

AUDUBON OF KANSAS Sanctuary Update

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HUTTON NIOBRARA RANCH WILDLIFE SANCTUARY

The Niobrara Sanctuary is a 5,000-acre ranch and wildlife sanctuary located along the Niobrara National Scenic River near Bassett, NE. It consists of spectacular scenery, including upland prairie, steep canyons, woodlands, and high bluffs that overlook meadows, marshes, and riparian forest along the river, which forms the Sanctuary's northern boundary. Two guesthouses provide opportunities for visitors to experience the diverse wildlife and dark skies.

So much is happening at Hutton that it is hard to know where to start. This spring, the Bassett and Newport Volunteer Fire Departments were able to burn almost 200 acres of prairie to manage cedar encroachment. Utilizing the Environmental Quality Incentives Program (EQIP), a cost-share agreement with the Natural Resources Conservation Service, we were able to remove cedar and sumac from an additional 50 heavily-infested acres. The same program supported the installation of a solar-powered well to provide water to cattle, instead of allowing them access to the river where they may damage the stream bank. A hail storm in July meant we had to replace the roofs on both the Hutton house and the Lazy Easy, the latter of which was not covered by insurance due to the advanced age of the roof. Half of the Hutton house's siding also had to be replaced. The National Park Service documented successful breeding of two species of birds federally listed under the Endangered Species Act: the endangered Interior Least Tern and the threatened Piping Plover. They both nested on sand bar islands in the Niobrara River. Finally, we are welcoming the local community to Hutton through inviting neighbors to an 'open house,' welcoming high school and middle school children as they visit the property, and providing a meeting venue for a civic leadership group that covers three counties. Although I could expound on any of these, one partnership with the Nebraska Game and Parks is a bit more unusual: the testing of a fish ladder. See the side box for more information.



Sunset over the Niobrara River as viewed from Hutton.
Photo by Dr. Jackie Augustine

We've all seen videos of salmon jumping out of the water to get over a small waterfall. They do this to get upstream to spawn. But have you ever wondered how small fish move upstream? Even though small fish do not make long-distance migrations like salmon, they do move up and down streams to take advantage of available food sources and access suitable habitats for various life stages. However, culverts that pass under roads can create a hindrance to their movements. As culverts age, a deep pool generally forms on the downstream side due to erosion, creating a drop in a couple inches to a couple feet of elevation between the drain and the surface of the pool. There is no way a fish a couple inches long could possibly climb if the distance was more than a couple inches.

But why would anyone care about such small fish? First, little fish are an important food source for larger fish, herons, and kingfishers. Second, they are an important component of a healthy stream ecosystem. Lastly, there are several unique species of fish found in Willow Creek which runs through Hutton. The cool water streams in the Sandhills of Nebraska support several species of fish whose nearest populations are in cooler climates of states such as Minnesota and Wisconsin. It is believed the species expanded their ranges to Nebraska as glaciers advanced south about 12,000 years ago. As glaciers retreated, small pockets of the fish remained where cool groundwater flows into the stream to counteract summer heating. Three fish occur in Willow Creek that are of particular interest to Nebraska Game and Parks. The blacknose dace (*Rhinichthys atratulus*) is a species of concern in Nebraska. Blacknose dace have one of the most specialized habitat requirements of all Nebraska fishes. They need clear, small streams with moderate to swift currents and gravel bottoms. A second fish of interest is the Finescale x Northern Redbelly Dace (*Phoxinus eos* x *Phoxinus neogaeus*) hybrid. Its coloration from top to bottom starts with brown-gray back, then an iridescent, silvery band, and lastly a dark, thick gold-orange stripe along its side. They have a unique method of breeding compared to other fish – they breed parthenogenetically where females produce only daughters (males are not needed to complete reproduction). Although considered secure in most of its range, Finescale x Northern Redbelly Dace is considered a threatened species in Nebraska. The Plains Topminnow (*Fundulus sciadicus*) is another species that was observed. They are invaluable to the functioning of healthy streams and upland habitats because they feed heavily on mosquito larvae. They are nearly endemic to Nebraska, meaning that the species is rarely found outside of Nebraska. Plains Topminnow are doing well in the Sandhills but suffering substantial declines elsewhere due to habitat loss and the introduction of *Gambusia* (mosquitofish) which outcompete Plains Topminnow for habitat and food.

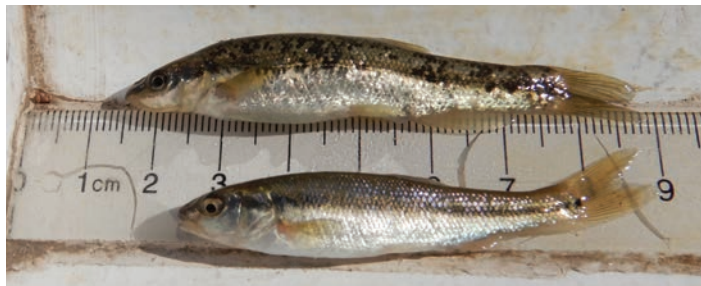
To allow a path for little fish to move upstream, Nebraska Game and Parks tested 'fish ladders'. These structures



Hutton fish ladder. Photo by Nebraska Game and Parks

create a series of pools with 1-2 inch elevation changes between each pool. This allows little fish to move upstream. One of these fish ladders was tested on Willow Creek on the Hutton Niobrara Ranch Wildlife Sanctuary for one week in mid-June. Before installation, a crew from Nebraska Game and Parks surveyed the fish above and below the culvert to see what is currently present. When the fish ladder was installed, they also placed a trap at the top of the ladder to determine which fish used it. After the one week study, it was found that blacknose dace had used the fish ladder to travel upstream. The researchers from Nebraska Game and Parks were pleased, not only because the fish were able to use the ladder, but also that the ladder withstood a heavy rainfall event. AOK plans on working with Nebraska Game and Parks to install a permanent ladder in the future.

We are honored to host these small fish with large importance at the Hutton Niobrara Ranch Wildlife Sanctuary.



Two fish caught by Nebraska Game and Parks - Blacknose Dace (top) and Creek Chub (bottom).

ACHTERBERG WILDLIFE-FRIENDLY DEMONSTRATION FARM



Blazing star within a pollinator plot at Achterberg. Photo by Dr. Jackie Augustine

This 240-acre property is a special central-Kansas farm in Lincoln County. Creeks meander through substantial forest and diverse habitats that were once common on Kansas farms. AOK has planted filter strips of native grasses and wildflowers along the edge of every field. Pollinator habitat complements an eight-acre remnant prairie meadow. Brown thrashers, wild turkeys, kingbirds, woodpeckers, and wrens are among the regulars.

As with Hutton, the focus of our efforts on Achterberg include habitat management and connecting the sanctuary with the community. In spring, we burned prairie buffer strips that almost encircled the property. Unlike Hutton where cedars are a problem, the burns were conducted at Achterberg to remove an invasive elm. If left unchecked, these elms would crowd out and shade the wildflowers which butterflies and birds rely on for food. We are also increasing our community outreach by maintaining 0.6 miles of trails for the public to enjoy and meeting with local community leaders. We are exploring an opportunity to restore a post rock fence to the property. These fences, made out of native limestone, were popular in the region at the time of European settlement when very few trees were present on the landscape to make fence posts.

MOUNT MITCHELL HERITAGE PRAIRIE



Mount Mitchell in March.

The 47-acre Mount Mitchell Heritage Prairie is located approximately three miles south of Wamego, Kansas. This prairie remnant is associated with Captain William Mitchell, a key figure on the Underground Railroad prior to the Civil War. Changing arrays of wildflowers are in bloom throughout most of the growing season, and the historical nature of the property makes it a destination at any season. Trails extend to the summit of the prominent hill. The property was conveyed to Audubon of Kansas from the Kansas Historical Society via a legislative order, and is managed jointly with the Mount Mitchell Prairie Guards.

We have made a concerted effort to document the birds, wildflowers, and insects on all of AOK's properties this year. Birds are documented through breeding bird surveys conducted in June. Wildflowers and insects are documented through photography and identified by posting them to iNaturalist. This app and website allow others to comment and suggest



Whorled milkweed (*Asclepias verticillata*)



Flat tailed leafcutter (*Megachile mendica*) on sunflower.



Differential Grasshopper (*Melanoplus differentialis*)

identifications of species. If two people agree on an identification, it is considered a ‘research grade’ observation.

Although Mount Mitchell is the smallest property owned by AOK, it currently has the most species identified (188 species at Mount Mitchell vs 68 species at Achterberg and 94 at Hutton). A major reason why Mount Mitchell has the most species identified is that the property is heavily utilized by the public, whereas I am the primary observer on Achterberg (100% of observations) and Hutton (88% of observations). At Mount Mitchell, my observations only account for 69% of the total observations.

Of the 188 species identified, 53% are plants and 37% are insects. The rest are vertebrates, 2 species of spiders, and one fungus. Of the insects, butterflies or moths were the most common (27%), followed by grasshoppers and katydids (19%) and beetles (17%). I thought the grasshopper diversity on this site was remarkable given that grasshoppers, katydids, and crickets only make up 2.4% of the worldwide insect diversity (according to Wikipedia). I had to learn more about grasshoppers so I turned to a grasshopper expert with ties to Manhattan, Dr. Ellen Welti. See the side box for more information.

Dr. Ellen Welti received her PhD from Kansas State University in 2017. Her dissertation was entitled “Ecological networks of grassland plants and arthropods.” In 2020, part of her dissertation was published in the prestigious journal, *Proceedings of the National Academy of Science*. The manuscript provided one reason why we are seeing declines of insects throughout the planet: a phenomenon called the nutrient depletion hypothesis. As global climate change proceeds, more carbon dioxide is available in our atmosphere. Because plants use carbon dioxide to make sugars, additional carbon dioxide actually makes plants grow faster – but at a cost. The concentration of beneficial nutrients, namely nitrogen, phosphorus, potassium and sodium, goes down. Therefore, herbivores, like grasshoppers, are eating nutrient-poor diets, which in turn may limit reproduction. This finding is particularly troubling because “Unlike other potential drivers of insect declines—habitat loss, light and chemical pollution—nutrient depletion may be widespread in remaining natural areas” (quoted from the manuscript <https://www.pnas.org/content/117/13/7271>). Given her important work studying grasshoppers, I asked Dr. Welti some general questions about grasshoppers.

Why study grasshoppers?

Grasshoppers are a great taxonomic group to work on for several reasons. First, they are a key member of grassland systems. While they have likely existed on Earth for the last 300 million years, they became more dominant and diverse with the rise of grasslands around 60 million years ago. They are a dominant herbivore in grassland systems, and thus can have a big impact on the ecosystem. They are also a key food source for many other taxa including birds, reptiles, spiders, and mammals (small mammals but also larger ones like foxes and coyotes). Further, while there have not been that many studies on long-term trends in grasshoppers, the International Union for Conservation of Nature did red list about 25% of the European Orthopteran species so there is some evidence that grasshoppers are declining. There are also a number of practical reasons: they are easy to sample with minimal equipment (e.g. a sweep net), they are common and easy to find, and they are relatively non-diverse compared to other insect groups which makes them feasible to identify—there are roughly 50 species of short-horned grasshoppers that have been recorded on Konza Prairie, with about 30 of these commonly encountered. This is compared to likely thousands of species of some of the hyper-diverse groups of flies, wasps, beetles, and moths.



Spotted Bird Grasshopper
(*Schistocerca lineata*)



Admirable Grasshopper
(*Syrbula admirabilis*)



Two-striped Grasshopper (*Melanoplus bivittatus*) on sunflower.

Why are grasshoppers important to grasslands?

Grassland birds are a group that has been seeing some of the most severe declines in the past decades, and grasshoppers are a key food source for many of these species. There are also a number of parasitoid species which depend on grasshoppers, including some fly species which are important pollinators as adults (in the Flint Hills area, one example of this is the Nemestrinidae flies). Besides being a major source of protein for birds and other predators, grasshoppers play several key roles in grassland ecosystems. They contribute to nutrient cycling through herbivory and defecation, and also transport nutrients to different grassland areas. Different grasshopper species eat different plant species, and thus control plant community composition as well as alter plant biomass. Grasshopper species also compete with each other, so a diverse grasshopper community is less likely to produce a species that will swarm and be a pest.

Please describe the natural history of grasshoppers.

The short-horned grasshoppers are primarily herbivores, and can generally be grouped into species which primarily feed on grasses, those that feed on forbs, and mixed feeders. There are a few grasshopper species that tend to prefer a few host plant species (e.g. a large part of the diet of *Hypochlora alba*- the Cudweed grasshopper- is *Artemisia*, though even this species still eats a number of other forbs). Many species are fairly generalist in their diet and will regularly eat 20 or more plant species. Grasshoppers are often nutrient limited and will seek out plant species or parts of the plant that are more rich in particular nutrients like nitrogen and sodium. Other Orthoptera groups like katydids and crickets can be omnivores or scavengers, though some species are also primarily herbivores. Most grasshoppers overwinter as eggs underground, hatch in the spring, molt around five times- each time becoming a larger instar; then after the last molt they become an adult. In most species the adults have full-wings but several species remain short-winged. However, a number of species overwinter as nymphs. These species will be adults in late spring/early summer— if you see an adult grasshopper at this time of year, it likely overwintered as a nymph. While many species look quite different, there is one genus in this region with many similar looking species—this genus is *Melanoplus*. This is a confusing group that still needs taxonomic work for many “species” and often the best way to differentiate them is by male genitalia (sometimes it is nearly impossible to identify females). Differences in male genitalia are a key means of grasshopper speciation. Some species, most famously katydids and crickets, have unique songs which they can use to call mates of the same species. Probably the most important predators of grasshoppers in this region are wolf spiders and birds.

Anything else we should know about grasshoppers?

In the west, grasshoppers are often considered pests that eat crops and compete with cattle. Drought, a common phenomenon in the west in recent years, can increase grasshopper densities. This has led to large-scale aerial spraying efforts which have intensified in recent years, both by local land owners, and by government agencies. Large-scale aerial spraying may control grasshoppers in the short-term but it has many negative long-term effects. First, grasshopper species can compete with each other, which can keep individual species in check. Large-scale spraying selects for the few most robust species, which may cause larger outbreaks in later years. Spraying is indiscriminate and also can kill important invertebrates such as those that are predators and parasitoids of grasshoppers, as well as pollinators and seed dispersers. The loss of grasshoppers, an integral member of grassland ecosystems, will have strong repercussions up and down the food chain.