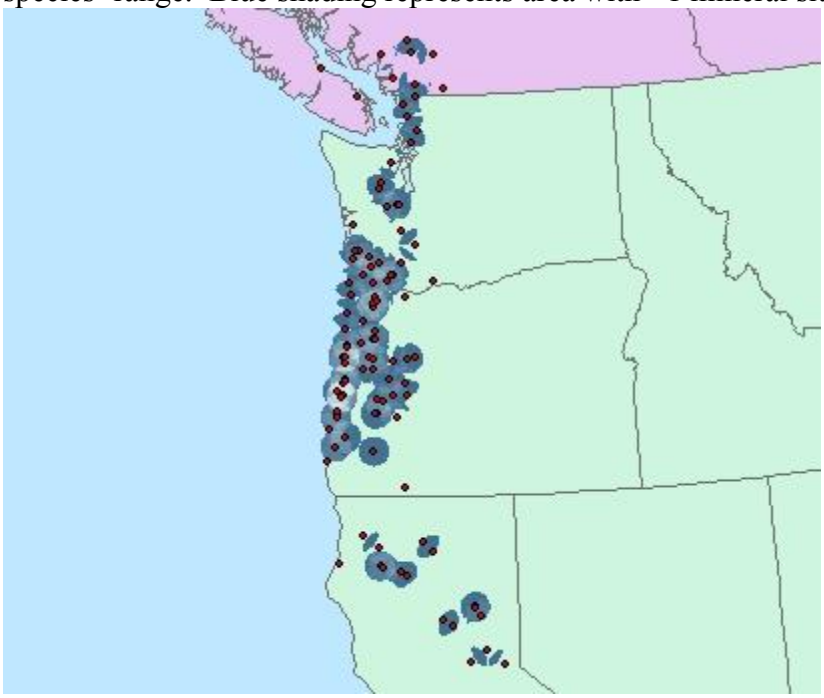


Figure 2. The maximum distance band-tailed pigeons move between habitats on a daily basis is limited. The maximum observed movements of breeding band-tailed pigeons in Oregon was 51Km. Assuming 50km represents the limit to which band-tailed pigeons will move to visit a mineral site, portions of the species breeding range are devoid of known mineral sites.

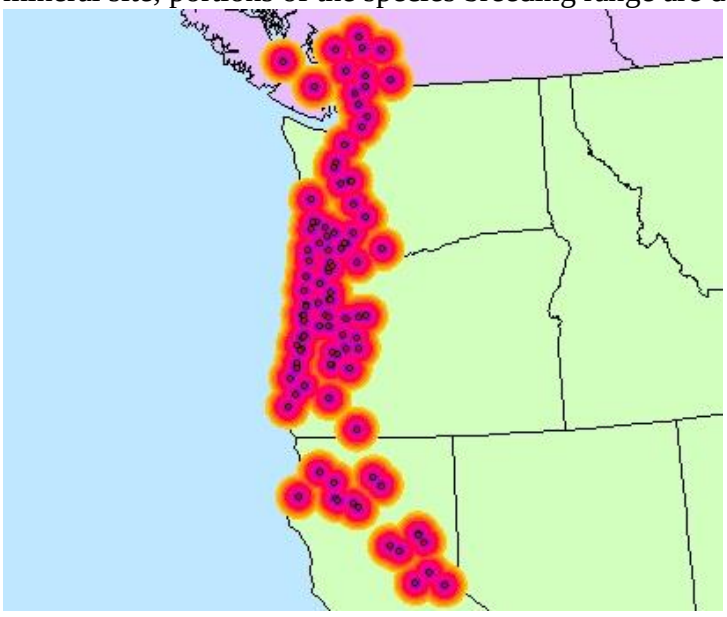
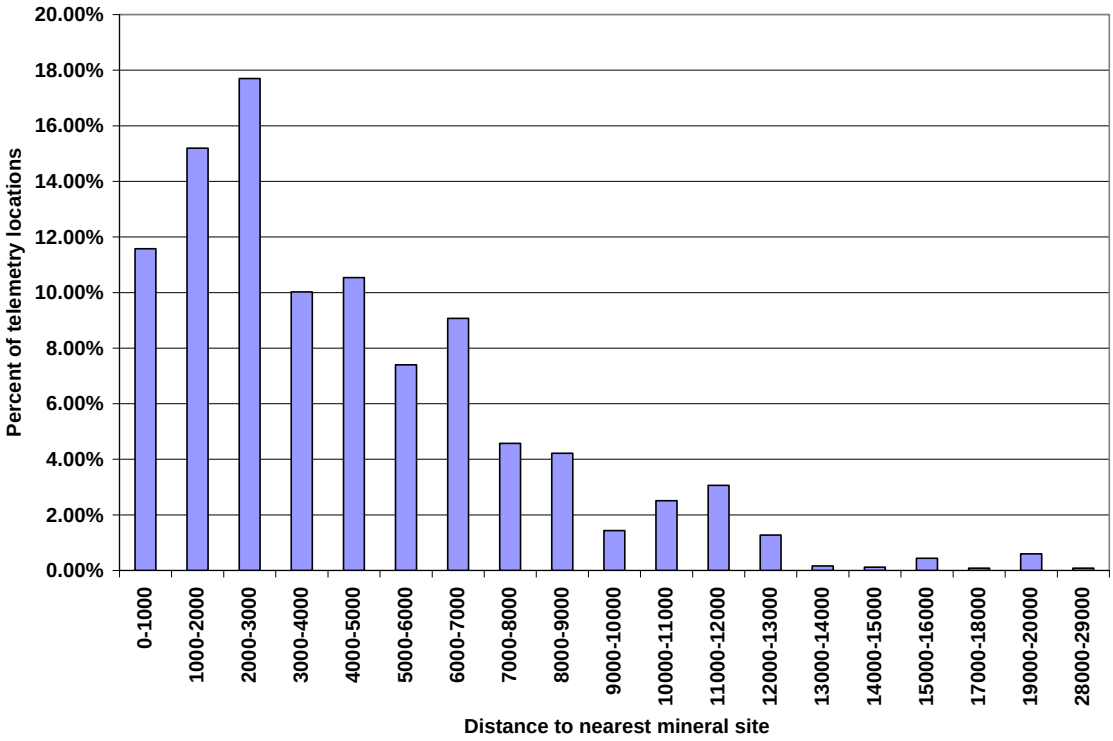


Figure 3. Distance between radio marked band-tailed pigeon locations and nearest known mineral site in Northern California 1999-2000. Sixty-five percent of locations within 5Km and 90% within 9Km of the nearest mineral site.



## Literature Cited:


Braun, C. E. 1994. Band-tailed Pigeon. *In* Migratory shore and upland game bird management in North America (T. Tacha, and C. E. Braun, eds.). Int. Assoc. Fish Wildl. Agencies, Washington, D.C.

Casazza, M. L., J. L. Yee, D. L. Orthmeyer, M. R. Miller, C. T. Overton, and R. Schmitz. 2003 Development of a reliable population index for Pacific Coast band-tailed pigeons. 2003 Final Report to the Webless Migratory Game Bird Research Program. U.S. Geological Survey, Biological Resources Division. unpubl. report.

Casazza, M.L., J. L. Yee, M. R. Miller, D.L. Orthmeyer. D. R. Yparraguirre, R.L. Jarvis, and C. T. Overton. 2005. Evaluation of current population indices for band-tailed pigeons. Wildlife Society Bulletin.

Girard, Y.A., K.H. Rogers, R. Gerhold, K.M. Land, S.C. Lenaghan, L.W. Woods, N. Haberkern, M. Hopper, J. D. Cann, C.K. Johnson. 2014. *Trichomonas stableri* n. sp. An agent of trichomonosis in Pacific Coast band-tailed pigeons (*Patagioenas fasciata monilis*). International Journal for Parasitology: Parasites and Wildlife. 3:32-40.

Jarvis, R. L. and M. F. Passmore. 1992. Ecology of band-tailed pigeons in Oregon. U.S. Fish Wildl. Serv. Biol. Rep. No. 6.

Jeffrey, R. 1989. The Band-tailed pigeon: Distribution, effects of harvest regulations, mortality rates and habits of Band-tailed Pigeons 1968-1979. Washington Dep. of Wildl. Olympia, WA.

Keppie, D., H. M. Wight, and W. S. Overton. 1971. A proposed Band-tailed Pigeon census - A management need. Trans. N. Am. Wildl. Nat. Resour. Conf. 35: 157-171.

Leonard, J. P. 1998. Nesting and foraging ecology of Band-tailed Pigeons in western Oregon (*Columba fasciata).* Ph.D. diss., Oregon State Univ., Corvallis, OR.

Sanders, T. A. 1999. Habitat availability, dietary mineral supplement, and measuring abundance of Band-tailed Pigeons in western Oregon. Ph.D. diss., Oregon State Univ., Corvallis, OR.

Western Migr. Game Bird Tech. Comm. 1994. Pacific flyway management plan for the Pacific coast population of Band-tailed Pigeons. Pacific Flyway Council. U.S. Fish Wildl. Serv. Portland, OR.

California Department of Fish & Wildlife

# Upland Game Bird Account Project Proposal

**Project Title and Description**: Central and Southern Upland Game Developed Water Structure Inventory and Master Data Base Creation

**Funding Request**: $76,862/$38,431yr. 1 & $38,431yr. 2

**CDFW or Non-Governmental Organization project contact:**
Name: Daniel P. Connelly, Quail Forever
Phone #: 702-606-6775
Email: dconnelly@pheasantsforever.org

Administrative contact:
Name: Joe Moore, Pheasants Forever
Phone: 651-209-4929
Email: jmoore@pheasantsforever.org

**Project Proposal:** Create an inventory of man-made small game guzzlers. List location/coordinates, historic information, and current status. The project would also set a priority list on which guzzlers need complete restoration/replacement or repair based on the proximity to other water. The project would include all developed water sources from Fresno south in California.

This project to proceed from a period of funding availability, i.e. executed contract for 24 months. As anticipated, January 1, 2017 to December 31, 2018. FY 2017

California Department of Fish and Wildlife Region and location of proposed project:
Regions 4, 5 and 6

**Objectives**: Carrying capacity for upland game species as well as other non-game and big game is heavily dependent upon water in arid environments. The objective of this effort is to, to the degree possible, systematically list known and visit suspected developed water sites throughout the state to determine the location and functionality. While many of these sites are entirely man-made many are often seep and spring improvements. Many of the efforts to bring water to these arid areas started in the late 1950 and continue today. As with any structure that is exposed to the elements these water developments over the past 60 years have begun to break down and degrade in function. This proposal encompasses all of these water sources. The projects objective is to locate and develop a master data base for the 1,500 sum-odd sites. Proper servicing duration should diminish as the maintenance cycle shortens. Only about 3/4ths of the 1,500-plus guzzler locations in the southern part of the state have been inventoried in recent years, but the data on the remaining 1/4 of the guzzlers is old, often with very sketchy locations, and will likely require Google Earth and field research to locate and determine condition.

**Benefits**: By finally establishing a Master Data the Department can now begin to prioritize and directs its resources, and those of the various non-profits who assist in the maintenance of these critically valuable landscape features in the most efficient manner. The three main benefits from this proposal; First, and really the primary beneficiary, are to the upland game populations, as well as the hundreds of other species of wildlife that are in many cases entirely dependent upon these limited water resources for survival. With the effects of climate change and increasing demands on the aquifer coming in various forms from invasive plants to feral animals make these facilities increasingly vital for the maintenance of the desert ecosystem. Secondly, with recent actions by the federal government establishing ever increasing designated wilderness areas in the state, as well as new interpretations by various federal agency personnel on the value of developed water sources, and for that matter wildlife management it is absolutely essential that a management presence be maintained on the landscape. In many cases the volunteers are some of the only active wildlife people some of these agency people come into contact with. These relationships are critical if we are to have any input as to what is occurring on Federal land. Lastly, and maybe just as important, is to keep this special interest group of volunteers actively involved with the resource. By having these folks put their blood sweat and tears into these projects you are much more likely to have them stand up with the Department of Fish and Wildlife if someone comes up with a project that is likely to harm the very resources they have so passionately tried to protect.

The Department of Fish and Wildlife would have in its possession an entire listing of the location and condition of all of the developed water sites in the central and southern part of the state. It could then be in a position to lead in the prioritization of the various non-profits and state resources to help maintain these critical resources in the most economical way, in terms of manpower and funding, possible

## TASKS

All of these phases are going to be undertaken simultaneously during the course of the project and are not totally dependent upon completion of one before moving on to the next.

**PHASE I**

**Inventory/Historic Information:** There is not a single database that lists locations of guzzlers in California. Even though most were made by the Department of Fish and Wildlife (Game) crews during the 1950s and 60s, the state does not have a complete inventory and data is scattered across field offices and individual staff's files. The DFW no longer maintains the guzzlers, and much of the location data has been lost. U.S. Forest Service and Bureau of Land Management staff also has some of this data, even though they do not maintain these water sources either, they can be a source of information. Volunteers from hunter-conservation groups have taken over the task of restoring and building new guzzlers in California, and they frequently are the best source for this information. But again, this information is saved in file cabinets and on home computers. This phase would be divided into two parts. First, this project would be to pull together a master list of maps and/or coordinates from all of the agency staff and conservation groups. Second, it would also include data on the most recent visits to these guzzlers and their condition, if recorded.

**PHASE II**

**Field Check Information/Current Status:** Where no recent data is available from these public and private groups on the condition of these guzzlers, locations, and status will be field checked. This is the labor intensive part of the project that will involve field research, driving, hiking, GPSing of locations, and describing access.

**PHASE III**

**Create Master Database:** The final phase, which would be ongoing during the project, would be to create a master database that can be linked to GIS mapping and other software systems, shared among federal, state, local government agencies, NGOs, and other conservation groups. The master database will be kept with the Quail Forever, updated as needed, and forwarded with updates to the Department of Fish and Wildlife.

Activities occur in Central and Southern California on Public land. Primary land holders being: US Forest Service, Bureau of Land Management and California Department of Fish and Wildlife.

## COSTS

| **Project Funding Breakdown** | | |
|---|---|---|
| Item of Expense (salary & wages, equipment, supplies, etc) | | Amount |
| Phase 1 | 320 hrs@$35/hr. | $11,200 |
| Phase 2 | 375 sites@4.25 hrs. each / $149 for each site | $55,875 |
| Phase 3 | 80 hrs@$35/hr. | $2,800 |
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| Subtotal | | $69,875 |
| Overhead at 10% | | $6,987 |
| | | |
| Total | | **$76,862** |

*The estimates provided below are given to demonstrate the level commitment that the volunteers are dedicating to the effort of maintaining the extensive network of developed water sources in the central and southern part of the state. The amounts are based on annual historic averaged information.*

| **Non-Governmental Organization and other Agency Contributions** | |
|---|---|
| Organization/Agency Name | % of Matching Funds and/or Volunteer Effort |
| Quail Forever chapters: San Gabriel, Riverside, Ventura, Los Padres, Ridgecrest, High Desert | 5992 hrs work,4080 hrs travel and $41,160 in mileage@.565 cents per mile/IRS rate |
| | |
| San Diego Quail Chapter | 900 hrs work, 180 hrs travel, and $1,602.00 in mileage a >.565 cents per mile/IRS rate |
| Water for Wildlife/Society for the Protection and Care of Wildlife | 1200 hrs. work, 960 hrs.travel, $8475.00 in mileage @.565cents per mile/IRS rate |
| Total | 8092 hours worked, 5220 total travel hours and $51,237 in mileage |

| **Total Project Funding** | |
|---|---|
| Item of Expense (salary & wages, equipment, supplies, etc) | Amount |
| Total Requested Funding | $76,862 |
| Total Matching Funds | |
| If $24.75 (http://www.independentsector.org/volunteer_time) is applied to the 13,312 work and travel time donated you end up with $329,472 Add to this the $51,237 in mileage cost/ totals | $380,709 |
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| | |
| Total Project Costs | $457,571 |

California Department of Fish & Wildlife

# Upland Game Bird Account Project Proposal

**Project Title and Description**: MONITORING OF PHEASANT POPULATION VITAL RATES AND SPACE USE IN THE CENTRAL VALLEY AND KLAMATH BASIN, CALIFORNIA

**Funding Request: $62,617**

CDFW or Non-Governmental Organization project contact:
Name: Daniel P. Connelly (Pheasants Forever Inc.)
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Administrative contact: Joe Moore (Pheasants Forever Inc.
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## STUDY PROBLEM

The ring-necked pheasant (*Phasianus colchicus;* hereafter, pheasant) is an economically important game bird species currently experiencing rapid population decline in California (Fleskes and others, 2014). It may also serve as a biomonitor of other farmland wildlife based on their association with agricultural lands, omnivorous diet, and resilience to human disturbance. Population vital rates, space use, and factors that threaten population growth are not well-understood and require field data collection and analyses.

## BACKGROUND INFORMATION

Declines of bird populations within agricultural settings across North America and Europe have been attributed to various aspects of agricultural intensification, including the removal of hedges adjacent to crop fields (Chamberlain and others, 2000; Benton and others, 2003), changes in crop types and the timing of crop harvest (Glemnitz and others, 2015), increases in pesticide application (Mineau and Whiteside, 2006), and higher susceptibility to predation as a result of habitat change (Evans 2004). Ring-necked pheasant populations in California have experienced similar declines based on Annual Game Take Surveys (AGTS; CDFW 2014), as well as state-wide Christmas Bird Counts (CBC; National Audubon Society 2014), and Breeding Bird Surveys (BBS; Sauer and others, 2014).

Aspects of agricultural intensification and changes in abundance of avian competitors and predators may be contributing factors to pheasant decline in the Central Valley. Many of the rice fields in the Sacramento Valley are disked or flooded during the winter (Hill and others, 1999), and the consistent increase in rice cultivation since the 1980s has come at the expense of fallowed fields and grain crops such as barley and winter wheat (USDA 2014a) that provide potential cover for pheasants . In the Delta, wetland habitat and cereal grain crop cultivation has also been reduced (USDA 2014a), which is thought to reduce the amount of potential nesting and brood rearing habitat in the region. Agro-chemical application in farmland habitats across California, particularly the use of organophosphates and neonicotinoids, has both lethal and sub-lethal effects on individual pheasants (Mineau and Whiteside, 2006), as well as reduces the abundance of non-target arthropod food resources essential for chicks (Messick and others, 1974). Furthermore, the additive effects of habitat change due to agricultural intensification and pesticide application coupled with the increase in corvid and raptor abundance in recent decades may increase pheasants' susceptibility to predation (Evans 2004). Lastly, mosquito abatement practices, changes in annual precipitation, and farmed pheasant introductions could also be factors influencing pheasant population dynamics in California. Demographic information on population vital rates (e.g., individual, nest, and brood survival) of pheasant populations is lacking in California and such information would substantially benefit our understanding of factors that influence local population trends.

A comprehensive assessment of pheasant population status and possible factors related to population trends was initiated in 2013 and those monitoring efforts are currently ongoing. Approaches and methods developed and data gathered during the pilot study are being used in this follow-up study to address key data needs identified by the comprehensive assessment of population and related factor data.

## STUDY RATIONALE

California Department of Fish and Wildlife in partnership with Pheasants Forever is seeking an intensive investigation to assist in conservation and management plans. Western Ecological Research Center provides expertise in field operations and analytical approaches to better understand pheasant population dynamics and factors that influence populations. Together, CDFW, PF, and WERC have entered into a partnership to initiate monitoring and research on several pheasant populations in California. This study will follow up on the pilot study initiated in 2013, and will be a longer-term monitoring effort building upon the data collected since 2013. The purpose of this ongoing partnership is to employ a science-based approach to effectively manage pheasant populations and factors that may be responsible for long-term declines.

Studies that evaluate the relative importance of factors that contribute to declines in pheasant abundance by employing long-term survey data at large spatial scales could be of high value to conservation management planning. The results of this assessment may shed light on factors that are currently limiting pheasant populations and other upland nesting birds in California, as well as provide wildlife area managers and other land stewards with decision support tools to help guide pheasant management practices within their region. We propose to continue gathering information on pheasant population dynamics and ecology across multiple study sites within

California. This study provides a foundation for evaluating management strategies using longer-term monitoring of pheasant populations at multiple sites by execution of a Before-After-Control-Impact (BACI) study design. This study design calls for at least one impact site in which a proposed change will occur and one or more control sites to be monitored before and after that proposed change using identical field methods (Underwood 1991). The BACI study design would allow us to assess the impact of implemented management strategies, while making inferences about pheasant populations at sites we have not monitored. We plan to include Gray Lodge WA, Yolo Bypass WA, and Roosevelt Ranch as potential study sites in the execution of this study design because we have collected three years of data in the field at these sites and major changes in habitat management or hunting regulations have yet to occur.

We also propose to continue monitoring pheasant populations at Upper Butte Basin WA and Lower Klamath NWR to bolster samples sizes and maintain a high level of regional and site-level variation, which enhances our ability to make inferences about populations outside of the Central Valley. Continuing to monitor pheasants at Upper Butte Basin WA and Lower Klamath NWR would benefit our understanding of pheasant population dynamics in California for several reasons. First, average pheasant (rooster) crow counts are much higher at Upper Butte Basin WA than at Gray Lodge WA, while habitat, weather, avian predators and competitors, and agricultural practices in the area are relatively similar. Collecting demographic information on pheasants at Upper Butte Basin WA would strengthen sample sizes and allow for comparison between sites with different population densities but similar environmental pressures. Second, the pheasant population at Lower Klamath NWR has shown an increasing trend in crow counts since 2012, and historically has supported some of the highest densities of pheasant in the Northern region of California. Comparisons between Lower Klamath NWR and sites within the Central Valley will help us understand factors that might contribute to pheasant population growth. Third, Lower Klamath NWR would not only allow for comparison of a site that is currently experiencing an upward trend in pheasant abundance, but also increases regional and site-level variation critical for making inference to non-monitored populations. Therefore, monitoring pheasants in multiple regions across California will: (1) bolster sample sizes, (2) allow a more rigorous investigation in spatial variation in the effects among pheasant populations, (3) increase our ability to make inferences about pheasant populations outside the study area, and (4) set up for empirical evaluation of management strategies across different spatial and temporal scales.

## STUDY AREA

We will focus on conducting our field work on three state wildlife areas (Gray Lodge State WA, Butte County; Upper Butte Basin State WA, Butte County; Yolo Bypass State WA, Yolo County), one national wildlife refuge (Lower Klamath NWR, Siskiyou County), and one private hunt club (Roosevelt Ranch, Yolo County). Working in these various areas will allow us to look at different management strategies that may or may not be effective in increasing pheasant populations in a given region as well as giving us a better understanding of common variables that may be causing pheasant populations to decrease across California. Furthermore, spatial and temporal variation across sites is imperative when making inferences about pheasant populations in regions outside of the study area.

Pheasant habitat within the study area is typical of managed wetland-riparian, upland, and open rangeland habitat surrounded by irrigated agriculture that includes rice, orchards, hayfields, and a variety of row crops. Gray Lodge WA is located approximately 11 km southwest of Gridley, CA, and is just north of the Sutter Buttes. Upper Butte Basin WA is located approximately 16 km west of Gridley, CA and is 7 km northwest of Gray Lodge WA. The Yolo Bypass WA is located between West Sacramento and Davis, CA, adjacent to the Sacramento deep-water shipping channel. The Roosevelt Ranch duck club is located near the town of Zamora and is 16 km north of Woodland, CA. Lower Klamath NWR is located approximately 19 km west of Tulelake, CA and runs along the California-Oregon border.

## STUDY OBJECTIVES AND METHODS

We propose a field study that is a longer term, in-depth investigation of factors that influence pheasant populations in the Central Valley, California. This study will allow key data needs identified in the comprehensive pheasant data assessment to be addressed in a timely fashion. The study will include field operations, data collection, and analytical approaches aimed at answering basic questions regarding pheasant populations. Intensive on-the-ground monitoring will be carried out during the spring and summer seasons with less frequent monitoring during fall and winter. Details of the monitoring and analyses are listed below. The primary purposes of this research effort are to:

1) Continue collaboration between CDFW, USGS, and Pheasants Forever to carry out field monitoring and research aimed at guiding effective management of pheasant populations in California.
2) Use field methodology for capturing, marking (VHF and GPS), and monitoring individual pheasants developed during the reconnaissance study to meet project objectives (3 and 4).
3) Estimate population vital rates (egg, nest, brood, juvenile, and adult survival)
    a. Investigate the relationships between habitat selection and fitness (e.g. nest selection vs. nest survival).
    b. Investigate covariates of micro- and macro-habitat composition, amount of visual obstruction or cover, raven and raptor abundance, and individual covariates (e.g. pheasant age).
4) Use Global Positioning System (GPS) transmitters to evaluate differences in spatial use of habitats, as well as movements between habitats during the nesting and brood-rearing phases.

### Field Operation Objectives

These findings will provide relevant information for CDFW wildlife managers to inform decisions regarding pheasant management. These specific field objectives will be carried out during this multi-year study:

1) Spotlighting techniques
2) Blood and feather sampling for disease analysis,

3) Fitting of VHF- and GPS/PTT-transmitters,
4) VHF- and GPS/PTT data acquisition,
5) Locating and monitoring nest sites,
6) Collect and perform contaminant tests on pheasant eggs,
7) Locating and counting chicks,
8) Surveys for corvids and raptors at nests and brood sites,

**Description of Methodologies**

- *Rooster Crow Counts.* Pheasant crow counts will be conducted during the height of the breeding season (April – May) to develop a population abundance index and lambda values for each study site. Counts are conducted at several stations spaced at least 1 km apart along a pre-established route for two, three, and four minute intervals. Crow counts will start one half hour before sunrise and are completed by one half hour after sunrise.

- *Blood Sampling.* Blood will be extracted from the brachial vein for disease testing. We will test both wild and pen-reared pheasants for common wildlife and poultry industry diseases that have lethal and sub-lethal effects. The release of pen-reared pheasants on private hunting clubs and public wildlife areas may increase the exposure of wild pheasants to diseases not normally encountered in the environment.

- *Capturing Pheasant.* Pheasants will be captured ($n \geq 40$, approximately 1:4 male to female) using spotlighting techniques (Wakkinen et al. 1992, Giesen et al. 1982) during the fall and spring of each year. Captured pheasants will be aged, weighed, sexed, banded, and measured including short tarsus, culmen, flat wing and primary 1,9,10. Measurements will be used to calculate body condition indices and age birds.

- *VHF- and GPS/PTT Transmitter Installment.* Nearly all captured pheasant will be fitted with necklace style VHF-transmitters (<3% of body mass). At least two pheasant will be fitted with a rump-mounted GPS/PTT device. Two pheasants were outfitted with rump-mounted harnesses during 2012 at the USGS, Dixon Field Station. The pheasants were monitored for injury and adjustment of harness. These preliminary measures suggest rump-mounted harnesses are an effective technique that does not cause injury to pheasant. This GPS transmitter technology has multiple benefits over conventional radio-telemetry. For example, GPS are necessary to reliably identify year-round locations and obtain fine-scale movement patterns. Transmitters with GPS technology are not limited to access or weather conditions and provide reliable relocations, allowing data to be collected without a year-round field technician. A relatively small (8-g) VHF-transmitter will be placed on the GPS to relocate the transmitter following fatality or GPS signal failure. Data from the GPS transmitters will be downloaded from the ARGOS website and post-processed using various computer software and quality control measures.

Pheasant will be released at the point of capture. Radio-transmittered pheasant will be relocated by ground every 2 – 3 days and locations will be recorded using a hand-held GPS.

- *Nest Location and monitoring.* Monitoring will begin in March and continue through August. We will use portable VHF receivers and hand-held antennas to track VHF-marked pheasant and minimize location error by circling each pheasant at a radius of 30 – 50 m. Locations of female pheasant will be determined to within approximately 30 m every two days throughout the nesting season using a portable receiver and hand-held antenna. Care will be taken to not disturb the females. Transmitters will be equipped with an activity sensor and we will assume females are nesting when movements become localized and/or activity sensors indicate long periods of inactivity. By locating the female and her nest site, data can be collected on timing of incubation, nest failure, and nest success. Variation in transmitter signal frequency will help indicate female behavior. Nest locations will be mapped using a GIS. When monitoring indicates that a female has terminated the nesting effort, nest fate will be determined by examining the chorioallantoic membrane, allantoic sac, and broken eggshells. A membrane that is detached from the eggshell will be classified as a successful hatch. We will determine clutch size when possible by counting eggshells following a successful hatch or the destruction of the nest within five days of the females' departure from the nest site.

- *Collecting of pheasant eggs.* During the spring nesting season we will perform contaminant analysis on eggs collected, focusing on chemicals used in mosquito abatement and agricultural pesticides commonly used in the region.

- *Brood location and counting.* For females that successfully hatch, we will continue on-the-ground locations of broods using VHF-monitoring. We will locate radio-marked females with broods four times each week to help evaluate brood rearing habitat. Weekly locations will be divided into three time periods: morning (within 4 hr after sunrise), mid-day (>4 hours after sunrise to >4 hours before sunset), and evening (within 4 hr before sunset) (Dunn and Braun 1986). We will estimate fledging success as the percent of females that produces $\geq$1 chick $\geq$50 days old (Schroeder 1997). Areas important to brood-rearing will be identified. We will locate and count chicks every 10 days (intervals) following hatch. During each interval post-hatch, broods will be approached using pointing dogs, counted, and feather samples will be collected from $\geq$1 chick when it is possible. Spotlight surveys will also be conducted at night to confirm chick numbers and brood survival. If no chicks are located with the female pheasant day or night, then a follow-up survey will be conducted within 24 h to confirm brood failure.

- *Adult and Juvenile Survival*. Radio-transmitters will be equipped with mortality sensors that will double the pulse rate of the transmitter after eight hours of no movement. During

the non-breeding season, checks will be conducted once per month to relocate pheasant with VHF and determine status (i.e., alive or mortality).

- *Invertebrate sampling.* Sampling of invertebrates via pitfall traps will be conducted at brood sites every 10-d interval. We will sample invertebrates at treated and untreated areas for mosquito abatement before and after spraying of insecticides. Nine pitfall traps will be placed flushed with the ground along four transects that intersect the point location in a grid arrangement. Traps will be placed at five and 10 m. Traps will be open for 48 hours and insects will be collected and preserved at the end of the period. Pan traps that consist of approximately 5 – 10 cm of water will be placed in the center of each quadrant. These traps are designed to sample jumping insects. We will preserve all insects in propylene glycol solution or by freezing. Insects will be classified to order and families.

- *Raven and Raptor Monitoring.* We will conduct point surveys for ravens and raptors throughout study sites from 15 April – 30 August each year. We will use binoculars to count the numbers of avian predators, flying or perched, at each point. Rangefinders and compasses will be used to calculate a projected UTM coordinate of each avian predator. We will use generalized linear models to estimate occurrence of ravens and raptors. To understand factors that influence raven and raptor populations we will investigate metrics related to various anthropogenic factors (e.g., distance to transmission line) in the probability of occurrence models. We will further calculate density estimates for each species by habitat type. Raven and raptor densities will be estimated in relation to anthropogenic structures, roads, and landscape characteristics.

- *Data collection and storage.* We will maintain a database of all morphological, telemetry, and vegetation information collected within the study area. Data will be collected in the field using personal digital assistants (PDA's).

**PRODUCTS AND DELIVERABLES**

*Reports.* Annual reports documenting results of all conservation measures described in this proposal will be provided to CDFW, USFWS, and PF no later than December 31 each year. Preliminary findings of research will also be reported to these companies and agencies. Data summaries and preliminary findings will be presented to every two years.

*Professional Paper Presentation.* Preliminary and final results of this study will be presented at professional conferences and meetings as oral or poster presentations. We anticipate at least 5 presentations.

*Scientific Articles***.** We will publish a minimum of five peer-reviewed scientific journal articles. Tentative titles include:

- Widespread changes in agricultural practices influence farmland bird abundance: ring-necked pheasants as an indicator in western United States
- Nesting success of ring-necked pheasant in the Central Valley of California in relation to vegetation composition and related covariates
- Ring-necked pheasant survival and daily movement patterns in relation to agricultural and wildlife area management practices
- Including cropland in resource selection function models for pheasants in northern California.
- The effects of fruit and nut orchards on raven and raptor densities and nesting associated with state wildlife areas.

*USGS Open File Report (OFR) Guidance Document***.** If sufficient data is collected across years of study, then WERC will develop a management guidance document based on scientific findings for CDFW, USFWS, and other agencies. This report will help inform guideline standards for state and federal agencies. The report will include a series of recommendations based on scientific findings regarding factors related to pheasant population decline in California.

**Objectives for Population Estimates**

Data collected from this study will be used to estimate population vital rates and movement patterns. Therefore, analyses listed below will provide preliminary estimates of vital rates and effects and will be based on limited sample sizes until the project is completed.

1) Estimate egg and nest survival using maximum likelihood modeling approach,
2) Evaluate covariates for nest survival (e.g., raven abundance, age of pheasant, etc.),
3) Estimate brood survival using known fate (10-d interval) maximum likelihood modeling approach,
4) Evaluate covariates for brood survival (e.g., insect abundance, raven abundance, etc.),
5) Estimate seasonal survival of pheasant and identify sources of variation,
6) Calculate utilization distributions by adults and brood-rearing pheasant using VHF- and GPS/PTT-relocations, and
7) Identify use areas, movement corridors, and patterns in movement by pheasants using GPS technology.

**Statistical Software (analysis in parentheses)**

- Arc GIS 10 and Spatial Analysis (spatial statistics and mapping)
- Geospatial Modeling Environment (estimation of utilization distributions)
- 'Lme4' in Program R (generalized linear mixed models for invertebrate data)

- ‘Adehabitat’ in Program R (Brownian bridge models for pheasant movement patterns)
- Program MARK (estimation of survival parameters)
- Program DISTANCE (density estimation for corvids and raptors)
- WINBUGS (parameter estimation)

**BUDGET:** Itemized budget for CDFW, PF, and USGS collaborative pheasant project for FY2017 in the Central Valley and Klamath Basin, CA.

| **BUDGET ITEM** | **DESCRIPTION** | **TOTAL AMOUNTS** |
|---|---|---|
| **From CDFW** | **Employment** | |
| | Biological Field Technician (1 for 6 months) | $12,000 |
| | Research Wildlife Biologist (0.07 FTE) | $7,000 |
| | Wildlife Biologist (Project Manager) | $17,800 |
| | **Equipment** | |
| | VHF Transmitters (40 @ $225/unit) | $9,000 |
| | **Vehicles** | |
| | Field Vehicle Expenses (1 for 9 months) | $10,125 |
| | **Processing** | |
| | Genetic and disease | $1,000 |
| **Overhead @10%** | | $5,692 |
| **Subtotal** | | **$62,617** |
| **Pheasants Forever Match Funding** | **Employment** | |
| | Biological Field Technician (1 for 6 months) | $12,000 |
| | Research Wildlife Biologist (0.07 FTE) | $7,000 |
| | Wildlife Biologist (Project Manager) | $17,800 |
| | **Equipment** | |
| | 5 GPS Transmitters (refurbs included) | $12,500 |
| | Survey Equipment (bird and insects) | $1,000 |
| | **Vehicles** | |
| | Field Vehicle Expenses (1 for 6 months) | $6,750 |
| **Subtotal** | | **$57,050** |
| **Total Request** | | **$119,667** |

**Literature Cited**

Benton, T.G., Vickery, J.A. & Wilson, J.D. “Farmland biodiversity: is habitat heterogeneity the key?” Trends in Ecology & Evolution (2003): 182-188.

Chamberlain, D.E., Fuller, R.J., Bunce, R.G.H., Duckworth, J.C. & Shrubb, M. “Changes in the abundance of farmland birds in relation to the timing of agricultural intensification in England and Wales.” Journal of Applied Ecology (2000): 771-788.

California Department of Fish and Wildlife, 2014, Game Take Hunter Survey Reports. Available at: https://www.dfg.ca.gov/wildlife/hunting/uplandgame/reports/surveys.html

Dunn, P.O., and Braun, C.E. "Summer habitat use by adult female and juvenile sage grouse." The Journal of wildlife management. (1986): 228-235.

Evans, K.L. The potential for interactions between predation and habitat change to cause population declines of farmland birds. Ibis. (2004): 146, 1-13.

Fleskes, J.P., Skalos, S., Kohl, J., and Loughman, D. “The Ring-necked Pheasant (Phasianus colchicus) in California: Current Status and Factors Possibly Related to Population Trends.” Unpublished Data Summary (2014). United States Geological Survey Western Ecological Research Center

Giesen, Kenneth M., Thomas J. Schoenberg, and Clait E. Braun. "Methods for trapping sage grouse in Colorado." Wildlife Society Bulletin (1982): 224-231.

Gregory, R. D., Noble, D. G., and Custance, J. The state of play of farmland birds: population trends and conservation status of lowland farmland birds in the United Kingdom. Ibis. (2004): 146, 1-13.

Hill, J.E., D.M. Brandon, and S.M. Brouder. “Agronomic implications of alternative straw management practices.” Winter Flooding and Straw Management: Implications for Rice Production 1994–1996: Agronomy Progress Report No. 264. (1999) University of California, Davis.

Messick, J.P., Bizeau, E.G., Benson, W.W. & Mullins, W.H. “Aerial pesticide applications and ring-necked pheasants.” The Journal of Wildlife Management. (1974): 679-685.

Mineau, P. & Whiteside, M. “Lethal risk to birds from insecticide use in the United States—a spatial and temporal analysis.” Environmental Toxicology and Chemistry, (2006): 1214-1222.

National Audubon Society. “The Christmas Bird Count Historical Results” (2010) [Online]. Retrieved from http://www.christmasbirdcount.org [11/1/2015]

Pheasant Hunter and Harvest Trends on Type A Wildlife Areas. [Graph illustrations of harvest trends 1996-2012]. (2012): California Department of Fish and Wildlife. Retrieved from https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83158.

Schroeder, Michael A. "Unusually high reproductive effort by sage grouse in a fragmented habitat in north-central Washington." Condor (1997): 933-941.

Underwood, A. J. Beyond BACI: experimental designs for detecting human environmental impacts on temporal variations in natural populations.Marine and Freshwater Research. (1991): 42(5), 569-587.

USDA, 2014a. Census of Agriculture. Available at: http://www.agcensus.usda.gov/Publications/index.php

USDA, 2014b. Crop Acreage Data Available at: http://www.fsa.usda.gov/FSA/webapp?area=newsroom&subject=landing&topic=foi-er-fri-cad

Wakkinen, Wayne L., et al. "An improved spotlighting technique for capturing sage grouse." Wildlife Society Bulletin 20.4 (1992): 425-426.

List any CDFW personnel participation by name and classification:

| | |
|---|---|
| Name: Scott Gardner | Classification: Staff Environmental Scientist |
| Name: Matt Meshriy | Classification: Environmental Scientist |
| Name: Stella Mcmillian | Classification: Investigation Laboratory |
| Name: Andy Atkinson | Classification: Senior Environmental Scientist |

California Department of Fish & Wildlife

# Upland Game Bird Account Project Proposal

**Project Title and Description**: Upland Game Developed Water Structure Reconstruction and Maintenance

**Funding Request: $36,124**
***The request is divided into two segments, materials and supplies. While applied for as a package there certainly is the open option of only funding one portion without rejecting the entire project.***

**Project contact:**
Name: Daniel P. Connelly, Quail Forever
Phone #: 702-606-6775
Email: dconnelly@pheasantsforever.org

Administration:
Name: Joe Moore, Pheasants Forever Inc.
Phone #651-209-4929
Email: j,oore@pheasantsforever.org

This project to proceed from a period of funding availability, i.e. executed contract for 12 months. As anticipated, January 1, 2017 to December 31, 2017. FY 2016

California Department of Fish and Wildlife Region and location of proposed project:

Regions 4, 5 and 6

**Objectives**: There is a small army of volunteers most weekends that with their own equipment, time and whatever financial resources they can scrape together go out to the desert and forests to make things better for wildlife through providing adequate water. These dedicated volunteers are virtually on the front lines of wildlife conservation. The purpose of this grant is to help these individual with materials and supplies in addition to the hundreds of thousands of dollars they are donating in the form of in-kind services and mileage to help them do this important work. Providing funding will help with the securing of necessary building materials and supplies for the maintenance of the State's extensive system of developed wildlife watering facilities which will enhance production of upland game populations using the sites. In the long run this will ensure future generations will be able to enjoy enhanced hunting opportunities. The project involves the state providing the materials and supplies to accomplish the work while private non-profits provide the fuel, vehicles and manpower to restore and in many cases virtually replace existing watering structures.

Carrying capacity for upland game species as well as other non-game and big game is heavily dependent upon water in arid environments. The objective of this effort is to, to the degree

possible, systematically visit developed water sights throughout the state to insure that they are functioning in an optimum fashion. While many of these sites are entirely man-made many are often seep and spring improvements. Many of the efforts to bring water to these arid areas started in the late 1950 and continue today. As with any structure that is exposed to the elements these water developments over the past 60 years have begun to break down and degrade in function. This proposal encompasses all of these water sources. The overall objective is to get around to the 1500 odd sites at least every 15 years for maintenance. The time at each site and the degree of effort need to upgrade a site should diminish as the maintenance cycle shortens.

**Benefits**:
There are three main benefits from this proposal; First, and really the primary beneficiary, are to the upland game populations, as well as the hundreds of other species of wildlife that are in many cases entirely dependent upon these limited water resources for survival. With the effects of climate change and increasing demands on the aquifer coming in various forms from invasive plants to feral animals make these facilities increasingly vital for the maintenance of the desert ecosystem. Secondly, with recent actions by the federal government establishing ever increasing designated wilderness areas in the state, as well as new interpretations by various federal agency personnel on the value of developed water sources, and for that matter wildlife management, it is absolutely essential that a management presence be maintained on the landscape. In many cases the volunteers are some of the only active wildlife people some of these agency people come into contact with. These relationships are critical if we are to have any input as to what is occurring on Federal land. Lastly, and maybe just as important, is to keep this special interest group of volunteers actively involved with the resource. By having these folks put there blood sweat and tears into these projects you are much more likely to have them stand up with the Department of Fish and Wildlife if someone comes up with a project that is likely to harm the very resources they have so passionately tried to protect.

**Schedule of project tasks**:

| Tasks | Start Date | Finish Date |
|---|---|---|
| Various chapters of QF generally go out at least once per month to accomplish their water development work. Keeping in mind that not all developed water sites are created equal, nor are they the same distance away from start point. This often dictates the cost and time involved in each site can | | |
| | | |
| Chapters vary from 6 completed projects per year to 40 depending on manpower availability and age, nature and condition of site. This proposal is for the maintenance of an anticipated 18 sites. Mileage and hours are based on annual historic data for each chapter | | |
| | | |
| | | |
| | | |

Activities occur on the East and West portions of the Mojave Preserve, National Forest and BLM Properties in Central and Southern California

| **Project Funding Breakdown** | |
|---|---|
| **Materials** | Amount |

| | |
|---|---|
| *Specific project description and photographs in Appendix A* | |
| **South Valley Chapter-**San Luis Obispo County | |
| K-80-Temblor Mts. 35.1878N, 119.6656N /Replace tanks and fence | $3952.00 |
| **Ventura Chapter-**Santa Barbara County | |
| Rose Valley #3. Pine Mt. 34.32560N,119.11.266W/ Apron Repair | 396.15 |
| Rose Valley #4. Pine Mt. 34.32.465N,119.10.838W/ Seal cover | 84.44 |
| Rose Valley #1. Pine Mt. 34.32.032N,119.14.133W/ Seal cover | 84.44 |
| Reyes Creek. Reyes Peak 34.41.356N,119.18.040W/Apron Repair | 396.15 |
| Tinta. Chumash wilderness 34.15.707N, 119.10.468W/Apron Repair | 396.15 |
| Cherry Creek. Pine Mt. 34.36.252N, 119.21.420W/Replace Tank Lid | 286.42 |
| Santa Barbara Canyon. Cuyama Peak 34.46.964 N. 119.33.307W/Replace Tank Lid | |
| **Ridgecrest Chapter-**Kern County | |
| K-136/ El Paso Mts. Utm 5-39-271-12N 4-291-34E Replace apron and fence | 682.00 |
| K-129/ El Paso Mts. Utm 5-39-205-50-N 4-299-22E/Replace apron and berm | 690.00 |
| K-157/ El Paso Mts. Utm 39-272-50S 4-374-24E/ | 500.00 |
| K-93/Ridgecrest south Utm5-39-345-85N 4-424-99E/Replace Apron | 974.00 |
| **San Diego Chapter-**San Diego County | |
| McCain Valley/Jacumba Mts./32.41.335N,116.14.568W/Clean tank and repair apron | 278.11 |
| Ocotillo /32.40.269N 115.53.647W/ clean tank and repair apron | 220.14 |
| Black Canyon Road. 33.06.291N 116.49.662W/ Clean and seal tank and repair apron | 278.11 |
| Thing Valley Rd. 33.47.897N 116.24.158W Repair apron | 278.11 |
| Palomar Divide Rd., Palomar Mts. 33.20.825N 116.47.871W/ Clean tank,seal and repair apron | 278.11 |
| Palomar Divide Rd., Palomar Mts. 33.20.539N 116.47.465W/ Clean tank, seal and repair apron | 278.11 |
| **Subtotal for Materials** | **$10,339.30** |
| | |
| **Supplies** | |
| **Ventura Chapter** (Santa Barbara County) | |
| 1-/1-9/16" Rotary Hammer | $599.00 |
| 1-Flat chisel | 16.97 |
| 1-resharpenable chisel | 26.97 |
| 1-5lb. pick | 24.97 |
| 1-shovel | 14.97 |
| **Ridgecrest Chapter** (Kern county) | |
| 1-dump trailer/5000lb. capacity | 4,326.00 |
| 1-single axle trailer 5'x12' | 2,121.00 |
| 1-/1-9/16" rotary hammer | 599.00 |
| **Riverside Chapter** (Orange County) | |
| 6-shovels@20each | 120.00 |
| 2-wheelsbarrows@100 each | 200.00 |
| 1-spade handle mixer | 170.00 |
| 1-/1-9/16" rotary hammer | 599.00 |
| 1-concrete tamp | 100.00 |
| **Water for Wildlife** (San Bernadino County) | |
| 1-6'x10' single axle trailer | 2,000.00 |
| 2-water tanks/250 gal. with removable wire cages@150 each | 300.00 |
| 1-waterhose 1-1/12" /150ft. | 350.00 |

| | |
|---|---|
| **San Diego Chapter**(San Diego County) | |
| 1-pressure washer | 385.00 |
| 1-2,000 watt generator | 1,000.00 |
| 2 rotary hammers@110 each | 220.00 |
| 1-1/2 drill | 80.00 |
| 7-7gal. water containers @ 15.42 each | 108.00 |
| 1-water pump | 150.00 |
| **High Desert Chapter** (San Bernadino) | |
| 1-4000 watt generator | 500.00 |
| 1-power washer | 500.00 |
| 2-4.5" angle grinders@90 each | 180.00 |
| 2-Gas Blowers@125 each | 250.00 |
| **South Valley Chapter** (Kern County) | |
| 6-shovels@20each | 120.00 |
| 2-fence post drivers | 90.00 |
| 1-tool chest | 350.00 |
| 1-1/2" rechargeable drill | 140.00 |
| 1-power auger | 430.00 |
| 1-3,500 watt generator | 500.00 |
| 1-1"water pump | 460.00 |
| 1-300'/3/4 hose | 180.00 |
| 1-Chainsaw | 350.00 |
| 1-trailer/5'x8'/ 2,000lb | 2,100.00 |
| 1-fence tools | 225.00 |
| **San Gabriel Chapter** (Los Angeles County) | |
| 1-power auger | 480.00 |
| 2 auger bits@140 each | 280.00 |
| 1-ladder rack | 700.00 |
| 1-cordless drill | 180.00 |
| 1-air compressor | 200.00 |
| 1-air compressor accessories | 200.00 |
| 2-water tanks@125 each | 250.00 |
| 1 water pump | 125.00 |
| 1 hose and connectors | 200.00 |
| **Subtotal for Supplies** | **$22,500.88** |
| Overhead 10% | **3,284** |
| | |
| | |
| **Grand Total** | **$36,124.18** |

**The following below are estimated amounts based on historical annual work effort to demonstrate the amount of contribution that is being provided by those applying for the funds.**

| Non-Governmental Organization and other Agency Contributions | |
|---|---|
| Organization/Agency Name | % of Matching Funds and/or Volunteer Effort |
| Quail Forever chapters: San Gabriel, Riverside, Ventura, Los Padres, Ridgecrest, High Desert | 5992 hrs work,4080 hrs travel and $41,160 in mileage@.565 cents per mile/IRS rate |
| | |
| San Diego Quail Chapter | 900 hrs work, 180 hrs travel, and $1,602.00 in mileage a >.565 cents per mile/IRS rate |
| Water for Wildlife/Society for the Protection and Care of Wildlife | 1200 hrs. work, 960 hrs.travel, $8475.00 in mileage @.565cents per mile/IRS rate |
| Total | 8092 hours worked, 5220 total travel hours and $51,237 in mileage |

| Total Project Funding | |
|---|---|
| Item of Expense (salary & wages, equipment, supplies, etc) | Amount |
| Total Requested Funding | $36,124 |
| Total Matching Funds | |
| If $24.75 (http://www.independentsector.org/volunteer_time) is applied to the 13,312 work and travel time donated you end up with $329,472 Add to this the $51,237 in mileage cost/ totals | $380,709 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Total Project Costs | $416,833 |

# Appendix A – Project Materials

## South Valley Chapter

## Guzzler K-80

**Location**: Guzzler K-80 is located in western Kern County, California within the Temblor Mountains in the NW1/4, NW1/4 Section 31; T31S, R22E at 35.1878N, 119.6656W on lands managed by the Bureau of Land Management as part of the Carrizo Plain National Monument. The site is situated at an elevation of approximately 3,100 feet.

**Project Description**: The guzzler consists of twin 600 gallon fiberglass tanks supported by two 400 sq. ft. concrete capped aprons. The tanks and aprons were originally protected from livestock by a four strand barbed wire fence. The fence became deteriorated and cattle were able to gain access to the site. In 2009 both tank tops were trampled by livestock and collapsed into their respective tanks. The force of the collapse caused both tanks to split in numerous places rendering them useless and irreparable. Repairs were attempted but failed. Each tank is currently only able to hold a few gallons of water for a very short time before the water is lost to evaporation making the guzzler unavailable to wildlife during the long summer months.

This guzzler is a valuable link in a series of four guzzlers located along the spine of the Temblor Mountains. When operable, this site supports very good numbers of quail, chukar and dove as well as other birds and small mammals. To keep this important wildlife watering source functional, reprovisioning trips have been made each month during the summer for the past six years. A long term solution, although expensive, is necessary to ensure that this guzzler remains a reliable and functional water source.

We propose to remove the two existing damaged tanks and covers and install two new custom built "coffin type" reinforced fiberglass tanks. These will be direct replacements and can be installed with little modification to the existing aprons. The existing fence will be removed and completely rebuilt to a higher standard that will ensure that the new tanks will be adequately protected from livestock. All materials removed from the site will be disposed of at a county landfill.

All labor will be provided by a combined crew of volunteers from Quail Forever and the local Taft Sportsman's Club.

**Budget**:

| | |
|---|---|
| Coffin Style Guzzler tanks with domed covers - 2 ea. @ $1,849.00 ea<br>Fiber Enterprises | $3,698.00 |
| Fence Supplies and Miscellaneous Materials- | |
| Wood Fence Posts - 6" x 8' Pressure treated- 4 ea @ $21.50/ea | 86.00 |
| Barbed Wire, 2-point, 1 roll at $75.00 ea | 75.00 |
| Fence staples and wire clips | 25.00 |
| Concrete to connect tanks to apron - 10-#60Bags @$4.30/bag | 43.00 |
| Disposal of old tanks and construction debris at landfill, estimate 500lbs | 25.00 |
| **Project Total** | **$3,952.00** |

*All Prices includes freight and sales tax as appropriate

K-80 Aprons with collapsed tanks in background and dilapidated fence

K-80 Left Tank Damage

# Ventura Chapter

## Santa Barbara Canyon #4
## Gallinaceous Guzzler

**Location:** GPS = N 34 46 964  W 119 33 307

**Project Description**:

- Replace domed tank top on cement guzzler.
- Cement lid has collapsed for unknown reasons and no longer stores water or keeps elements out.
- Cement top shall be removed and a new top with hatch installed.

**Budget:**

Materials

| | | |
|---|---|---|
| 10 - 60 lb bags cement | @$2.97 | = $29.70 |
| 10 - 2x4x10s | @$4.53 | = $45.30 |
| 2 - 4x8x ¾ plywood | @$38.00 | =$76.00 |
| 10 - 10ft rebar | @$3.37 | =$33.70 |
| 1 - concrete adhesive | @$18.00 | =$18.00 |
| 6 - bags mortar mix | @$13.99 | =$83.94 |
| **Project Total:** | | **$286.64** |

# Ventura Project #2
# Cherry Creek Gallinaceous Guzzler

**Location:** GPS = N 34 36 252 W 119 21 420

**Project Description:**

- Replace domed tank top on cement guzzler.
- Cement lid has collapsed for unknown reasons and no longer stores water or keeps elements out.
- Cement top shall be removed and a new top with hatch installed.

**Budget:**

Materials

| | | |
|---|---|---|
| 10 - 60 lb bags cement | @$2.97 | = $29.70 |
| 10 - 2x4x10s | @$4.53 | = $45.30 |

| | | |
|---|---|---|
| 2 - 4x8x ¾ plywood | @$38.00 | =$76.00 |
| 10 - 10ft rebar | @$3.37 | =$33.70 |
| 1 - concrete adhesive | @$18.00 | =$18.00 |
| 6 - bags mortar mix | @$13.99 | =$83.94 |
| **Project Total:** | | **$286.42** |

# Ventura Project # 3
# Tinta Gallinaceous Guzzler

**Location:** GPS = N 34 15 707 W 119 10 468

**Project Description:**

- Apron is falling apart and needs to be repaired.
- Patch, caulk and reseal apron.

(Photos taken in 2012 – cracks have gotten worse)

**Budget:**

| Materials | | |
|---|---|---|
| 4 – caulking | @$6.29 | = $25.16 |
| 55 lbs - grout | @$21.24 | = $21.24 |
| 5 – scratch kote | @$69.95 | =$349.75 |
| **Project Total:** | | **$396.15** |

# Ventura Project #4
# Reyes Creek Gallinaceous Guzzler

**Location:** GPS = N 34 41 356 W 119 18 040

**Project Description:**

- Apron is falling apart and needs to be repaired.
- Patch, caulk and reseal apron.

**Budget:**

| | | |
|---|---|---|
| Materials | | |
| 4 – caulking | @$6.29 | = $25.16 |
| 55 lbs - grout | @$21.24 | = $21.24 |
| 5 – scratch kote | @$69.95 | =$349.75 |
| **Project Total:** | | **$396.15** |

# Ventura Project # 5
# Rose Valley #1 Gallinaceous Guzzler

**Location:** GPS = N 34 32 032 W 119 14 133

**Project Description:**

- Fiberglass top needs sealing and cover graffiti.
- Prime and paint cover.

**Budget:**

| Materials | | |
|---|---|---|
| 1 quart – primer | @$10.48 | = $10.48 |
| 2 gallons - paint | @$36.98 | = $73.96 |
| **Project Total:** | | **$84.44** |

# Ventura Project # 6
# Rose Valley #4 Gallinaceous Guzzler

**Location:** GPS = N 34 32 465 W 119 10 838

**Project Description:**

- Fiberglass top needs sealing and cover graffiti.
- Prime and paint cover.

**Budget:**

| Materials | | |
|---|---|---|
| 1 quart – primer | @$10.48 | = $10.48 |
| 2 gallons - paint | @$36.98 | = $73.96 |
| **Project Total:** | | **$84.44** |

# Ventura Project # 7
# Rose Valley #3 Parabolic Guzzler

**Location:** GPS = N 34 32 560 W 119 11 266

**Project Description:**

- Apron in need of repair.
- Cracks caulked and sealed.

**Budget:**

| Materials | | |
|---|---|---|
| 4 - caulking | @$6.29 | = $25.16 |
| 1 - grout | @$21.24 | = $21.24 |
| 5 – scratch kote | @69.95 | =$349.75 |
| **Project Total:** | | **$396.15** |

# Ridgecrest Chapter

## K-136
## El Paso Mountain

**Location: UTM No 5-39-271-12**
**UTM E 4-291-34**

**Project Description:**
PAD: LARGE CRACK 35'X26' 910 SQFT
CUT MOUTHOUT 6SQFT
Repair Fence

**Budget:**

| | | |
|---|---|---|
| LINEAR POLYPROPYLENE | 60MIL AT.70/ SQFT | 597.00 |
| 6 SACKS OF CEMENT | | 60.00 |
| FENCE WIRE 30' | | 25.00 |
| **Project Total:** | | **$682.00** |

# K-129
# El Paso Mountains

**Location:**
UTM 5-39-205-50 UTM E 4-299-22

**Project Description:**
PAD: LARGE CRACKS 30X30 900 SQFT
CURBING: FAIR
FENCE: GOOD

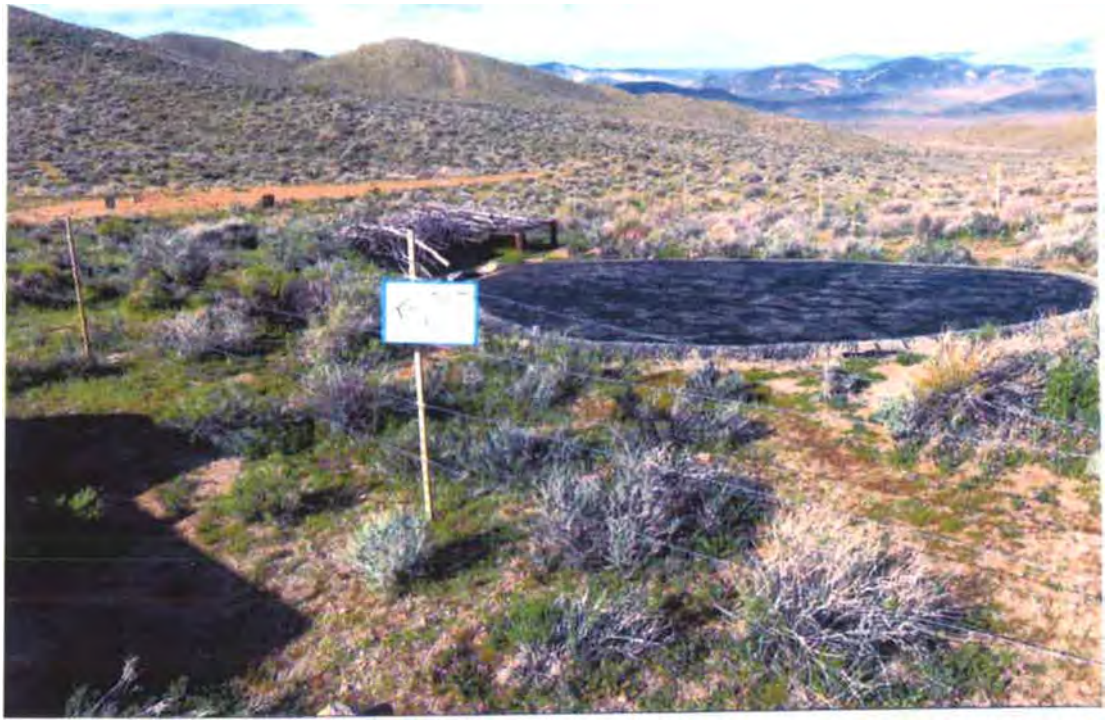
**Budget:**

| | |
|---|---|
| MATERIAL | |
| POLYPROPYLENE 60MIL .70/SQFT | $630 |
| 6 SACKS OF CEMENT | $60 |
| **Project Total:** | **$690** |

# K-157
# El Paso Mountain

**Location:**
S 39-272-50
UTME 4-374-24

**Project Description:**
Pad – Large Cracks 32'x20' - 640 SQFT
Curbing: Repair Needed
Fence: Good



**Budget:**
Materials

| | | |
|---|---|---|
| LINEAR MATERIAL | 640 SQFT | |
| POLYPROPYLENE | 60 MILAT .70/SQFT | $440 |
| 6 SACKS OF CEMENT | | $60 |
| **Project Total:** | | **$500** |

# K-93
# Ridgecrest South

**LOCATION:**
UTM 5-39-345-85
UTM E 4-424-99

**Project Description:**
PAD: LARGE CRACKS 30'X24' 1020SQFT
CURBING: GOOD SHAPE
FENCE: GOOD


**Budget:**
**Material**

| | | |
|---|---|---|
| LINEAR - 1020SQFT | AT .70/SQFT | $714.00 |
| 6 SACKS CEMENT | | $60.00 |
| SUN SHADE | 12'X6' | $200.00 |
| **Project Total:** | | **$974.00** |

# San Diego Chapter

## Project 1 – J19
## McCain Valley

**Location:** 32º 41.335' N, 116º 14.568' W

**Project Description:**
This Guzzler (J-19) has been defunct for several years. The tank is dry and full of debris. We will remove overhanging vegetation, remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 3 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $59.91
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 3 bags of Masterseal waterproof coating @ $38.00 x 3 = $114.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½" masonry cutting blades (consumables) @ $22.97

**Total cost: $278.11**

# Project 2 – 45
# Ocotillo, CA

**Location:** 32º 40.269' N, 115º 53.647' W

**Project Description:**
This Guzzler (45) is in Imperial County, near Ocotillo, CA. It has always held water until 2015. It is now dry and the tank is full of sand and debris. The apron is cracked. We will remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied to the apron. The tank will be entered, mucked out and cleaned and filled with clean water.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 2 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $39.94
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 2 bags of Masterseal waterproof coating @ $38.00 x 2 = $76.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½” masonry cutting blades (consumables) @ $22.97

**Total cost: $220.14**

# Project 3, 142
# Black Canyon Road

**Location:** 33º 06.291' N, 116º 49.662’ W

**Project Description:**
This Guzzler (142) has been defunct for several years. The tank is dry and full of debris. The apron is cracked. We will remove overhanging vegetation, remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied to inside of tank and on the apron.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 3 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $59.91
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 3 bags of Masterseal waterproof coating @ $38.00 x 3 = $114.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½” masonry cutting blades (consumables) @ $22.97

**Total cost: $278.11**

# Project 4, D-8
# Thing Valley Road

**Location**: 32º 47.897' N, 116º 24.158' W

**Project Description:**
This Guzzler (D-8), is badly overgrown with vegetation and has not been worked on in several years. The apron has extensive cracking that was repaired with tar in the early 1980's. We will remove overhanging vegetation, remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 3 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $59.91
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 3 bags of Masterseal waterproof coating @ $38.00 x 3 = $114.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½" masonry cutting blades (consumables) @ $22.97

**Total cost: $278.11**

# Project 5, P-21
# Palomar Divide Road

**Location:** 33º 20.825' N, 116º 47.871' W

**Project Description:**
This Guzzler (P-21) is along the Palomar Divide Road. It has been dry for years. It is now dry and the tank is full of sand and debris. The apron is cracked. We will remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied to the apron and the inside tank.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 3 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $59.91
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 3 bags of Masterseal waterproof coating @ $38.00 x 3 = $114.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½" masonry cutting blades (consumables) @ $22.97

**Total cost: $278.11**

# Project 6, P-20
# Palomar Divide Road

**Location:** 33º 20.539' N, 116º 47.465' W

**Project Description:**
This Guzzler (P-20) is along the Palomar Divide Road. It has been dry for many years. The apron is cracked. We will remove the tar and repair the cracks with mortar and non-shrink grout. A finish coat of Masterseal waterproof coating will be applied to the apron and the inside tank.

**Budget:**

1. 2 bags of Rapid Set Mortar @ $14.45 x 2 = $28.90
2. 3 bags of Rapid Set Non-Shrink Grout @ $19.97 x 3 = $59.91
3. 1 gallon of Quikrete concrete glue @ $11.93
4. 2 bags of FastSet concrete @ $5.20 x 2 = $10.40
5. 3 bags of Masterseal waterproof coating @ $38.00 x 3 = 114.00
6. 1 gallon of Acryl-60 adhesive @ $30.00
7. 2 each 4 ½" masonry cutting blades (consumables) @ $22.97

**Total cost: $278.11**

# MOJAVE NATIONAL PRESERVE YOUTH QUAIL HUNT AND BLM LAND WILDLIFE GUZZLERS RESTORATION

**AMOUNT REQUESTED: $48,729** FOR A THREE YEAR TERM 2016-2018 AT $16,243 PER YEAR AS DETAILED BELOW

**APPLICANT CONTACT INFORMATION:**

Safari Club International Orange County Chapter, 501 (c)(3) Federal Tax ID #33-0047659
Matt McCroskey, President SCIOC
949-369-6218
Matt@McCrosco.com
Authorized Signer Matt McCroskey

**INTRODUCTION:**

**a.** Project type:

**i.** Hunter Opportunity – Mojave Youth Quail Hunt includes education, outreach and safety.

**ii**. Habitat Improvement – BLM Land wildlife guzzlers restoration includes conservation.

**b.** Background of the issue is to introduce new youth hunters afield; and the need for the project is to help supply much needed water to the wildlife in this very arid region.

**c.** Specific goals and objectives are to introduce 60 new youth quail hunters and their families to the outdoors each year and to restore 31 BLM Land guzzlers.

**PROJECT DESCRIPTION:**

a. Attached is the Memorandum of Understanding between SCIOC and the U.S. Department of the Interior, National Park Service, Mojave National Preserve to handle the Mojave Youth Quail Hunt. This details both party's specific involvement and responsibilities.
b. The other phase of this grant request is to restore 31 wildlife water guzzlers. These are all BLM land in the Kingston and Clark Mountains west of I-15.
c. All staffing requirements are done by volunteers. No contractors or subcontractors.
d. Timelines on the guzzler restorations will begin almost immediately while the Youth Quail Hunts will be per the California DFW before the general quail seasons starting in 2016.
e. Materials necessary are listed in the BLM Guzzler estimate and the Youth Quail Hunt Expenses under this BUDGET section.
f. SCI Certificate of Liability Insurance will be provided and list as Additional Insured. The SCI Shooting and Archery policy has a limit of $1,000,000 per occurrence and the Umbrella and Excess Liability policies provide and additional $25,000,000 of coverage.
g. With this $48,729 we will create a separate Endowment Account used for this project. We will be able to accept private donations which can fund this program for many, many years.

**EXPECTED BENEFITS:**
The expected benefits are introducing 60 new youth hunters afield each year along with their families with an annual group size of about 200 people. This will help in long term goals of continuing our American hunting tradition. This provides additional hunter days per the CA DFW youth quail hunt program. The water guzzlers restoration will provide much needed water to the area wildlife.

**BUDGET:**

| | | |
|---|---|---|
| 60 Youth Quail Hunters Upland Game Bird Vests @ $20 each | = | $1200 |
| Giveaways (hats, T-shirts, knives, etc.) | | 750 |
| Raffle Prizes | | 1250 |
| Food 200 people, three meals @ $7 per meal | | 4200 |
| Miscellaneous Supplies (propane, firewood, lanyards, etc.) | | 750 |
| Office Supplies (postage, paper, ink, posters, printing, etc.) | | 300 |
| Mobile Sensory Safari | | 1500 |
| **ANNUAL TOTAL** | | **$9950** |

**2016 - 2018 THREE YEAR TERM BUDGET $9950 @ 3 YEARS $29,850**

The other phase of this grant request is to restore 31 wildlife water guzzlers. Attached is the BLM Guzzler estimate which shows the materials breakdown cost for the $609 each. These are all BLM land in the Kingston and Clark Mountains west of I-15. Attached is the BLM Map of the guzzlers to be restored.

**2016-2018 THREE YEAR TERM BUDGET $609 @ 31 GUZZLERS $18,879**

## TOTAL GRANT REQUEST $29,850 + $18,879 = $48,729

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**SUPPORTING DOCUMENTATION IN EMAIL ATTACHED:**

1. Memorandum of Understanding between SCIOC and the U.S. Department of the Interior, National Park Service, Mojave National Preserve to handle the Mojave Youth Quail Hunt.
2. A wonderful thank you card from one of the youth quail hunters.
3. BLM Land News publication featuring this guzzler success.
4. BLM map shows the 31 guzzlers to be restored.
5. 2015 estimate gives the specific breakdown of the $609 repair cost for each guzzler.
6. SCIOC Tracker newsletter July 2015 which has an article on this project plus the other events of our Chapter.
7. We have been awarded the SCI Chapter of the Year letter attached!
8. Mobile Sensory Safari trailer photos which we share with and help educate kids on the outdoors.
9. SCIOC BLM guzzlers before, after and quail usage pictures.

**Project Title**: Ecological study of wild turkey (*Meleagris gallopavo*) in San Diego County

**Amount Requested:** $107,050.00

**Applicant Contact Information**
Southwestern Wildlife Survey, Inc., 47-4418883
Charles J. Randel, III, PhD
Phone: 626/799-0259
E-mail: southwesternwildlife@gmail.com

**Introduction**
*Project type: Research*
Wild turkey (*Meleagris gallopavo*) have been extensively studied throughout their native range and much is known about life history and ecological requirements within these areas. However, limited data are available on home range size, habitat use, annual/seasonal movement patterns, and roost site selection for wild turkey in California. To address these California specific life history and ecology data gaps, regional studies are needed, and will provide the California Department of Fish and Wildlife (CDFW) with data to determine appropriate management actions within the Southern California Turkey Management Unit (TMUs; CDFG 2004).

Previous research in the Southern California (TMU) consists of a single study (Delgado 2004). This study reported wild turkey of both sexes used herbaceous grassland/meadow, hardwood forest, and conifer/hardwood forest types consistently in all seasons. Delgado (2004) found significant differences in home range estimates based on age classes and between study year. While the results of Delgado (2004) provide insight into some aspects of wild turkey ecology in central San Diego County, inadequate data collection techniques (e.g., insufficient telemetry fixes) likely influenced analyses, resulting in a potential misrepresentation of wild turkey habitat use and home range estimates. Technological improvements (e.g., Platform Transmitter Terminals; PTTs) allow for more robust/accurate data collection, particularly in areas with limited access on which to determine spatial movement patterns, estimate home range, and habitat usage. Improved data collection and analysis methods will provide the CDFW with need ecological data on which management actions and harvest decisions can be based (Kurzejeski and Vangilder 1992, Weinstein et al. 1995, Krebs 1999).

Our research goals are to provide CDFW with data on wild turkey movement patterns, habitat use, and roost locations in San Diego County. Our research objectives are: (1) determine home range size; (2) compare male and female seasonal habitat use; (3) assess seasonal movement patterns; and (4) compare roosting and non-roosting tree characteristics.

**Project Description**
*Project Location:* San Diego County

*Staffing Requirements*: One (1) wildlife biologist. The wildlife biologist for this project will be responsible for coordination/conducting capture and collar activities, with the responsibility for weekly data download, analysis, report/publication preparation.

*Implementation Plan*

| *Activity* | *Anticipated Date* |
|---|---|
| Estimated project award | 5/31/2016 |
| Capture/Collar | 12/15/2016 |
| Data collection | 12/16/2016–11/30/2018 |
| Report preparation | 12/1/2018 |
| Final report submission | 2/28/2019 |

To accomplish the above stated research goals and objectives we will capture wild turkey using modified walk-in traps (Davis 1994, Peterson et al. 2003) and drop nets (Glazener et al. 1964) at sites determined in consultation with the CDFW, U.S. Forest Service (USFS), and National Wild Turkey Federal (NWTF) on both public and private lands, with the assistance of CDFW, USFS, NWTF personnel and volunteers. Captured wild turkey will be removed from traps and placed into individual holding boxes located in shaded/darkened areas to reduce stress prior to handling. Our processing protocol will consist of hand securing individual birds and placing a dark breathable hood over their head to reduce stress. We will collect and record: age (adult or juvenile) based on 9th and 10th primary (Pelham and Dickson 1992), sex, and weight of each bird. We will additionally fit numbered CDFW aluminum bands, check for the presence of external parasites and injuries, and fit 20 wild turkey (10 male and 10 female) with backpack style, solar PTTs (Model 9.5 GS, North Star Science and Technology, LLC) secured using 1/4" telflon ribbon straps and a 1.6 cm nylon snap rivet (ITW Fastex Snap Rivets part number 236-220603-00-0101) as described by Humphrey and Avery (2014).

PTTs will be programmed to collect one location (lat/long) hourly during daylight hours with an additional location collected at 0001 to determine roost locations. All locations data be downloaded weekly, imported and stored in a database, post-processed, and plotted in a geographic information system (GIS) platform (ArcGIS 10.2, ESRI, Redlands, California). Post-processed geographic locations will be used to calculate individual fixed kernel seasonal and annual home ranges using Geospatial Modeling Environment (GME; Beyer 2012), with a Brownian bridge movement model (BBMM; Horne et al. 2007) used to estimate daily, seasonal, and annual movements; as well as vegetation community preference (used vs. available). We will test for differences in male and female home range size using paired t-tests or Mann Whitney u-tests. We will additionally test for differences in daily movements using the standard normal Z test.

Roost sites will be characterized by abiotic (e.g., elevation, aspect, percent slope, time since last fire, distance to perennial water, distance to paved/unpaved roads) and vegetative (e.g., macrohabitat classification, species composition, tree density, percent cover, diameter breast height, tree height) variables (Keegan and Crawford 2005). Paired locations $\leq$ 1.6 km will be randomly selected and similarly characterized. We will use paired t-tests or Mann Whitney u-tests to determine if roost sites are selected randomly or if wild turkey select roost locations for specific features. We will additionally use ANOVA or AIC to determine seasonal differences in roost selection and determine if male and female turkey select for different features based on season.

**Expected Benefits**

Currently, significant knowledge gaps of wild turkey ecology and life history traits exist throughout California. The primary advantage of this research project are that it should clarify temporal and spatial movement patterns of wild turkey and provide empirical data upon which management and harvest decisions based, delineate areas of potential wild turkey habitat on public and private lands, and identify potential areas for future population surveys to be conducted. Our research methodology provides a robust, statistically valid, data collection design from which accurate home range and movement patterns can be determined.

The overall benefit of this research project is intensive data collection over multiple years assisting CDFW in the development of scientifically based management actions for the Southern California TMU. High resolution data collection will fill existing knowledge gaps on spatial and temporal movement patterns, seasonal and annual survival rates, habitat use vs. habitat availability, and roost locations. We anticipate obtaining approximately 200,000 locations, including 14,600 roost sites, during this project, or a 65 fold increase from previous studies in the region.

Research results will be presented at suitable scientific meetings and published in peer reviewed scientific journals where CDFW will be acknowledged as the major funding source. We additionally anticipate publishing at least one popular article for submission to *California Outdoor*, or similar outlet.

**Budget**

| Ecological study of wild turkey (*Meleagris gallopavo*) in San Diego County **Budget** | **FY17** | **FY18** | **Project Totals** |
|---|---|---|---|
| **Personnel** | | | |
| Wildlife Biologist ($2000/month) | $2,000.00 | $2,000.00 | $4,000.00 |
| **Total Personnel Expenses** | $2,000.00 | $2,000.00 | $4,000.00 |
| **Operating Expenses** | | | |
| Separate line items for each – Show units need & cost per unit | | | |
| NorthStar 9.5 GS PTT (20 @ $3050/unit) | $61,000.00 | | $61,000.00 |
| PTTs Data Subscription (20 @ $1000/unit/year) | $20,000.00 | $20,000.00 | $40,000.00 |
| Argos AL-1 PTT Location | $1,450.00 | | $1,450.00 |
| **Total Operating Expenses** | $82,450.00 | $20,000.00 | $102,450.00 |
| **Subtotal Personnel & Operating Expenses** | | | |
| Overhead at 15% | $300.00 | $300.00 | $600.00 |
| **Total Project Cost** | $84,750.00 | $22,300.00 | $107,050.00 |

**References**

Beyer, H.L. 2012. Geospatial Modelling Environment (Version 0.7.2.0). (software). URL: http://wwwlspatialecology.com/gme.

California Department of Fish and Game [CDFG]. 2003. Strategic plan for wild turkey management. California Department of Fish Game, Sacramento, CA. 45pp.

California Department of Fish and Game [CDFG]. 1997. California turkey hunter's guide. California Department of Fish and Game, Sacramento, CA. 33pp.
California Department of Fish and Wildlife. 2015. Hunting regulations. California Department of Fish and Wildlife, Sacramento, CA. (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=106757&inline).
Davis, B.D. 1994. A funnel trap for Rio Grande wild turkey. Proceeding of the Annual Conference of the Southeastern Fish and Wildlife Agencies 48:109–116.
Delgado, A. 2004. Spatial and temporal habitat use and selection of wild turkeys (*Meleagris gallopavo*) in central San Diego County, California. Thesis. California State University, Sacramento, California. 114pp.
Fischer, J.W., W.D. Walter, and M.L. Avery. 2013. Brownian bridge movement models to characterize birds' home ranges. Condor 115:298–305.
Glazener, W.C., A.S. Jackson, and M.L. Cox. 1964. The Texas drop-net turkey trap. Journal of Wildlife Management 28:280–287.
Horne, J.S., E.O. Garton, S.M. Krone, and J.S. Lewis. 2007. Analyzing animal movements using Brownian bridges. Ecology 88:2354–2363.
Humphrey, J.S., and M.L. Avery. 2014. Improved satellite transmitter harness attachment technique. Journal of Raptor Research 48:289–291.
Keegan, T.W., and J.A. Crawford. 2005. Roost habitat selection by Rio Grande wild turkeys in Oregon. National Wild Turkey Symposium 9:253–259.
Krebs, C.J. 1999. Ecological methodology. Second edition. Addison-Welsey Educational, Menlo Park, California, USA.
Kurzejeski, E.W., and L.D. Vangilder. 1992. Population management. Pp 165–184 *in* J.G. Dickson, editor. The wild turkey: biology and management. Stackpole, Mechanicsburg, Pennsylvania, USA.
Mackey, D.L. 1984. Roosting habitat of Merriam's turkeys in south-central Washington. Journal of Wildlife Management 48:1377–1382.
Pelham, P.R., and J.G. Dickson. 1992. Physical characteristics. Pages 32–45 *in* J.G. Dickson, editor. The wild turkey: biology and management. Stackpole Books, Mechanicsburg, PA, USA.
Peterson, M.N., R. Aguirre, T.A. Lawyer, D.A. Jones, J.N. Schaap, M.J. Peterson, and N.J. Silvy. 2003. Animal welfare-based modification of the Rio Grande wild turkey funnel trap. Proceedings of the Annual Conference of the Southeastern Fish and Wildlife Agencies 57:208–212.
Weinstein, M., B.D. Leopold, and G.A. Hurst. 1995. Evaluation of wild turkey population estimation methods. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:476–487.

**Developing and implementing a population assessment survey to examine impacts of forest change on forest galliforms in California: a pilot study**

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## INTRODUCTION

### The Environmental Setting

More than 100 years of effective fire suppression across northern California forests has altered the tree species composition, increased tree density, and led to an accumulation of snags and downed wood far greater than was typical in these forests prior to Euro-American settlement in the 19th century (Skinner and Taylor 2006). As a result of these changes, ecological disturbances such as wildfire and insect outbreaks are increasing in severity. Both the frequency and duration of large wildfires and the length of the wildfire season have been increasing in the western U.S. during the past three decades (Westerling et al. 2006). In California, the average number of wildfires that burn >400 ha (>1,000 ac) annually has more than doubled, and spring and summer temperatures have increased on average 0.19 °C/decade (0.35 °F/decade) and 0.17 °C/decade (0.31 °F/decade), respectively, since the 1970s (Climate Central 2012). Areas with historically higher severity fire regimes, complex topography, and greater continuity of fuels may be more affected by predicted increases of wildfires than other areas (Cansler and McKenzie 2014). Fire has the potential to alter landscape patterns at large spatial scales and could decrease the amount and quality of wildlife habitat, fragment its distribution, or convert it to non-suitable land-cover types for many wildlife species.

The high densities of dead and dying trees in northern California forests also increase the severity of insect pest outbreaks. Within the coterminous U.S., an estimated 29.0 million ha (71.7 million ac) of forest are considered at risk of >25% tree mortality due to insect and disease during the next 15 years (Forest Service 2014). In California, the Jeffrey pine beetle, mountain pine beetle, and western pine beetle are associated with the highest mortality levels of pines (e.g., ponderosa, lodgepole, whitebark) and often impact drier, lower-elevation sites; Douglas-fir beetle activity has increased substantially in northern California; and fir engraver beetles are associated with the majority of mortalities of red and white fir (Forest Service 2007, California Forest Pest Council 2014). Large-scale tree mortality may be caused by infestations during drought, where stressed trees in dense stands may be particularly susceptible. From 2013 to 2014, the area affected by some elevated tree mortality levels due to bark beetles increased

substantially from 142,000 to 332,000 ha (350,000 to 820,000 ac) as droughty conditions continued (California Forest Pest Council 2015). Weather conditions influence both wildfire severity and beetle outbreaks, with recent climate change expected to continue to increase these events (Andrus et al. 2015).

**Forest Galliforms of Northern California**

Three native galliform species, sooty grouse (*Dendragapus fuliginosus*), mountain quail (*Oreortyx pictus*), and California quail (*Callipepla californica*) are widely distributed across the forests and woodlands of northern California and a fourth species, ruffed grouse (*Bonasa umbellus*) occurs within a limited range. Forest and woodland galliforms are important upland game birds in California and it is estimated that hunters spent approximately 546,000 days hunting these four species during the 2014–2015 season (Responsive Management 2015).

The taxonomic history of "blue" grouse includes lumping and splitting, with sooty (in California, northern portions south through the Sierra Nevada) and dusky (*Dendragapus obscurus*; multiple states and provinces within the Rocky Mountains) grouse currently assigned as different species (see Schroeder 2006). Much of what little we know about sooty grouse habitat has been through studies conducted outside of California (e.g., Bendell and Elliot 1966, Hines 1987). This species seems to prefer forested areas throughout the year, often select Douglas-fir and ponderosa pine, and are considered obligatory needle consumers (Zwickel and Bendell 2004, Schroeder 2006). Their habitat includes a range of forest conditions, such as shrub-dominated, early seral stages, closed-canopy forest, and open parklands. However, sooty grouse most commonly nest in open settings.

Across their distribution, suitable habitat for mountain quail has been described to include areas containing tall, dense shrubs and areas near escape cover and water within upland forests and woodlands (Brennan 1991). Within northern California, this species can be found in chaparral and mixed evergreen forests (Brennan et al. 1987), whereas in the Mojave Desert region, quail may be found in sparse mixed desert shrub and open woodlands (Troy et al. 2013). Many populations of mountain quail have been undergoing population declines, but with habitat improvements, translocations have proven successful both within and across-state translocations from source populations in California and Oregon (Budeau and Hiller 2012, Troy et al. 2013). In northern California, lack of disturbance (e.g., prescribed burns, logging) to maintain early successional shrubs and forbs, invasive vegetation species, urbanization, overgrazing, and other factors are major management concerns (Zornes and Bishop 2009).

California quail are relatively widespread and common in California (California Partners in Flight 2004), with the mean number harvested per day by hunters the highest of any galliform in in the state (Responsive Management 2015). California quail are adapted to a variety of habitat types including forest, shrublands, agricultural fields, and riparian areas. This species is associated with vegetation type edges, feeding in openings, and using forest or shrub patches for roosting and hiding cover (California Wildlife Habitat Relationships System 2016). Although habitat conditions may be diverse, California quail abundance may be positively associated with high forb abundance and negatively with dense stands of grasses or forest; disturbance to create early successional vegetation may be beneficial for food production and as brood habitat

(Leopold 1977, Oates and Crawford 1983). As with other species of quail, annual population fluctuations are often linked to weather conditions (e.g., Francis 1970), including demographic responses to precipitation in semi-arid regions (Botsford et al. 1988), although the magnitude of the response may be dependent on regional weather characteristics (Leopold 1977). As with mountain quail, numerous factors can lead to habitat degradation for California quail, including clean farming practices, urban development, and damage to riparian systems (Zornes and Bishop 2009).

The distribution of ruffed grouse is closely associated with the distribution of quaking aspen in North America (DeByle 1985), but the species will also use stands of alder and mixed hardwoods (Pelren 2003). Young, dense stands provide breeding, nesting, and brood-rearing cover, whereas mature stands provide winter food (Svoboda and Gullion 1972). Activities such as fire suppression and reduced logging reflect a loss of disturbance necessary to create early successional forests and therefore, aspen regeneration through colonization; protection from livestock and wild ungulate grazing may be necessary for regeneration for recently treated stands (e.g., Wiggins 2006, Forest Service 2012). This seems to have affected some western populations of ruffed grouse through a decline in abundance, although perhaps not in distribution (Wiggins 2006). Most past and current research on ruffed grouse has occurred in the eastern and upper Midwest within the U.S. (e.g., Robinson 1984, Devers et al. 2004, Kouffeld et al. 2013), but given the major land-use difference, it is questionable whether much of this information is applicable to the western U.S. Northern California serves as the southern-most distributional limit for ruffed grouse in the western U.S., a situation where ruffed grouse populations may be expected to be more sensitive to large-scale perturbations. Although our proposed study area (see below) does not include populations of ruffed grouse, our proposed methods and management benefits readily extend to this species for our future planned research.

There are few monitoring data to characterize the status of forest galliform populations in California. Furthermore, information about galliform populations conflicts among different sources in some cases. Breeding Bird Survey (BBS; (www.pwrc.usgs.gov/bbs)) data are insufficient to estimate population trends of sooty and ruffed grouse in California (Sauer et al. 2014 ), but a subjective assessment by another source reports these species are secure across their geographic ranges (NatureServe 2016). California quail populations are reported to be stable, but the species is sensitive to changes in precipitation and habitat fragmentation (Leopold 1977). Data and analyses by BBS indicate a slight downward trend in the population index for California quail populations in California from 2003 to 2013 (Sauer et al. 2014). Mountain quail populations are reported to be stable in California by California Partners in Flight (2004), but BBS data and analyses indicate a decline of 7.0% in the population index for the species during 2003–2013 (Sauer et al. 2014). Given these inconsistencies, there is a need to develop protocols for a field survey that can be applied across large spatial extents and specifically for forest galliforms to support management and conservation decisions.

## Information Needs

The long-term consequences of fire suppression, drought, and recent climate patterns have led to significant alterations in stand structure and composition from historical conditions in southern Cascades and Sierra forests. Increases in the severity and extent of wildfires and insect pest outbreaks can be expected to change the distribution forest successional stages and their spatial configuration. There are currently few research or monitoring data available to assess the population status of forest galliforms in California or predict how these species will respond to changing forest conditions. In the face of this uncertainty, upland game bird managers will require a more detailed understanding of species-habitat relationships for galliforms, especially landscape-scale patterns of forest interior areas and edges. Furthermore, because climate change forecasts remain imprecise, state wildlife agencies will require regular updates on the population status of upland gamebird programs and be prepared to adapt hunting programs and habitat management efforts as climate and forest conditions evolve in the future.

To assess galliform population responses to forest management and climate change, it is first necessary to have survey designs and analytical approaches that are matched to this purpose. Methods to inventory and monitor galliform populations vary widely among species and across their geographic ranges. Mid-summer visual surveys along transects or roads can result in observations of birds of different age-classes that support inferences about breeding success that year. However, some species may be more detectable during spring surveys designed for counts based on calling or drumming males. At present, the methods to efficiently estimate population abundance of galliform populations over large spatial extents in California forests are undetermined. Here, we propose a pilot study to address these topics.

## Goal and Objectives

The overall goal of our proposed pilot study is to address major information gaps that hinder our understanding of how forest galliforms will respond to altered disturbance regimes and climate change. Information gained from our pilot study will allow the California Department of Fish and Wildlife to make informed and defensible upland game bird management decisions in an increasingly complex and controversial setting. Specifically, we have developed 4 project objectives:

1. To implement a pilot study to assess the feasibility and relative efficiency of using replicated road-based spring call count and summer visual surveys for collecting data on forest galliforms,
2. To assess the feasibility to estimate absolute abundance of each species of forest galliform detected based on forest composition and structure, including effects of the aforementioned large-scale perturbations,
3. If data are insufficient to meet objective 2 for any species, to assess the feasibility to estimate relative abundance, and
4. To make recommendations to improve survey design and implement a well-designed survey across large spatial scales (e.g., throughout state and multi-state levels in the western U.S.).

## STUDY AREA

Northeastern California contains habitat and hunted populations of sooty grouse, mountain quail, and California quail. All three species occur within Lassen National Forest (Lassen NF; 4,330 $km^2$; 1,672 $mi^2$), an area that includes portions of the Modoc Plateau, Great Basin, Cascades, and Sierra Nevada in northeastern California (Fig. 1). Lassen NF is 97% forested and has and is expected to continue experiencing high levels of forest disturbance. For example, almost half of Lassen NF is considered to be at risk (i.e., >25% tree mortality due to insects and disease) during the next 15 years (Forest Service 2014; Fig. 2). The mountain pine beetle and the western pine beetle are considered major risk agents within Lassen NF (Forest Service 2014). The proposed study has experienced wildfires across large spatial extents, especially recently (Fig. 3) and also includes an extensive network of roads (Fig. 4), which is ideal for broad spatial coverage for road-based surveys.

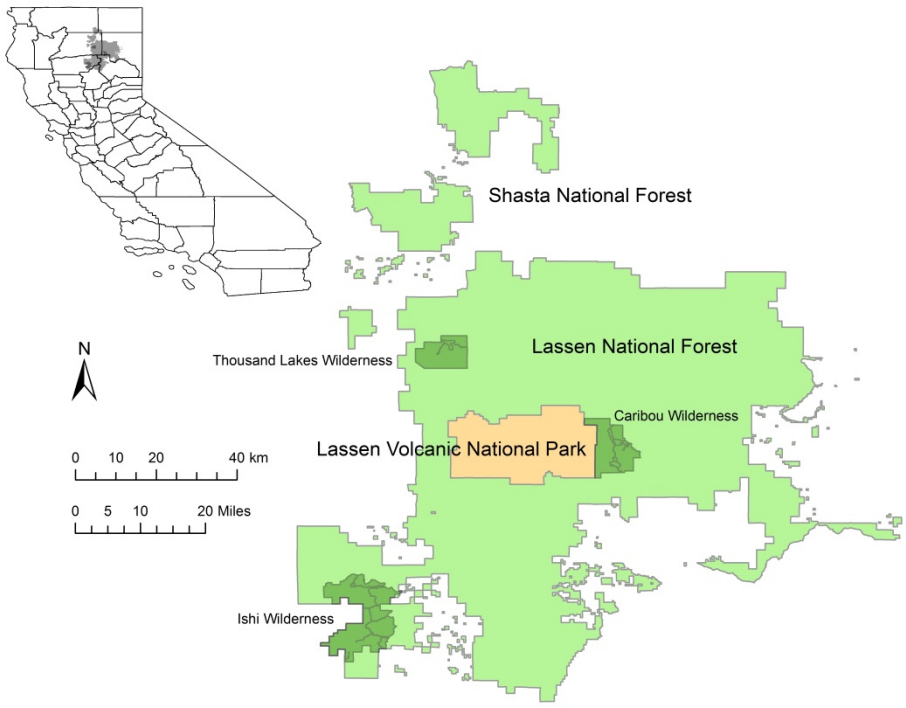


Fig. 1. Proposed study area includes Lassen National Forest in northeastern California, USA, excluding roadless areas (Caribou, Ishi, and Thousand Lakes wilderness areas).

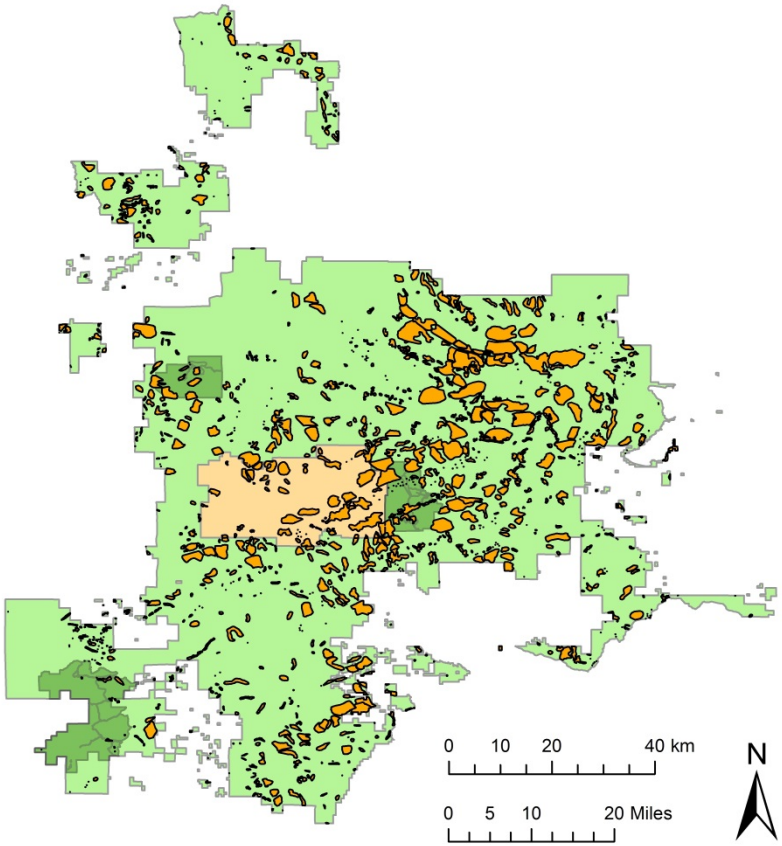


Fig. 2. Areas containing tree damage caused by all damage-causing agents, including bark beetles and other insects, identified during 2015 aerial surveys in Lassen National Forest, California, USA, by the Forest Service.

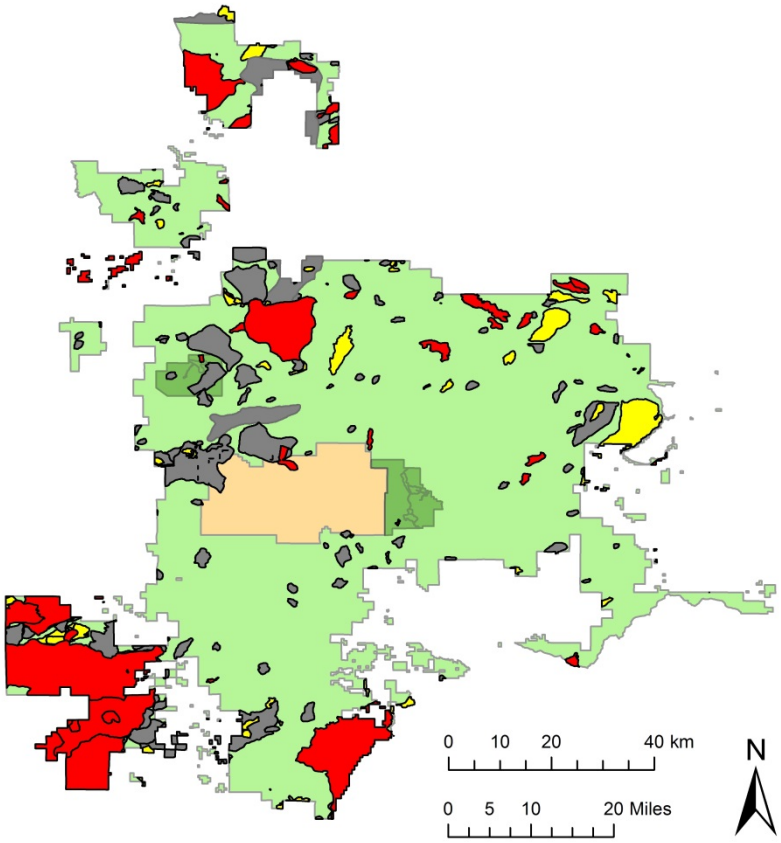


Fig. 3. Fire history of study area based on 3 time periods: 1910–1942 (gray), 1943–1974 (yellow), and 1975–2007 (red) in Lassen National Forest, California, USA.

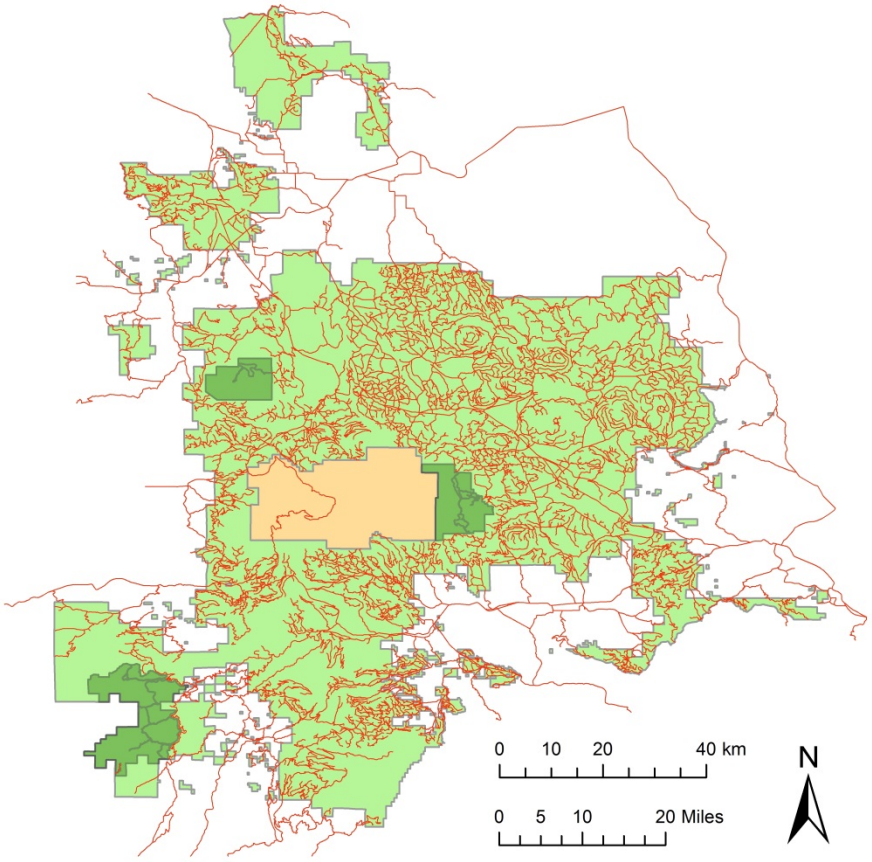


Fig. 4. An extensive road network exists throughout Lassen National Forest, California, USA.

## METHODS

### Data Collection

Although there are currently at least two large data sets available from monitoring avian species (BBS, eBird), like all surveys, these have their limitations. Initiated in 2002 by the Cornell Lab of Ornithology, eBird (ebird.org) has amassed a substantial data set of bird observations globally through citizen science. Although these data are invaluable for several purposes (e.g., identifying biodiversity hotspots, assessing species distributions), data collected on forest galliforms in California across all years are far too sparse (and lack a standardized collection protocol) to use to meet the objectives outlined in this proposed project. Similarly, despite the considerable management and conservation value of the long-term data collected through the BBS, these data are also extremely limited for several species of forest galliforms because of very low detection rates during spring call counts; the result is very wide confidence limits for population trends of these species (e.g., sooty grouse, dusky grouse; U.S. Geological Survey 2014). Further, counts conducted during spring may be less useful than visual counts during summer for galliform harvest management decisions and forecasts (e.g., Hiller et al. 2015).

If we accept that these data limitations exist for eBird and BBS, then there is currently no western forest galliform survey that covers large spatial extents to accurately describe annual population trends or to link abundance with effects of weather, wildfire, forest management practices (e.g., thinning), insect infestations that cause widespread tree mortality, and other factors. However, a highly effective galliform survey has been implemented for decades throughout the Midwestern U.S., referred to as the rural mail-carrier survey (RMCS). State wildlife agencies recruit rural mail carriers to record wildlife observations during their normal business travels, resulting in a large quantity of high-quality data over large spatial extents. Generally, these ongoing surveys have been conducted throughout a given state and for many decades (e.g., 1940s for NE; Hiller et al. 2015). Their value includes assessing long-term population trends, pre-harvest population status to forecast hunting success, and estimating an index of annual spring production. Costs of implementation are minimal for the data collected because rural mail carriers conduct surveys on a volunteer basis. Here, we propose to develop a similar method to survey forest galliforms in the western U.S. to benefit state agency management, but also to help inform federal land-management decisions. We will refer to our version of the RMCS as the summer visual count survey.

Fox et al. (2011) found that call count surveys for sooty grouse in Oregon required prohibitively large sample sizes to detect trends in time. However, Fox et al. (2011) assumed that each route would be sampled only once in a given year, and in the presence of detection error this design is seriously underpowered (Field et al. 2005, Mackenzie and Royle 2005). Fox et al (2011) also assumed that some minimum power needed to be achieved; it is more useful to identify the design that maximizes power given a fixed budget (Field et al 2005). In addition, we do not know the relative value of spring call count surveys versus summer visual count surveys; it is possible that some mixture of survey types gives the most power in a multi-species context. Therefore, we will implement spring call count surveys at selected locations along road transects as a comparison to summer visual count surveys, with a focus on sooty grouse for this proposed pilot study. This comparison will allow us to assess which survey method is more financially and logistically feasible, which method has higher predictability of fall harvest, and how spring and summer abundance estimates may be affected by large-scale perturbations.

We recognize that both state and federal agency budgets are limited, but we will attempt to recruit state and federal biologists to assist with data collection to reduce project costs of this proposed pilot study. However, we have included expenses in our budget to hire field technicians and cover their associated costs (e.g., vehicle use). We will establish survey routes for observers based on roads to be traveled during survey periods. Each route will be replicated $\geq$3 times to estimate detection probabilities by species. Data recorded during each summer visual count survey will include each species detected, number and age class (chick, adult) of each individual detected, location (UTMs) of each detection, date and time of survey, etc., similar to the RMCS. Selection of survey locations will occur to provide a diversity of forest conditions from which to examine. We will correspond with CDFW and the Forest Service Ranger Districts (Almanor, Eagle Lake, and Hat Creek RDs) to establish survey routes. Locations of routes will be stratified by forest classification (based on structure, composition, and disturbance) to allow us to estimate the effects of forest classification on abundance or occupancy of forest galliforms.

**Data Analysis**

Traditional field methods designed to collect data to estimate relative abundance typically use count data to estimate a visitation rate (e.g., number of visits/night) for the species of interest; researchers then assume this estimate of relative abundance is correlated with true abundance, whether through space or time (e.g., Long and Zielinski 2008). However, when estimating occupancy or abundance, perfect detection (detection probability = 1.0) of individuals of most wildlife species is likely the exception (Royle et al. 2005). Without estimates of detection probabilities, estimates of occupancy or abundance are negatively biased by an unknown amount (Tyre et al 2001). This negative bias also shrinks estimated effects of covariates, such as forest disturbance or time, reducing the power to detect important habitat effects and temporal trends (Field et al 2005). For both spring call count and summer visual count surveys, we will adjust abundance estimates (i.e., counts from surveys) by incorporating detection probabilities based on a subset of data that included spatially and temporally replicated counts and by assuming a closed population during each survey period at a given site (<1 wk). We will follow Royle (2004) for estimating abundance from temporally replicated surveys based on the likelihood for a given count history. With adequate spatial and temporal replication, we can use *N*-mixture models to estimate relative abundance of a given species (Royle 2004). We will use the pcount or gmultmix function in package *unmarked* (Fiske and Chandler 2011) for Program R, following the approach recommended by Royle (2004) and Kéry et al. (2005). If we have insufficient numbers in either survey type, we will fall back to estimating occupancy and detection. These methods reduce variability in estimated relative abundance by accounting for variation in detectability between locations, dates, and years.

To assess the effects of large-scale perturbations, we will model effects of landscape characteristics (e.g., forest type, insect infestation stage, number of years post-burn) on occupancy or abundance as appropriate. For both types of surveys, site- or route-specific covariates generally remain constant through time. For spring call count surveys, we will include covariates at each survey location, such as forest type at the location, distances to nearest road and water, and elevation. Based on estimated detection distances, we can also create buffers around each location using a GIS to assess spatial attributes (e.g., composition, spatial arrangement, and diversity of land-cover types; intensity of tree damage by bark beetle infestation; proportion and age of last wildfire event). For summer visual count surveys, landscape characteristics will be modeled at a coarser spatial scale, with each route divided into homogenous segments. Covariates that are measurable at the scale of a road segment (e.g., forest type, intensity of tree damage) will be included in the model set. Summer visual count surveys also provide a measure of production to evaluate upland game bird population parameters.

We will incorporate daily weather conditions into the detection component of occupancy or *N*-mixture models (Royle 2004), as weather often influences galliform behavior (e.g., Robel et al. 1969, Guthery et al. 2005). For spring call count surveys, we will use wind velocity, presence of precipitation, current temperature, and time of day as detection covariates because these can be measured at the exact time of the listening period. For summer visual count surveys, we will include average wind velocity, precipitation, maximum temperature, and minimum temperature, because detection rates will be modeled at the scale of an entire route. Once we have specified

our set of covariates, we will construct an *a priori* set of candidate models to fit using maximum likelihood estimation methods. We will rank models within each set using Akaike's Information Criterion (AIC) or quasi-likelihood adjusted AIC (QAIC) if data are overdispersed (Burnham and Anderson 2002). We can also evaluate predictive abilities of the highest-ranked model using cross-validation procedures.

Multi-species surveys can present some challenges, specifically related to accurate species identification. We will address this potential issue by providing specific training to observers to improve their classification accuracy. However, because species identification will not always be possible, we will allow observers to record unidentified galliform species as unknown species. During analysis, if few observations are categorized as unknown, we may elect to discount these observations during analysis without detrimental effects (Buckland et al. 2001). Another potential problem with multi-species surveys arises when making recommendations for future monitoring. The best allocation of effort in space and time may vary among species (Field et al 2005), which we will describe should that situation arise.

Recommendations for future monitoring will be based on a power analysis informed by estimates of detection probabilities from the pilot study. In consultation with CDFW, we will identify the magnitudes of habitat effects and temporal trends that would cause concern for these species. Following the methods in Field et al. (2005), we will then simulate a range of allocation scenarios that mix the different survey types (spring call counts and summer visual counts), numbers of stops or length of survey routes, and the number of temporal replications necessary to maximize statistical power for a given budget.

**TIMELINE**

We anticipate this pilot study being a 2-year study (2 spring call count and 2 summer visual surveys). If funding is available before July 2016, we will work to implement the first summer visual survey during August 2016, followed by the spring 2017, summer 2017, and spring 2018 surveys. If funding is not available before July 2016, our first and last surveys will be during spring 2017 and summer 2018, respectively. We will examine preliminary data following each survey, and complete a final report (in a format for submission to a peer-reviewed scientific journal) within approximately 6 months after the final survey (i.e., by Dec 2018 if spring 2018 survey, or by Mar 2019 if summer 2018 survey). We will request comments from CDFW on the draft manuscript prior to submission for publication.

**BUDGET**

We have included a budget based on a 2-year pilot study, with annual costs identified should funding be based on annual allocations. Personnel costs include salary for the PI and Co-PI to design and implement the surveys, hire and train technicians as observers, organize and analyze data, prepare a manuscript for publication in a peer-reviewed scientific journal, and formalize recommendations for potential future surveys. Other than transportation and equipment costs directly related to implementing this pilot study, we have included contracting costs for a project collaborator (Dr. Andrew Tyre, University of Nebraska-Lincoln) for assistance with complex statistical analyses. *For a 2-year study, total amount requested is $203,266.*

**Literature Cited**

Andrus, R. A., T. T. Veblen, B. J. Harvey, and S. J. Hart. 2015. Fire severity unaffected by spruce beetle outbreak in spruce-fir forests in southwestern Colorado. Ecological Applications. http://dx.doi.org/10.1890/15-1121.1.

Bendell, J. F., and P. W. Elliot. 1966. Habitat selection in blue grouse. Condor 68:431–466.

Botsford, L. W., T. C. Wainwright, J. T. Smith, S. Mastrup, and D. F. Lott. 1988. Population dynamics of California quail related to meteorological conditions. Journal of Wildlife Management 52:469–477.

Brennan, L. A. 1991. Regional tests of a mountain quail habitat model. Northwestern Naturalist 72:100–108.

Brennan, L. A., W. M. Block, and R. J. Gutiérrez. 1987. Habitat use by mountain quail in northern California. Condor 89:66–74.

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, New York, New York, USA.

Budeau, D., and T. L. Hiller. 2012. Age, sex, and nest success of translocated mountain quail in Oregon, 2001–2010. Proceedings of the National Quail Symposium 7:354–359.

Burnham, K. P. and D. R. Anderson. 2002. Model selection and multimodel inference. Second edition. Springer, New York, New York, USA.

California Forest Pest Council. 2014. California forest pest conditions, 2013. http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046704.

California Forest Pest Council. 2015. California forest pest conditions, 2014. http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046704.

California Partners in Flight. 2004. The coastal scrub and chaparral bird conservation plan: a strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California. PRBO Conservation Science, Stinson Beach, California, USA. www.prbo.org/calpif/plans.html.

California Wildlife Habitat Relationships System. 2016. California quail (*Callipepla californica*). California Department of Fish and Wildlife, California Interagency Wildlife Task Group. https://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx.

Cansler, C. A., and D. McKenzie. 2014. Climate, fire size, and biophysical setting control fire severity and spatial pattern in the northern Cascade Range, USA. Ecological Applications 24:1037–1056.

Climate Central. 2012. The age of western wildfires, western wildfires 2012. Climate Central. www.climatecentral.org/wgts/wildfires/Wildfires2012.pdf.

DeByle, N. V. 1985. Wildlife. Pages 135–152 in N. V. DeByle and R. P. Winokur, editors. Aspen: ecology and management in the western United States. General Technical Report RM-119. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, Colorado, USA.

Devers, P. K., D. F. Stauffer, G. W. Norman, D. E. Steffen, D. M. Whitaker, J. D. Sole, T. J. Allen, S. L. Bittner, D. A. Buehler, J. W. Edwards, D. E. Figert, S. T. Friedhoff, W.W. Giuliano, C. A. Harper, W. K. Igo, R. L. Kirkpatrick, M. H. Seamster, H. A. Spiker, Jr., D. A. Swanson, and B. C. Tefft. 2004. Ruffed grouse population ecology in the Appalachian region. Wildlife Monographs 168:1–36.

Field, S. A., A. J. Tyre, and H. P. Possingham. 2005. Optimizing allocation of monitoring effort under economic and observational constraints. Journal of Wildlife Management 69:473–482.

Fiske I. and R. Chandler. 2011. Unmarked: an R package for fitting hierarchical models of wildlife occurrence and abundance. Journal of Statistical Software 43:1–23.

Forest Service. 2007. Bark beetles and vegetation management in California. U.S. Department of Agriculture, Forest Service, Forest Health Protection, Region 5, Vallejo, California, USA.

Forest Service. 2012. Management indicator species/range suitability/capability analysis. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3837453.pdf.

Forest Service. 2014. National insect and disease forest risk assessment, 2013–2027. Report FHTET-14-01. U.S. Department of Agriculture, Forest Service, Forest Health Technology enterprise Team, Fort Collins, Colorado, USA.

Fox, T. T., B. D. Dugger, and K. M. Dugger. 2011. Survey protocol for monitoring the relative abundance of sooty grouse (*Dendragapus fuliginosus fuliginosus*) populations in western Oregon. Final Report. Oregon State University, Corvallis, Oregon, USA.

Francis, W. J. 1970. The influence of weather on population fluctuations in California quail. Journal of Wildlife Management 34:249–266.

Guthery, F. S., A. R. Rybak, S. D. Fuhlendorf, T. L. Hiller, S. G. Smith, W. H. Puckett, Jr., and R. A. Baker. 2005. Aspects of the thermal ecology of bobwhites in North Texas. Wildlife Monographs No. 159.

Hiller, T. L., J. S. Taylor, J. L. Lusk, L. A. Powell, and A. J. Tyre. 2015. Evidence that the

Conservation Reserve Program slowed population declines of pheasants on a changing landscape in Nebraska, USA. Wildlife Society Bulletin 39:529–535.

Hines, J. E. 1987. Winter habitat relationships of blue grouse on Hardwicke Island, British Columbia. Journal of Wildlife Management 51:426–435.

Kéry, M., J. A. Royle, and H. Schmid. 2005. Modeling avian abundance from replicated counts using binomial mixture models. Ecological Applications 15:1450–1461.

Kouffeld, M. J., M. A. Larson, and R. J. Gutiérrez. 2013. Selection of landscapes by male ruffed grouse during peak abundance. Journal of Wildlife Management 77:1192–1201.

Leopold, A. S. 1977. The California quail. University of California Press, Berkeley, California, USA.

Long, R. A., and W. J. Zielinski. 2008. Designing effective noninvasive carnivore surveys. Pages 8–44 in R. A. Long, P. MacKay, W. J. Zielinski, and J. C. Ray, editors. Noninvasive survey methods for carnivores. Island Press, Washington, DC, USA.

MacKenzie, D. I., and J. A. Royle. 2005. Designing occupancy studies: general advice and allocating survey effort. Journal of Applied Ecology 42:1105–1114.

NatureServe. 2015. NatureServe Explorer: an online encyclopedia of life (web application]. Version 7.1. NatureServe, Arlington, Virginia, USA. Available http://explorer.natureserve.org.

Oates, R. M., and J. A. Crawford. 1983. Effects of habitat manipulation on California quail in western Oregon. Journal of Wildlife Management 47:229–234.

Pelren, E. C. 2003. Ruffed Grouse (*Bonasa umbellus*). Pages 176–177 in D. B. Marshall, M. G. Hunter, and A. L. Contreras, editors. Birds of Oregon: a general reference. Oregon State University Press, Corvallis, Oregon. USA.

Responsive Management. 2015. Harvest of small game, upland birds, and other wildlife in California. https://www.wildlife.ca.gov/hunting/upland-game-birds#22503332-harvest-data.

Robel, R. J., D. J. Dick, and G. F. Krause. 1969. Regression coefficients used to adjust bobwhite quail whistle count data. Journal of Wildlife Management 33:662–668.

Robinson, W. L. (editor). 1984. Ruffed grouse management: state of the art in the early 1980's. The North Central Section of the Wildlife Society, and The Ruffed Grouse Society. Proceedings of a Symposium held at the 45th Midwest Fish and Wildlife Conference, St. Louis, Missouri, USA.

Royle, J. A. 2004. *N*-mixture models for estimating population size from spatially replicated counts. Biometrics 60:108–105.

Royle, J. A., J. D. Nichols, and M. Kéry. 2005. Modelling occurrence and abundance of species when detection is imperfect. Oikos 110:353–359.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American breeding bird survey, results and analysis 1966–2012. Version 02.19.2014. U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland, USA.

Schroeder, M. A. 2006. Blue grouse divided by two equals dusky and sooty grouse. Washington Birder 14(3):1, 4–5.

Skinner, C. N., and A. H. Taylor. 2006. Southern Cascades bioregion. Pages 195–224 in N. G. Sugihara, J. W. van Wagtendonk, J. Fites-Kaufman, K. E. Shaffer, and A. E. Thode. Fire in California's Ecosystems. University of California Press, Berkeley, California, USA.

Svoboda, F. J., and G. W. Gullion. 1972. Preferential use of aspen by ruffed grouse in northern Minnesota. Journal of Wildlife Management 36:1166–1180.

Troy, R. J., P. S. Coates, J. W. Connelly, G. Gillette, and D. J. Delehanty. 2013. Survival of mountain quail translocated from two distinct source populations. Journal of Wildlife Management 77:1031–1037.

Tyre, A. J., B. Tenhumberg, S. A. Field, D. Niejalke, K. Parris, and H. P. Possingham. 2003. Improving precision and reducing bias in biological surveys: estimating false-negative error rates. Ecological Applications 13:1790–1801.

U.S. Geological Survey. 2014. North American Breeding Bird Survey, 1966–2012 analysis. http://www.mbr-pwrc.usgs.gov/bbs/specl12.html.

Westerling, A. L., H. G. Hidalgo, and T. W. Swetnam. 2006. Warming and earlier spring increase western U.S. forest wildfire activity. Science 313:940–943.

Wiggins, D. A. 2006. Ruffed grouse (*Bonasa umbellus*): a technical conservation assessment. U.S. Department of Agriculture, Forest Service, Rocky Mountain Region. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182048.pdf.

Zornes, M., and R. A. Bishop. 2009. Western quail conservation plan. Wildlife Management Institute, Cabot, Vermont, USA.

Zwickel, F. C., and J. F. Bendell. 2004. Blue grouse: their biology and natural history. NRC Research Press, Ottawa, Ontario, Canada.

**Wildlife Ecology Institute**
P.O. Box 700, Starkville, MS 39760

Funding Agency: California Department of Fish and Wildlife
Principal Investigator: Tim Hiller
Project Title: Developing & implementing a population assessment survey to examine impacts of forest change on forest galliforms in California:a pilot study

Project Start Date: 7/1/2016 Project End Date: 6/30/2018

| | Annual base | Pers. mos. Yr 1 | Pers. mos. Yr 2 | Pers. mos. Yr 3 | Pers. mos. Yr 4 | Fringe Rate(%) | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A. Senior Personnel** | | | | | | | | | | | |
| Tim Hiller | 84,000 | 1.25 | 1.50 | | | 32.00 | 8750 | 10500 | 0 | 0 | 19250 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| *Subtotal Senior Personnel* | | | | | | | 8750 | 10500 | 0 | 0 | 19250 |
| **B. Other Personnel** | | | | | | | | | | | |
| Field technicians (5; spring) | 26,000 | 5.00 | 5.00 | | | 12.00 | 10833 | 10833 | 0 | 0 | 21667 |
| Field technicians (5; fall) | 26,000 | 5.00 | 5.00 | | | | 10833 | 10833 | 0 | 0 | 21667 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 0 | 0 | 0 | 0 | 0 |
| *Subtotal Other Personel* | | | | | | | 21667 | 21667 | 0 | 0 | 43333 |
| **Total Salaries & Wages** | | | | | | | 30417 | 32167 | 0 | 0 | 62583 |
| **C. Fringe Benefits** | | | | | | | | | | | |
| Senior Personnel | | | | | | | 2800 | 3360 | 0 | 0 | 6160 |
| Other Personnel | | | | | | | 2600 | 2600 | 0 | 0 | 5200 |
| **Total Fringe Benefits** | | | | | | | 5400 | 5960 | 0 | 0 | 11360 |
| **Total Salaries & Fringes** | | | | | | | 35817 | 38127 | 0 | 0 | **$ 73,943** |

Funding Agency: California Department of Fish and Wildlife

Principal Investigator: Tim Hiller

Project Title: Developing & implementing a population assessment survey to examine impacts of forest change on forest galliforms in California:a pilot study

| | | | | | | |
|---|---|---|---|---|---|---|
| **D. Equipment** | | | | | | |
| Handheld GPS units (6) | 1200 | - | - | - | | 1200 |
| Binoculars (6) | 390 | - | - | - | | 390 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| | - | - | - | - | | 0 |
| **Total Equipment** | 1590 | 0 | 0 | 0 | **$** | **1,590** |
| **E. Travel** | | | | | | |
| Domestic | | | | | | |
| Hiller (PI) | 2200 | 2200 | - | - | | 4400 |
| Vesely (Co-PI) | 1600 | 1600 | - | - | | 3200 |
| Technicians | 10400 | 10400 | - | - | | 20800 |
| **Total Travel** | 14200 | 14200 | 0 | 0 | **$** | **28,400** |
| **F. Other Direct Costs** | | | | | | |
| Supplies | 650 | 325 | - | - | | 975 |
| Publication Costs | - | 800 | - | - | | 800 |
| Consultant Services | - | - | - | - | | 0 |
| Dave Vesely (OWI) | 10500 | 8750 | - | - | | 19250 |
| Drew Tyre (UNL) | 4300 | 27100 | - | - | | 31400 |
| Computer Services | - | - | - | - | | 0 |
| Subawards/Consortium | - | - | - | - | | 0 |
| Other | - | - | - | - | | 0 |
| **Total Other Direct Costs** | 15450 | 36975 | 0 | 0 | **$** | **52,425** |
| **G. Total Direct Costs** | **$67,057** | **$89,302** | **$0** | **$0** | **$** | **156,358** |
| **H. Indirect Costs (%)** 30.00 | **20117** | **26791** | **0** | **0** | **$** | **46,908** |
| **I. Total Costs** | **87174** | **116092** | **0** | **0** | **$** | **203,266** |

## Investigator Biographies

**Tim Hiller (PI)**
With nearly two decades of experience as a wildlife professional, Tim has both management experience at a state wildlife agency and applied research experience in academia. Consequently, Tim can identify with the social, political, and economic components of agency decision making while developing and implementing research projects. His research interests include a diversity of game and non-game avian and mammalian taxa in an equally diverse array of ecosystems. Tim has published numerous technical and management plans, scientific articles, and book chapters; served on numerous state and national wildlife research and management committees; and is an active member of The Wildlife Society.

**Dave Vesely (Co-PI)**
Dave has a B.A. in Psychology from the University of Minnesota, a B.F.A. in Illustration from Oregon State University, and a M.S. in Forest Science also from OSU. He is presently a co-executive director of the Oregon Wildlife Institute. Dave has been a wildlife ecologist for more than 20 years, specializing in the assessment of the effects of human land use on wildlife populations and their habitats. His professional interests include restoration planning for wildlife, natural resource inventory and monitoring designs, and modeling approaches to understand land management effects on wildlife habitats. He has conducted research on threatened/endangered species and wildlife communities of the Oregon Coast Range, Oregon Cascades, and the Willamette Valley. Dave lives in Corvallis, Oregon.

**Andrew Tyre (Collaborator)**
Drew is a Professor in the School of Natural Resources at the University of Nebraska-Lincoln. His main area of interest revolves around helping people to make good wildlife management decisions, especially when very little is known about the wildlife population. Drew enjoys engaging with agency decision makers and framing their management problems to identify "robust" decisions that ensure good outcomes, even when inaccurate information must be used. He focuses his attention on extracting the most information possible from available data to address decision making.

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## EDUCATION

Ph.D., Wildlife Ecology. 2007. Michigan State University, East Lansing, MI
M.S., Wildlife Ecology. 2004. Oklahoma State University, Stillwater, OK
B.S., Fisheries and Wildlife Biology. 1995. Iowa State University, Ames, IA

## RECENT POSITIONS HELD

**Executive Director and Founder** (Nov 2015–present)
*Wildlife Ecology Institute, Starkville, MS*

**Research Scientist** (Aug 2013–present)
*Forest and Wildlife Research Center, Mississippi State University, Starkville, MS*

**Carnivore-Furbearer Program Coordinator** (Jul 2010–Aug 2013)
*Oregon Department of Fish and Wildlife, Salem, OR*

**Post-doctoral Research Scientist (**Jun 2008–Jul 2010)
*School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE*

## SCIENTIFIC PUBLICATIONS

Hiller, T. L., J. Beringer, and J. L. Belant. Shape complexity of space used by American black bears influenced by sex and intensity of use. Basic and Applied Ecology (*In review*).

Beringer, J., A. T. Timmins, and T. L. Hiller. 2016. Unintentional toxicosis from methylxanthines in chocolate-based baits consumed by American black bears. Wildlife Society Bulletin: *In press*.

Hiller, T. L., J. E. McFadden-Hiller, and B. N. Sacks. 2015. Genetic and photographic detections document Sierra Nevada red fox in the northern Cascades of Oregon. Northwest Science 89: *In press*.

Hiller, T. L., J. L. Belant, J. Beringer, and A. J. Tyre. 2015. Resource selection by recolonizing American black bears in a fragmented forest landscape. Ursus 26:116–128.

Hiller, T. L., J. S. Taylor, J. J. Lusk, L. A. Powell, and A. J. Tyre. 2015. Evidence that the Conservation Reserve Program slowed population declines of pheasants on a changing landscape in Nebraska. Wildlife Society Bulletin 39:529–535.

McFadden-Hiller, J. E., and T. L. Hiller. 2015. Non-invasive survey of forest carnivores in the northern Cascades of Oregon, USA. Northwestern Naturalist 96:107–117.

Hiller, T. L., J. E. McFadden-Hiller, S. R. Jenkins, J. L. Belant, and A. J. Tyre. 2015. Demography, prey abundance, and management affect number of cougar mortalities associated with livestock conflicts. Journal of Wildlife Management 79:978–988.

Hiller, T. L., J. L. Belant, and J. Beringer. 2015. Sexual-size dimorphism mediates effects of resource dispersion on American black bear space use. Journal of Zoology 296:200–207.

Hiller, T. L., D. M. Reding, W. R. Clark, and R. L. Green. 2014. Misidentification of sex among harvested bobcats. Wildlife Society Bulletin 38:752–756.

Hiller, T. L., and A. J. Tyre. 2014. Comparison of two age-estimation techniques for cougars. Northwestern Naturalist 95:77–82.

Buneau, K. E., T. L. Hiller, and A. J. Tyre. 2014. Modeling the effects of river flow on population dynamics of piping plovers (*Charadrius melodus*) and least terns (*Sternula antillarum*) nesting on the Missouri River. River Research and Applications 30:964–975.

Milburn, P., and T. L. Hiller. 2013. Recent kit fox detections at their northern-most extent in southeastern Oregon. Northwestern Naturalist 94:150–153.

Reding, D. M., C. Carter, T. L. Hiller, and W. R. Clark. 2013. Using population genetics for management of bobcats in Oregon. Wildlife Society Bulletin 37:342–351.

Campa III, H**.,** S. J. Riley, S. R. Winterstein, T. L. Hiller, S. A. Lischka, and J. P. Burroughs. 2011. Changing landscapes for white-tailed deer management in the 21st Century: parcelization of land ownership and evolving stakeholder values in Michigan. Wildlife Society Bulletin 35:168–176.

Hiller, T. L., D. R. Etter, J. L. Belant, and A. J. Tyre. 2011. Factors affecting harvests of fishers and American martens in northern Michigan. Journal of Wildlife Management 75:1399–1405.

McFadden, J. E., A. J. Tyre, and T. L. Hiller. 2011. Evaluating the efficacy of adaptive management approaches: is there a formula for success? Journal of Environmental Management 92:1354–1359.

Vantassel, S. V., T. L. Hiller, K. D. J. Powell, and S. E. Hygnstrom. 2010. Using advancements in cable-trapping to overcome barriers to furbearer management in the United States. Journal of Wildlife Management 74:934–939.

Hiller, T. L., J. Pusateri Burroughs, H. Campa III, M. K. Cosgrove, B. A. Rudolph, and A. J. Tyre. 2010. Sex-age selectivity and correlates of capture for winter-trapped white-tailed deer. Journal of Wildlife Management 74:564–572.

Hiller, T. L., and A. J. Tyre. 2009. Investigating active learning strategies in wildlife ecology college courses. North American Colleges and Teachers of Agriculture Journal 53:36–41.

Hiller, T. L., L. A. Powell, T. D. McCoy, and J. J. Lusk. 2009. Long-term agricultural land-use trends in Nebraska, 1866–2007. Great Plains Research 19:225–237.

Hiller, T. L., A. B. Felix, and F. S. Guthery. 2009. Association of northern bobwhites with surface water in the semi-arid Texas Panhandle. Wilson Journal of Ornithology 121:135–140.

Hiller, T. L., H. Campa III, and S. R. Winterstein. 2009. Estimation and implications of space use for white-tailed deer management in southern Michigan. Journal of Wildlife Management 73:201–209.

Hiller, T. L., H. Campa III, and S. R. Winterstein. 2008. Multi-scale cover selection of white-tailed deer, *Odocoileus virginianus*, in an agro-forested landscape. Canadian Field-Naturalist 122:32–43.

Hiller, T. L., and H. Campa III. 2008. Age-specific survival and space use of white-tailed deer in southern Michigan. Michigan Academician 38:101–119.

Hiller, T. L., H. Campa III, S. R. Winterstein, and B. A. Rudolph. 2008. Survival and space use of fawn white-tailed deer in southern Michigan. American Midland Naturalist 159:403–412.

Hiller, T. L., F. S. Guthery, A. R. Rybak, S. D. Fuhlendorf, S. G. Smith, W. H. Puckett, Jr., and R. A. Baker. 2007. Management implications of cover selection data: northern bobwhite example. Journal of Wildlife Management 71:195–201.

Guthery, F. S., A. R. Rybak, W. R. Walsh, S. D. Fuhlendorf, and T. L. Hiller. 2005. Quantifying usable space for wildlife with use-availability data. Journal of Wildlife Management 69:655–663.

*Guthery, F. S., A. R. Rybak, S. D. Fuhlendorf, T. L. Hiller, S. G. Smith, W. H. Puckett, Jr., and R. A. Baker. 2005. Aspects of the thermal ecology of bobwhites in North Texas. Wildlife Monographs 159:1–36.

Hiller, T. L., and F. S. Guthery. 2005. Microclimate versus predation risk in roost and covert selection by bobwhites. Journal of Wildlife Management 69:140–149.

Hiller, T. L., and F. S. Guthery. 2004. Correlates of fall–spring mass dynamics of bobwhites. Wilson Bulletin 116:324–329.

Guthery, F. S., T. L. Hiller, W. H. Puckett, Jr., R. A. Baker, and S. G. Smith. 2004. Effects of feeders on dispersion and mortality of bobwhites. Wildlife Society Bulletin 32:1248–1254.

**Received The Wildlife Society Wildlife Publications Award for Outstanding Monograph, 2006.*

**PUBLISHED PROCEEDINGS**

Hiller, T. L., C. M. Wilton, J. Beringer, and J. L. Belant. 2015. Spatial responses of a recolonizing American black bear population to a fragmented landscape in Missouri (abstract). Proceedings of the Eastern Black Bear Workshop 22:*In press*.

Vantassel, S. M., S. E. Hygnstrom, and T. L. Hiller. 2013. Efficacy of two raccoon eviction fluids: a trial evaluation. Proceedings of the Wildlife Damage Management Conference 15:108–112.

Budeau, D., and T. L. Hiller. 2012. Age, sex, and nest success of translocated mountain quail in Oregon, 2001–2010. Proceedings of the National Quail Symposium 7:354–359.

Hiller, T. L., F. S. Guthery, and H. Campa III. 2008. Quantifying usable space to increase wildlife management efficacy (abstract). Proceedings of the Australasian Wildlife Management Society Conference 21:97.

**BOOK CHAPTERS**

Hiller, T. L., B. White, and J. Erb. 2017. State management of furbearing animals. Pages xxx–xxx in T. J. Ryder, editor. State wildlife conservation and management. Johns Hopkins University Press, Baltimore, Maryland, USA. *In review*.

Hiller, T. L., and S. M. Vantassel. 2016. The global consumptive use of small carnivores: social, cultural, religious, economic, and subsistence trends from prehistoric to modern times. Pages xxx–xxx in E. Do Linh San, J. Sato, J. L. Belant, and M. Somers, editors. Small carnivores: evolution, ecology, behaviour and conservation. Wiley-Blackwell, Hoboken, New Jersey, USA.

**PROFESSIONAL MEMBERSHIPS**

The Wildlife Society (TWS)
TWS Hunting, Trapping, and Conservation Working Group (charter member)
American Society of Mammalogists

Society for Northwestern Vertebrate Biology
*Martes* Working Group

**PROFESSIONAL AND VOLUNTEER SERVICE**

Oregon Forest Carnivore Working Group (2016–present)
Fur Resources Committee, Southeastern Section, The Wildlife Society (2015–present)
Nominating and Elections Committee, TWS Hunting, Trapping, and Conservation Working Group (2015–2017)
Peer reviewer (invited), USFWS draft species report for the Sierra Nevada red fox (2015)
Peer reviewer (invited), Oregon Department of Fish and Wildlife, Oregon Conservation Strategy update (2015)
Volunteer, Oregon Department of Fish and Wildlife (2013–present)
Staff Writer, Fur Taker Magazine, Fur Takers of America (2007–present)
Oregon Representative on the USFWS Wolf Status Review Team (2011–2013)
Wildlife Damage Management Committee, Oregon Dept. of Fish and Wildlife (2012–2013)
Wildlife Holding and Seizure Committee, Oregon Department of Fish and Wildlife (2013)
Panel Member, Interagency Livestock Depredation Investigation Review Process (2011)
Mentor, Oregon Chapter of The Wildlife Society Conference (2011)
Associate Editor, *Wildlife Society Bulletin* (2010–2014)
U.S. Furbearer Conservation Technical Work Group, AFWA (2010–2013)
- Member, Research Sub-Committee
- Committee Member, AFWA BMPs for Trapping (striped skunks)
- Committee Co-Chair, AFWA BMPs for Trapping (ringtails)
- Committee Chair, AFWA BMPs for Trapping (western coyotes)
- Committee Co-Chair, AFWA BMPs for Trapping (wolves)
- Committee Member, AFWA BMPs for Trapping (American marten)

Assistant Editor, Internet Center for Wildlife Damage Management News (2010–2011)
Committee Member, The Wildlife Society Donald H. Rusch Memorial Game Bird Research Scholarship (2008–2012)
Judge, Conservation and Wildlife Displays, Nebraska State Fair (2009)
Assistant Firearms Instructor, Deer Damage Management Workshop, University of Nebraska-Lincoln (2009)
Poster Judge, Midwest Ecology and Evolution Conference, University of Nebraska-Lincoln (2009)
District 20 MUCC Representative, National Trappers Association (2007–2008)
District Director (districts 3 and 6), Michigan Trappers Association (2006–2008)
Landowner Assistance Program Liaison, Michigan Trappers Association (2006–2008)
Lead Editor, Staff Writer, Michigan State University Department of Fisheries and Wildlife Spotlight Magazine (2006–2007)
Saylorville Osprey Reintroduction Program Volunteer, Iowa Department of Natural Resources (2000)

# David G. Vesely

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*Education*

M.S. Forest Science, 1996. Oregon State University.
B.F.A. Illustration, 1991. Oregon State University.
B.A. Psychology, 1977. University of Minnesota.

*January 2007 to Present*

**Oregon Wildlife Institute- Executive Co-Director & Conservation Biologist**

The Oregon Wildlife Institute is a non-profit organization dedicated to the conservation and enhancement of wildlife resources in both native and human-altered environments through research, education, and conservation planning. As an executive director of a small non-profit, my primary responsibilities have been to build organizational capacity, develop partnerships with other conservation groups and government agencies, and lead promotion/outreach efforts. As a staff conservation biologist, I have more than 20 years expertise in habitat restoration planning for wildlife, species-habitat relationship studies, wildlife inventory & monitoring methodologies, and assessing land use impacts on wildlife.

*August 2004 to Present*

**Natural Resources Consultant-**

In addition to my employment at OWI, I also provide consulting services to state and federal agencies, watershed councils, and private companies. Types of services include:

- FSC/SFI forest certification audits
- Land use impact studies
- Wildlife habitat model development
- NEPA EIS/EA preparation
- GIS & cartography

*July 1998 to August 2006*

**Pacific Wildlife Research, Inc.- President & Wildlife Ecologist**

As president of a small consulting company, I employed 3 full-time PhD/M. S. level ecologists and managed 38 major contracts for PWRI. Representative projects include:

- Mt. Hood and Fremont-Winema National Forests SFI/FSC pilot certification (2006); clients were Scientific Certification Systems and the U.S. Forest Service
- Environmental report for the City of Turner water reservoir project (2006); clients were City of Turner and USDA Rural Development.
- Development of monitoring protocols for plants, fish, and wildlife (2005); client was USDA Forest Service, Washington, DC Headquarters

*Selected Wildlife Assessments & Planning Reports*

Hagar, J. C., D. G. Vesely, and P. Haggarty. Accepted 2016. Wildlife Management using airborne lidar: finding murrelet habitat. GIM International.

Vesely, David G. 2015. Capability of conservation detection dogs to perform searches for Mazama pocket gophers. Report submitted to Washington Office, U.S. Fish and Wildlife Service. Oregon Wildlife Institute. Corvallis, OR.

Vesely, David G. 2015. Conservation Assessment of the kit fox in southeast Oregon. Report submitted to USDA/USDI Interagency Special Status and Sensitive Species Program. Oregon Wildlife Institute. Corvallis, OR.

Vesely, David G. 2012. Monitoring songbird populations at the Pioneer Butte meadow restoration project, Siuslaw National Forest: survey methods and 2011/2012 pre-treatment results. Oregon Wildlife Institute. Corvallis, OR.

Vesely, David G. 2011. A guide to conserving wildlife on Willamette Valley farms. Report prepared for the Oregon Processed Vegetable Commission. Oregon Wildlife Institute. Corvallis, OR.

Vesely, D.G. and D.K. Rosenberg. 2010. Wildlife conservation in the Willamette Valley's remnant prairie and oak habitats. Oregon Wildlife Institute. Corvallis, OR.

Vesely, David G. 2008. Training conservation detection dogs to locate Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*). Report prepared for the U.S. Fish and Wildlife Service, Oregon State Office. Oregon Wildlife Institute. Corvallis, OR.

Vesely, David, G. 2008. Conservation planning for wildlife at Newton Creek Wetlands, Benton County, Oregon. Report prepared for the Marys Peak Natural Resources Interpretive Center, Philomath, OR.

*Publications*

Hagar, J.C., B.N.I. Eskelson, P.K. Haggerty, and D.G. Vesely. 2014. Modeling Marbled Murrelet (*Brachyramphus marmoratus*) Habitat Using LIDAR-Derived Canopy Data. DOI- 10.1002/wsb.407: Wildlife Society Bulletin, p. online.

McComb, B.C., B. Zuckerberg, D.G. Vesely, and C. Jordan. 2010. Monitoring animal populations and their habitats: a practitioner's guide. Taylor & Frances Group, LLC. Boca Raton, FL.

Hosten, P.E., O.E. Hickman, F.K. Lake, F.A. Lang, D.G. Vesely. 2006. Chapter 4: Oak savannas and woodlands. *In*, D. Apostal and M. Sinclair [eds.].Restoring the Northwest: The Art and Science of Ecological Restoration in Cascadia. Island Press, Washington, D.C.

Vesely, D.G. and G. Tucker. 2005. A landowner's guide to restoring and managing Oregon white oak habitats. USDI Bureau of Land Management, Salem District. Salem, OR. 72 p.

Vesely, D.G. and W.C. McComb. 2002. Terrestrial salamander occurrence and species richness in headwater riparian buffer strips in the Oregon Coast Range. Forest Science 48:291-297.

McComb, W.C., M.T. McGrath, T.A. Spies, and D.G. Vesely. 2002. Models for mapping potential habitat at landscape scales: an example using northern spotted owls. Forest Science 48: 203-216.

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**Professional Preparation**

| | | | |
|---|---|---|---|
| University of Alberta | Edmonton, AB, CA | Zoology | B.S. 1991 |
| Simon Fraser University | Burnaby, BC, CA | Behavioral Ecology | M.S. 1994 |
| University of Adelaide | Adelaide, South Australia, Australia | Agriculture and Natural Resources | Ph.D. 1999 |

**Professional Appointments**

| | |
|---|---|
| 2015 – present | Professor, School of Natural Resources, UNL |
| 2009 – 2015 | Associate Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL) |
| 2003 – 2009 | Assistant Professor, School of Natural Resources, UNL |
| 2002 – 2003 | Research Scientist, CSIRO Marine Research, Cleveland |
| 1999 – 2001 | Postdoctoral Fellow, University of Queensland |

**Publications**

*Selected publications most closely related to the proposed project*

1. Hefley, T. J., Baasch, D. M., **Tyre, A. J**., & Blankenship, E. E. (2014). Correction of location errors for presence-only species distribution models. Methods in Ecology and Evolution. 5:207-214.
2. Hefley, T. J., **Tyre, A. J**., Baasch, D. M., & Blankenship, E. E. (2013). Nondetection sampling bias in marked presence-only data. Ecology and Evolution, 3(16), 5225-5236.
3. Max Post van der Burg, Bartholomew Bly, Tammy VerCauteren and **Andrew J. Tyre**. (2010) Making better sense of monitoring data from low density species using a spatially explicit modeling approach. Journal of Applied Ecology, 48:47-55.
4. David M. Baasch, **Andrew J. Tyre**, Joshua J. Millspaugh, Scott E. Hygnstrom, Kurt C. VerCauteren (2010) An evaluation of three statistical methods used to model resource selection. Ecological Modelling 221:565-574.
5. Justin D. Hoffman, Naikoa Aguilar-Amuchastegui, and **Andrew J. Tyre** (2010) Use of simulated data from a process-based habitat model to evaluate methods for predicting species occurrence. Ecography, 33:656-666.
6. Jonathan Rhodes, **Andrew J. Tyre**, Niclas Jonzen, Clive McAlpine, Hugh Possingham. (2006) Optimising presence/absence surveys for detecting population trends. Journal of Wildlife Management 70(1):8-18.
7. Martin, T.G., Wintle, B.A., Rhodes, J.R., Kuhnert, P.M., Field, S.A., Low-Choy, S.J., **Tyre, A.J.**, Possingham, H.P. (2005) Zero tolerance ecology: improving ecological inference by modelling the source of zero observations. Ecology Letters, 8, 1235 -1246.

8. Scott Field, Andrew J. Tyre, Katherine Thorn, Patrick O'Connor, Hugh P. Possingham (2005) Improving the efficiency of wildlife monitoring by estimating detectability: a case study of foxes (Vulpes vulpes) on the Eyre Peninsula, South Australia. Wildlife Research 32: 253-258
9. Scott Field, **Andrew J. Tyre**, Hugh P. Possingham. (2005) Optimizing landscape-scale monitoring under economic and observational constraints. Journal of Wildlife Management 69:473-482.
10. **Andrew J. Tyre**, Brigitte Tenhumberg, Scott Field, Darren Niejalke, Kirsten Parris, Hugh Possingham. (2003) Improving precision and reducing bias in biological surveys by estimating false negative error rates in presence-absence data. Ecological Applications. 13, 1790-1801

**Synergistic Activities**

- **Course development:** Developed a course on using Population Dynamics models for environmental management for fisheries and wildlife students using "Problem Based Learning"; Developed a course on “Ecological Statistics” for graduate students, and migrated to on-line platform for access by students at other institutions. Currently developing an on-line graduate course for sampling, data management, and visualization.
- **Reviewer for**: Diversity and Distributions, Journal of Applied Ecology, Ecology Letters, Austral Ecology and Ecological Modelling in past 12 months; **Section Editor,** Methods, Current Reports in Landscape Ecology (new Journal coming from Springer).
- Developed a software add-on for R statistical system for estimating zero-inflated binomial models, currently used in Australia for wildlife monitoring and habitat modeling.
- Participated in NSF REU program in UNL Dept of Mathematics on applying robust control theory to biological populations, the NSF UBM program in Research for Undergraduates in Theoretical Ecology, and the NSF IGERT program “Resilience in Stressed Watersheds”.
- Helped organize an NSF funded mathematical biology conference in 2012.