

## **Raven Workshop Speaker Background Information and Abstracts**

### **Brian Croft, Western Mojave Desert Division Chief, U.S. Fish and Wildlife Service**

#### *Background information:*

Brian Croft is the U.S. Fish and Wildlife Service's Division Chief for the Western Mojave Desert. His division primarily oversees implementation of the Endangered Species Act, including consultation with Federal agencies, conservation planning, and implementation of recovery projects for federally listed species. Brian has worked in the Mojave Desert since 2000, starting as the Land Condition Trend Analysis Coordinator at Fort Irwin before moving to work as a Natural Resources Specialist at the Bureau of Land Management Barstow Field Office. Since 2004, Brian has worked for the U.S. Fish and Wildlife Service in both the Ventura and Palm Springs Field Offices. His work has focused on recovery planning for the Sierra Nevada bighorn sheep, recovery implementation for several listed species in the Amargosa River Basin, section 7 consultations for renewable energy and military operations, and development of habitat conservation plans like the DRECP.

#### *Abstract:*

Over the past decade, the U.S. Fish and Wildlife Service has partnered with federal agencies, researchers, and other organizations to jointly carry out a program of common raven management in the California Desert. This talk will provide an overview of the program including the current status of funding mechanisms, projects that have been completed or are ongoing, and regulatory documents that provide for its implementation.

### **Brian Wakeling, Game Division Administrator, Nevada Department of Wildlife**

#### *Background information:*

Brian Wakeling currently serves as Administrator for the Game Division with the Nevada Department of Wildlife, a position he has held since September 2014. Prior to accepting this role, Brian served in a variety of positions with the Arizona Game and Fish Department during a 26 year career, including research biologist, big game supervisor, and Chief of Game. Brian holds both Bachelors and Masters degrees from Arizona State University, and he is both a Certified Wildlife Biologist and a Certified Public Manager.

#### *Abstract:*

Nevada Department of Wildlife holds primary state trust responsibilities for wildlife conservation within Nevada, although close coordination is needed on federal trust wildlife. This creates interesting management challenges when trying to keep a state trust species (greater sage-grouse) from Endangered Species Act listing, when some predators remain federal trust (ravens) and the habitat on which the species depends is managed by federal land management agencies. Close coordination and cooperation is paramount to the continued successes in the management of this important species.

## **Dr. Bill Boarman, Conservation Research Science and Consulting Founder**

### *Background information:*

Dr. William I. Boarman, founder and owner of Conservation Science Research & Consulting, and former research wildlife scientist with the U.S. Geological Survey, has over 35 years of experience working in the field, conducting scientific research, and providing technical support to many government and private agencies in the fields of wildlife ecology and conservation biology. His expertise is in desert wildlife, and he has performed research on desert tortoise conservation and ecology, common raven biology and management, and terrestrial vertebrate ecology within the Mojave Desert. In collaboration with Hardshell Labs, Inc., he is helping to develop and test in the field 3-D printed tortoise shells to study raven predation on tortoises and to develop future uses of the technology in conservation and resource management applications. Dr. Boarman is also working on field tests and refining methodologies for the use of lasers to deter ravens and other avian pests from accessing and damaging endangered species and other valuable resources.

### *Abstract:*

Common raven predation was first identified as one factor causing the decline in desert tortoise populations in the Southwest US in the 1980's. I report on 26 years of research primarily in the Mojave Desert of California to understand the links between human activity, raven populations and predation, and desert tortoises. Additionally, I touch on the few studies that have evaluated the effectiveness of management actions at reducing raven impacts on tortoises.

## **Dr. Christian Hagen, Senior Research Faculty, Oregon State University**

### *Background information:*

Dr. Christian Hagen has been involved in the research, monitoring and management of prairie grouse since 1996. His expertise focuses on the demography and habitat use of lesser prairie-chickens and greater sage-grouse, and in particular how these species respond to landscape-scale management and conservation. He has served as a Science Advisor to the Natural Resource Conservation Service Lesser Prairie-Chicken Initiative since 2011 and a Sage Grouse Coordinator to the Oregon Department of Fish and Wildlife from 2004-2011.

### *Abstract:*

Greater sage-grouse (*Centrocercus urophasianus*) face a suite of predators during all life-history stages across the sagebrush (*Artemisia* spp.) biome. However, none of these predators specialize on sage-grouse. This exposure to predation often leads to the hypothesis that predator control would be an effective conservation tool for sage-grouse populations. Generally, nest-success rates and adult survival are high, suggesting that on average predation is not limiting. However, in fragmented landscapes or in areas with subsidized predator populations, predation could limit population growth. Few studies have linked habitat quality to mortality rates, and fewer still linked these rates to predation. Predator management studies have not provided sufficient evidence to support implementation over broad geographic or temporal scales, but recent information suggests predator management may provide short-term relief for a population sink. Evaluating the need for predator management will require linking reduced demographic rates to habitat quality (fragmentation or degradation) or predator populations out of the natural range of variability (exotic species or subsidized populations).

## **Tim Shields, Contract Field Biologist and Hardshell Labs Founder**

### *Background information:*

Tim Shields spent 35 years working as a contract field biologist, mainly on a long term desert tortoise population monitoring project for Dr. Kristin Berry of the U.S. Geological Survey. Observing the decline of the tortoise convinced him of the need for active ecological management to help ensure its survival. He is focusing on raven management techniques using emerging technologies as he views the growing numbers of ravens and their predation on tortoises as an existential threat to his favorite species.

### *Abstract:*

The application of emergent technologies for the reduction of problems caused by growing numbers of Common Ravens holds promise for altering the birds' behavior. Hardshell Labs is using a number of tools to develop techniques for repelling ravens from areas of conflict. These include lasers and aerial and terrestrial drones. We are also experimenting with altering raven predation behavior toward tortoises using 3D printed desert tortoise replicas equipped to deliver aversive experiences. Shields will provide context for Hardshell's work and report on progress to date on the above projects.

## **Dr. William Webb, Independent Wildlife Biologist and Biology Instructor, Foothill College**

### *Background information:*

Bill has worked in a number of capacities related to wildlife biology within the private, public, and nonprofit sectors. He earned his Master's in Biology at University of California Riverside where his thesis focused on ravens in the Mojave Desert. Bill obtained his Doctorate at the University of Washington and studied ravens in western Washington. He currently lives in the Bay Area where he wears a variety of hats, including teaching community college biology, working as a postdoctoral researcher for the U.S. Geological Survey and Idaho State University and also working as an independent wildlife biologist.

### *Abstract: Linking Raven Demography and Behavior Across Ecosystems*

Gauging the impacts of ravens on prey such as the Desert Tortoise requires understanding raven population dynamics, sociality and predatory behavior. Demographic and behavioral studies in starkly different ecosystems - the Mojave Desert and the temperate rainforest of western Washington State - illustrate relationships between resources, raven behavior and demographic parameters. While greater insight into raven ecology promotes more informed management, significant gaps remain in our knowledge of raven ecology within the range of the desert tortoise.

## **Dr. Jimmy D. Taylor, Supervisory Research Wildlife Biologist, U.S. Department of Agriculture Wildlife Services, National Wildlife Research Center**

### *Background information:*

Jimmy Taylor is a supervisory research wildlife biologist and field station leader with the U.S. Department of Agriculture's National Wildlife Research Center. His field station is on the campus of Oregon State University in Corvallis, where he is a courtesy faculty member in the Forest Ecosystems and Society Department. Jimmy has an undergraduate degree in forestry and wildlife management, a master's

degree in wildlife science, and Ph.D. in forest resources from Mississippi State University. His research is conducted at the human-wildlife interface and focuses primarily on defining impacts and developing strategies to reduce human-wildlife conflicts. His studies often involve overabundant species and species of concern.

*Abstract: Population dynamics of greater sage-grouse in Bighorn Basin, Wyoming*

Greater sage-grouse (*Centrocercus urophasianus*) populations have declined in range and abundance. This decline has prompted concerns about population persistence and exposed a need for information to inform management decisions. We developed a population viability analysis (PVA) model and estimated 10,000 values of population growth drawn from distributions based on field data we collected from 5 sites in Bighorn Basin, Wyoming. Our results illustrate the need to examine sub-populations separately and that reducing raven depredation of nests may improve sage-grouse fitness at multiple scales.

**Dr. Peter S. Coates, Research Wildlife Biologist, U.S. Geological Survey, Western Ecological Research Center**

*Background information:*

Dr. Peter Coates is a research wildlife biologist for U.S. Geological Survey's Western Ecological Research Center. He completed a Ph.D. at Idaho State University in 2007 focused on sage-grouse nesting behavior and ecology, particularly related to raven predation events. Throughout his career he has been employed by Nevada Department of Wildlife, U.S. Department of Agriculture, universities, and non-profit organizations. Currently, Peter leads a research team focused on multi-scale demographic studies of multiple avian species, particularly ravens and sage-grouse. His research involves multiple field sites across the Great Basin to study interactions between prey response, habitat, predator abundance, and predator/prey behavior. He is committed to carrying out sound science that helps to inform management and policy decisions for federal and state agencies aimed at sustaining populations of species of conservation concern.

*Abstract: Science to Inform Adaptive Management for Ravens*

Predation is a natural component of wildlife populations and is the primary cause of reproductive failure across a wide variety of birds and reptiles. However, unnatural levels of nest predation may limit population growth by reducing annual reproductive rates of prey species. Generalist nest predators are of conservation concern because they substantially reduce prey populations, even at low prey densities. This effect is especially pronounced if predators are increasing in abundance and distribution as a result of anthropogenic resource subsidies. I provide an overview of the conservation issues associated with the common raven (*Corvus corax*), a ubiquitous generalist predator in western US. Specifically, I address: (1) increases in estimated numbers since the 1960s, (2) identified potential causes for such increases, and (3) effects to species of conservation concern, particularly the greater sage-grouse (*Centrocercus urophasianus*). I also describe an empirically-based, data-driven decision support tool for adaptive management framework that can be used to inform management actions aimed at minimizing the impacts of ravens on greater sage-grouse populations and other prey species.