Your names:

Case Study: The value of urban prairie restoration



Part 1: Where are all the birds?

In 2010, Ed Fair was living in Austin, Texas, and working as a music attorney, which mainly involves things like copyright claims, trademark disputes, and contract management. As the "Live Music Capital of the World", Austin is a great place for this kind of work! In Ed's free time, he liked to go bird watching - also something that Austin is a great place for. Indeed, Texas has far and away the highest bird diversity of any state in the US and is home for at least for part of the year to 70% of all birds in North America!

Austin is located at the edge of two ecoregions – the Blackland Prairie and the Edwards Plateau – both of which are known for supporting high plant diversity that provide great habitat for a diverse array of prairie, woodland, and savannah birds, some of which are endemic to the region and occur nowhere else on earth. The grasslands of Central Texas form the southern extension of the Great Plains tallgrass and mixed-grass prairies. These are among some of the most endangered ecosystems of the US due to a range of threats, such as agriculture, urban and suburban development, exotic plant invasion, and woody plant encroachment. Still, remnant patches of pristine grasslands exist where you can find high plant and bird diversity just down the road from Austin, Texas, one of the largest cities in the US. Ed often explored the parks and preserves around Austin with his friends, and sometimes got away for longer trips to other parts of Texas, ticking off all the different species of birds that he'd identified, aiming to eventually see them all.

One morning in 2010, Ed and his friend Alex were out at a park located about 10 miles west of downtown Austin called Commons Ford Ranch Metropolitan Park looking for birds. Commons Ford is situated adjacent to the Colorado River with deep rich soils, wooded creeks that flow into the river, and a large 40-acre meadow. It seemed to Ed like this would be an ideal place to see a diverse array of Central Texas prairie birds, but after scanning the area with his binoculars he found nothing. **"Where are all the birds?"** Ed asked Alex.

Adapted from materials created by Amy Concilio who participated in the Prairie Project educator cohort program. Learn more about the Prairie Project at: theprairieproject.org

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<u>Your first task</u> is to brainstorm some ideas about what was going on at Commons Ford. Discuss the following questions with your group and then jot down some potential responses. Be prepared to share your hypotheses with the rest of the class.

1. Come up with 2-3 hypotheses explaining why there were no birds at the Commons Ford prairie. Provide some justification for your hypotheses.
2. What evidence could you gather that would support (or refute) one of these hypotheses?

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Part 2: Returning fire to the prairie

Like the rest of the Great Plains, Central Texas prairies were once dominated by the "Big Four" prairie grasses – big bluestem, little bluestem, switchgrass, and Indiangrass – which grew alongside a mix of hundreds of other species of grasses and wildflowers and provided food and shelter for a vast array of insects, birds, and small mammals. When Ed and Alex looked around the Commons Ford prairie that day in 2010, Alex pointed out that the whole meadow was covered with the exotic grasses King Ranch bluestem, Johnsongrass, and Bermuda grass, along with higher-than-normal levels of native shrubby species like mesquite and prickly pear cactus. The invasive grasses were brought to North America from Eurasia intentionally for forage, erosion control, and suburban lawns and ball fields, but they had "escaped" from cultivated areas and begun to spread into natural ecosystems where they outcompeted native plants and reduced biodiversity. So, Alex surmised that there were no birds at Commons Ford because there was nothing for them to eat. Ed turned to Alex and said, "Well, then let's bring back the native plants and restore the prairie!"

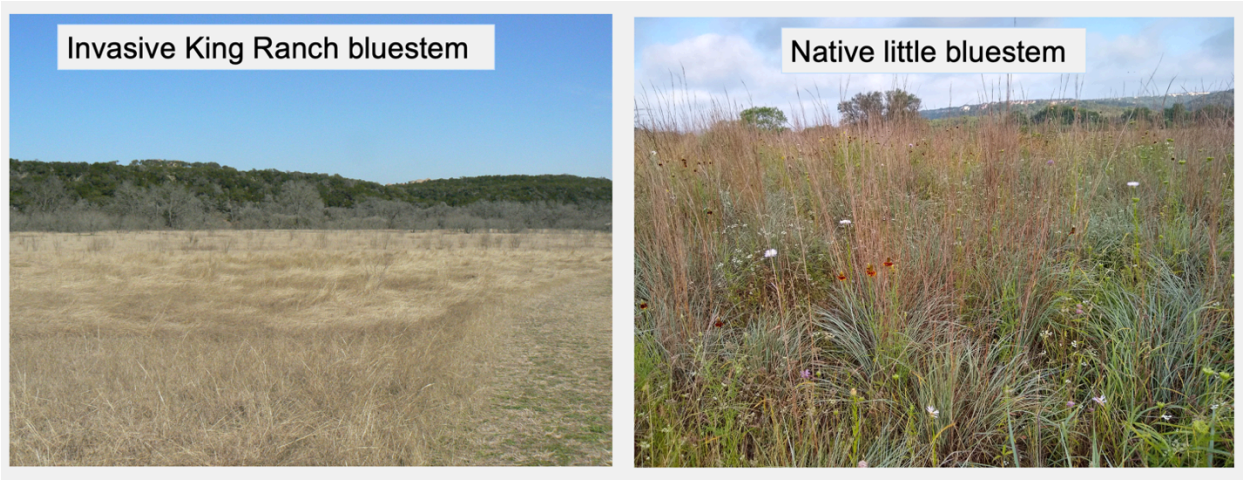


Figure 1: The dominant invasive grass of Central Texas grasslands, KR bluestem (left) and dominant native, little bluestem.

Ed was committed to restoring this prairie, but since he was a music attorney – not a park ranger or ecologist - he had no idea *how* to bring back the native plants. He needed to get some biologists involved and a team of dedicated people to see it through. He joined with other birders to form the Commons Ford Prairie Restoration Organization (CFPRO), and then contacted the city office in charge of managing the park – Austin Parks and Recreation Department (PARD)– along with environmental non-profits, businesses, and other agencies. In all, he and his group rounded up significant support from eight different entities (listed below) and raised $60,000 from companies like Patagonia to conduct the first round of restoration treatments, which took place in 2011. Through this process, Ed learned from the ecologists and park managers how to restore a native Texas prairie.



phenomenon called "woody encroachment". Historically, grassland ecosystems of the Great

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Historically, the Great Plains were grazed by large ungulates like bison and burned either naturally or through the management of Native Americans every few years. Over the last 150 years, fire suppression has been the norm for managers, and only relatively recently have land managers and ecologists recognized the value of frequent fire for stimulating grassland productivity and maintaining diversity. So, the first thing that Ed and his collaborators needed to do was reintroduce fire into the ecosystem. Before burning, the ecologists prepared the site by spraying herbicide on the mesquite, prickly pear, and invasive grasses, and they drill seeded the entire site with a mix of 75 different native grass and wildflower seeds donated by Native American Seed. The treatments all took place between 2011 and 2012, and the site has been burned periodically every 2 to 4 years since that.

Take a minute to discuss the restoration treatments with your group. Again, be prepared to discuss your responses with the rest of the class.

1. What do you think some of the biggest challenges were to conducting restoration treatments at Commons Ford Ranch Metropolitan Park?
2. What were some of the main reasons that you think Ed was successful in securing the funding for the project and making it happen?

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Part 3: Did the treatments work?

To determine whether the prairie treatments were successful, Ed and his colleagues needed to monitor the birds and plants at the site before and after the treatments. In the winter of 2010-11, they measured bird diversity along three transects spaced evenly across the meadow. This involved walking a straight line through the meadow along 3 set transects and counting and identifying all birds that were "flushed" by the disturbance (Figure 3). They took these same measurements in each winter until 2016-17.



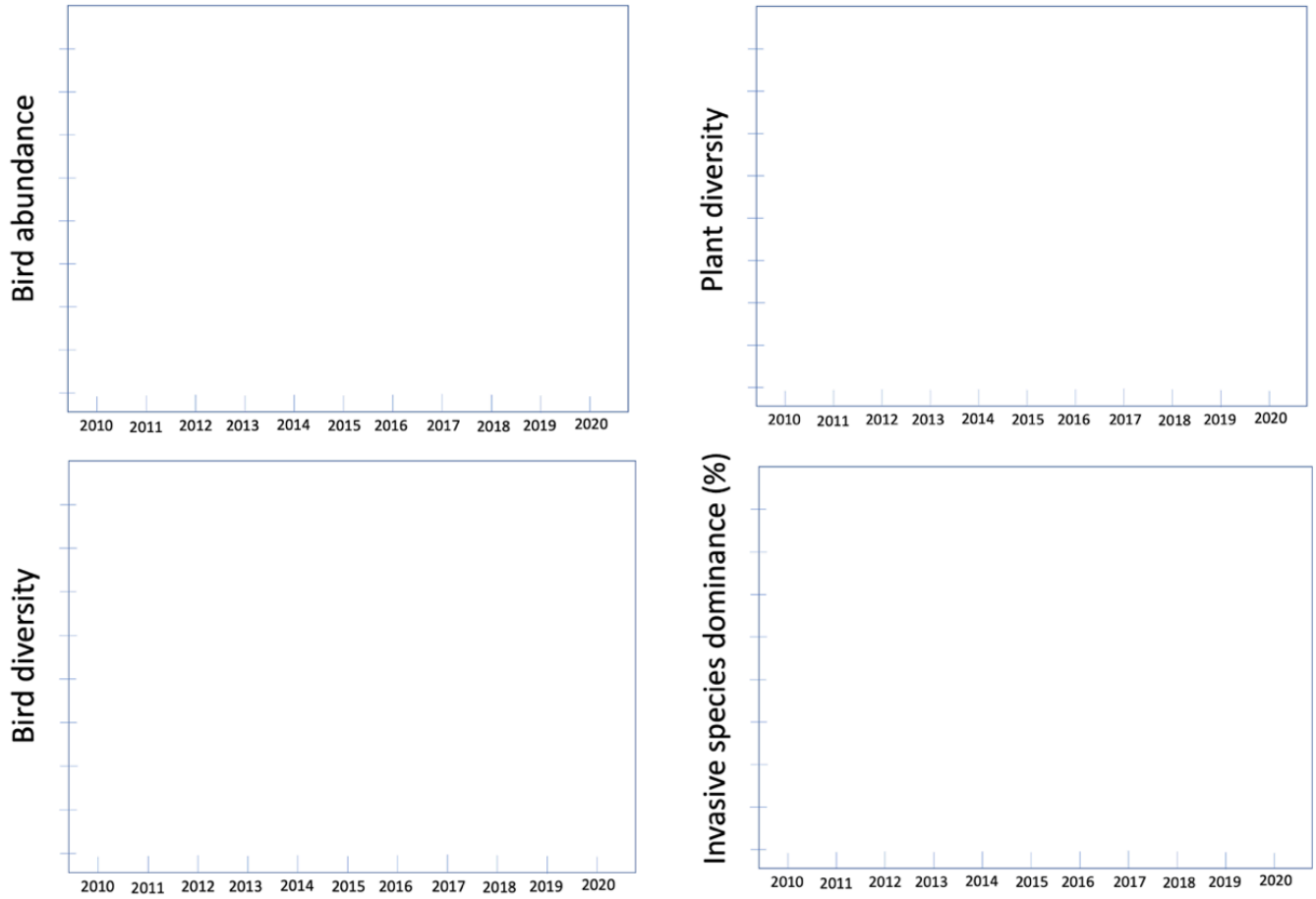
Figure 3: Volunteers conducting bird surveys at Commons Ford in 2010 before the restoration was completed. Source: https://www.flickr.com/photos/commonsfordpro/

Additionally, the CFPRO wanted to measure how the plant community would respond to the treatments. They randomly placed 9 set sampling locations across the prairie using GPS coordinates and measured plant cover and composition along 20-m long transects. Again, this occurred both before the treatments were conducted in 2010 and every year afterward in the spring. Along with plants and birds, researchers have measured a range of different characteristics at the site, including pollinator diversity, soil organic matter, and soil moisture, in the restored meadow compared to a nearby unrestored field to quantify the impacts of the restoration on biodiversity and ecosystem function. What do you expect that they found?

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<u>Your next task</u> is to discuss what the likely impacts were of the restoration treatments.

1. The biologists measured plant diversity over time from 2010 to 2020 and bird diversity and abundance from 2010 to 2017. Fill in the 4 graphs below depicting what you think happened over time for the following variables: bird abundance, bird diversity, plant diversity, and percent invasive species cover (i.e., how dominant invasive species are compared to the total cover of all plant species at the site). Include your predicted average and standard deviation for each variable during each year. You can use a line graph or bar graph.

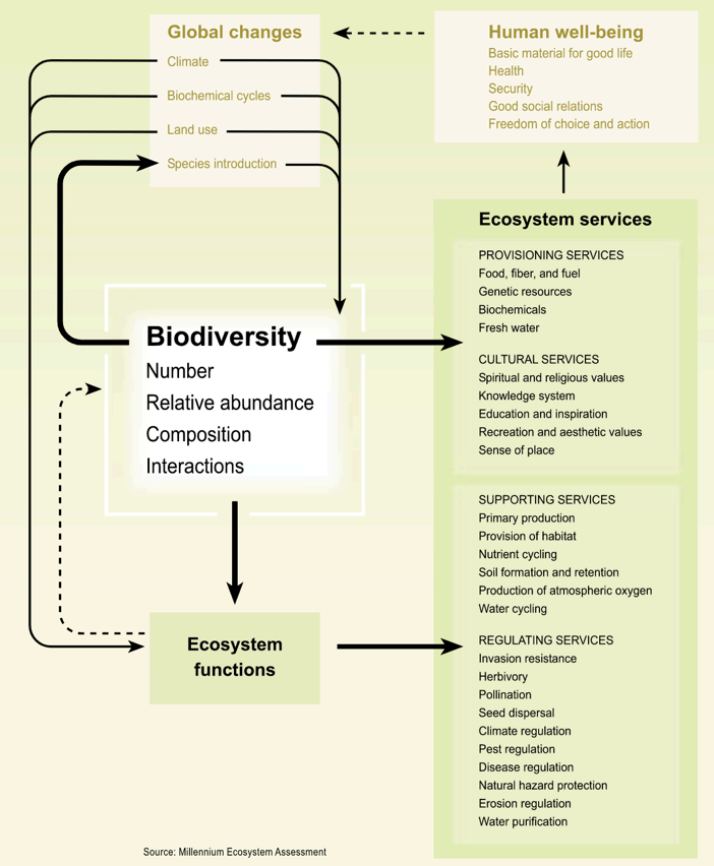


2. Explain the rationale for the patterns you drew.

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Part 4: Ecosystem services of a restored prairie

Ecosystem services are all those things that we get for "free" from well-functioning ecosystems, such as air purification, rainwater infiltration, and pollination of our crops and fruit trees (Figure 4). There is much evidence from ecological research that ecosystems with greater biodiversity provide improved "services" and increased human well-being. For example, by increasing the variety of different wildflowers at a site, more native bee species can be supported, which then spill over to pollinate agricultural crops in nearby fields. A greater variety of plants also contributes to a diversity of root structure, which may lead to more efficient water and nutrient uptake and greater productivity. It is for this reason that by returning plant diversity to the Commons Ford meadow, we might expect to measure additional ecological benefits.



Another subset of ecosystem services falls under the category of "cultural services", such as spiritual and religious values, recreation, education, and inspiration. However, for people to benefit from these cultural services, they need to interact with nature. Research in the environmental social sciences points to a decline in connection to nature as more and more people move to cities.

Can urban restoration projects help to reconnect the public with nature? What do you think? Your next task is to discuss the ecosystem services that may – or may not- be affected by ecological restoration in cities.

*Figure SEQ Figure * ARABIC 4: The relationship between biodiversity, ecosystem function, ecosystem services, and human well-being is depicted here. Environmental change can reduce biodiversity, impacting services and well-being. Source: Millennium Ecosystem Assessment.*

Discuss the following questions with your group:

1. Make a list of 5 ecosystem services that might be provided by grasslands, and then note whether you think the restored system would provide the same, less, or more of this service than the degraded grassland. In other words, what do you hypothesize changed the most with the prairie restoration, and what may not have changed much? List the services and then insert "+" if you think that service increased with restoration, "-" if it likely decreased and a "=" if it stayed the same. Additionally, indicate if it increased or

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decreased substantially by adding multiple + or - signs. Try to come up with a diverse list of ecosystem services that includes more than just "+'s".

Ecosystem Service	Predicted change with restoration (+, -, =)

2. Consider the social ecosystem services, such as recreation, spiritual connection, and human health benefits. *Who* do you think most benefits from urban prairie restoration? Are there groups of people that might be left out? If so, in what ways would you suggest increasing the reach of urban restoration projects?

3. What do you think the costs, benefits, and challenges are of restoring prairies in urban settings? Do you think it's worth it, or should we spend more time, energy, and money on places that are farther from urbanized centers and anthropogenic interference?