

## OKNRC 2020 Poster Presentation Abstracts

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### **Preliminary Study of Genetic Diversity in *Grindelia Ciliata*, a Promising Biofuel Crop Native to Oklahoma**

*Grindelia ciliata*, of the family *Asteraceae*, has the potential to be utilized as a crop for the production of bio-crude; as a whole, this genus exhibits high production of diterpene acids, which can be turned into bio-crude. However *G. ciliata* is unique in that it does not secrete the acids, but rather sequesters them within its leaves, making it easier to harvest. The native range of *G. ciliata*, within Oklahoma, contains a strong east-west precipitation gradient that may have resulted in various genetic mutations of drought resistance genes. Currently, we have collected and extracted DNA from approximately 500 individuals, primarily located in Oklahoma, or the surrounding states, and have begun sending them out to undergo RAD-Sequencing. RAD-Seq is a next generation sequencing technology that can identify and compare large amounts of genetic markers within a genome.

Keywords: Prairie, Biotechnology, RAD-Seq, Plant Biology

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### **Seed dispersal of sericea lespedeza (*Lespedeza cuneata*), an exotic invasive plant**

*Sericea lespedeza* is an invasive legume native to eastern Asia. Although it was initially introduced for forage and erosion control, it has since become a widespread problem, especially in prairie and rangeland areas, forming dense monocultures and outcompeting more palatable native plants. While much work has been done on identifying methods of controlling sericea, less is known about the biology of the plant itself. One particular knowledge gap concerns the methods by which sericea disperses its seeds. As sericea is considered a significant threat to biodiversity in Oklahoma, an understanding of how it spreads may help to identify areas that may be impacted in the future. It has been suggested that water may play a role in sericea's dispersal. To test this hypothesis, we set out 27 transects at Oklahoma State University's Range Research Station, and the Joseph H. Williams Tallgrass Prairie Preserve, with six seed traps per transect. Each transect consisted of six seed traps located downslope from a patch of *sericea*. Slope and sericea density varied for each transect, from 2° to 16° slope, and 10% to nearly 100% upslope *sericea*. We also used Worldview-2 satellite imagery to map the extent of *sericea* at the Tallgrass Prairie Preserve. We expect greater numbers of *sericea* seed to be found in more distant traps over time, and that this will occur at a faster rate on steeper slopes. Additionally, we expect to see a relationship between the location of *sericea* on the Preserve, and the direction in which water flows over the landscape.

Keywords: Invasive Species, *Sericea lespedeza*, Seed dispersal, Seed traps, Overland flow

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### **Modifying an Existing Trap Design to Increase Efficiency and Safety of Catching American Black Bear**

Oklahoma black bear researchers have traditionally used the M-15 Humane Foot Snare (bucket snare) for capture-recapture study designs. Years of trapping the same areas, with the same trap design, have caused the bears to become wary of the traditionally used bucket snares. This increase in wariness does not deter interactions with the trap, but shows the bears becoming strategic in their approaches to obtain the bait from the trap. These strategies include ripping the bucket off the tree and tearing the lid off the front of the bucket, drastically increasing the potential for head snares. Another concern with the bucket snares is by-catch caught during the

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trapping period, which is typically raccoons. Modifications made to the bucket snare include adjustment of the spring arm and replacement of the bucket with 6" PVC pipe. This allows researchers to reduce the probability of head snares, while increasing capture efficiency and reducing by-catch. In a preliminary study, we successfully captured seven black bears in 109 trap nights, with zero head snares, and zero non-target species captured. Our preliminary study resulted in a 256% increase in trap efficiency over previously used trapping methods in the study area.

Keywords: Wildlife, game species

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### **Monarch Butterfly Eggs Oviposited on Tropical Milkweed (*Asclepias currasavica*) in Oklahoma During Late Summer and Fall Are Unlikely to Reach Maturity.**

Oklahoma lies directly in the path of the fall Monarch butterfly migration, making it a crucial source of nectar to fuel traveling butterflies. With declining population facing a multitude of threats, research in Oklahoma will help to direct effective conservation strategies. One common conservation action for Monarchs is growing milkweed, the larval food source. The easily-cultivated and widely available Tropical Milkweed, *Asclepias currasavica*, is a popular species to grow in Oklahoma and Texas. *A. currasavica* is a non-native species that, when grown in Oklahoma, blooms late into the fall, retains healthy vegetation until fall frosts, and does not fully die back until the first hard freeze. If *A. currasavica* is available in the fall, it could cause migrating female Monarchs to break reproductive diapause, laying eggs that will not have enough time to mature before the first freeze. To test this, we cultivated *A. currasavica* in a greenhouse, then planted 48 individuals in 6 outdoor raised beds. Each 4ft diameter circular bed contained 8 milkweeds surrounding a variety of native fall nectar sources. We inspected the milkweed plants for Monarch egg and caterpillar presence twice a week. Based on Monarch sightings in Oklahoma reported to Journey North's database, our observation began 12 August 2019. We recorded the abundance of eggs and caterpillars found on each plant. We also noted caterpillar instar (size of caterpillar). Over 9 weeks, we observed 145 eggs and 39 caterpillars on 40 of the 48 *A. currasavica* plants. We found no caterpillars older than 3<sup>rd</sup> instar and no chrysalises were found. Monarchs take approximately one month to mature from egg to adult. Over half of the eggs were laid after 24 September. Therefore, none of the eggs laid after 12 September had sufficient time to mature before the first freeze on 12 October. Our data shows the availability of *A. currasavica* during fall migration could be detrimental to migrating Monarchs by triggering a break in reproductive diapause, causing energy to be spent laying eggs that will not have time to mature, rather than fueling flight to Mexico. Our future research will include the influence of native milkweed availability during fall migration on ovipositional patterns and the influence of *A. currasavica* availability during spring migration and first generation reproduction.

Keywords: Species of Concern, Conservation projects and planning, Monarch butterfly, invertebrates, tropical milkweed, exotic species

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### **QUANTIFYING BEAVER DAMAGE TO TREES IN A BOTTOMLAND FOREST AT ARCADIA LAKE, OKLAHOMA**

North American beaver (*Castor canadensis*) are known to be important ecosystem engineers. Beaver target various tree species and are able to change species composition and manipulate the habitat significantly. There is a possibility that *C. canadensis* are targeting specific tree species in a bottomland forest in Arcadia Lake, Oklahoma, indicating a preference or bias on tree selection for food or habitat construction. Using three 75 m

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transects as a sample of the research area, various tree species were analyzed to determine levels of tree damage, diameter at stump height, and overall height of beaver damage. Beaver damage was assessed using a scale from zero-to-five, with zero indicating no damage and five indicating a felled tree as a result of damage. Sprouting was also assessed to determine if trees survived beaver damage. The most common species present were Green Ash (*Fraxinus pennsylvanica*) and Black Willow (*Salix nigra*), with a small number of Silver Maple (*Acer saccharinum*) and Boxelder (*Acer negundo*) present. The purpose of this research project is to determine if there is a pattern in tree selection by beaver in a bottomland forest at Arcadia Lake, Edmond, Oklahoma. With 262 individual trees sampled, Green Ash had a relative density of 64.48% (n = 170) and Black Willow had a relative density of 31.68% (n = 83). For Green Ash, the average diameter at stump height was 12.59 cm and 25.45 cm for Black Willow, respectively. Preliminary results indicate Green Ash being targeted more often and more frequently than Black Willow, with a 2.52 average on the beaver damage scale compared to 0.529 for Black Willow. Castor canadensis may be targeting Green Ash instead of Black Willow more often because of the smaller diameter at stump height or simply because of a higher relative density. This research will provide a deeper understanding of how the ecosystem of a bottomland forest at Arcadia Lake, Oklahoma will change due to beaver activity.

Keywords: Wildlife, game species, Stream and River, Forestry, Forest Dynamics

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### **Capture Success of American Black Bears (*Ursus americanus*) in Southeastern Oklahoma Utilizing Bucket Snares**

Examining how wildlife respond to various capture techniques is incredibly beneficial as it allows researchers to further improve traps or determine if new techniques may be necessary to increase capture success in previously trapped areas. Black bears have been shown to have extensive learning capabilities and high levels of cognition. Thus, their ability to associate traps with positive or negative experiences, remember these experiences, and alter their behavior is not unwarranted. Black bears in southeastern Oklahoma have primarily been captured utilizing bucket snares since 2014, with a total of 386 capture events using this specific capture technique. With this capture data, we will assess our capture success of black bears when using bucket snares, yearly trends of bear captures, and the sex ratios of captured bears. Bears captured within the Ouachita National Forest (ONF) will also be compared to those that are captured outside of the ONF so we can investigate capture success in periphery areas. These assessments can inform us on black bear behavior regarding their prior experiences with bucket snares and whether using new capture techniques may be beneficial in areas that have been extensively been trapped.

Keywords: Wildlife, game species, Capture/Trapping Techniques, Black Bear

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### **Does Long Term Use of Frequent Prescribed Fire Reduce Crude Protein Content in Plants?**

Prescribed burning is a common management practice in Oklahoma, and historically much of Oklahoma is a fire dependent ecosystem. According to fire scar data areas in eastern Oklahoma burned every 3-5 years prior to European settlement in the area. Beginning in the early 1900s, fire was nearly excluded from the landscape. Gradually, prescribed fire utilization has increased, but these prescribed burns often deviate from historical burn conditions and fire return intervals. To study the effects of different forest thinning and fire frequency treatments, a series of experimental plots were established in 1984 using a completely randomized experimental design at

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Pushmataha Wildlife Management Area in Pushmataha County, Oklahoma. This long running controlled experimental design allows for the examination of a wide variety of topics relating to managing forested systems with prescribed fire. One of which is what are the long-term effects of prescribed burning on protein content in plants. I will be collecting crude protein content data in fall 2019, and spring, summer, and fall 2020. In October 2019, I collected samples of current annual growth from 12 species of plants from 3 replicates of treatments with 1-year, 2-year and 3-year fire return intervals of dormant season fire, and measured the crude protein content of each species. Preliminary results from fall 2019 suggest that long term application of frequent fires may limit protein content in forage plants. Protein content was the lowest in 1-year burns, intermediate in 2-year burns and, highest in 3-year burn units. This may be because annual or biennial burning exceeds even pre-suppression era historical fire return intervals in the area and the system is not adapted to fix nitrogen back into the soil at a fast-enough rate to replace the nitrogen that is lost due to volatilization during burns. To test this hypothesis soil nitrogen data will also be collected in the relevant treatment units in 2020.

Keywords: Fire and Prescribed Burning, Protein, fire frequency, Nitrogen

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### **Assessing the distribution, trends, and abundances of bobcats (*Lynx rufus*) in Oklahoma.**

Bobcats (*Lynx rufus*) are heavily-harvested furbearers in Oklahoma, yet little is known of the population status and their trends over the last decade. Previous estimates have used data collected from fur harvest and roadside surveys, but these sources are often highly variable and not necessarily dependent on bobcat population trends. This study aims to determine the trends and ecological patterns of bobcat distributions across the state, whilst also focusing on three areas of specific interest from different ecoregions of Oklahoma. We are using specifically designed hair-snare cubbies to collect hair samples that will be identified to species microscopically, whilst extracted hair follicles will allow genetic identification of individual bobcats on three intensive study areas. Hair-snare cubbies will be deployed state-wide by student volunteers and using occupancy modelling, population trends and distribution of bobcats in Oklahoma will be determined. Using more intensive arrays of hair snare cubbies on the three specified areas of interest, individual bobcat encounter histories will be analyzed in a genetic capture-recapture framework, which will be used to make inferences on the ecological patterns of space-use and resource selection of individual bobcats. This data will help inform management decisions for an economically and culturally important, heavily harvested fur-bearer species in Oklahoma. Preliminary results from camera traps at our intensive study sites suggest the probability of bobcat occupancy is higher at sites with lagomorph and rodent prey, whilst reduced at sites with present coyotes. Interestingly, activity patterns depict asynchronous activity patterns between bobcats and their major sources of prey (lagomorphs and rodents), which may be a result of temporal avoidance of coyotes, though further analyses are needed to explore this in more detail.

Keywords: Wildlife, game species, Occupancy modelling, Capture-recapture, Ecology, Population

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### **Variation in the quality of potential arthropod prey of bobwhite quail (*Colinus virginianus*)**

Land management practices for conservation have direct and indirect consequences for target and non-target species. Prescribed fire and strip disking are two practices used to increase habitat quality in areas where

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bobwhite quail (*Colinus virginianus*) live. These practices may alter arthropod communities, which are important prey for quail chicks. Although, the effects of changes in arthropod communities on quail will likely depend on the relative quality of different arthropod species. The goal of this study was to compare the nutritional quality of different arthropods that are potential prey of bobwhite quail. Arthropods were collected from a variety of habitats at Packsaddle WMA and analyzed for exoskeleton and macronutrient content. There was variation among species of prey in their exoskeleton and macronutrient content. Exoskeleton and macronutrient content were inversely related. Given that exoskeleton is largely indigestible by quail, understanding the balance of exoskeleton and nutrients in arthropods is important for evaluating the quality of potential prey. These results suggest that changes in species composition of potential arthropod prey could affect quail and other insectivorous species by changing the relative concentrations of nutrients available in prey.

Keywords: Wildlife, game species, Fire and Prescribed Burning, Nutritional Ecology, Land Management

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### **Field Test of the Effectiveness of Window Markers for Deterring Bird-Window Collisions**

Bird-window collisions are a top source of direct human-related avian mortality. Collisions occur when birds are unable to perceive glass as a barrier due to its transparent and reflective qualities. These collisions can be directly fatal or result in delayed fatality from sustained injuries. Multiple mitigation techniques exist to reduce bird-window collisions, including window markers, films, or fritted glass which reduce surface reflection and transparency, alerting birds that windows are barriers. Although many window collision deterrents have been tested in a lab setting, few field studies have attempted to validate their effectiveness when installed on structures. We implemented a before-after control-impact (BACI) study to test the effectiveness of a commercially marketed window marker in reducing bird collisions at glass-walled bus shelters in Stillwater, Oklahoma. A baseline study in 2016 included bird collision surveys at 18 of the city's 36 bus shelters. 9 shelters with the most collisions and 9 additional randomly selected shelters not surveyed in 2016 were treated with the window markers (on the outside surface only), resulting in 18 treated and 18 untreated shelters for our BACI study. We are conducting collision monitoring at all 36 shelters twice weekly from Sept-Oct of 2019 and May-Oct of 2020. Preliminary results from 2019 suggest that the markers may be effective in reducing total collisions, but that reductions only occur for the treated outer surface of bus shelters, with a non-trivial number of collisions still occurring on untreated inside surfaces. This suggests that when birds can approach glass from both sides, window markers may need to be applied on both surfaces to achieve the greatest collision reductions. However, results also indicate that the window markers we tested may be effective for situations where birds can only approach glass from one side, including the majority of building windows where most bird collision mortality occurs.

Keywords: Wildlife, non-game species, bird-window collisions, avian mortality, collision prevention, mitigation technique

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### **A Possible Look into the Future: The Effect of Fertilizer and Simulated Drought on Loblolly Plantations**

Loblolly pine is the most economically important timber species in the US, especially in the Southeast. As climate change is expected to bring variability in precipitation, drought will become more common and could reduce growth in forests. In 2012, a distributed experiment, the PINEMAP tier III network was setup in loblolly

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plantations in Florida, Georgia, Oklahoma, and Virginia, with drought (33% precipitation reduction), fertilizer, control, and drought&fertilizer treatments. After 6 years, we collected tree-ring increment cores from the treated trees in 2018. We scanned increment cores and measured annual growth for the Georgia site in the spring of 2019 using WINDENDRO, with this data annual basal area increment (BAI) was calculated for each tree. SPSS analyzed BAI in relation to treatment and year, along with year-to-year growth and multiple means. A repeated measures ANOVA showed that from year-to-year, there was significant effect of treatment on annual BAI, driven by growth differences in several years, especially in the fertilized treatments in 2013, the second year of the experiment. We also compared cumulative BAI both before (2007-2011) and after (2012-2017) the experiment began among treatments. Our results showed that individually on a year-to-year basis there was a significant growth effect, especially in the year that fertilizer was applied (2013), but overall the drought treatment did not have a lasting effect on the treated trees. These results have further implications in our changing climate, as this preliminary data from Georgia demonstrates that if you applied fertilizer to a plantation on a semi-regular basis that you could increase growth in drought conditions. In short, you could out fertilize a drought if those drought conditions were worse than the average growth season. Factors such as pretreatment BAI differences may cloud our results, in an effort to resolve them we plan to study the differences in the Oklahoma and Virginia sites.

Keywords: Climate Change, Forestry, Plantation, Experiment, Botany

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### **Oklahoma Land Access Program**

Administered by the Oklahoma Department of Wildlife Conservation, The Oklahoma Land Access Program (OLAP) provides financial incentives to landowners who allow public access for hunting, fishing, stream access, and wildlife viewing opportunities on private lands. The ODWC received a \$2.26 million dollar grant from the U.S. Department of Agriculture as part of the 2014 Farm Bill, through the Voluntary Public Access - Habitat Incentive Program (VPA-HIP). VPA-HIP programs are successful at simultaneously rewarding conservation on private lands and providing more opportunities for sportspersons. The OLAP consists of 79,000 acres of hunting access, 55 surface acres of fishing access, 480 acres of wildlife-viewing access, and 3.83 stream miles of streams access.

Keywords: Conservation Projects and Planning, Private Lands, Public Access, Farm Bill

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### **Evaluation of Recreational Fishing for Eufaula Lake in Eastern Oklahoma 2010-2014**

Eufaula Lake, the largest lake in Oklahoma at 105,500 acres, attracts anglers from across the state. It is known for White Bass (*Morone chrysops*) fishing and nationally recognized for Crappie (*Pomoxis Sps.*) fishing. Understanding how anglers utilize the reservoir can assist with developing a sound management strategy. Fishing pressure, angler success rates and angler harvest was evaluated through a roving creel survey at Eufaula Lake from 2010-2014. The reservoir was stratified into five arms (Deep Fork, South Canadian, North Canadian, Gaines Creek, and Central Pool) with one arm surveyed each year for twenty days during the March-June time period. Instantaneous counts and interviews were conducted to determine angling hours, catch rates and harvest rates of sportfish species. A total of 4,055 anglers were interviewed, 1,187 were weekday anglers and 2,868 were weekend anglers. Boat anglers represented the majority of angling pressure at 60.3% when compared to the entire lake. However, it fell second to bank anglers in the Deep Fork arm. Species most sought after varied between

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arms. Crappie (*Pomoxis Sps.*) anglers dominated the fishing pressure at 56.5% when compared to the entire lake. Similar results were also found in the 2014 Oklahoma Angler Survey, as Crappie (*Pomoxis Sps.*) were the number one preferred species statewide. However, Crappie (*Pomoxis Sps.*) fell to second at 30% as the most targeted species by a wide margin behind Largemouth Bass (*Micropterus salmoides*) at 50% in the Central Pool. Blue Catfish (*Ictalurus furcatus*) were the second most sought after species at 15.6% when compared to the entire lake. Largemouth Bass (*Micropterus salmoides*) angling ranked highest in fishing type in the Central Pool but ranked a distant third (14.8%) in species most sought compared to the entire lake. White Bass (*Morone chrysops*) were only targeted by 4.5 % of the total anglers but comprised the second most harvest at 24% following Crappie (*Pomoxis Sps.*) at 25%.

Keywords: Fisheries, Creel

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### **Digitization of a historical fish dataset from Oklahoma: the legacy of Jimmie Pigg**

The fields of conservation and biogeography are facing a data revolution in terms of the extent and availability of biodiversity data which promises to transform to science. However, many historical datasets sit idle in physical form, as institutions and data-holders struggle to keep up with this digital revolution. The digitization of historical datasets presents many challenges such as accurate attribution of geospatial locality and transcription. Here, we confront those challenges in the digitization of a legacy fish dataset. Collected by biologist Jimmie Pigg between the years 1969 - 1991, these data span the extent of Oklahoma. These data now reside in a geospatial database consisting of 158 unique species, 33287 observations, and 460 locations. We are now engaged in the herculean task of assuring data quality. Challenges encountered to date include 1) misattributed locations in the original data, 2) taxonomic changes 3) and formatting the data in Darwin Core standard format. Upon completion of the quality control process, we intend to provide these data to the researchers via the Oklahoma Biodiversity Information System.

Keywords: Fisheries, Conservation Projects and Planning, Stream and River, Historical data, Data digitization, Fisheries sampling, Datasets