

New research proposal to Western National Parks Association

The information supplied should be limited to the space provided and submitted on these forms. A proposal received in any other format will be returned. Additional attachments are not permitted.

Title of Project: Predict Condor Range and Habitat Requirements to Reduce Development Threats	Park(s) in which research is to be conducted: Pinnacles National Park
Name, address and phone number of principal investigator(s): PI - Randall Boone, PhD. and CoPI- Arianna Punzalan Department of Ecosystem Science and Sustainability 1499 Campus Delivery – 8234 NESB Colorado State University Fort Collins, CO 80523-1499 Phone: (970) 491-1806	Payee information - individual name and address or institution's name and address required: Karen Beppler-Dorn, Superintendent Pinnacles National Park 5000 Highway 146 Paicines, CA 95043
Is this a multi-year project? <input checked="" type="checkbox"/> YES NO <input type="checkbox"/> Total amount requested: This year \$ <u>7500.00</u> If multi-year project, estimated amount: 2nd year \$ <u>7500.00</u> 3rd year \$ _____	Desired start date: <u>December 1, 2016</u> Note: Not prior to October 1st
Project Duration: <u>1-2 years (Phase 1 is 1 year)</u> Project final completion date: <u>August 2017 for Phase 1</u> (see Research Guidelines)	
Name(s) of research participant(s) who will acquire advanced degree(s) as a result of working on this project, if any: Arianna Punzalan	Product(s) of research (articles, theses, maps, checklists, etc.) in addition to final report to WNPA (see research guidelines): Map of Current and Historic Condor Range and Habitat in CA

Abstract to be provided by PI(s). Do not exceed the half-page space provided below.

California condors are federally endangered and one of the rarest birds in the world, with fewer than 300 in the wild. This research will identify vital habitat necessary for condor population expansion and protect it from development that would negatively impact condors. Colorado State University (CSU) researchers will collaborate with Pinnacles National Park (PINN) to predict condor range expansion into their historic range to determine essential habitat and critical movement corridors. Following a precipitous decline, in 1987 the remaining 22 wild condors were brought into zoos for captive rearing programs. By the mid-1990's condors were being released back into the wild from several release sites in CA and, for over a decade, there have been two condor flocks in CA that are separated by thousands of square miles of vacant historical range. However, PINN detected long-range condor movements in 2015 and 2016 from central to southern CA, which highlighted a critical need to understand how condors will be using the landscape across the state as they expand back into their historical habitat. Unfortunately, energy development may proceed within currently unoccupied habitat without analyzing potential impacts to condors despite the significant threat it poses to birds. Data are needed on condor habitat preferences, movements within their current and historical range, and the conditions that promote long-range movements, such as interactions with other condors. This research will result in a GIS modeling tool to predict California condor range expansion, habitat requirements, and essential travel corridors in currently vacant but historically occupied condor range. Predicting condor range and hotspots will protect vital habitat threatened by development by enabling industry to consider impacts to condors and select alternate sites during compliance processes. This request is for Phase 1 of the project: conducting a review of all historical condor sightings in CA and creating a GIS layer of historical sightings to add to existing condor movement and location data. This research will protect habitats that are crucial for conserving and recovering endangered California condors.

(1) JUSTIFICATION (to be provided by submitting park): This section should specify the following: 1) Are NPS-appropriated funds available for the project (Yes/No)? 2) Where does this project rank in NPS and the submitting park's research priorities? 3) Was this proposal solicited by the park? 4) How will this research enrich visitors' understanding of the park? 5) What are the implications for resource management?

The California condor (*Gymnogyps californianus*) narrowly escaped extinction in the early 1980's when its population hit a low of just 22 individuals. To save the species from extinction, all remaining wild birds were brought into zoos for captive breeding programs. The success of those programs was followed by the release of captive-reared condors into the wild, starting in the mid-1990s. Pinnacles National Park (PINN) was selected as one of three CA release sites in 2003 and today there are >250 individuals in the wild with approximately 150 of those in California. Together with Ventana Wildlife Society (VWS), PINN manages the central California condor flock of 85 birds and USFWS manages the southern CA flock, from its release site in Santa Barbara County. Condors released from PINN not only contribute to the central CA flock, but to over-arching condor recovery goals.

The experimental nature of reintroducing this endangered species back into the wild after removing 100% of individuals in the late 1980s created an artificial, total absence of condors across their historical range. This absence allows development projects to move ahead without considering potential impacts to condors, even in areas within their historical range, between southern and central CA. Planning efforts to date have been based on limited data and a lack of knowledge of how birds released from captive release sites would behave and expand their range as their population increased.

Considering the California condor's critical status and slow trajectory toward recovery, losing even a single individual is a significant setback for the population and to PINN's investment in condor recovery. Development projects take many years to plan and during the span of those efforts, landscapes now devoid of condors will likely be occupied. Given the increasing mandates for renewable energy construction, and the strike risk that wind projects pose to condors, it is crucial we learn what travel corridors and habitat are most vital to protect. To anticipate and prepare for California condor range expansion, data are needed on historical range, range expansion, and long-range movements. Understanding and modeling anticipated high use areas and travel corridors based on current GPS data and historical use patterns will provide information to management agencies such as NPS, responsible for recovering this species. It will also inform recovery planning efforts and priorities, including a need for future release sites.

This project is highly leveraged by commitments from PINN's Condor Recovery Program. The program has placed GPS wing tags on one third of the condors it manages and has a staff of five employees and two interns who capture, tag, and download all GPS data that will be used for this project. However, there are not NPS funds for the Geographic Information System (GIS) research and analyses that are necessary to plan for the anticipated population increase and subsequent range expansion. PINN initiated collaboration with Colorado State University (CSU) to conduct this project based on the University's GIS analysis and modeling expertise. The NPS is strongly committed to endangered species recovery. California condor recovery is one of PINN's highest resource management and research priorities and is part of the Park's enabling legislation. PINN is the only NPS unit that actively manages and releases condors.

Visitors and avid bird watchers from all over the world come to PINN in the hopes of seeing condors in their natural habitat. This research will enrich visitors' understanding of the park by providing new knowledge about condors and how they interact with their habitat. Research results will be shared with visitors through maps, large posters, the NPS web site, and through interpreters on the trails and in the Park's Visitor Center and Visitor Contact Station.

Scientific research that improves condor survival by informing management is a high priority for PINN and the >30 federal, state, and non-profit condor recovery partners. This project has important implications for management and providing for natural condor range expansion free from the threats of developments; it will protect habitats that are crucial for conserving endangered California condors.

(2) CONCISE STATEMENT OF RESEARCH OBJECTIVES, DESIGN, AND METHODOLOGY. This section should include the facilities and sites to be used. Note: Limit this section to the two pages provided.

Project Goal and Objectives

Currently, condor recovery partners are forced to speculate about range expansion and habitat needs. Such speculation is insufficient to require proposed development projects to consider risks to condors in their project planning. Developing a predictive GIS model, or tool, would not only enable agencies to provide scientific probability of condor use within currently vacant habitat between southern and central CA, but would help inform recovery goals and management actions.

Project objectives address threats to California condors by reducing risk to condors from development in their historic range and by directly informing recovery planning and management actions:

- Analyze and digitally map historic (pre-removal into zoos) condor location data;
- Analyze current and new (2003-2017) GPS data to create a predictive GIS model and map anticipated range expansion and travel corridors between current southern and central CA flocks;
- Share the GIS modeling tool to aid proposed development planning that could pose threats to condors;
- Use the GIS model to inform condor recovery planning and management actions, such as release site selection; and
- Integrate research findings into web-based condor location maps and posters accessible to park visitors to increase their chance of viewing condors in the wild and to learn about NPS condor recovery efforts.

Project Design and Methods

Phase 1 (Year 1, 2016 – 2017):

1) PINN will continue placement of GPS tags on condors through capture operations conducted within the park. USFWS and VWS will also place GPS tags on condors and have already agreed to share data for this research. GPS tags provide unbiased, precise data that is critical in determining condor locations in areas with limited access, which are extensive across the expanding condor range. PINN, USFWS, and VWS use Movebank (an on-line data storage and management software) to download, proof, and map GPS data. PINN will also use ArcGIS 10.2 (ESRI software) to map and analyze all location data.

2) Review and digitize historic movement data and evaluate conditions that increase long-range, exploratory movements. All old observation data need to be reviewed and entered into a GIS to aid in the interpretation of current data. Old (pre-1987) observations are primarily opportunistic in nature and biases with these data need to be quantified.

3) Create GIS map layers that display historic data and current GPS location data. These overlays will highlight likely areas of re-inhabitation as condors return to areas they used historically.

(2) CONCISE STATEMENT OF RESEARCH OBJECTIVES, DESIGN, AND METHODOLOGY (Cont'd):

Phase 2 (Year 2, 2017 – 2018):

4) Analyze historic and current GPS data and create predictive model for high use areas and corridors between southern and central CA. Topography, plotted data, and changes over time will be used to create a predictive GIS model and tool for management and planning. When evaluating conditions that prompt long-range movements, correlations between factors such as: condor age, association with other condors, weather patterns, and other parameters will be analyzed with an analysis of variance (ANOVA) statistical model.

5) Create GIS modeling tool to predict: a) movement corridors between flocks and in historical range, b) habitat hot spots between southern and central CA flocks, and c) when the two flocks will be a single CA population. PINN and CSU will conduct data analysis and create the GIS model. Agent-based modeling will be used to simulate the effects of different variables such as climate and development on the movement of condors into currently vacant historical habitat.

On-going (Phases 1 and 2):

6) Share new GIS layers and modeling tool with condor recovery partners to inform: a) planning for proposed development projects that may impact condors negatively and b) condor recovery planning and management actions. Land managers and agencies responsible for evaluating development projects will use the model to predict high use areas that should not be developed. Condor recovery partners, including PINN, will use the tool to aid in long-term recovery planning. It will inform specific management actions that are currently being considered, such as new release sites.

7) Incorporate results from this study into PINN's interpretive programs with new map and poster displays to enhance visitors' understanding of NPS endangered species recovery efforts and where visitors can go to view condors in the wild.

The results of this research will directly inform and positively impact recovery efforts currently conducted by the NPS, USFWS Condor Recovery Program, VWS, The Peregrine Fund, and many other organizations. In addition, endangered species recovery is a public value that supports public recreation and appreciation of wildlife on public and private lands beyond PINN's boundaries.

3) CONCISE STATEMENT OF HOW YOUR RESEARCH CAN ENHANCE THE INTERPRETIVE MISSION OF THE PARK. ALSO INCLUDE ONE PARAGRAPH DESCRIBING THE PLAN FOR AN INTERPRETATION-RELATED PRODUCT OF THE RESEARCH. Use this page only.

PINN's interpretive mission is to connect visitors to the Park's natural resources through inspiring, personal experiences. Without a doubt, seeing a California condor in the wild creates this experience like few others. Condors are one of the main attractions for park visitors from all over the world and visitor surveys indicate they are a primary reason to visit PINN. Visitors regularly ask park staff where they can go to find and view condors. This research project will result in protecting condors and ultimately increasing their population, which in turn increases the chance that visitors can see condors in the wild. PINN staff conduct outreach and interpretation along park trails and even beyond park boundaries as biologists monitor condors and invite visitors to view them through scopes to learn more about the species. These opportunities greatly enhance visitors' experiences associated with the Park and enable them to develop a connection with the natural resources the NPS protects. Information gathered under this study will be relevant to the entire California Condor Recovery Program and will thereby benefit multiple PINN partners, including federal entities, non-profits, and state agencies.

Interpretive Plan

If this project is funded, PINN biologists and interpretive staff will work together to create maps showing current as well as anticipated condor expansion into their historic range. Maps will be available and updated quarterly on the Park's web site, in staff presentations, as well as in poster form on bulletin boards in the Park.

These colorful displays will show how:

- PINN is just one place in California where visitors can look for condors;
- Condor recovery and all of the Park's natural resources are tied to our surrounding landscape;
- Condors may travel over 100 miles in a day; and how
- Both public and private lands make up the landscape upon which condors rely.

(4) QUALIFICATIONS OF THE PRINCIPAL INVESTIGATOR(S) CONDUCTING THE RESEARCH. Use this page only. List only those qualifications directly related to this grant request. Include a list of other WNPA-funded research conducted by this PI.

1. PI: Randall Boone, PhD

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Dr. Randy Boone has been with the Natural Resource Ecology Laboratory for more than a decade, and is a founding faculty member of the Department of Ecosystem Science and Sustainability. He is also a faculty member of the Graduate Degree Program in Ecology. Randall is a wildlife ecologist with training from Oregon State University and the University of Maine. He received his PH.D. in Wildlife Ecology from the University of Maine in 1996. After completing graduate work at the University of Maine, he joined Colorado State University. His experience is diverse, with research in spatial analyses and GIS, ecosystem modeling, landscape ecology, database management, biogeographical relationships of birds and plants, species/habitat relationships, wildlife and pastoral livestock mobility, spectroscopy, cluster analysis, and telemetry techniques. Randy's research focuses on three main topics: animal movements and the habitats they use, ecological simulation, and pastoral ecology and simulation.

Co-PI: Arianna Punzalan, graduate student.

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Arianna Punzalan is Dr. Boone's graduate student in the NREL lab at CSU Ft. Collins. Arianna has been working with the Condor Recovery Program at PINN for four years and has five years of wildlife handling and data collection experience. She has been managing PINN condor GPS data since 2012. Arianna has also taken GIS classes through the Institute for Geographic Information Science program at San Francisco State University. Her knowledge of condor movements and GPS data has prepared her to conduct this study.

Budget for New Research Proposal

Project title and submitting park: Predict Condor Range and Habitat Requirements to Reduce Development Threats- Phase 1
Pinnacles National Park

Personnel

Principal investigator(s)	Funds requested from WNPA	Cash or in-kind contribution (Please specify which and source.)
1 Randall Boone, PhD.: Cash		\$28,800
2 Co-PI: Arianna Punzalan, graduate student: Cash	\$7500	\$35,700
3		

Other personnel (Specify number in brackets. Specify duties to be performed to earn funds on next page.)	Funds requested from WNPA	Cash or in-kind contribution (Please specify which and source.)
1 PINN Condor Program Manager: In-kind		\$36,720
2 PINN Wildlife Bio-technician: In-kind		\$41,340
3		
4		
5		

Total Personnel Costs \$7500

EQUIPMENT COSTS (List item and dollar amounts for those items costing more than \$100 each on next page.) 0 \$60,000

TRAVEL AND SUBSISTENCE (Itemize on next page.) 0

Other costs

1 Supplies and material		
2 Consulting services		
3 Computer services		
4 Subcontracts (Itemize on next page.)		

Total Personnel Costs

Total Personnel Costs \$7500.00

\$202,560

If multiyear project, summarize estimated subsequent year(s) budget(s) on next page.

COSTS (Cont'd). Note: Be sure to explain here the duties that will be performed by any funded individual.

Budget Narrative

Our request to conduct Phase 1 of this project is \$7500 to directly support work to be conducted by the project's graduate student (co-PI), Arinanna Punzalan. She will be supervised by the project PI, Dr. Randall Boone at CSU. Through NPS natural resource funding there is cash match in place and starting in October 2016 for this project in the amount of \$28,800 for Dr. Boone's time to design and direct the GIS analysis: \$28,800 during the project. The matching NPS grant also provides \$35,700 toward a graduate stipend for Ms. Punzalan's time on the project over two years conducting data management, analysis, and mapping in the GIS. She will also be responsible for close coordination with PINN's Condor Program. Our request of \$7500 would increase the amount of time she could work on the project from approximately 19 months through the existing matching grant, to 24 months, allowing Phase 1 to be completed through support from WNPA.

This project is heavily leveraged by in-kind personnel time from PINN. PINN Condor Program Manager (GS-11) will provide project coordination and oversight [.2 FTE for each project year, totaling \$36,720 for the 2-year project duration]. Additional PINN staff time will contribute to the project in-kind through PINN's Wildlife Biological Technician (Condor Crew Leader, GS-07) who is permitted for condor handling and will lead trapping and condor handling efforts [.3 FTE for two years totaling \$41,340]. Finally, GPS condor wing tags have been purchased by PINN and have an in-kind value of \$60,000 (\$4000 per GPS tag for 15 units).

A special note for researchers and the park superintendent:

WNPA is the funder of this grant on behalf of NPS, and WNPA handles selection, monitors progress, administers the payment schedule, and determines successful completion or default. WNPA also posts the final research report on its website, WNPA.org.

All other decisions regarding the conduct of this research grant (c.g., park access, laws, safety, protocols, etc.) and uses of the research, data, and its products (e.g., release of information, publication, intellectual property, etc.) rest in the hands of NPS and are the responsibility of NPS. Researchers and NPS should clarify any questions or assumptions before accepting the grant.

Due to several factors, ALL WNPA grants are for ONE YEAR ONLY (1 year only); however, we welcome and will carefully consider applications for second or third years following a successful first year.

Best wishes and hopes for a successful project. Thank you from WNPA.

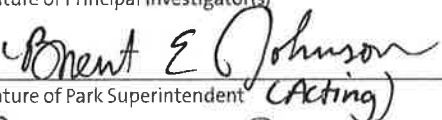
I have read and agree to abide by the research guidelines in effect at the time of this application.



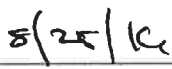
Signature of Principal Investigator(s)



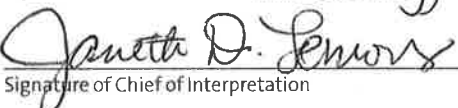
Date



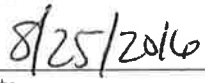
Signature of Park Superintendent (Acting)



Date



Signature of Chief of Interpretation



Date

For WNPA Use Only

WNPA Research Committee Review: Action and Date:

Amount Granted: