Wildlife Abstracts

Student Paper Contest

Listed Alphabetically by Presenter

Behavioral Responses of Desert Bighorn Sheep in the Pusch Ridge Wilderness Area to Backcountry Visitor Use and Recreation

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From 2013-2016 the Arizona Game and Fish Department released a total of 110 desert bighorn sheep (*Ovis canadensis mexicana*) in the Pusch Ridge Wilderness area (PRW), Arizona, USA. Bighorn were released in an effort to re-establish a former endemic population that was extirpated in the mid to late 1990's after experiencing rapid population decline. Reasons for the decline are likely multifactorial, however, urbanization and an increase in backcountry recreation are often cited as likely contributing factors. Many prey species exhibit antipredator responses in the presence of humans. These responses may lead in turn to behavioral modification and spatiotemporal avoidance strategies that can be energetically expensive, reduce foraging time or limit recruitment. Our research was developed to better understand the effects of backcountry recreation on the behavior and distribution of desert bighorn sheep. Human use of the PRW was quantified across the study site using real time observer field counts and modeled use metrics derived from motion activated trail cameras (n=15) placed on six US Forest Service (USFS) trails. We conducted 125 behavioral observations at multiple spatial scales from February of 2015 through May of 2016 to quantify bighorn activity budgets and responses to human interaction. Bighorn behavior was characterized in a generalized linear model (GLM) to examine how human use and environmental covariates affect changes in the frequency of behaviors within the bighorn activity budget. Our models indicate an increase in human activity in the PRW is inversely correlated with time spent grazing. As a potential trade off bighorn significantly increased the frequency in time bedded. Bighorn also varied foraging time in relation to increased temperature and distance from rugged terrain. These results suggest that bighorn may modify behavioral responses to human activity in a way that is most energetically conservative when the perceived risk is predictable.

Competition between Ecologically Similar Territorial and Invasive Species

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Biological invasions threaten biodiversity globally, and degraded ecosystems increase the potential for invaders to compete with threatened native populations. In natural systems, niche partitioning minimizes interspecific competition, but introduced species may alter expected

outcomes by competing with ecologically similar species for scarce resources. Where food production is highly variable, coexistence of native and invasive competitors may depend on dietary niche flexibility. Territorial species under invasion face additional challenges in maintaining economically defendable territories. From 2011-2016, we conducted removal and behavior experiments to determine effects of non-territorial introduced Abert's squirrels (*Sciurus aberti*) on diet, space use, and territoriality of endangered Mount Graham red squirrels (MGRS; *Tamiasciurus fremonti grahamensis*) in their declining habitat in the Pinaleño Mountains, Arizona. We collected comparative data from Arizona sites of natural syntopy between Abert's and red squirrels (*T. fremonti*). Stable isotope analysis revealed similar dietary partitioning among populations. Removals did not affect MGRS diet but did affect MGRS space use. Territory sizes and body mass of MGRS were sensitive to conspecific population density and food production. Behavioral experiments showed MGRS were more aggressive than other red squirrels. Dietary flexibility of Abert's squirrels may have facilitated coexistence with MGRS, possibly due to coevolved resource partitioning with red squirrels. However, aggressive territoriality toward Abert's squirrels may incur fitness costs for MGRS especially during poor food production years. Climate change may reduce the advantage of ecological specialist species globally, and where introduced species are better-adapted to novel environmental conditions, native species may ultimately be replaced.

Evaluating Resource Use Prediction for American Black Bears using Occupancy Models with Independent Data

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Discerning the ecological relationship between wildlife populations and the abiotic and biotic resources they use is a fundamental research question for ecologists. Understanding these relationships is important because the quality and quantity of these resources drives individual fitness and thus population dynamics and can dictate long-term demographic viability. Furthermore, understanding which resources are selected by wildlife populations will help determine how changes in habitat abundance, distribution, and quality will affect wildlife populations. We investigated if genetic data collected by a recent large-scale density estimation study could be coupled with occupancy modeling to aid in estimating resource use for black bear populations in 2 New Mexico mountain ranges: the Sangre de Cristo Mountains and the Sacramento Mountains. We then applied the resource use model generated by our occupancy modeling to the Jemez Mountains, NM and compared the predicted probability of resource use across the mountain range to an independent data set comprised of observed locations from GPS collared black bears. The model selection results from our occupancy analysis supported road density, enhanced vegetation index (EVI), and the coefficient of variation for the EVI (EVICV) as the most explanatory predictors of black bear resource use at the scale of our study. Resource use by black bears decreased with increasing road density and increased with increasing EVI and

EVICV. Observed resource use by black bears in the Jemez was well correlated with predicted resource use suggesting our model had good predictability. Our results suggest that occupancy modeling can be used to assess population level resource use for a highly mobile species, and provides an approach to estimate resource use of wildlife populations for conservation and management agencies faced with limited budgets.

The Active Space of the Northern Grasshopper Mouse *(Onychomys leucogaster)* and Implications of Woody Plant Encroachment.

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Vocal communication is a critical component of mate selection, predator alarming, and territory establishment in diverse taxa. The efficacy of communication depends on signal transmission through an often-cluttered environment. Anthropogenic changes in vegetation structure may impact sound propagation and thus habitat quality, but few studies have explored this hypothesis. Northern grasshopper mice (*Onychomys leucogaster)* use long-distance vocalizations to advertise their presence to rivals and potential mates and live in regions where woody plant encroachment is affecting the landscape. My research couples sound transmission experiments with auditory brainstem response (ABR) measurements, the frequency of their vocalizations, and how woody plant encroachment influences sound propagation and quantify the reduction in active space. My findings will contribute to a better understanding of how changing landscapes may impact the ecology of animals that rely on acoustic communication and define the active space of *O. leucogaster*.

Northern Mexican Gartersnakes use specific macro- and microhabitat conditions in Lower Tonto Creek

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We examined habitat use and selection patterns in Northern Mexican Gartersnakes at Lower Tonto Creek. Based on other snake habitat use studies, we predicted that specific macro- and microhabitat characteristics would be important for the species. Using radio-telemetry and tracking animals for two years, we found three patterns. 1. Aquatic edge habitat is important. 2. Forbs and debris/litter ground cover are important. 3.Snakes use areas with more % ground cover, more % canopy cover, less distance to water and low sloped areas. We conclude that snakes are selecting habitat based on certain features and that cover and certain types of cover are important for the species. We discuss patterns in habitat use and which types of habitat with certain macro- and microhabitat are crucial to preserve for this specie's recovery.

Use of Riparian Habitats by Couch's Spadefoot Toad

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More than half of all amphibian and reptile species located within Mojave, Chihuahuan, and Sonoran Deserts utilize riparian or wetland habitats. The coupled effects of climate change and altered hydrologic regimes can result in a transition towards more xeric riparian habitats, like mesquite bosque and non- native saltcedar forests. Amphibians are known to be particularly sensitive to changes in both terrestrial and aquatic environments because of their dual life cycles, specific microhabitat requirements, and specialized physiological requirements. Couch's spadefoot toad (*Scaphiophus couchii*) is a fossorial toad that inhabits some of the driest habitats in North America by avoiding activity and sub-surface exposure for most the year, emerging only after summer monsoonal rain events. Our objectives were to determine what effect riparian habitat type has on the occurrence and abundance of S. couchii. We measured vegetation and conducted herpetofauna sampling at 18 independent locations in three distinct habitat types; native cottonwood-willow gallery forest (n=6), xeric mesquite-shrubland (n=6), and non-native saltcedar (n=6) from May to August in 2016 and 2017 near the confluence of the Gila and San Pedro Rivers. We found the capture rate S. couchii to be more than three times higher in mesquite sites than sites characterized by monotypic saltcedar and cottonwood-willow vegetation. The mesquite sites had greater average distance from river channel, higher percent herbaceous cover, and percent cover of grasses. Our results show that *S. couchii* may select arid habitats unless dominated by monotypic saltcedar.