FLAGSTAFF KESTREL PROJECT:

INTEGRATING COMMUNITY INTO CONSERVATION

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ABSTRACT

FLAGSTAFF KESTREL PROJECT:

INTEGRATING COMMUNITY INTO CONSERVATION

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Abstract: The Flagstaff Kestrel Project organized a community base of support to build, install, and monitor nesting boxes for American kestrels. This thesis seeks to understand effective strategies for building interconnected community support to accomplish conservation goals and build community resilience.

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Acknowledgements

Thank you to my father, Jonathan Rappaport, for being my close friend, confidant, and supporter throughout this process.

Thank you to the dozens of volunteers who contributed to the Flagstaff Kestrel Project.

Thank you to the kestrels, grasslands, and wild collection of little creeping things for the infinite lessons they teach.

Thank you to the past and present stewards of this land.

Thank you to my beloved friends who have lifted me up through darkness and despair.

I am grateful!

Dedication

This work is dedicated in memory of my mother, Rana Rappaport.

She was a masterful web-weaver who sustained relationships and built communities across decades, continents, and cultures.

Our shared love of wild nature tethers us together. Like the wizard Merlin in owl form and his pupil the Wart as a sparrowhawk, I see us flying together, over fields of time and space.

Preface

The Flagstaff Kestrel Project (FKP) was a community-based citizen science project that I founded and coordinated from 2018 – 2022. FKP brought a new initiative to the Flagstaff community and provided me opportunities to apply what I learned during my graduate studies. FKP organized a broad base of community partnerships to support a citizen science monitoring program for American kestrels, a threatened species of falcon. Through this project, a team of community scientists worked together to build, install, and monitor 23 nesting boxes for kestrels around the greater Flagstaff area.

I experienced great disturbance in my personal life during the years I was involved in this work. Additionally, COVID-19 necessitated changing the project's direction. The initial research design was predicated on togetherness and included creating specific research treatments by bringing together volunteers from different backgrounds to monitor kestrel nesting boxes. COVID-19 triggered a complete restructuring of a project design two years in the making, forcing volunteers to work independently and shifting the focus of my inquiry.

My involvement with organizing this project waned as I navigated extreme disruption and new demands. While FKP's kestrel nesting boxes were monitored during 2020 and 2021, in 2022 I was unable to organize the monitoring effort and no data were submitted. As of March 2023, the fate of this work is unknown. Through working on this thesis, I am reinspired to find a community of stewards who will tend to the nesting boxes.

I write this retrospective after a long period away from focusing on this work. I do so in deep gratitude to the people, habitats, and wild things that motivated and supported the Flagstaff Kestrel Project. At the foot of this mountain, sacred to at least 13 Indigenous Nations, I thank this land, its native peoples, and all who have lovingly stewarded these forests and grasslands before and into the future.

Introduction

"People power," the collective power of an organized group, is a constant in moments of significant social change. Movement building has led to the greatest advancements in civil rights and other social justice issues of the past few centuries (Monbiot, 2017). As climate change continues to worsen, threatening unprecedented loss of habitats and species, and as conditions for the survival of all species become increasingly fragile, we have an urgent need to amass real power in our communities to enact change. How can we create movements that effectively utilize people power for the protection of species, habitats, and communities?

I began organizing the Flagstaff Kestrel Project with this idea in mind. While the focus of my research ultimately shifted, at the heart of FKP lie these central questions: where is the intersection of conservation and movement building? How can we borrow strategies from the canon of effective community organizing for the conservation of species and habitats?

COVID-19 impacted much of the work of FKP. The initial research design into which I had hoped to embed my questions on movement building and conservation was forced to shift to ensure the safety of project participants. COVID necessitated a change in research design to ensure participant safety prior to the availability of a vaccine. Rather than examine the impacts of group work, this thesis instead turned to examine organizing community-supported conservation projects in moments of crisis.

Despite many challenges posed by COVID, FKP participants were still able to find ways to share in this odd but wonderfully collaborative effort. Participants of all ages and backgrounds gained new perspectives, skills, and connections through involvement with FKP. Each participant I

interviewed had positive feelings resulting from working with a group to accomplish tasks, motivated by the sense of meaningful participation within a larger community. And, ultimately, there are 23 nesting boxes, possibly housing kestrels, or flycatchers, or screech owls, or any number of other wild things, scattered in grasslands around Flagstaff. May they continue to generate a vibrant community of life including kestrels, their habitats, and their stewards.

About the Flagstaff Kestrel Project

I began organizing FKP by building relationships with community partners. I sought in-person, one-on-one relational meetings with representatives from educational institutions, environmental nonprofits, local businesses, and land management organizations. “Relational meetings” are conversations held with particular people that have specific goals and purposes, intended to grow relational power and build community (Alinsky, 1971). This approach is used by groups like the Industrial Areas Foundation and other grassroots organizations. By encouraging deep listening and sharing of life experiences, different actors are put into relationship with one another. The relationships that develop as a result are built upon trust and mutual understanding, leading to an increased ability to accomplish goals within that partnership.

“Relational power” refers to the power that grows when people are working in relationship with one another. The strong ties between participants that grow from the fertile soil generated by sharing and listening can facilitate powerful action (Dobson, 2012).

I used IAF-style relational meetings to build power within FKP. The forms of relational power I hoped to build included relationships between participants of different backgrounds, relationships between organizations in the community, and relationships between people and organizations. The relational meetings I held during this period served several purposes: to create community awareness of FKP with influential people and organizations, to solicit donations of materials and other forms of support, to generate new perspectives to solidify and improve the project's design, to recruit volunteers, and to locate sources of funding.

Typically, relational meetings with new project partners took place in person, and were around 30 minutes long. I focused on describing the project and on creating personal ties through mutual story-sharing and listening. Building rapport with local actors was of benefit to every stage of the project. The partnerships that arose through this process became interconnected through mutual goals and proximity, which was another intended result of approaching community building at the individual level.

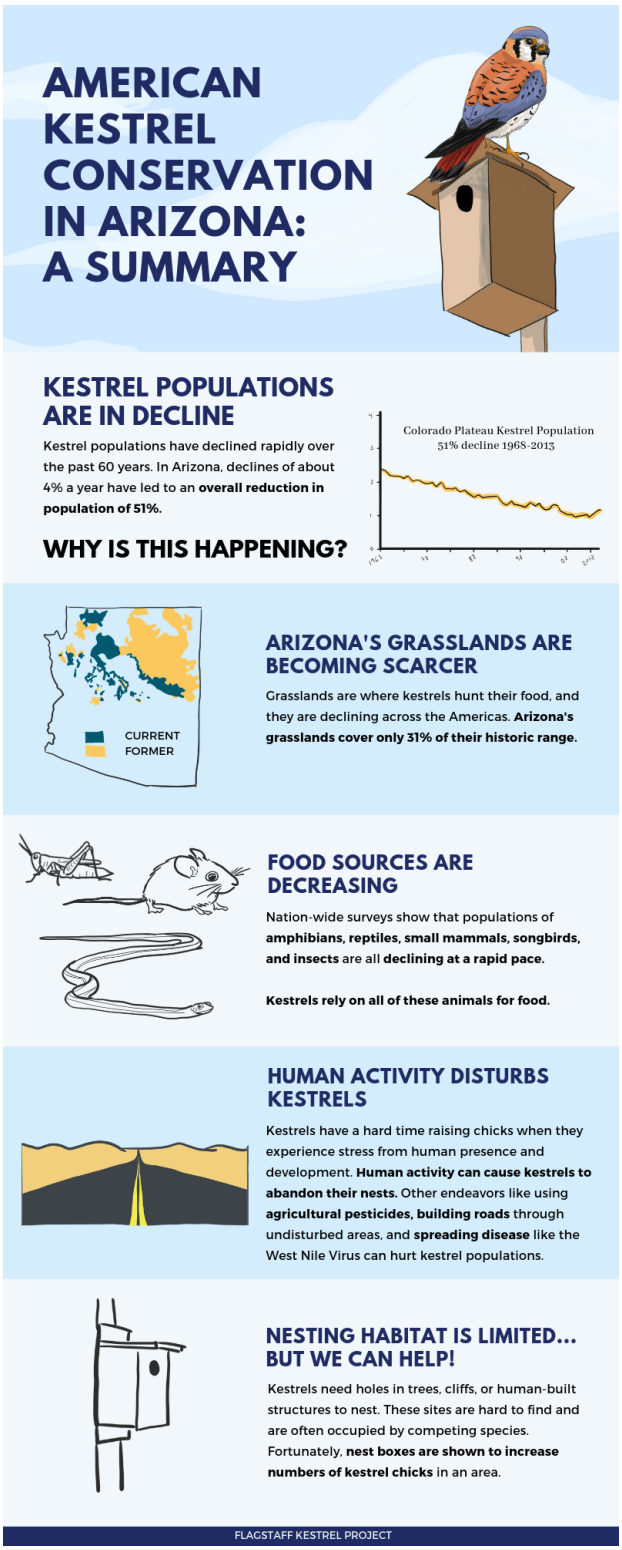
To build resilience in community networks and decenter myself, I put contacts in touch with one another through emails, shared meetings, in-person groupwork, and in the field. Developing connections using a relational strategy can be described as "web-weaving," or developing a network of individuals who are all linked through common relationship and mutual motivation (brown, 2017).

To support the project, I applied for grants and crowd-sourced funding, and sought in-kind donations. From January 2019 to March 2020, I raised over $14,000 in small grants, individual giving, and crowd-sourced funding from 88 donors (Appendix B).

I developed a strategy for outreach to increase community awareness about FKP and to solicit volunteer participation. I gave presentations on FKP in formal settings like the AZ Field Ornithologists Conference and at collaborative organizations like the Greater Flagstaff Forests Partnership to broaden the reach of the project and generate new interest. I presented informally to colleagues, in passing to fellow birders met out on the trail, to professors, to classrooms, and to whomever and wherever else I was invited. I spoke with the press on numerous occasions, which resulted in several pieces on the project in NAU News, the Arizona Daily Sun, and on KNAU's EarthNotes radio program. I wove this web of relationships while borrowing heavily from the community organizing tradition (Chambers, 2004).

To aid in promotion, I created a specific brand identity for FKP. I made illustrations, designed graphics, and created infographics, and used them in promotional materials. In creating promotional materials, I focused on communicating project concepts and motivations while appealing to would-be volunteers, using modern conventions for accessibility, and implementing design techniques used for improving cognition. Techniques to help viewers process and understand content messaging include using reader-friendly fonts, making content red/green colorblind accessible, and ordering content logically using headers and numerical schema, so I used these strategies and others in designing FKP's graphics and promotional materials.

FKP logo



Infographic communicating conservation issues for American kestrels

I put fliers up around town and emailed them directly to well-connected contacts to help spread the word. I also began a social media and online presence at this time. A former colleague of mine offered up web hosting for free for the project, so we had an online hub for information about the project (Appendix C).

A flier advertising an FKP nest box building event

Starting in June 2019, I hosted several nest box-building workshops at Willow Bend Environmental Education Center's facility. I solicited donations of wood from local sawmills and home improvement stores, asked community members for help in cutting the pieces to size, and then invited community participants to join in building the boxes (Appendix D). In Summer-Fall 2019, we built 26 nesting boxes, all with donated materials and volunteer labor.

Locally milled lumber donated by AP Sawmill

Volunteers cutting lumber to size

Assembly line of nest box components

Volunteers building nest boxes

Building boxes collaboratively

Triumphant box builders

Educational display at a nest box building event

In Fall 2019, we began installing nesting boxes around Flagstaff. Installations were group events, often involving a landowner or other community partner in the process. Land managers and property owners were curious about the project and eager to get involved. Project participants enjoyed meeting with land managers at these events and learning from their observations about local habitats and bird species. We installed boxes on private property, on city-owned land, and on land trusts. Site selection criteria included proximity to suitable

grassland habitat, driving times of within ~60 minutes of Flagstaff, ease of access, and land manager/owner consent (Appendix D).

Also in Fall 2019, I began working with an undergraduate in the Environmental Sciences program. We worked to develop in-classroom presentations designed to generate interest in the project. The student gave these presentations, then followed up in person by having relational meetings with interested students. This strategy recruited four additional hard-working and motivated students who would go on to complete formal internships with FKP.

In December 2019 and January 2020, I developed an internship for FKP. Five undergraduates in the Environmental Science department registered as interns under the class designation ENV 408. During the Spring 2020 semester, the interns worked together with and without my supervision to locate suitable nest sites, install nesting boxes and bedding, and begin monitoring the boxes for kestrel presence/use. Each intern worked on an individual project to deepen their personal engagement and to bring new perspectives to FKP. Projects included organizational systems for managing our data, generating GIS maps, independently creating a vegetation monitoring protocol, event coordination, and more.

Interns affixing box components during a box installation at a project site

Interns installing a nest box

Intrepid interns

Nest box at a project site

Nest box on Ponderosa pine

By mid-February 2020, we had installed all but three of the kestrel nesting boxes we had built.

In March 2020, it became clear we would need to re-evaluate the project, as well as the internship, in light of Covid-19.

Initially, I designed research treatments based on specific treatments in monitoring teams, where teams would be composed of volunteers from different demographic backgrounds in particular combinations. By examining the impacts of creating teams with specific combinations of citizen scientists in small, in-person groups, I had hoped to draw conclusions about strategies for motivating community-based conservation efforts. For example, I had hoped to create control groups as well as experimental groups that would include combinations of younger and older participants to learn about the impact of intergenerational exchange of information. However, because we could not safely gather in-person at that time, project participants and I developed a remote work strategy that allowed us to complete project tasks while following social distancing practices. This strategy consisted of interns and volunteers working by themselves to monitor nesting boxes while getting together on video calls to share observations and catch up. Working in this manner posed some issues in terms of creating a real feeling of community, but project participants nonetheless found satisfaction in becoming involved with a group project for a common goal.

To solicit nesting box monitoring volunteers, I contacted people who had previously expressed interest in the project at other stages of the work. I emailed anyone who attended a nest box building workshop, presentation, info session, or relational meeting. I posted to social media and sent targeted messaging to key contacts who had broad networks. Over Spring-Summer

2020, 16 total volunteers independently monitored our 23 nesting boxes and submitted data through the American Kestrel Partnership database (Appendix F). In Summer 2021, a year after FKP's first summer of monitoring, I was able to follow up with 10 of these nest box monitors by the time I was ready to conduct interviews for my thesis research, which I did according to a research protocol approved by the NAU IRB (Appendix G).

Unfortunately, we did not note the presence of any nesting kestrels over the course of the project.

Project Goals

I had several goals for both the project and its participants. These goals guided the direction of how I organized FKP.

FKP Goals:

- Provide nesting habitat for American Kestrels
- Provide opportunities for hands-on experience in conservation to project participants
- Generate awareness in the local community about American Kestrels and associated ecological issues

Goals for FKP Participants:

- Participants learn about ecological interconnectedness
- Participants learn about American Kestrels
- Participants feel more engaged with conservation concepts and efforts
- Participants believe that they are more likely to work in conservation in the future

Research Questions

In designing interviews to assess participants' experiences, several questions directed the design of the inquiry:

1. Does involvement with FKP result in understanding of ecological interconnectedness?
2. What is the impact of encouraging community- and relationship-building as part of this work?
3. Are FKP participants more capable of working in conservation, or do they believe themselves more likely to work in support of conservation in the future, as a result of their experiences with the project?

Personal Narrative

In many ways, the web-weaving I did to create FKP was a reflection of the experiences I have had in many different kinds of communities.

Being raised in a large Jewish family, my early education in being together with others took place in countless dining rooms and community centers across Massachusetts and New York. I observed how community members would share deeply of their experiences with one another, how the linkages between people sprung forth from collective and individual sharing. I would watch my mother *kibitz* with the other Jewish adults, observing how she asked about their personal lives, families, and feelings.

I also had the good fortune of being born into an extremely musical family. My *sabba*, my mom's father, was a jazz trumpeter who fronted bands in nightclubs in the Catskills throughout the 50s, 60s, and 70s. My parents bonded early in their relationship over their shared love of music. My late mother sang in a bold and beautiful tenor and had an incredible knack for harmonizing. She could recognize a piece of music's composer within the first few seconds of hearing it on the local classical radio station. Many of her fondest memories revolved around music: singing Christmas carols across New York City in her youth (mostly in choirs made up of other Jews who attended Brooklyn College), meeting famous musicians during her time coordinating for the Jerusalem Symphony Orchestra in the 1980s, attending countless concerts across New England with my father.

My dad is a skilled choral director, music educator, scholar of musical pedagogy, pianist, and hobbyist accordion player. Much of his work centers around finding ways to explain concepts to groups of musicians, so they may in turn find harmony.

Growing up singing in choirs from a very early age, and playing viola from age 8, many of the most notable features in the landscape of my childhood include collaboration with groups of my peers to perform music. I believe any artistic collaboration can build important skills for participants, and musical collaboration is especially enriching. The skills I developed while performing music in ensembles included listening and collaborating, serving as part of a whole, and finding strategies for de-centering myself to support my ensemble-mates more sensitively.

I have played in musical ensembles ranging from two players to over 100. My favorite kind of ensemble to play in, however, is chamber music. In a chamber music ensemble, there is no conductor. The members of the ensemble, usually a group fewer than eight players, must collaborate to reach musical goals. To play well in a chamber group requires more focus on listening than on virtuosic playing. The satisfaction to be gleaned from chamber music arises from the pleasures of working together.

Beyond my family background and experiences in musical collaboration, I learned to be a communicator from an early age in other ways, like participating in Model United Nations in high school, and working my first customer service job at age 16. Also in my teens, I volunteered on local political campaigns and participated in grassroots movement work.

A love of the natural world was another constant in my childhood, and I grew up catching crayfish and newts in the freshwater streams of New England. At age 17, after many years of mental health struggles, I began to consider the impact that the natural world had on my happiness and ability to feel peace. That summer, I worked my first farm job with the Many Hands Farm Corps. Many Hands used a model commonly found in environmental rehabilitation therapy, bringing together a group of ten teenagers to work collectively on organic farms throughout the Pioneer Valley in western Massachusetts. Growing food alongside relationships, I developed more awareness about how some of my day-to-day darkness could lighten through contact with the more-than-human world, and through sharing that contact with others.

Two years later, after additional personal difficulties, I took a gap year between my second and third years of college to work on The Living Farm in Paonia, Colorado, nestled against Mount Lamborn along the Western Slope of the Colorado Rocky Mountains. I lived and worked with four other young farmers and experienced a great deal of joy in our friendship and collaboration. In the rugged, rural Intermountain West, I also found a new sense of peace through my contact with the Earth and its inhabitants.

The farm was bordered by a drainage ditch and so it generated a great deal of life in an otherwise arid habitat. I remember finding praying mantis egg cases stuck onto leaves throughout the gardens, and gently relocating them to the greenhouses, so hatching mantises could assist in pest control in our beds of tender salad greens. Once, while pulling weeds from a carrot bed in fall, I accidentally dug up the cold, smooth body of a tiger salamander, sleepy in brumation. As the aspen forests on nearby mountainsides turned to gold, on one crisp autumn

morning, we arrived at the farm at sunrise, and looked up into the apple tree to find a black bear sleeping, contented, and gorged on fallen fruit.

Of course, birds also frequented the pastures and gardens of the farm. Bluebirds perched along the power lines and wood-and-wire fences that corralled our herds of dairy sheep. I was captivated by the bluebirds' vibrant blue backs and by their sweet way of interacting with one another. Sometimes, they were joined by a pair of kestrels. As a new birder, I had seen kestrels in passing before my time on The Living Farm, but had never had opportunities to carefully observe them. As I planted seeds, harvested produce, herded sheep, collected eggs, turned compost heaps, milked cows, and weeded endless beds, I watched the kestrels live their daily lives alongside me.

The pair struck me as guardians of the farm. I delighted in seeing them hunt, hovering over the open fields of the farm, catching insects and small reptiles and rodents. Living together in the same habitat, and feeding ourselves from the same patch of Earth, I felt connected to the pair of falcons. In many ways, my close contact with this pair of kestrels spurred a passionate interest in learning more about the birds around me that has motivated and inspired me since.

In the years that followed, I spent summers living in remote hunting cabins or out of a field vehicle while working as a bird biologist, conducting bird surveys in habitats across New Hampshire, Maine, Utah, Colorado, and Montana. Seeing kestrels was always, and still is, a joyful experience. Eventually, this work led me to Northern Arizona, and to the American kestrels of the Colorado Plateau.

Theoretical Basis and Literature Review

I. Overview
II. American Kestrels
III. Citizen Science
IV. Ecological Interconnectedness
V. Community Organizing Strategy
VI. Encouraging Engagement with Conservation

I. Overview

> "...if you sit still in the dark, breathing quietly, the world will come to life around you. Astonishment will rise in you like the slow tide, sliding in under the soles of your feet. And then you will understand: you are kin in a family of living things, aware in a world of awareness, alive in a world of lives, breathing as the shrimp breathe, as the kelp breathes, as the water breathes, as the alders breathe, the slow in and out. Except for argon and some nitrogen, every gas that enters your lungs was created by some living creature - oxygen by plankton, carbon dioxide by the hemlocks. Every breath you take weaves you into the fabric of life."
>
> Kathleen Dean Moore, 2004

Community-based conservation employs the efforts of local people to support ecological conservation initiatives and has many benefits both for the focal species/habitat/landscape and for the participants (Barrow and Murphree, 1998). For the Flagstaff Kestrel Project, I created an organization centered around the benefits of community-based conservation for both human participants and more-than-human habitats and species (Abram, 2012).

A note about word use throughout this literature review: I opt for the term "more-than-human world" rather than rely on more established concepts like "the human world and natural world" because the latter implies a binary in which humans and nature are diametrically opposed. The term more-than-human world captures more of the nuances inherent in the fact that human beings are just one of many species that occupy this Earth.

II. American Kestrels

The American Kestrel (*Falco sparverius*) is North America's smallest and most widely distributed raptor (Sibley, 2014). Once extremely common, this charismatic raptor has declined in population by about 60% nationally in the past 6 decades, with steeper declines of over 90% in parts of the Eastern US (Peterjohn, 1999). The causes of kestrel declines are not entirely understood, but major contributors include loss of habitat and grassland systems declines, poisoning by rodenticide and pesticide, road collisions, and the increasing spread of avian illness (Smallwood et al, 2009, Strasser and Heath, 2013). Climate change worsens and accelerates these threats, particularly due to habitat and prey species loss, and because of increasing spread of avian illness through higher-density occupation in dwindling habitat.

American Kestrels are, like all species, deeply interconnected with the other components (creatures, microbes, plants, fungi, abiotic components like water and wind, human beings and more) of their habitat system. Kestrels hunt in open grasslands for rodents, insects, small birds, and reptiles, which closely connects them to farmers, ranchers, and orchardists (Mineau and Whiteside, 2013). Kestrels rely on healthy grasslands to hunt enough prey. Healthy grasslands exist because of clean, functional watersheds, which in turn connect kestrels to the water table. I chose kestrels because they live alongside us; they interconnect people with place. I believe this beautiful, threatened species can bridge the gap many people feel between "us" and "nature," and serve as a conduit for providing education on a broad range of environmental topics.

Another compelling motivation for focusing on American Kestrels is the ready availability of thoroughly proofed monitoring protocols. The American Kestrel Partnership (AKP), an organization nested within The Peregrine Fund, provides all the necessary information for instituting and running an American Kestrel nest box monitoring program, including clear monitoring protocols, blueprints for nesting boxes, online tools for group data management, and a wealth of information and other resources. AKP manages an extensive database, organizing data from kestrel nest box programs across the continent. The interrelationship between FKP and AKP is of mutual benefit; FKP is aided greatly by the tools provided by AKP, and FKP's data was submitted directly to AKP, helping to fill a regional knowledge gap in the national dataset. In this way, FKP was interconnected with a wide-ranging network of other kestrel nest box projects. As kestrels migrate across landscapes and prey upon animals linking a diverse array of habitats and species, so too are nest box monitors interlinked through the framework of AKP and the interface of citizen science and community-based conservation.

III. Citizen Science

Citizen science is a highly effective route to quality data. Data collected by citizen scientists is of a quality on par with data collected by professional scientists and is sometimes more comprehensive (Bonney at al. 2017). Citizen science can cover a much broader area and generate far more data than is possible with professional, paid scientists alone. The far-reaching potential of citizen science is extremely useful in the wide-scale study of species and habitats (Phillips et al. 2018). A well-known example of the broad impact of citizen science is eBird.org, the largest database of citizen scientist-submitted bird observations. eBird relies on a

network of birders to proof and approve data, and as such is a highly accurate database. Because eBird allows any birder to submit observations, the quantity of points in its database is staggering. Such a richness of content and information could never be generated if solely collected by paid, formally trained, professional scientists. Population scientists and ecologists now use eBird data to track trends in habitats and species populations on a wider scale than was ever available before. eBird is one example of the power of well-organized citizen science for understanding habitat-level, or even global, trends in ecology (Wood et al. 2011). Many current citizen science projects center around collecting data to understand trends in climate change, including several initiatives that use eBird data, or results from other kinds of bird surveys, like the Climate Watch Citizen Science Program.

Citizen science has the benefit of introducing lay people to new concepts and skills, which could encourage them to take up environmental action in the future or spread environmental concepts by word of mouth. It can help participants "increase science knowledge and literacy… understand the process of science… and develop positive action on behalf of the environment" (Phillips et al. 2018).

In the context of this project, exposure to citizen science methodology (specifically, protocols and practices of monitoring kestrel nesting boxes) was intended to result in meaningful impacts on participants. Such impacts included: participation in conservation in the future, knowledge of kestrels or other species, ability to teach others about ecological concepts, a sense of empowerment in science, skills in biological observation, and team leadership.

Citizen science is particularly important in addressing climate change (Albagli et al. 2022, Day et al. 2022). Developing meaningful strategies for addressing climate change requires an enormous amount of data to track environmental trends and understand patterns. Because of the scope and level of detail required in amassing such data, a wide-ranging approach should be implemented, and citizen participation can provide the necessary base of support for such endeavors.

Involving community members in science-based efforts in conservation and addressing climate change also has the critical benefit of increasing people's connection to the more-than-human world. By developing a sense of interconnectedness with local species, habitats, and communities, community members can become inspired to engage in environmental work.

IV. Ecological Interconnectedness

Q1: Does involvement with FKP result in understanding of ecological interconnectedness?

This research inquiry is predicated on the concept of ecological interconnectedness. Related terms for this concept include ecological interdependence and kincentric ecology, among others. The term "ecological interconnectedness" as used in this discussion refers to the ways in which all life is deeply and inextricably linked.

My early experiences with this concept are difficult to trace to a single point of origin, as this is inherent knowledge to many people who spend time out-of-doors. But some scholars that impacted my early thinking on this subject include Rachel Carson, Terry Tempest Williams, Aldo Leopold, Helen Macdonald, Annie Dillard, and Mary Oliver. Texts such as Robin Wall Kimmerer's

Braiding Sweetgrass and David Abrams' *The Spell of the Sensuous* reinforced these ideas more recently, and their work echoed throughout my inquiry.

The concept of ecological interconnectedness is in no way new. Indigenous peoples from all over the globe have long held such beliefs. Enrique Salmón describes the relationship between the Rarámuri people and the more-than-human world of the Sierra Madre region of Mexico thus:

> The natural world, therefore, is not one of wonder, but of familiarity. The human niche is only one of a myriad of united niches that work together to continue the process of iwígara [(kin-centric ecology or interconnectedness)]. If one aspect of the lasso is removed, the integrity of the circle is threatened and all other aspects are weakened.

He goes on to note how Indigenous connections to the Earth are common in every culture:

> The natural world is referred to in various ways by [I]ndigenous languages... No matter the terms, they all make reference to the complex flow of life with which they and their ancestors have lived interdependently for centuries. Nearly all indigenous cultures share a set of structures, (expressions, metaphors, concepts) that describe their links to the natural world. (Salmón, 2004)

In nature, everything is inextricably connected; everything is interdependent. My relationship with myself, with others, and with the world around me is profoundly impacted by this concept. When I feel small, meditating on the immensity of all life and my interconnected place, my small thread woven into the infinite tapestry, brings me great comfort and relief. A powerful motivation for creating this project was the desire to bring this same feeling to project participants who might not have internalized this important concept. As Chianese says, recognition of interdependence is "a key concept for understanding systems—especially living ones, such as an ecosystem." (Chianese, 2014). To understand the habitats upon which

conservation programs are built, and to understand how to protect them, participants benefit greatly from exploring concepts of ecological interdependence.

Certain common social norms purport that human beings are a blight on the planet, that humans are inherently in opposition to the more-than-human world (Bakari, 2015). This can result in emotional barriers to meaningful involvement in efforts to enact change (Ray, 2020, Pihkala, 2020). I resist this notion, as do many Indigenous cultures, environmental scholars, and naturalists. As an inherently interconnected part of all life, humans have the same value as all other life. Human beings have as much potential to improve the health of habitats and species as we do to damage them. The notion of kincentric ecology - the concept that humans are kin with all other elements of nature - is best described by Indigenous scholars:

> Indigenous cultures of North America include human communities in their cultural equations of nature. To indigenous people, humans are at an equal standing with the rest of the natural world; they are kindred relations. In addition, indigenous people believe that the complex interactions that result from this relationship enhance and preserve the ecosystem. It is understood that human practices such as burning and pruning promote new growth of shrubs, trees, and grasses. This attracts animals such as birds to sprouting trees and shrubs, and mammals such as deer and elk to grasslands. This concept of kincentricity with the natural world is what is being referred to as “kincentric ecology.” (Salmón, 2000)

Non-Indigenous environmental philosophers share this view. In *Pine Island Paradox,* Kathleen D. Moore writes:

> As we grow older and grow also as moral beings, we recognize broader and broader webs of relatedness, a larger family that extends even to strangers in faraway places. This sense of belonging can bring us comfort, and when we find ourselves alone and apart, we sometimes feel a sadness that edges towards

> despair. These are facts of the greatest moral importance: If we value caring relations, then it makes sense that we commit ourselves to act in ways that strengthen and reweave and sustain the webs of relationships that we value. (Moore, 2004)

As Moore indicates, reweaving and sustaining valued relationships is central to a community's ability to meaningfully protect species and habitats. It is crucial to build, re-build, and strengthen relationships between people and community, to "grow as moral beings" and "sustain the webs of relationships that we value" in order to tackle systems-wide issues like climate change and destruction of the more-than-human world.

The concept of ecological interconnectedness provides a counter to dominant social narratives about the role of humans in nature. Living under capitalism requires people to disconnect from the more-than-human world, or else engage with the immensity of pain inherent to its destruction. Remaining distant from the suffering of our more-than-human neighbors allows us to participate in consumerist culture with ease. But on the precipice of environmental collapse, we can not afford to look away. I believe that encouraging meaningful engagement with the notion that humans are deeply interdependent with all life is an essential component of resisting the destruction of wild nature that currently threatens species, habitats, and communities worldwide.

V. Community Organizing Strategy: Building Community and Relationships

Q2: What is the impact of encouraging community- and relationship-building as part of this work?

We are in a moment of unprecedented ecological crisis (IPCC, 2022). As climate change looms, and while habitats and ecological systems fall continually into devastation at the hands of extractive industry and apathetic governance, people feel hopelessness, loss, and devastation (Monbiot, 2017). These patterns will not be changed by big businesses or governments that are invested in extraction (Levy, 2015). Groups of concerned citizens have made lasting changes in the face of oppressive powers many times in recent history; movements for social justice won most major social and environmental protections seen in the US today (Piven, 2006, Chambers, 2004). Considering how social transformation is enacted by groups of people organized in civil society, it is probable that environmental degradation can most effectively be prevented by strong resistance generated by and from communities of everyday people.

Guided by this thought, I sought to learn more about the critical intersection between community organizing and environmental protection and conservation. I created FKP because I was curious about best practices for integrating communities and individuals into local conservation work. I wanted to gain knowledge about resisting large-scale problems like species loss, habitat destruction, and climate change through small-scale projects like this one.

There is evidence that participation in ecological restoration, citizen science, and similar projects empowers project participants, offering relief from the incredible pressures of life in this moment of ecological crisis (Ewing and Gold, 2011, Ray, 2020). As biodiversity wanes, as the impacts of the climate crisis are felt with increasing intensity and frequency, and as political leadership continues to favor the short-term profit of extractive industry over the health of

communities and habitats, communities need to develop opportunities for their members to connect and work towards common goals.

Building community support through relationships is central to this project. I borrowed several strategies from the community organizing tradition, including: building a broad network of community partnerships, encouraging relationship building among participants, offering skills-building experiences to participants, education and consciousness-raising, and solidifying the strength of our group through story-sharing and creating other shared experiences (Alinsky, 1971, Piven, 2006, Chambers, 2004, Wright, 2008, Monbiot, 2017). A consistent theme in all of this is the importance of developing relationships among participants and the FKP community at large.

Building relationships in community-based conservation work is shown to increase the long-term success of a project or organization. In a discussion of the power of social relationships in sustaining engagement with scientific work, Phillips makes the case that

> Social relationships… were critical for sustaining and enhancing engagement. These relationships fostered mutual respect and made participants feel valued and part of the scientific community… All projects [have a need] to provide and support meaningful outlets for peer-to-peer, participant-to-scientist, and participant-to-public forms of communication (Phillips, 2018).

Building relationships is central to the success of a citizen science project. The FKP project design included many different forms of communication intended to grow potential relationships between participants, the community at large, and the community within the project.

To foster interdependence and interconnectedness in the relational-building design of the project, I made connections through in-person relational meetings with businesspeople, teachers, academics, students, community volunteers, land managers, farm workers, city officials, members of the press, and other groups. I put these contacts in touch with one another, contributing to a network of support for the project and its participants. I involved volunteers at every step of the process to grow their sense of empowerment and connection to the work. I organized group work so volunteers would be put into continued contact with one another. I designated leaders for various tasks like teaching others to build boxes, giving presentations to draw attention to the project, scouting nest box locations, creating GIS maps of project sites, organizing photos taken by volunteers, and organizing monitoring of boxes.

When COVID interfered with the in-person, group-based design of the project, I assigned designated nesting boxes to individual monitors. Monitors checked their boxes throughout the breeding season, returning to the same sites 3 or more times from May - August. We gathered on Zoom and shared our monitoring observations monthly. I sent out emails to the monitors to keep them apprised of project progress, and also sent prompts in advance of video call meetings to encourage reflection on their experiences.

This intentional design reiterates foundational project concepts, and encourages deeper engagement with themes of interconnection. Tightly woven relationships are shown to improve the health of a project by keeping participants engaged and by motivating them with a sense of shared identity and belonging.

> Given the crucial importance of a strong sense of belonging and identification as a fundamental factor in the resilience of a human group, it is clear that… participation, beyond its specific effects, is able to increase and intensify the resilience of the group and the ecosystem in which it resides (Reyes, 2011).

Through sustained and resilient networks of support, communities made up of robust interconnections can lead to healthier habitats. Interconnected communities can have more power to accomplish goals, including in environmental protection.

The Flagstaff Kestrel Project was designed as a place-based project that invited the local population to participate in a variety of ways, putting them in contact with other volunteers as well as landscapes and species. Monitors developed relationships with their assigned monitoring sites, one another, and American kestrels through this work.

As an observer of the more-than-human world, I have long been fascinated by the complex webs of interconnectivity between forms of life that generate the habitats I know and love. Replicating the interdependence and interconnection of natural systems strikes me as a powerful organizing strategy for community-based work.

VI. Encouraging Engagement with Conservation

Q3: Are FKP participants more capable of working in conservation, or do they believe themselves more likely to work in support of conservation in the future, as a result of their experiences with the project?

Experiential learning is a highly effective form of education in the context of a citizen science project; as reported behavioral engagement increases, so do self-perceived skills of scientific inquiry (Phillips, 2018). It is not possible to substitute the in-the-field educational experience of

hands-on environmental work in a classroom setting. People learn deeply in this engaged setting. And lessons on ecological interconnectedness are rarely more profoundly felt than in the field.

Additionally, engagement in in-the-field ecological work can have many different kinds of impacts on participants. Frequent contact with the same habitats and species over time grows understanding about the self and about one's surroundings. As Ewing and Gold write,

> Ecological restoration has potential to do things besides motivating people to coalesce behind environmental issues, such as changing the way they think about their relationship to the land, and making them want to learn about their surroundings. With its ability to unleash the energy and interest of people, ecological restoration is a perfect vehicle for education because it engages people in ideas and subjects they find innately interesting and personally important (Ewing and Gold, 2011).

FKP relied on the relationships participants built through sustained contact with the same monitoring sites. These relationships motivated participants and were the locations for some very interesting revelations, as discussed in participant interviews.

Some Indigenous scholars agree. There is little substitute for hands-on experiential education. As Leanne Betasamosake Simpson writes in *As We Have Always Done: Indigenous Freedom Through Radical Resistance*,

> To me, this is what coming into wisdom within a Michi Saagiig Nishnaabeg [Anishinaabe First Nations] epistemology looks like. It takes place in the context of family, community, and relation. It lacks overt coercion and authority, values so normalized within mainstream, Western pedagogy that they are rarely ever critiqued. The land, Aki, is both context and process. The process of coming to know is learner led and profoundly spiritual in nature. Coming to know is the pursuit of whole-body intelligence practiced in the context of freedom, and when realized collectively, it generates generations of loving, creative,

> innovative, self-determining, interdependent, and self-regulating community-minded individuals. It creates communities of individuals with the capacity to uphold and move forward our political practices and systems of governance. (Simpson, 2017)

My time as a farm worker from 2011 – 2013 and as a field biologist from 2013 – 2022 helped me, as Simpson says, come to know myself as an extension of the Earth and therefore as one of its protectors. I sought to replicate this experience for FKP participants by having them dirty their hands building boxes, hike out across landscapes to install them, and return multiple times to the same habitats to experience them during the turn of the seasons. FKP was designed to offer participants that "whole-body intelligence practiced in the context of freedom," encouraging them to grow as lifelong scholars and protectors of the natural world.

As Salmón says,

> Rarámuri land management represents a tradition of conservation that relies on a reciprocal relationship with nature in which the idea of iwígara becomes an affirmation of caretaking responsibilities and an assurance of sustainable subsistence and harvesting. It is a realization that the Sierra Madres is a place of nurturing, full of relatives with whom all breath is shared. (Salmón, 2000)

American Kestrels are a hallmark species of American grasslands. They are an essential component of the character and identity of Western grasslands. And monitoring for kestrels draws participants to visit iconic grassland vistas that are central to the culture and sense of place in Flagstaff, Arizona. Through in-the-field experiences with wild nature, kestrels, and one another, FKP participants are in a better position to learn deeply and engage meaningfully with ecological concepts. This has the potential to shape some of the direction of their lives, or at least their thought processes, and will furnish participants with the necessary set of skills to be impactful if they choose to continue in this field.

I thank the scholars I have quoted in this work for their guiding insights.

Project Synthesis

Research Inquiry: Participant Interviews

To organize the Flagstaff Kestrel Project, I borrowed heavily from the canon of community organizing strategy, using concepts like building relationships between participants, creating an interconnected web of partnerships, collaborating with other relevant groups and actors, and encouraging deep engagement with project concepts through immersion in hands-on, field-based, and conversational learning. The purpose of this research inquiry was to assess the effectiveness of those strategies by asking participants questions about their experiences and perspectives.

To answer my research questions, I designed an 11 question interview and administered it to 10 project participants during Summer 2021. These interviews took place on video calls over Zoom due to challenges posed by COVID-19, and ranged from 30 minutes to an hour. Interview questions were designed after committee input. Interviewee recruitment, interview questions, and interview methodology were IRB-approved (see Appendix G).

By the time participants were interviewed, the project had been running for over two years, and interviewees had concluded their volunteer efforts. The sole purpose of conducting interviews was to learn from participants' answers. No formal statistical data analyses were performed, as the interviews were all qualitative and semi-structured in nature.

Anyone who participated in the Flagstaff Kestrel Project was asked for an interview, including nest box monitors and participants who helped build or install nesting boxes. Participants

ranged in age from seniors to young adults, including two minors who participated with parental consent. Volunteers who were interviewed included mid- to late-career working professionals, undergraduate students, and local high school students. All participants lived in Flagstaff at the time of participation.

Interview Protocol

I conducted a series of semi-structured interviews with project participants to answer my research questions. Interviews were conducted on Zoom video calls and took 30-60 minutes to complete. To solicit interviewees, I sent out communications via email and social media, using my established communication networks. At the beginning of each interview, I read the consent/assent script I created for this work using IRB protocol. I obtained verbal consent for participation from each interviewee.

For minors, I had additional interview protocol steps, including parental consent.

To analyze interviews, I used Microsoft Office transcription technology and listened back to recordings while reading through the transcripts. I summarized main talking points and indicated either “yes” or “no” for each of my three research questions based on participants’ responses. To capture further nuance, I pulled quotes from interviewees to include in the synthesis that follows.

Question 1: Does involvement with FKP result in understanding of ecological interconnectedness?

To answer this question, I asked participants about their connections to the natural world pre- and post- participation with FKP, their knowledge of and feelings about ecological interconnectedness, and if they felt working with FKP altered their conceptualizations of ecological interconnectedness.

Participants' Connections to the Natural World

All 10 participants I interviewed were self-selected to participate in FKP because of their pre-existing interest in nature and/or wildlife. While every participant had some degree of connection to the more-than-human world in advance of working with FKP, all interviewees mentioned deepened senses of connection resulting from their involvement. Younger participants, including high school students and undergraduates, expressed learning much about the natural world through repeat visits to monitoring sites, and experiencing growing connection to and passion for their designated monitoring locations and the species encountered while in the field. Participants who had worked decades-long careers in conservation-related jobs reported fewer revelations of this kind, but still mentioned learning something new about their monitoring locations through repeated contact.

While FKP did not generate brand-new relationships between humans and the more-than-human world, project participants gained new perspectives and deepened relationships with species and habitats through project involvement.

One undergraduate participant said,

> "[During the Flagstaff Kestrel Project] I realized that guess what? Birds are around! And now I perk my ears at any bird sounds or anything I see in the trees, and that's exciting. I want to find out what kind of species it is! And that's just a love that I think will keep going for the rest of my life."

Participants' Perceptions of Ecological Interconnectedness

Parallel to the above discussion of how participants' connections to the more-than-human world were developed before involvement with FKP, most participants had some degree of awareness of the concept of ecological interconnectedness before participation. However, this sense did evolve during involvement with the project, particularly for younger participants. By repeatedly visiting sites during FKP fieldwork, participants expressed generating new or different senses of how they fit into the landscape of species and habitats.

One participant said,

> "Now I think [what I knew about ecological interconnectedness] beforehand I knew at a very surface level, in terms of what you learn in classes, how one thing affects another in a domino effect. And like you learn that very one-sidedly in the classroom, and it's a pretty easy concept to understand. But I don't think you seem to internalize it until you're actually out there. Watching a bird eat a bug. A hawk above you circling its prey. That's when you start to realize that all these sounds are individual items that affect all these other things, like this grass you're sitting in is life-giving to insects or a certain kind of herbivores in the area… [Being outside during monitoring] made it very real, very three-dimensional for me."

Some participants mentioned enjoying speaking with land owners and land managers – like farmers, rangeland managers, and local homeowners who happened to be birders – and learning more about the local wildlife and seasonal changes from people connected to those sites. A member of the FKP intern team reflected,

> "[It was rewarding to be] around a bunch of other people that are invested in the same thing, trying to learn more about it or protect it, so that made it an interesting social group [experience]. It was cool because the community's not just the volunteers, it's the property owners that might have a box too. So it was cool going out to properties, not expecting to run into the landowners, and then [having the opportunity to speak with them], being like, have you seen anything lately, or seen signs of kestrels? All that was pretty fun to be a part of."

Many participants mentioned new information learned from other participants or from their own observations about species they had previously not known existed. Late-career conservation professionals mentioned enjoying the opportunity to be in a new place and watch it change over time. And participants at all life stages mentioned enjoying learning about birds and especially about kestrels, their habitats, and their specific conservation issues. One young ecologist volunteer said,

> "Taking certain data [while monitoring] made me think about other ways that those boxes could be helpful to the whole ecology of the area. Seeing the options on the data sheet to note what other species use the boxes really made me think, oh it would be really cool if insects or other species use those boxes as wintering sites. That kind of stuff got me thinking."

Some participants described feeling an enriched understanding of kestrels because of first-hand experiences seeing the other species that inhabited their territories. For example, this adult participant encountered some interesting creatures while monitoring,

> "There were some unexpected things that were really neat. Two out of my three boxes had snakes! I would have never expected that. I know snakes exist but I never thought I'd find them up in a tree in a hole. It just was like this really cool view into how the world finds a way. They needed a place that was warm and dry, and they found it. That definitely gave me a new perspective on some things."

To prepare for our monthly video calls, which were held with as many monitors as were available to participate, I sent out prompts to encourage participants to reflect on various themes related to ecological interconnectedness. I also used each in-person field activity as an opportunity to discuss the various species that could be found in each habitat and their interconnections. Participants expressed that this framing encouraged further reflection with concepts of interconnectedness, and many shared some of their own new observations on the theme. A young birder involved with the project mentioned,

> "While it would have been interesting to have had kestrels in my nest boxes, it was nice to see some other birds. One event I remember from monitoring was there was this young Western meadowlark that was like right nearby, and it was practicing its song. It sounded super goofy, doing half of its song and then fizzling out. So I think another thing that was really useful for me was just going out and seeing all the birds, even if the kestrels weren't there. It was kind of interesting to see what's up there, because I otherwise wouldn't have been [near the monitoring sites]."

RQ #1 Summary: Did involvement with FKP result in understanding of ecological interconnectedness?

It depends – participants early in conservation work said yes across the board, but more experienced participants (older professionals) gained supporting perspectives without necessarily having any paradigm shifts. Even later career conservation professionals enjoyed the opportunity to be in a new habitat and to watch it change over time. Everyone enjoyed learning about kestrels and their specific conservation issues, and several participants remarked on enjoying seeing first-hand what other creatures inhabited the same areas. One participant remarked,

> "When I was sitting there listening and watching to see what comes around the nest boxes, I definitely picked up on other sounds. I may not have known exactly what they were, and I don't think they were birds, but just smaller critters. I've definitely picked up on more species being able to interact in an area than I thought. I felt that my senses were heightened and I definitely became more connected [to the natural world]."

Question 2: What is the impact of encouraging community- and relationship-building as part of this work?

To answer this question, I asked participants to describe the community of FKP, discuss their perceptions of relationship building within the project, and explain their feelings on how COVID-19 impacted said potential relationship building.

Participants' Perceptions of FKP Community

Participants had a wide range of perceptions of the FKP community informed by their level of involvement and the time period during which they were involved. The team of undergraduate interns who frequently met in-person pre-pandemic to build, install, and monitor boxes had very different views of the FKP community than participants who only began participating as independent nest box monitors after the onset of COVD-19. Overall, while perceptions ranged from "group of friends and trusted teammates" to "distant entity," all participants mentioned that a primary motivator for the work was the positive feeling resulting from working, as several participants said, "with a group for a cause." One later-stage professional mentioned,

> "In the zoom calls and nest box building workshops, it [was] affirming to see some of the other people who were involved in this. I guess it's a sense of finding your people, people who share what seems to be an unfortunately relatively uncommon interest, of knowing there's a community out there that I didn't know about before, or maybe knew about only in the abstract, but not in terms

> of specific faces and names. A benefit of a project like this is finding a particular community within the larger community that has shared interests… [Communities based on mutual interest] really aren't casual, they're really important, and since I had the experience [during COVID] of having pretty much all of those just sort of drop out and disappear, that was a big blow. And so it really makes me reevaluate the importance of those kind of communities."

A constant theme in the interviews was that members took pride in being associated with the group, and helped to reinforce the idea of the community among themselves. Hearing about other participants' experiences encouraged new participants, and seeing how relationships were already formed within the group encouraged further forging of connections. Long-term participants sharing their connections to the project with other group members likely made it more appealing for newer participants to connect meaningfully with the group.

One mid-stage professional said,

> "Working for species conservation feels good, it feels good to make a difference. My sense of connection to the FKP community was tied to this common goal, so it was motivating, particularly during a period of isolation."

Impacts of Building Relationships

While participants reported a variety of experiences, some participants only gained one or two new connections. Sometimes the only connection a participant felt they made was with me, as I was their main point of contact. Other participants specifically highlighted how the creation of several meaningful relationships within the participant group motivated deeper engagement with FKP. In particular, interviewees who were a part of the undergraduate intern team reported that important friendships were developed during this time, and that those connections were motivating for project participation. One undergraduate intern said,

> "[The relationships built during FKP] were definitely significant. It's not a group of people that I'm going to forget. I've taken part in volunteering and done a lot of other related stuff, but this was my first real internship I've done so it was exciting to work with these people with the same goal. We bonded, we created this relationship with each other over making small little accomplishments to create one big accomplishment. I still keep in contact with some of [the other interns] still, so the relationships were solid and to this day I could call them friends."

Participants reported enjoying the community interconnection that resulted from the project. Participants learned about other volunteer opportunities through project contacts, and community partners put into contact with one another through FKP formed new relationships independently of the project as well. For example, managers from the two different farms on which we installed boxes developed new ties.

One participant hadn't known about the local Audubon society until meeting some of its members at an FKP event, and now is an active volunteer on several projects sponsored by them. FKP also connected birders to one another, establishing a few new relationships where participants became birding buddies.

One participant enjoyed meeting some of the property owners who hosted nest boxes. This participant said,

> "I find myself really missing the people that I worked with. And I find myself even more so connected to the community, even if they don't know it. Connecting to project partners, like [the owners of] Flagstaff Family Farm, I now know a lot about them, and feel that if I ever talk to them one-on-one I would feel comfortable, and could see myself collaborating with them on future projects. So not only did I get super connected with the interns and the other people on the project, but I also got an inside peek into the community around me, which is still something I carry with me today."

I have been excited to serve as a professional reference for project participants, and enjoy seeing past participants around town or in community with one another. I myself found that the relationships developed during this process were significant. Through involvement with FKP, I met many new community members, grew new friendships, explored previously unknown-to-me areas of the Flagstaff community and surrounding habitats, and grew as an organizer.

Participants' Experiences During Involvement Under COVID-19

All participants cited COVID-19 as presenting challenges to this project. The majority of comments focused on how COVID prevented us from doing in-person work together, and how it interfered with relationship building as a result. Despite this, participants still found meaning in working as a group on a unified project. Participants mentioned finding the Zoom video calls helpful, since they created a motivating sense of group involvement.

FKP also provided participants with a sense of relief during a difficult time. Participants enjoyed the opportunity to connect deeply with the more-than-human world during this crisis, and found comfort through monitoring activities.

> "You hear the term 'grounding,' where people just sit with the earth and be connected to it. Before I was like, yeah, it's a thing, but not actively involved in doing so, until I was doing this project. I would be out sitting, just finding a tree to sit under and wait and watch and see if I could, you know, see something and it was really impactful. It really put into perspective my place in everything. It was relaxing, you know, almost like meditating. And I got to see some really cool stuff while I was out there, like a red-tailed hawk hunting in the field."

COVID presented mainly challenges, but it also offered a few opportunities. With in-person events canceled, participants had more flexibility to participate in projects like FKP. One participant said,

> "In the context of coronavirus, when you do individual monitoring projects, as long as you have the tools to do it yourself you'll be engaged. You don't necessarily need a team of people to do things. I had a lot of flexibility since I could go out on my own."

Another participant noted,

> "It was a great way to get out and feel like you were doing something useful, even when you couldn't socialize with other people face-to-face."

RQ #2 Summary: What is the impact of encouraging community- and relationship-building as part of this work?

The main takeaway was that participants were motivated by a sense of connection to a group working for positive outcomes. Relationship-building and community-building encouraged an exchange of learning between participants and others involved, including land owners and land managers, other birders, local environmental professionals, teachers, and participants. New community connections formed on their own as a result of this work. Connections within the intern group facilitated meaningful and impactful experiences for the interns, but the connections outside of the intern group were limited, and COVID limited the extent to which relationships could be built.

Question 3: Are FKP participants more capable of working in conservation, or do they believe themselves more likely to work in support of conservation in the future, as a result of their experiences with the project?

To answer this question, I asked participants about skills building and new learning they developed as a result of participation in FKP, and if they felt themselves likely to work in conservation in the future.

Skills Building and New Learning

Participants seemed to gain skills in amounts inversely proportional to their existing experience. Long-time conservation professionals gained comparatively fewer skills than high school students and undergraduates; however, professionals still reported learning something new, whether it was gaining new carpentry skills from building nesting boxes, or learning to identify a particular bird call by ear. Younger participants gained many new skills, including bird identification, nest box monitoring protocol, data entry, navigation, site selection, leadership, and team building skills.

Other new learning that interviewees mentioned revolved around the themes of ecological interconnectedness and community. Participants expressed newfound appreciation for the complexity of the more-than-human world and for fragile habitats. Some participants discussed new learning about how to organize citizen science projects. Other participants noted new knowledge of complex conservation issues.

One participant said,

> "Actively going out and preserving certain areas of land, and then doing research like putting out and monitoring nest boxes, was part of the reason I went into the Kestrel project. I had an interest in [doing conservation research], and [FKP] made me feel more confident that I'd be doing that kind of research in the future."

Likelihood of Future Involvement in Conservation

All participants interviewed said they were interested in working in conservation in some capacity in the future. Young participants mentioned that the skills they learned during involvement with FKP made them feel more prepared to apply for conservation jobs. Older participants mentioned how returning to the field to monitor nesting boxes was a welcome reminder of the joys of volunteer field work and encouragement to continue conservation-based volunteering.

As previously mentioned, I was able to serve as a professional reference for conservation jobs for some of the project's interns, indicating a pattern of FKP participants going on to work in conservation. Such jobs included field-based positions with the US Forest Service and other agencies, animal caretaking positions at conservation zoos, and others.

One undergraduate intern said,

> "I've learned a lot about fieldwork [from participation with FKP]. And just how field work is the first step for everything else to come after, because I watched the process of [how the project was organized]: 'We're going to watch the birds, make these boxes, put them up, [and] watch the birds again.' From that, there were all these other ideas that started to flood in from other interns, like how I mentioned, 'maybe we should do vegetation surveys' and that's when it all started to build. So I realized how field work [was the foundation] of FKP and how important that step is to get right, to get your bearings and really learn all the background you can about what you're studying, because it's really going to pay off in the long run."

RQ #3 Summary: Are FKP participants more capable of working in conservation, or do they believe themselves more likely to work in support of conservation in the future, as a result of their experiences with the project?

Again, it depends. It became clear in the interviews that everyone was drawn to this work because of some prior interest in birds or the environment, so it's hard to say if FKP will be the determining factor in people's future involvement in conservation. But all interviewees stated they would participate in conservation projects in the future. Some participants gained new appreciation for birds and new eyes for seeing nature. Others mentioned that participation in FKP was a helpful reminder of what they love about fieldwork. Others gained skills that made them feel more capable of working in conservation in the future.

Suggestions for Similar Projects, Personal Takeaways, and Conclusions

Organizing Community-Based Conservation Projects in Times of Crisis

A central motivator for organizing FKP was my curiosity about how to effectively organize community-based conservation projects. The onset of the COVID-19 pandemic extended this curiosity to questions of how to do this kind of work during times of crisis. From my experience organizing the Flagstaff Kestrel Project, I suggest that other projects that are attempting to involve community into conservation during difficult periods of time work to encourage meaningful engagement with project foci among participants.

Strategies for integrating community into conservation could include involving participants in every stage of the work so they develop senses of ownership of and care for the project,

putting participants into contact with one another to grow relational power and collaborate on accomplishing tasks, and maintaining a sense of group identity to motivate participants. Finding ways that participants can be engaged in both group and independent work is another important component. In organizing my project using these strategies, I formed action teams of interns and volunteers to accomplish tasks, designating individual leaders in activities like building nest boxes, scouting nest box installation sites, coordinating the organization of data and media, and managing project outreach. I encouraged sharing and team-based work among project participants, creating opportunities for shared experiences to increase participants' senses of familiarity and belonging. By encouraging independent connection with project tasks, volunteers felt deepened senses of ownership of the work, and were more engaged and motivated.

When the COVID-19 pandemic hit, I adapted by having monitors visit their sites independently, but replicating a sense of community through group zoom calls, regular group emails, and maintaining contact with project participants.

Some participants did not gain many new perspectives on ecological interconnectedness or community building through their participation, especially if they were involved in just one element of the work instead of a full suite of related activities. These participants still found meaning in contributing to a community science project, however, and were motivated by the sense that their efforts were meaningful. I recommend developing a sense of group identity to build momentum and power in similar projects.

Personal Takeaways

The single most challenging element of this work was organizing the majority of its structure and design independently as a solo project coordinator. Spearheading this work was important to me, but being the sole leader behind the organization was extremely difficult. I think working as a leadership team with collaborators would have relieved a lot of the stress and difficulty that came from leading this project as the only coordinator. While working with community partners, it became clear to me that I do my best work in collaboration with other people.

FKP was designed as an inherently collaborative endeavor, but the leadership was structured around one person. I believe single-person leadership teams are by default limited in their access to resources and information. In my experience organizing FKP, there were many gaps in my knowledge that led to missed opportunities. My main suggestion to people engaged in similar organizational roles is to find contacts and collaborators and to share the burden of leadership to sustain the passion required to motivate oneself to do this kind of work. A community is not created by one person, and cannot be sustained long-term by a figurehead.

Successful elements of this project included the creation of a group identity and the subsequent motivation participants felt. The team of undergraduate interns had a remarkable experience, and made new connections and built new skills from working so closely together, and that was a highlight of the work. Using cohesive branding and graphics in outreach materials helped other community members relate to the project and get involved, and speaking with local press assisted in raising local awareness about the project. Developing the community-based

infrastructure of connected community partnerships helped the project succeed along every step of its organization.

Due to the inherently limiting nature of organizing a project in the context of academia, I believe FKP missed certain opportunities in connecting with different populations in the Flagstaff community. Because FKP was housed by NAU, and because it was the focal project of my thesis research, the design of the project necessarily prioritized strategies that facilitated research. Rapid turnaround time was more important than thoroughness for some project elements. This likely prevented more meaningful engagement with different parts of the greater Northern Arizona community.

Involvement with FKP activities like nest box building, installation, or monitoring also required access to public transportation or a personal vehicle, morning availability, able-bodiedness, and some flexibility in schedule. These factors and others presented barriers to participation with FKP. While FKP participants ranged in age, race, experiential background, gender, and other demographics, we did not have any specific Indigenous tribal partners, likely because of the barriers to access described. Creating sustained community efforts is difficult in the context of academia, where a focus on production of research and results can dictate focal areas and distribution of resources.

Assessing Project Goals

The goals for FKP were to provide nesting habitat for American Kestrels, provide opportunities for hands-on experience in conservation to project participants, and generate awareness in the

local community about American Kestrels and associated ecological issues. The goals for participants of the project were to learn about ecological interconnectedness, learn about American Kestrels, engage with conservation concepts and efforts, and encourage their work in conservation in the future. Results from FKP interviews showed that, overall, goals were met.

While no American kestrels were recorded in FKP boxes during the course of this project, habitat was, regardless, created in the form of nest boxes.

Conclusion

In recent years, Flagstaff has seen colossal climate-related disturbance, including historic wildfires, flooding, drought, and record-breaking precipitation events. Climate change has begun to impact human and more-than-human communities, causing visible and non-ignorable devastation. Populations of wild species continually decline, habitats grow increasingly fragile under destabilizing weather patterns, and total availability of healthy habitat grows sparse. These climate change impacts and others are sure to worsen over the coming decades. The extent of the destruction can, however, be controlled by immediate action.

While many large-scale solutions will need to be implemented to mitigate the results of the climate crisis, like system-wide shifts away from fossil fuels and extractive industry, popular movements that support environmental and social transformation particularly in global economies, and massive changes in international policy, communities will also need to develop small-scale efforts to build sustained relationships and support local species and habitats. To resist the causes and withstand the impacts of climate change, communities will need to grow

capacity to build power and develop real resilience within networks of interdependence. By organizing the Flagstaff Kestrel Project, I sought to learn insights about optimizing small-scale projects to grow an interconnected base of supporters to benefit communities, the thriving of more-than-human neighbors, and the vast landscapes of place and narrative that interconnect and surround us all.

Complex linkages, some imperceptible to human observers, weave elaborate threads between all lives and all habitats. Survival of more-than-human species depends upon the ability of human communities to serve as stewards and protectors. The skills needed to engage meaningfully in species conservation overlap with the strategies necessary to build resilient communities. Building relationships, creating webs of interdependence, and fostering mutual thriving can empower communities to take on necessary challenges. By engaging in small-scale local projects, it is possible to grow community power, build relationships, and grow community resilience in order to support threatened species like American kestrels.

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Appendix

Appendix A: Step-by-Step Project Organization

To organize FKP, I did the following:

- Researched similar projects
- Conducted relational meetings with local conservation workers and project managers
- Determined the need for a kestrel monitoring project in Flagstaff
- Assessed the availability of funding and took preliminary steps to secure it
- Connected with American Kestrel Partnership to work in collaboration with them, receive their promotional materials, gather AKP-approved nest box blueprints, learn about AKP data entry, and determine other project specifics
- Met with the following partners within the first two months of organizing the project to determine project direction, solicit additional contacts and volunteers, assess funding options, and to begin building support for its work:
    - Jennifer Presler, biologist at AZ Game and Fish and local director of American Kestrel Partnership; Billy Cordasco, President of the Babbitt Ranches (a nest box site); Megan Hosterman, director of the Diablo Trust (a potential nest box site); Nancy Johnson, director of NAU's School of Earth and Sustainability; Moran Henn, director of the Willow Bend Environmental Education Center; Sarah Schulwitz, kestrel expert at Peregrine Fund; Nora Timmerman, Kim Curtis, Sean Ryan, Helen Rowe, and Rosemary Logan, faculty at NAU; Ruby Hammond, an environmental educator pursuing a PhD in bringing access to nature to disadvantaged populations of children; Glenn Dunno, SWCA Environmental Consultants; Kristin Haskins, director of the Arboretum at Flagstaff (a nest box site)

- Relational meetings continued throughout the entirety of the project, but the key relationships built early-on provided a great deal of community support and networking throughout the project.
- I began fundraising and applying for grants at the project's outset, and continued pursuing funding throughout this process.
    - I applied to local scientific grants, academic grants, and used the crowdfunding platform Experiment.com to raise funds to support project costs.
    - Certain grants required a public presentation component, so I was able to further spread the word about FKP to audiences of ornithologists and ecologists.
- After determining the approved nesting box design, I began soliciting donations of supplies from a local sawmill, a local franchise of a national hardware chain, and a locally owned hardware store
    - This involved setting up a meeting with managers or CEOs, explaining the project to them, giving them a fact sheet about FKP and about kestrels, and providing a proposal.
    - Managers were generally happy to support this local effort and eager to provide donations.
- I found volunteers (thanks Peter!) who had carpentry equipment with which we cut down lumber to size with assistance from other volunteers.
- I then organized and did outreach around nesting box building events.
    - Secured facility access several months in advance.
    - Created posters and digital graphics (see appendix)
    - Posted posters around town, sent graphics out through e-mail and social media.
    - Emailed contacts to spread the word.
- FKP held three nest box building workshops.
    - Volunteers brought their own power tools; I presented about kestrels to attendees so they would learn a bit about birds while working hands-on; we played music; we provided snacks (that I got donated by local restaurants)

    - Storage of the nesting boxes presented some challenges, so volunteers took some boxes home to store in their garages for later pickup.
- I scouted nest box locations solo and with assistance from volunteers, and solicited suggestions for sites from the greater FKP network, inviting landowners with suitable property to host box installation events.
    - Locations included land FKP had permission to install boxes on, like land trusts, city-owned property on Mars Hill and McMillian Mesa, private land, the Arboretum, and two organic farms.
    - Access to these locations was secured early on through relational meetings with relevant partners, but some locations were determined after establishing relationships through the greater FKP partner network after meeting new volunteers at box building or installation events.
- I collected contact information at every meeting and event, and organized contact information into a spreadsheet.
- Once the project design was solidified, relationships were established, supplies were secured, and boxes were built, I began soliciting volunteers for nest box installation and monitoring.
    - I sent out a call through FKP's outreach channels.
    - I also began working with staff at NAU's School of Earth and Sustainability to create an internship for undergraduate students.
- I spoke with press several times, both through my own efforts to make connections, and also through the natural growth of the project's network.
- I continued outreach throughout, including presenting about FKP to classrooms of undergraduate students and high school students, as well as at Audubon Society meetings and other venues.
- I held installation events, inviting local organizations to come help and observe.
- I finished up nest box installations with the help of the intern team.
    - Interns performed scouting and installation independently and with my support.

- Monitoring began in Spring 2020 after lockdown, so the monitoring design was changed from team-based to solo individuals.
- Monitors received a monitoring gear kit including a 12-foot telescoping pole, datasheets, writing tools, and other supplies.
- I provided training on monitoring protocol on video calls in advance of the monitoring season.
- I sent out regular emails to the monitors, organized monthly video calls, and frequently checked in with individual volunteers to troubleshoot any problems.
- At the conclusion of the first monitoring season in September 2020, I sent reminder emails for volunteers to submit their data through the AKP database website, and followed up with volunteers who had not yet submitted data.
- I collected photos and stories throughout, setting up a collaborative Google Drive so participants could upload their photos and see others' experiences.
- I shared press, highlights from the monitoring season, photos, and more

Appendix B: Funding

I include the following grant proposals and funding applications to demonstrate the language used in communicating the Flagstaff Kestrel Project to potential funders with the hope that it might be of use to leadership teams for similar projects.

I. Babbitt Ranches Landsward Foundation Proposal

The following is a proposal written for the Babbitt Ranches' Landsward Foundation. FKP was awarded $2000 from the Landsward Foundation upon their review of this proposal.

The Flagstaff Kestrel Project (FKP) seeks to mobilize diverse sectors of Flagstaff's community to create a long-lasting citizen science monitoring program for American kestrels.

GOALS

- Develop a community-based approach to large-scale conservation issues.
- Support Flagstaff's local population of American kestrels by creating nesting habitat -- through installing nest boxes -- and spreading ecological education.
- Provide opportunities for underserved youth to have experiences in the natural world.
- Interlace historically isolated sectors (private businesses, nonprofits, educational institutions, land managers, city offices) of Flagstaff's community for deepened connection, communication and strengthening of inter-institutional bonds.
- Spread information about Northern Arizona's ecology and habitats and educate the public on local conservation issues, using kestrels as a focal point.
- Deepen the Flagstaff community's connection with the natural world and ecological systems.
- Generate conversation and interest about human use of resources and land, bird conservation, and ecology.

COMMUNITY PARTNERS:
This project is widely supported and involves a range of community partners. Current partners include (please note I have excluded interested individuals from this list):

- Babbitt Ranches and the Landsward Foundation
- NAU School of Social and Behavioral Sciences: Sustainable Communities Program
- Willow Bend Environmental Education Center
- The Arboretum at Flagstaff
- Arizona Trail Association
- NAU School of Earth and Sustainability
- NAU School of Communications: Documentary Studies Program
- Jay's Bird Barn
- The Diablo Trust
- AZ Game and Fish/American Kestrel Project
- SWCA Environmental Consultants
- STEM Teachers of FUSD

Hopeful partners include the Museum of Northern AZ, Northern Arizona Audubon, and the Grand Canyon Trust. I will follow up with these organizations shortly.

MATERIALS/PRODUCTS TO BE GENERATED:

- I will create an accessible and comprehensive guide to creating and instituting broad-based community-supported conservation projects for threatened species.
- I will organize a Kestrel Festival for next Spring, likely to be held at the Arboretum. All of FKP's partners will have the opportunity to occupy a booth, present information, gain customers/volunteers/support, and/or sponsor monitoring teams.
- Drawing from my experience in visual art, I will create a series of graphic designs that will present information about grassland bird ecology through infographics and visual storytelling.

This will be hosted on a website dedicated to the project, to be launched in summer 2019. See below for examples of my designs/illustrations.

- Undergraduate Documentary Film students at NAU will create a documentary film about the project as a Senior Capstone project.
- Aside from digital and visual communication, I will present my work to the public at various workshops, presentations, and other public-facing in-person events, such as the Nest Building Workshop I will hold at Willow Bend on 6/8/2019. Additionally, I hope to secure funding to attend the Environmental Communications Conference in Vancouver, Canada this June where I hope to present the project.
- I will write about the project and publish it through local news channels or solicit journalists to do so. Media outlets I will target include the Arizona Daily Sun, Flag LIVE magazine, KNAU, Flagstaff Business News, and other sources as appropriate.

PROJECT PLANNING:

- I will organize teams of volunteer citizen scientists to build, install, and monitor nesting boxes for American kestrels. Teams will consist of a blend of undergraduates, high school students, and volunteers from the community.
- Each box will have a designated monitoring team of 1-4 people, depending on age, experience, and transportation ability.
- We will install boxes in town at the Arboretum, Willow Bend Center, Museum of Northern Arizona, McMillan Mesa, and potentially at other sites. Hopeful other nest box sites include Cromer Elementary School, Francis Short Pond, sites along the Arizona Trail, and more.
- Homeowners will have the opportunity to build and install nest boxes on their own properties. Boxes and the data they generate will be managed by the FKP coordinator.
- We will install 5-20 boxes on the Babbitt Trust lands and 2-5 boxes on the Diablo Trust ranchlands, depending on available habitat and number of volunteers.
- We will install boxes in other locations as they arise. Boxes can be installed until late January.
- Boxes will be built in summer and fall 2019 and installed during fall and winter 2019.
- Monitoring teams will begin to visit the installed boxes in April 2020 and will visit periodically through the season until a final nest box cleanup day in August 2020. Each box will require 2-5 visits throughout the season to check on: presence of eggs, presence of chicks, development, and survival of chicks, fledging of chicks, and end-of-season box departure.
- Monitoring data will be supplemented with footage from remote trail cameras.
- Monitors will follow the protocols established by the American Kestrel Project to ensure proper citizen science and data collection and management.
- The impact of the monitoring program will be expanded with public workshops, educational events, science communication materials, and educational programs that will be presented to schools.

- Undergraduate and high school students involved in the project will have the opportunity to develop and implement a local conservation curriculum to bring to schools.

COSTS:
The main costs for this project will cover materials (lumber for posts & nest boxes, GPS units, remote trail cameras), printing costs for education and promotional materials, transportation, and salary for the field coordinator for summer 2019 and summer 2020.

Here is a rough budget for summer and fall 2019:

ITEM	EXPECTED COST
Handheld GPS with SPOT capability	$300
Remote trail cameras	5x$70 = $350 minimum
Lumber for boxes	30 boxes @ $30/box = $900
Lumber for posts	15 posts @ $20/post = $300
Transportation- incl. gas & vehicle maintenance	$300
Other materials	$200
Printing informational materials, incl. booklets, infographics, and distributing video	$150
Web hosting	$150 (for 4 years of hosting)
Field coordinator stipend for summer 2019	20 hrs/week at $22/hr, for 13 weeks of summer= $5,720
TOTAL FOR 2019	$8,220

FINANCING:
A generous donor is offering $1000 to the project, to be deposited (in a tax-deductible donation) into the Sustainable Communities foundation. These funds will be used to purchase materials.
I am developing a crowd-sourced experiment.com page, to be launched the week of 4/8. If I make my target goal, I will be awarded approximately $3500. If I do not make my target goal, I will be awarded $0.
I will create merchandise- fine art prints and posters, apparel, stickers - to sell for project support.
I am applying for several community grants to cover expenses from Fall 2019-Summer 2020.

Rounding down, the cost of the project for summer 2019 is $8,200. The work that will pay for includes: building the boxes and installing them on posts where trees or structures do not exist; navigational aids; trail cameras for remote boxes; production and distribution of educational materials; field site visits and breeding bird surveys; the organization that will lead to a successful monitoring season in 2020.

Worst case scenario: I find no external funding. My experiment.com page is unsuccessful and does not get funded. I will need to find $7000 to do the project well.

Best case scenario: I secure $3500 from the experiment.com page and manage to find other donors. Lumber is donated by the local Home Depot and HomeCo. Trail cameras and GPS units are loaned or donated. I will still need to find $2850 to do the project well.

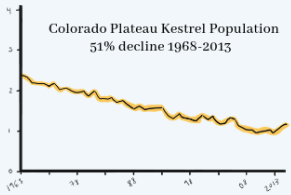
MY ASK OF THE LANDSWARD FOUNDATION:
Any amount of money would be immensely helpful. With increasing amounts comes the potential of more nest boxes, more teams of volunteers, more site visits, and development of additional educational and promotional materials. Based on the above calculations, a contribution of $2850-$5000 would ensure the project's success.

Digital Illustrations by Maya Rappaport

AMERICAN KESTREL CONSERVATION IN ARIZONA: A SUMMARY

KESTREL POPULATIONS ARE IN DECLINE

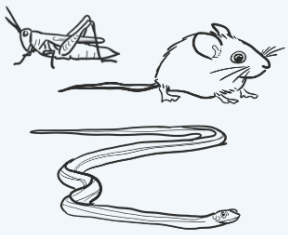
Kestrel populations have declined rapidly over the past 60 years. In Arizona, declines of about 4% a year have led to an **overall reduction in population of 51%.**



WHY IS THIS HAPPENING?

ARIZONA'S GRASSLANDS ARE BECOMING SCARCER

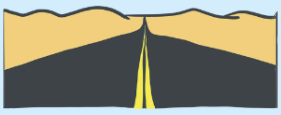
Grasslands are where kestrels hunt their food, and they are declining across the Americas. **Arizona's grasslands cover only 31% of their historic range.**



FOOD SOURCES ARE DECREASING

Nation-wide surveys show that populations of **amphibians, reptiles, small mammals, songbirds, and insects** are all **declining at a rapid pace.**

Kestrels rely on all of these animals for food.



HUMAN ACTIVITY DISTURBS KESTRELS

Kestrels have a hard time raising chicks when they experience stress from human presence and development. **Human activity can cause kestrels to abandon their nests.** Other endeavors like using **agricultural pesticides, building roads** through undisturbed areas, and **spreading disease** like the West Nile Virus can hurt kestrel populations.

NESTING HABITAT IS LIMITED... BUT WE CAN HELP!

Kestrels need holes in trees, cliffs, or human-built structures to nest. These sites are hard to find and are often occupied by competing species. Fortunately, **nest boxes are shown to increase numbers of kestrel chicks** in an area.

II. AZ Field Ornithologists Gale Monson Grant Application

The following is a grant application submitted for the Arizona Field Ornithologists' Gale Monson Grant, from which FKP was awarded $1000.

Flagstaff Kestrel Project - Creating Community-based Conservation for American Kestrels and Beyond

Maya Rappaport, Flagstaff Kestrel Project Coordinator
mjr486@nau.edu 508-471-7555

The Flagstaff Kestrel Project (FKP) is integrating community into conservation. Driven by scientific inquiry, FKP seeks to understand the best practices for engaging laypeople into conservation work while concurrently creating a long-term monitoring program for American kestrels in Northern Arizona. This research will have wide ranging implications for other communities that wish to become involved in conservation efforts. FKP is working to create and strengthen community, contribute to scientific research, furnish participants with experience in field biology, and create nesting habitat for a threatened species of falcon.

In summer 2019, FKP is building a broad base of community support by creating an interconnected web of partnerships and hosting community events. In fall 2019, our community partners at the AZ Trail Association will bring a kestrel-focused ecological curriculum to local public schools, and FKP volunteer teams will install at minimum 25 American kestrel nesting boxes in suitable habitat within an hour's drive of Flagstaff city limits. In spring and summer 2020, educational programming and community events will complement the beginning of our first American kestrel nest box monitoring season.

Through the duration of the monitoring process, we will evaluate the effectiveness of our community organizing strategies. We will interview and survey participants before, during, and after the monitoring season. And, of course, we will contribute our kestrel monitoring data to a national database hosted by the American Kestrel Partnership, helping AKP to understand kestrel population trends in the under-studied Southwest.

Study of FKP's organizing strategies will contribute to our collective understanding of how to integrate community into conservation. In an era of changing climate and dwindling biodiversity, it is critical to know how to encourage people to value nature and work to protect it. Using FKP to determine best practices for involving community participants will be invaluable for other communities that wish to engage in conservation.

We will evaluate the different ways participants became involved in FKP to establish trends. We will consider FKP successful if it involves people from diverse backgrounds and of different ages, if there are monitoring teams of at least 2-4 people for each site, and if participants value nature more and/or are more likely to work in conservation after involvement. FKP has a first-season goal of installing at least 25 nesting boxes, with 2-5 monitors per box, for a total goal of 50-125 volunteers, with hopes of reaching 200 more people through community events.

The Flagstaff Kestrel Project will enhance our understanding of kestrel populations in Northern Arizona. Boxes set up in town and on ranchlands will provide essential information about American kestrel breeding behavior and occupancy that will contribute meaningfully to the dataset managed by the American Kestrel Partnership. The data generated by these boxes will complement data generated by the new nest boxes installed by Jon Orona on the Kaibab NF, and provide the American Kestrel Partnership with excellent first and second year data on kestrels in Northern AZ. Additionally, FKP will contribute essential information about best practices for involving community participants into conservation efforts, helping to fill a worrisome gap in our knowledge. FKP's monitoring efforts will generate information about other cavity-nesting species in Northern AZ, including bluebirds, woodpeckers, chickadees, and starlings. Finally, FKP's community-based model, which focuses on ecological education, will inspire local community members to become more involved in avian conservation, in addition to educating the public on this and other threatened species.

FKP is requesting $1000 from the Gale Monson Research Grant. This $1000 will buy the remaining lumber needed for constructing nest boxes and posts. If there is a remainder, the funds will be used to purchase as many $40 "action cameras" as possible (see: https://www.amazon.com/ACTMAN-Underwater-Waterproof-Rechargeable-Accessories/dp/B07FLWQCPD). These GoPro-style cameras will be mounted to 10ft telescoping poles and will be used for nest box checks. This eliminates some of the human disturbance nesting kestrels otherwise experience.

FKP is supported widely by a growing network of community partnerships, including: Babbitt Ranches/the Landsward Foundation, Willow Bend Environmental Education Center, SWCA Environmental Consultants, the Diablo Trust, NAU Sustainable Communities Program, the Arizona Trail Association, Northern Arizona Audubon Society, Flagstaff Unified School District, AZ Game and Fish, the Arboretum at Flagstaff, NAU School of Earth and Sustainability, NAU Documentary Studies Program, Jay's Bird Barn, Mountain Sports Flagstaff, and AP Sawmill LLC.

FKP is actively pursuing funding in the form of private donations and competitive grants. In our first months, we have raised $3000 from generous community supporters and from Babbitt Ranches' Landsward Foundation, and as of July 11, 2019, we have successfully raised another $4000 on the rigorously-approved scientific crowdfunding platform Experiment.com (experiment.com/kestrels). FKP is applying to additional grants that range from $15,000-$50,000. Our hope and intention is to be able to support kestrel nest box monitoring and conservation-focused community building for years to come. The Gale Monson Research Grant would be a great help at this time in the process, as the majority of other grants have a much later application period. The Monson Grant would provide FKP with the support it needs to succeed in Fall 2019.

About the project coordinator: Maya Rappaport is a graduate student in Sustainable Communities and Science Communication at NAU. They have worked as a field ornithologist in New Hampshire, Maine, Massachusetts, Utah, Colorado, and Montana, and their undergraduate education is

in wildlife biology, ecology, and conservation. In addition to their professional life as an ecologist, Maya is a classical musician, visual artist, and environmental communicator.

III. McKenzie Endowment for Democracy Funding Application

The following is a proposal written for the McKenzie Endowment for Democracy, a foundation at NAU. FKP was awarded $4200 from the Endowment.

Maya Rappaport
Updated 4/29/2019

Proposal for McKenzie Endowment Funding- Flagstaff Kestrel Project

I am a first year student in Sustainable Communities. The Flagstaff Kestrel Project (FKP) is my master's project for my MA in Sustainable Communities, and will provide the infrastructure into which my capstone project for the Graduate Certificate in Science Communication will fit. My work with FKP seeks to answer the question: why is it so difficult for communities to come together to engage in stewardship of the land and conservation of species? How can this process be facilitated?

I am requesting McKenzie Endowment funding to facilitate organization and implementation of FKP programming in 2019. Funding will allow me to purchase materials and develop the concepts guiding this project more deeply. Additionally, funding would allow me to further develop FKP in relation to the ideas generated at the Environmental Communication Conference in Vancouver, BC this June.

FKP seeks to mobilize diverse sectors of Flagstaff's community to create a long-lasting citizen science monitoring program for American kestrels. Using kestrels as a focal point, broad audiences will be introduced to the interlinking factors that contribute to both grassland ecology and community-based conservation. FKP naturally aligns with the goals of the McKenzie Endowment in many ways:

- Builds democratic skills for participants, including developing political literacy about conservation issues and finding strategies for addressing them, democratic decision making, etc.
- Interconnects community and conservation
- Works towards a more egalitarian, socially & environmentally just local community that is engaged in scholarship about and preservation of the natural world

FKP will organize teams to build, install, and monitor nesting boxes for American kestrels. Throughout fall 2019, teams will build and install boxes, accompanied by a complimentary environmental education curriculum that will be taught in schools by the AZ Trail Association. In spring and summer 2020, curricular education will continue, augmented by public events like workshops, live bird showings, and a Kestrel Festival in 05/2020. Monitoring teams, made up of a mix of high school students, undergraduates, and community members, will monitor boxes from April 2020 to August 2020.

1. Flagstaff Kestrel Project Goals:

- Create a long-lasting monitoring and environmental education program for American kestrels.
- Develop a community-based approach to large-scale conservation issues.
- Support Flagstaff's local population of American kestrels by spreading ecological education and creating nesting habitat (through installing nest boxes).
- Provide opportunities for underserved youth to have experiences in the natural world.
- Interlace historically isolated sectors (private businesses, nonprofits, educational institutions, land managers, city offices) of Flagstaff's community.
- Spread information about Northern Arizona's ecology and habitats and educate the public on local conservation issues. Deepen the Flagstaff community's connection with the natural world and understanding of ecological systems.

2. Impact on myself/the NAU community:

Through organizing FKP, I will further develop skills in environmental education, leadership, community organizing, coordination, fundraising, science communication, and visual arts.

Because FKP is a community project, many different groups of people will be involved. NAU undergraduates will have opportunities to become involved in ecological monitoring, leadership, peer mentoring, environmental education, and science communication. Undergraduates in the documentary film program will have the opportunity to create their senior capstone film projects based on this work. Students in SES will gain valuable experiences in field biology through involvement with FKP. I am happy to incorporate particular students' skillsets and goals into this work on a case-by-case basis.

FKP will increase NAU's connections with the local community. I have created a broad network of community partnerships, including, in addition to other partners and interested individuals: Willow Bend, AZ Trail Association, Babbitt Trust, Diablo Trust, the Arboretum, Jay's Bird Barn, SWCA, and AZ Fish and Game. This interconnected network will facilitate student involvement with conservation work in the future. Also, FKP will grow fertile grounds for future study available to future graduate students by generating data on kestrels, citizen science, and environmental education.

3. Rough Budget for Spring and Summer 2019:

Handheld GPS with SPOT capability	$300
Remote trail cameras	5x$70 = $350 minimum
Lumber for boxes	30 boxes @ $30/box = $900
Lumber for posts	15 posts @ $20/post = $300
Transportation	$300
Other materials	$200
Producing informational materials	$150
Web hosting	$150 (for 4 years of hosting)
Field coordinator stipend for summer 2019	20 hrs/week at $22/hr, for 13 weeks of summer= $5,720
Vancouver, B.C. Environmental Communication Conference	Airfare ($350) + housing ($250) + registration ($225) = $825
TOTAL FOR 2019	$9,045

4. Other sources of funding:

A generous donor is offering $1000 to the project, to be deposited into the Sustainable Communities foundation. I received GSG funding for the Environmental Communication Conference in Vancouver, BC for $300. I am developing a crowd-sourced experiment.com page, to be launched the week of 5/6. If I make my target goal, I will be awarded approximately $3500. If I do not make my target goal, I will be awarded $0. I am also pursuing several grants, including the CC&E grant in Fall 2019. I will

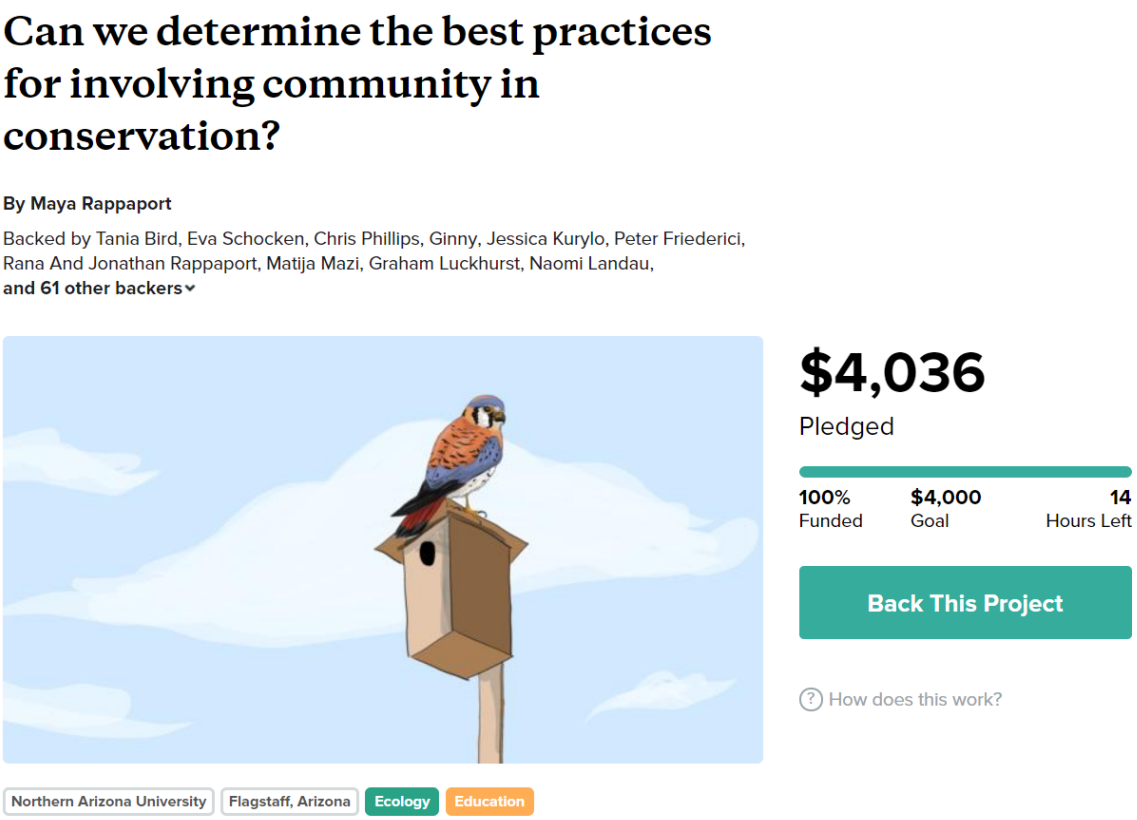
create merchandise- fine art prints and posters, apparel, stickers, etc. - to sell for project support. Additionally, I have approached the Babbitt Ranches/Landsward Foundation for funding - amount TBD.

McKenzie Endowment Fund Ask: Any amount would be incredibly helpful, and would allow me to do this work well. An amount of $825+ would cover remaining expenses for the Vancouver conference. An amount of $1000-$5000 would cover the conference in addition to materials and transportation, and would pay for some/all of my coordinator stipend for summer 2019. Please note that this budget only covers costs through 8/31/2019- any extra funds would be applied later in 2019 and 2020, when I will have to undergo the fundraising process for FKP a second time.

IV. Other Sources of Funding

In addition to the funds awarded to FKP by the Landsward Foundation, AZ Field Ornithologists, and the McKenzie Endowment for Democracy, FKP was funded upwards of $2500 by private anonymous donors who heard about the project through the greater FKP network.

FKP also won $4000 in donations through a crowdfunding campaign on Experiment.com, where over 80 donors contributed.



Screenshot of the fully-funded Experiment.com crowdfunding campaign

Appendix C: Graphic Design and Outreach

I. Kestrel Fact Sheet

I created the following documents to share relevant information with project partners and participants.

ABOUT AMERICAN KESTRELS

*Please note: there are several species of kestrel, but only the American kestrel occurs in the wild in North America. Any time the word "kestrel" is used alone, please assume it refers to the American kestrel.

American kestrel in flight. All illustrations by Maya Rappaport.

American kestrels are North America's smallest raptor, or bird of prey. They are considered to be part of the falcon family. Some other members of the falcon family are the merlin, Peregrine falcon, the prairie falcon, and the gyrfalcon. Falcons have sharp, long wings that help them navigate while flying and allow them to make very fast dives. In fact, the fastest bird on Earth is the Peregrine falcon. They can dive at speeds at around 200 mph! That's about 3 times as fast as a car driving at highway speed.

Recent DNA testing indicates that American kestrels are genetically different than the other members of the falcon family and diverged from a different lineage. Their closest relative, genetically speaking, is the Aplomado falcon, a rainforest dweller of Central and South America. This means that the American kestrel and Aplomado falcon had the same ancestor, which evolved later or differently than the other ancestors of the members of the falcon family.

There are 17 recognized, genetically distinct subspecies of American kestrel. A subspecies is a genetically distinct portion of a species that can look and behave differently from the rest of the species. Genetically distinct mean that the genes of a subspecies - the things that determine things about you and help your body function are genes - are different than the genes of the rest of the population. For example, subspecies of dark-eyed juncos in Massachusetts look different

and have a slightly different song from dark-eyed juncos in Flagstaff, AZ. Some subspecies of American kestrel look slightly different from populations here in AZ, and some behave a little differently too.

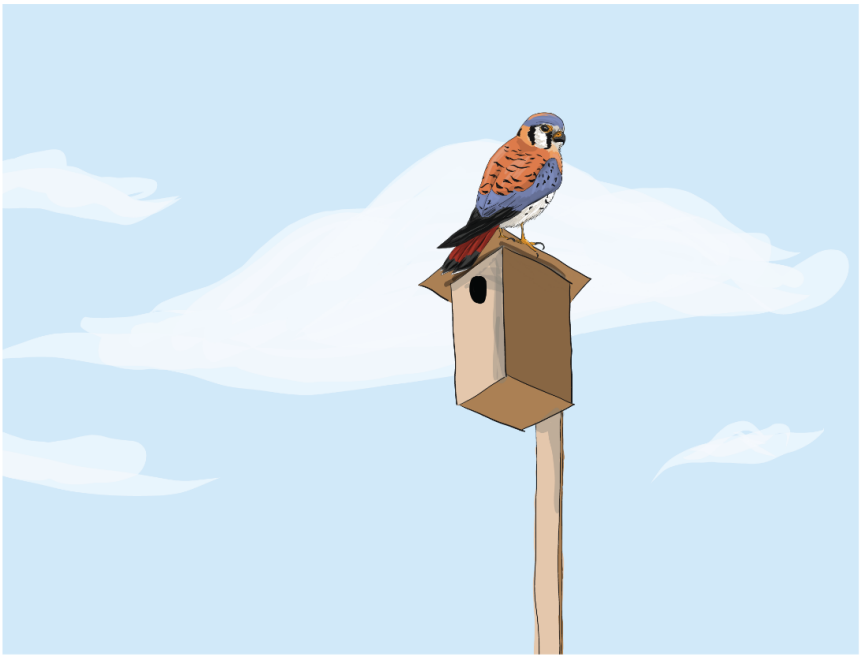
American kestrels are found in grassland habitats all the way from northern Canada to the very tip of South America.

Kestrels need grasslands to hunt. Like other falcons, they rely on their excellent eyesight and other senses to locate prey. Kestrels eat small animals like insects, rodents, lizards, snakes, and other birds. Depending on the habitat, kestrels can eat more of one thing than another. For example, kestrels that live in habitat with a lot of water might eat amphibians like frogs and toads, while kestrels that live in tall grasslands might eat more things like grasshoppers and mice. They need open grasslands to hunt in. Kestrels fly over grasslands, or perch over them on trees or electrical wires, and then quickly dive to capture prey. Something that makes kestrels unique is their ability to hover in place while flying. Only a few other bird species (like hummingbirds) can hover. This helps kestrels to find and catch prey.

Kestrels are secondary cavity nesters. This means that they raise their babies in holes that have been created by other animals like woodpeckers. Kestrels aren't able to dig out a nesting cavity themselves, and require existing holes in trees, cliffs, and human structures. We can help support kestrel populations by building nesting boxes for them to provide more cavities, which are a limited resource in many habitats. Recent fire management plans in many areas prioritize removing snags, which is a word for standing dead trees. Snags, because they are often soft and easy to excavate, and sometimes hollow, make excellent nesting cavities for many species, including birds, insects, spiders, and mammals like raccoons. In areas where many snags have been removed for hiker safety or to help prevent forest fires, installing nesting boxes may help kestrels by creating more places where they can raise their babies.

American kestrels lay clutches of 2-6 eggs, often laying 4-5 eggs. In rare cases, they can "double clutch", meaning they can incubate, hatch, and raise two groups of babies in a single season. If their nest fails (because of a predator attack, weather event, or other factors), they will often nest a second time. Kestrel eggs take about 30 days to hatch, and kestrel chicks take about 30 days to leave the nest, or "fledge." After fledging, kestrel chicks rely on their parents for food for about 2-3 weeks. In mid to late summer, it is common to see a group of several kestrel fledgelings together, as they will often stay close to their siblings until they get a good handle on skills like hunting and flying.

AMERICAN KESTREL IDENTIFICATION:



Male American kestrel on a nest box.

American kestrels are small falcons. They are sexually dimorphic, meaning that female kestrels look different from male kestrels. The differences between females and males are visible in American kestrels as young as 3 weeks old.

American kestrels are small birds, appearing to be about the same size as American robins, mourning doves, or blue, Steller's, or pinyon jays. They have a wingspan of approximately 22 inches, and are approximately 8-11 inches in length. Like most raptors, females are larger and heavier than males, though this difference can be hard to see.

Kestrels can appear larger or smaller depending on if their feathers are fluffed up. Birds fluff up their feathers for many reasons, including when they are cold, sick, or feeling threatened. Some birds fluff up their feathers to communicate other kinds of information with one another.

Both sexes of American kestrel have reddish, barred backs with dark, vertical facial markings. Some people call these markings a "double moustache." Male kestrels have slate blue wings. Female kestrels have reddish, barred wings. Both female and male kestrels have slate bluish coloring around the crowns of their heads, but male kestrels have a notable bright

reddish-orange cap. The female's orange cap is somewhat duller in color, smaller, and harder to notice.

Female American kestrel on a cattail.

American kestrels often flick their tails while perched. This can help you identify them if you happen to see them in the field! I always look for kestrels when I'm around open grasslands. I look over the grassland for hovering kestrels, and check any perches - wires, branches, trees, posts, signs, etc. - for perched kestrels.

KESTRELS AND OUR COMMUNITY:

American kestrels are an important component of the ecological tapestry that interconnects all life: insects, fungi, plants, mammals, birds, bacteria, humans, and more. No one component has a "purpose" in the human sense of the word, but all components of the natural world are important and serve functions for other parts of a habitat system.

Here in Northern Arizona, grasslands are an important part of our habitat, interlinking Ponderosa pine forests, wetlands, canyonlands, stream-side (or riparian) habitats, and human settlements. Grasslands, with the many hiding places and food sources they provide, nourish many kinds of life, including wildflowers and native grasses, insects, rodents, snakes, lizards, amphibians, grassland bird species, wild ungulates like deer and elk, and more. From the human perspective, grasslands provide a place to graze cows and sheep. They are also excellent places to watch wildlife and enjoy the natural world. Grasslands, with their large diversity and volume of life, produce fertile topsoil. Their variety of plants help prevent erosion, and they filter and clean water.

Kestrels, as grassland obligates (meaning, they must have grassland habitat to thrive), serve many functions in their habitat system. They are food for other birds of prey including Cooper's hawks. And because they are voracious predators, kestrels control populations of insects, rodents, birds, etc. Farmers that struggle with agricultural "pests" benefit from kestrels on their lands. Recent research shows that kestrel nestboxes may deter bird species from taking up residence in orchards. And they may help farmers use less pesticides as well.

Compiled by Maya Rappaport, Flagstaff Kestrel Project Coordinator. August 2019.

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II. FKP Fact Sheet

Flagstaff Kestrel Project - Connecting People, Habitats, and Kestrels

Research shows that the importance of healthy habitats cannot be understated. We all, humans and wildlife, need intact, functioning natural systems to live healthy and fulfilled lives.

The Flagstaff Kestrel Project is interconnecting community with conservation, empowering people to become involved with caring for their local habitats and species.

With the Flagstaff Kestrel Project (FKP), people of all ages and backgrounds will have opportunities to become involved with citizen science, environmental education, science communication, and environmental art.

We will build, install, and monitor nesting boxes for American kestrels, North America's smallest bird of prey. These colorful, beautiful, charismatic little falcons have suffered population declines of over 50% in the last 60 years across their range. But we can help! By learning about kestrel conservation and educating others, we can support this critical species. And we can help out by building safe, sturdy boxes in which they can raise their babies.

FKP will be conducting research on best practices for involving community participants in conservation work through the duration of the monitoring process. This research will contribute to our understanding of how to most effectively reach people and involve them in conservation.

Get involved:

Help FKP help kestrels & community!

Please consider joining FKP in partnership! 2019 is our first year, and we need support from the community to create a successful first monitoring season. Tax-deductible donations to FKP help us buy materials, build and install nest boxes, host community events, provide outdoor opportunities to under-represented sectors of our community, and spread ecological education.

If you are interested in donating money or supplies (FKP events always need food and beverage donations), or in donating your business space to host an event, please contact the Flagstaff Kestrel Project Coordinator, Maya Rappaport at **mjr486@nau.edu** or **508-471-7555.**

Additionally, if you or anyone you know might be interested in working as a kestrel box monitor, building or installing boxes, or working in environmental education and/or communications, please get in touch. We will find a way to integrate interests and passions to the best benefit of all involved.

Ink wash illustration of male American kestrel by Maya Rappaport

III. FKP Logo

Digital illustrations by Maya Rappaport - stickers and prints coming soon!

IV. FKP Conference Poster

The poster below was made for the AZ Field Ornithologists conference in 2019.

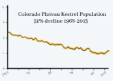
FLAGSTAFF KESTREL PROJECT - INTEGRATING COMMUNITY INTO CONSERVATION

Maya Rappaport, FKP Coordinator

AMERICAN KESTREL CONSERVATION IN ARIZONA: A SUMMARY

KESTREL POPULATIONS ARE IN DECLINE

Kestrel populations have declined rapidly over the past 60 years. In Arizona, declines of about 4% a year have led to an **overall reduction in population of 51%.**



WHY IS THIS HAPPENING?

ARIZONA'S GRASSLANDS ARE BECOMING SCARCER

Grasslands are where kestrels hunt their food, and they are declining across the Americas. **Arizona's grasslands cover only 31% of their historic range.**

FOOD SOURCES ARE DECREASING

Nation-wide surveys show that populations of **amphibians, reptiles, small mammals, songbirds, and insects** are all **declining at a rapid pace.**

Kestrels rely on all of these animals for food.

HUMAN ACTIVITY DISTURBS KESTRELS

Kestrels have a hard time raising chicks when they experience stress from human presence and development. **Human activity can cause kestrels to abandon their nests.** Other endeavors like using **agricultural pesticides, building roads** through undisturbed areas, and **spreading disease** like the West Nile Virus can hurt kestrel populations.

NESTING HABITAT IS LIMITED... BUT WE CAN HELP!

Kestrels need holes in trees, cliffs, or human-built structures to nest. These sites are hard to find and are often occupied by competing species. Fortunately, **nest boxes are shown to increase numbers of kestrel chicks** in an area.

FLAGSTAFF KESTREL PROJECT

The Flagstaff Kestrel Project (FKP) seeks to answer the question: **can we determine best practices for integrating community into conservation?**

Large-scale issues like climate change and species decline cannot be tackled by isolated groups. **Community** is crucial for such efforts.

FKP will research this **critical and under-studied topic** while **creating a long-term citizen science nest box monitoring program for American kestrels.**

All digital artwork by Maya Rappaport

FKP will

- interconnect community,
- create a sustained, broad base of community support for conservation,
- research the best practices of community integration into conservation, and
- provide opportunities for laypeople to gain experience in field biology, ecology, and conservation.

Want to get involved? communityconserves.org

FKP needs volunteers to build & install nest boxes in 2019. Volunteers needed for nest box monitoring beginning Spring 2020.

Goals and Long-term Impacts:

- Bolster populations of American kestrels by **creating nesting habitat**
- **Educate community** about ecological issues, using **kestrels as a charasmatic entry point**
- Creation of **conservation-focused community** in Flagstaff
- Citizen scientists will gain hands-on experience with field biology
- Interconnected network of partners will be able to **support projects & researchers** in the future
- Survey and interview participants & **analyze data to determine best practices**
- Findings on best practices of involving communities in conservation will **hold meaning for other communities and researchers**

FKP is supported by Babbitt Ranches/the Landsward Foundation, Willow Bend Environmental Education Center, SWCA Environmental Consultants, the Diablo Trust, Hart Prairie Preserve (TNC), NAU Sustainable Communities Program, AZFO, Experiment.com, the Arizona Trail Association, Northern Arizona Audubon Society, Teachers from Flagstaff Unified School District, AZ Game and Fish, the Arboretum at Flagstaff, NAU School of Earth and Sustainability, NAU Documentary Studies Program, Jay's Bird Barn, Mountain Sports Flagstaff, and AP Sawmill LLC. Project funding comes from the Landsward Foundation, AZFO, and 88 donors who contrinuted at Experiment.com/kestrels.

Appendix D: Nest Box Building

I. Nest Box Construction Plans

American Kestrel Nest Box Plan

Art Gingert
PO Box 185
West Cornwall CT 06796
Updated Spring 2015

These plans for the construction of an American Kestrel (*Falco sparverius*) nest box are based on experience gained during more than thirty years of field work in northwest and north-central Connecticut (National Audubon Society and individually) with a now successful, well-established population of kestrels. It is hoped that the information will be used by raptor enthusiasts elsewhere who are interested in the welfare of this open country falcon, whose numbers continue to decline in several regions of North America.

Notes on Design

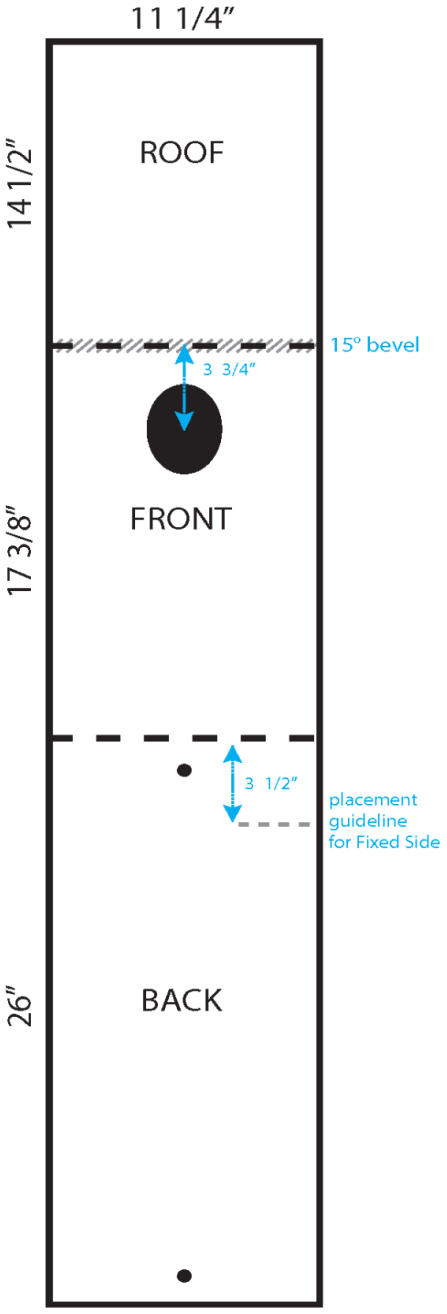
- The **side-opening design** of the nest box -- with fixed Side Stop -- serves a number of practical purposes. The box is much safer to monitor than if it were top-opening; wood shavings, eggs and nestlings are secure; and adult birds and nestlings are easier to capture for banding and research work.

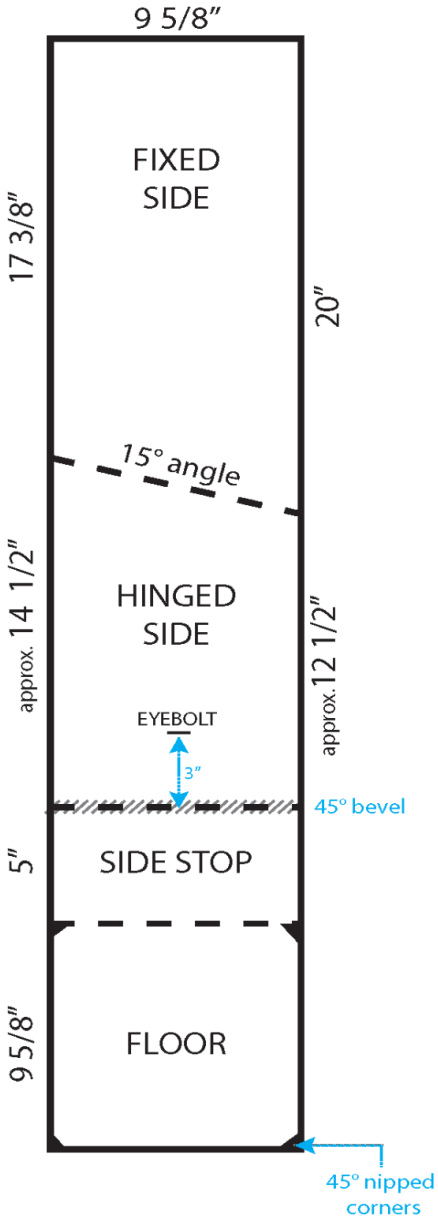
- The **floor size** for this nest box design provides almost 93 square inches, which is close to 50% larger than the 8"x 8" floors recommended in the majority of American Kestrel nest box designs available in the literature or online. Having observed breeding kestrels using wood duck boxes in drained beaver swamps years ago, I realized that more living space was significantly advantageous for broods of five or six nestlings which spend up to a month in the nest boxes.

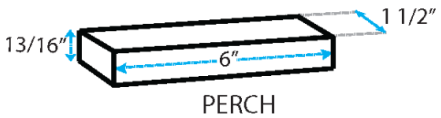
- Though a 3" diameter entrance hole is standard on many plans, a **3"x 4" vertical oval hole** provides more room for older nestlings looking outwards from the inside Perch, and may also offer a place for adult male pair-bonding display early in the breeding season.

Further notes regarding *Nest Box Sites and Installation* (choosing good American Kestrel breeding habitat, selecting ideal box locations, and options for safely erecting and monitoring a kestrel box) will be available. Good luck with your own efforts in assisting these beautiful raptors, and I welcome inquiries regarding wildlife management work with American Kestrels.

American Kestrel Nest Box Plan







Art Gingert
PO Box 185
West Cornwall CT 06796

2

Notes on Materials

- A great choice for lumber is Type EWP, 1x12 "rough one side" white pine, which is not only easy to work with, lightweight and quite aesthetic, but also inexpensive. It is most often found in a thickness of 13/16". Approximately 10' of 1x12 EWP lumber is needed per box, allowing for minimal waste and avoidance of knots, cracks, etc. Average 2015 prices are $1.50 per lineal foot. Cedar is also a good choice, but pricier, and oak, though durable, is heavier than needed. Avoid using 1" rough-cut sawmill pine, which is much harder to work with and creates a heavy, unwieldy nest box which can be unsafe to deal with during installation on post, tree, or building.

- For fasteners, Torx-head GRK screws (2" x #8 **Trimhead type) are superb. They are strong, easy to use with a cordless drill, look good, and most importantly, they will not split the lumber near the ends of pieces (which may happen with standard GRKs, decking screws or nails). Approximately 35 screws per box.

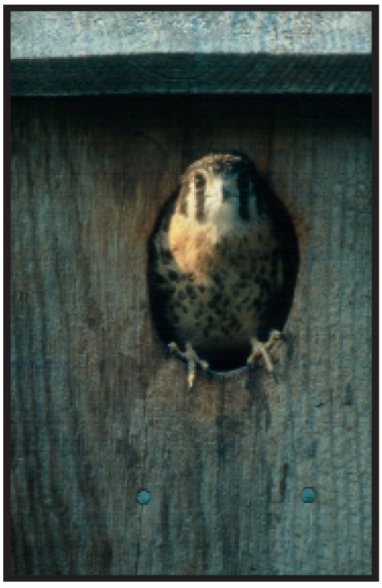
- The use of a light bead of high quality PL Premium construction adhesive on all joined edges guarantees a strong, weatherproof nest box with tight joints.

- Do not paint or otherwise treat with a wood preservative. The EWP pine will weather to a warm gray color naturally and last in all weathers and seasons for several decades, if well constructed.

- Approximate cost for lumber & hardware materials is $ 20.00 per nest box, at 2015 prices.

Assembly Sequence:

1. Attach Back to Fixed Side, then secure Floor to Back and Fixed Side.
2. Attach Front (with oval entrance hole and inside Perch) to Fixed Side and Floor.
3. Attach Roof to Fixed Side, Front and Back.
4. Cut 45° bevel across Hinged Side, check fit, and secure Side Stop to Back, Front and Floor.
5. Finally, attach Hinged Side using hinge nails.



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Construction Notes

- Quality carpentry in construction is important for many reasons -- for durability, appearance, weather "tightness" and ultimately the safety of the bird species which may use the box.

- A miter or radial arm saw is quite useful for cutting out nest box pieces, especially for the bevel and angle cuts, and for incidental trimming. Use a table saw to trim some of the 1x12 EWP boards to 9 5/8" as needed (see Nest Box Plan).

- If a number of boxes are needed, it is helpful to make a "jig" with support rails to assist in securing the Back of the box to the Fixed Side, which is the first step in construction. Drawing a short guideline 3 ½" down from the top of the Back is helpful for positioning these two pieces, which ensures adequate space (2 ½") at the top and bottom of the Back for the lag screws used when mounting the box. The Fixed Side can be installed on either the right or left side of the nest box, depending on the terrain at a prospective site or personal preference when monitoring.

- The Floor piece is inset upwards 1/8" in order to keep rainwater from seeping into the joints. Be sure to test the fit of this piece against the two sides, for both width and depth, since it may need to be trimmed slightly. Nip off small 3/8" sided triangles from each corner before securing the Floor. This ensures that however the box is mounted, any rainwater entering the box will find its way out at the lowest corner and drainage hole.

- A pattern can be made for the 3" x 4" oval entrance hole from wood, cardboard or plastic. A jigsaw can be used to cut out the oval, and 80 grit sandpaper wrapped around a 1" diameter dowel works well as a tool for smoothing the raw edges.

- A small Perch piece is very useful, secured horizontally inside the box, centered 2" below the base of the entrance hole. A bead of construction adhesive on the Perch helps it stay in place while the Front is turned over, braced, and the Perch screwed in place from the outside (using 2 screws, approximately 8" down from the roof, and 4" in from each side of box).

- When securing the Front, carefully align it with the Fixed Side. Trim bottom edge of Front if necessary.

- Cut the 45° bevel across the Hinged Side, with the cut edge of the upper part overlapping the lower part (shingle-like). Check for good fit with both pieces, leaving a 3/8" space below the top edge of the Front to allow for "hinging" & ventilation. If the Hinged Side is tight and needs trimming along one of its vertical edges, use a pencil with one's hand inside the entrance hole to mark it. One can also trim the lower edge of the Side Stop if needed. Secure the Side Stop piece to the Front, Back and Floor. ** It is helpful to drill small-diameter pilot holes before installing two or three screws to attach the Side Stop to the Floor. This usually prevents any splitting of the Side Stop as drying occurs over time. (Alternately, the Side Stop can be made from an additional piece of wood, orienting the grain so it is perpendicular to that of the Hinged Side.)

- The "hinge nails" for the Hinged Side are placed exactly in line with each other – use a combination square to mark the locations. Start with a mark for the nail on the Front, 2" down from the top. Use a thin wood shim to hold the Hinged Side exactly in place, and a thin drill bit to make pilot holes for two 8 penny galvanized common nails before hammering them home in turn.

- Select a clear piece of wood when cutting out the Roof -- or one with few imperfections -- which will help with durability. The Roof is best secured by working from the back of the box. Apply a thick bead of construction adhesive to the beveled edge of the Roof and use some force to squeeze the Roof tightly against the Back, creating a totally weatherproof seal which is quite durable in the field. A high quality caulk (like clear Lexel) could also be used with this step. Start by securing the Roof to the Fixed Side, and then to the Front. Make sure to put several screws through the Back and into the rear edge of the Roof to ensure a tight, waterproof joint.

- A 5/16" x 2 ½" zinc-plated (or stainless steel) eye bolt (Stanley Tool Co. #N221-150) provides a strong purchase for opening the Hinged Side, which may be tight in humid weather. Secure the eye bolt with a flat washer and lock nut on the inside of the Hinged Side, 3" up from the bevel cut. A 1 ¼" wooden cabinet knob is a nice-looking alternative, though it can dry out and split over time.

- To fasten the Hinged Side securely, one can use two 1 ¼" galvanized Screen & Storm series Half-Turn Buttons (Stanley Tool Co. #38-0010) at the top of the Side Stop, each placed 2" in from the edges of the box.

- Mark locations for two, 5/16" box mounting holes at the top and bottom of the Back piece – centered, and 1 ½" in from the edges – and drill them. It is suggested that two 5/16" x 3 ½" galvanized lag screws and washers be used for mounting (use shorter lags for utility poles or barn sides).

- A single 8 penny galvanized common nail (use thin pilot hole) can be driven into the lower edge of the Back piece, near the base of the Fixed Side. Leaving only ½" of the nailhead showing provides a very useful place to hang a small bucket (or stuff sack filled with wood shavings) when visiting the nest box for monitoring purposes.

- As the last step in assembly, either PL Premium construction adhesive or clear Lexel caulk can be used to seal any exposed end grain. This is very effective in limiting weathering in these susceptible areas, and will measurably extend the life of the nest box. Thin latex or vinyl gloves can be worn while using a 1" wide putty knife (or fingers) to apply and spread a protective coating on the following:

  - Top and bottom edges of Back and front edge of Roof
  - Bottom edges of Front and Fixed Side
  - Top and bottom edges of the Hinged Side and Side Stop

  It is also a good practice to seal the exposed edges of the entrance hole, where splitting can occur. Making a quick swipe with the sealant over any knots or small cracks is also recommended.

- Using EWP pine lumber and GRK Trimhead screws, the completed nest box will weigh 12 to 13 pounds.

- The name or identifying logo of a sponsoring organization can be applied to the Fixed Side of the box if desired.

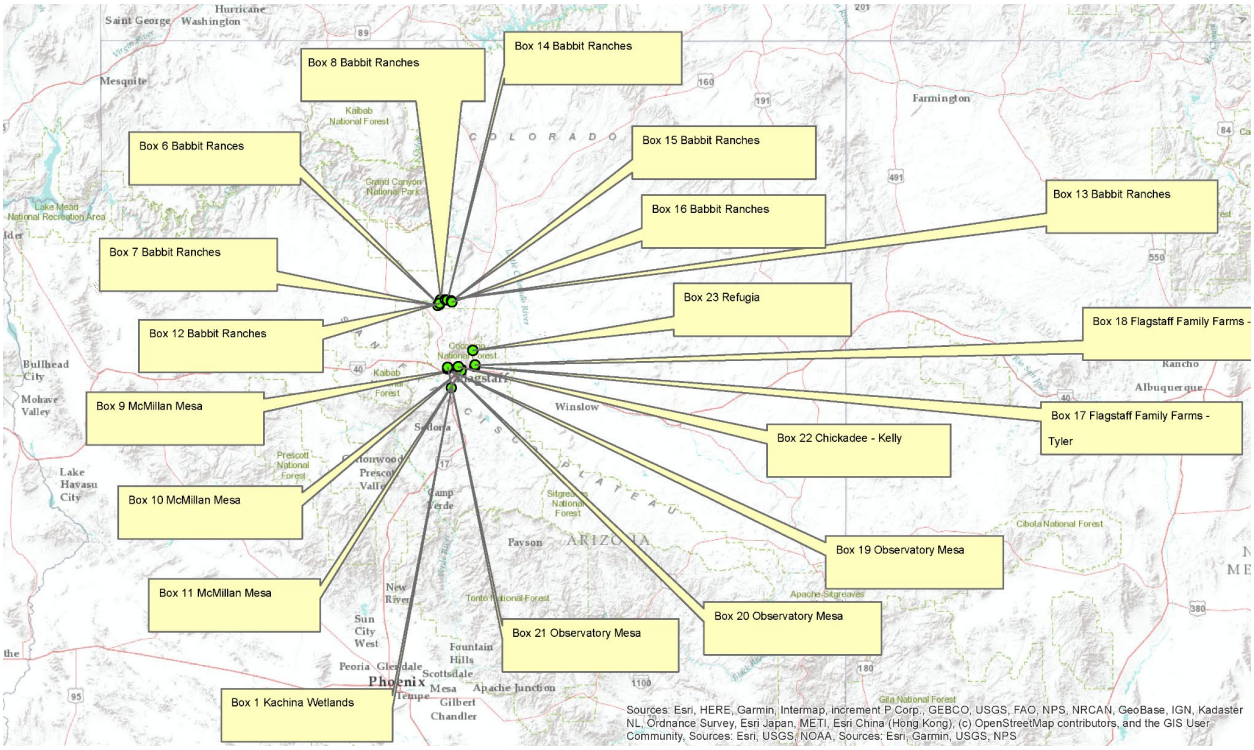
Appendix E: Nest Box Installation

I. Nest Box Installation Outreach

The following is a flier used to promote volunteer opportunities for installing nesting boxes with FKP.

II. Nest Box Installation Map

The following is a GIS map made by the FKP intern team showing locations of the nest boxes. The coordinates of the boxes have been removed from this image to protect the nesting habitat.



Appendix F: Nest Box Monitoring

I. American Kestrel Partnership Monitoring Protocol

The following is the monitoring protocol and data sheets used by FKP participants in 2020 and 2021.

american kestrel partnership

a project of The Peregrine Fund

Unifying citizen and professional scientists to advance conservation of the American Kestrel

Monitoring Instructions

Updated 2017

1. Install nest boxes

Look for open, grassy areas. Avoid heavy roads, places with pets, or similar disturbances. Avoid heavily forested areas. ***Please only install nest boxes if you intend to monitor them.***

- Place nest box at least 8-10ft off the ground. Remember: safety first! If a nest box can't be safely accessed, it is not useful for monitoring. In the Northern Hemisphere, northern-facing nest boxes should be avoided when possible.
- Install nest boxes between August and January to increase the chances of use by kestrels in the spring.
- Assign nest box a unique ID, record nest box characteristics according to this data sheet (on back), and register the nest box on our website.

2. Monitor throughout spring and into summer

Nesting begins at different times in different regions. In general, if you begin checking around early March (Northern Hemisphere) you should catch the entire nesting season. Disturbance is unlikely to cause nest abandonment once eggs are laid. (See Smallwood 2009) ***It is illegal to touch or possess any part of an American Kestrel (including feathers and eggs) without proper permits.***

- **At minimum,** please monitor once there are eggs, and then check again within 30 days for nestlings.
- **Our preferred protocol is for partners to check nests once every other week beginning in early March.** Do not monitor more than once a week to avoid stressing the kestrels.
- If possible, take a digital photo of the nest box interior during each visit. Photos will provide you with back-up and verification in case data are lost or mixed up.

3. Enter your nest record and observation data into the AKP website

Please enter your data the same day you collect it whenever possible! Hard work collecting data in the field is often wasted by postponing entry of the data and then losing it.

- Login to your profile on **kestrel.peregrinefund.org**.
- Under the 'Research' tab, click **Nests** or **Observations** to enter nest record and observation data.

4. Maintain nest boxes

- In the fall or winter, repair nest boxes, scrape the insides clean with a putty knife, sweep out with a hand broom, and replace bedding.

For assistance with anything, see our FAQ, post questions to our discussion forum, or email us directly at: kestrelpartnership@peregrinefund.org

***** Zero is a valuable number *****

Monitor even if no kestrels use your box!
This is absolutely critical. We need to understand why kestrels use some boxes but not others, so from a data context, an empty box is just as important as an occupied one.

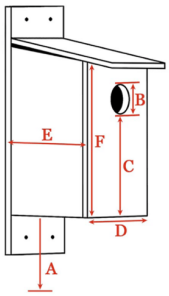
THE PEREGRINE FUND

Visit us: **kestrel.peregrinefund.org**

Nestbox ID: .....

Data Sheet

american kestrel partnership
a project of The Peregrine Fund



Nestbox Characteristics ***(required for box registration):***

☐*Check Box when Nest Box Characteristics Data have been uploaded to AKP website*

Geographic coordinates
or descriptive location: .....
Month/year installed: .....
Dimensions: in. or cm. (circle one)
A (height from ground): .....
B: ..... C: ..... D: ..... E: ..... F: .....

Mounting surface (pole, wall, etc.): .....
Type of interior bedding: .....
Entrance orientation (N, SE, etc.): .....
Interior cleaned annually? Yes / No
Type of predator deterrent, if using: .....

Visit	Date	Year	Time	# Kestrel Adults[1]	# Kestrel Eggs	#Kestrel Nestlings ♀ Live	♂ Live	Dead	Nestling age[2]	Other species using box?[3] Yes/No	Species	Removed?	
1													☐
2													☐
3													☐
4													☐
5													☐
6													☐
7													☐
8													☐
9													☐
10													☐
11													☐
12													☐

Check Box when Observations Sent to AKP

****** Zero is a valuable number! ***** ***Record data during every visit, even if there is no activity at the box.***

[1]Count only adults on, or flushed from, the nest.
[2]Approximate age of oldest nestling. Use Klucsarits and Rushbuldt's nestling aging guide, available under partnership documents at kestrel.peregrinefund.org
[3]Evidence of other species includes nest materials, eggs, chicks.

Reminder: It is illegal to touch or possess any part of an American Kestrel (including feathers and eggs) without proper permits.

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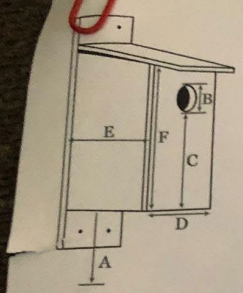
II. Flagstaff Kestrel Project Data Sheets

Below are two examples of FKP data sheets.

Nestbox ID: Box 23- Refugia

Data Sheet

american kestrel partnership



Nestbox Characteristics (required for box registration):

☑ Check Box when Nest Box Characteristics Data have been uploaded to AKP website

Geographic coordinates or descriptive location: Refugia Gardens

Month/year installed: Feb. 2020

Dimensions: in. or cm. (circle one)

→ A (height from ground): 98 in

B: 5 in C: 11 in D: 10 in E: 10 in F: 15 in

Mounting surface (pole, wall, etc.): pole

Type of interior bedding: mixed

→ Entrance orientation (N, SE, etc.): SE

Interior cleaned annually? (Yes) / No

Type of predator deterrent, if using: n/a

Visit	Date	Year	Time	# Kestrel Adults[1]	# Kestrel Eggs	#Kestrel Nestlings ♀ Live	♂ Live	Dead	Nestling age[2]	Other species using box?[3] Yes/No	Species	Remov
1	4/29	20	10a.m.	0	0	0	0	0	—	—	—	—
2	6/18/20	20	10am	0	0	0	0	0	—	—	—	—
3	7/1/20	20	10am	1	0	0	0	0	—	—	—	—
4												
5												
6												
7												
8												
9												
10												
11												
12												

*** Zero is a valuable number! *** **Record data during every visit, even if there is no activity at the**

[1] Count only adults on, or flushed from, the nest.

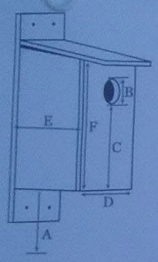
[2] Approximate age of oldest nestling. Use Klucsarits and Rushbuldt's nestling aging guide, available under partnership documents at kestrel.peregrinefund.org

[3] Evidence of other species includes nest materials, eggs, chicks

Nestbox ID: 18 - Flag Farms 2

Data Sheet

american kestrel partnership
a project of The Peregrine Fund



Nestbox Characteristics *(required for box registration):*

☑ *Check Box when Nest Box Characteristics Data have been uploaded to AKP website*

Geographic coordinates or descriptive location: [redacted]

Month/year installed: Feb. 2020

Dimensions: (in) or cm. (circle one)

→ A (height from ground): 9 ft

B: 3 C: 15 D: 11.25 E: 9.75 F: 17.5

Mounting surface (pole, wall, etc.): ~~tree~~ pole

Type of interior bedding: mixed

→ Entrance orientation (N, SE, etc.): 200° SW

Interior cleaned annually? (Yes) / No

Type of predator deterrent, if using: n/a

Visit	Date	Year	Time	# Kestrel Adults[1]	# Kestrel Eggs	#Kestrel Nestlings ♀ Live	♂ Live	Dead	Nestling age[2]	Other species using box?[3] Yes/No	Species	Removed?	Check Box when Observations Sent to AKP
1	May 5	2020	—	—	—	—	—	—	—	—	—	—	☑
2	6/20	20	7:37#	0	0	0	0	0		No			☑
3	7/20	20	6.40	0	0	0	0	0		No	—	—	☑
4	8/20	20	7:15	0	0	0	0	0		No	—	—	☐
5													☐
6													☐
7													☐
8													☐
9													☐
10													☐
11													☐
12													☐

*** Zero is a valuable number! *** **Record data during every visit, even if there is no activity at the box.**

Appendix G: Interview Questions

Interview Questions

Thank you for agreeing to participate in this research. Please avoid providing identifying information and saying things that could harm you or others. If necessary, I will seek to remove any identifying information after I transcribe your interview.

Background information:

Age:

Gender:

Race/Ethnicity:

Educational background:

Profession:

Where did you grow up and where have you lived?

Town/area currently living in:

General

1. What was your favorite thing about FKP?
2. What benefit do you see to this work?
3. What do you feel is significant, or not significant, about this work in the context of Covid-19?
4. Tell me about your connection to the natural world.
    1. Where did it originate? Can you tell me a story about that?
    2. What does the natural world mean to you?
5. What is your connection to kestrels?
    1. Did you have a connection to kestrels before your involvement with FKP?

Community Connection and Relational Building

6. How would you describe the “community” of FKP?
    1. How would you describe your feeling of connection to the FKP community?
    2. Did you have a sense of relationship building?
        1. If not, please say more about why not.
    3. If you felt connected, how did this sense of connection affect your relationship to FKP or conservation in general?
    4. What was the impact of Covid-19 on your feelings on the above?
7. Tell me about the relationships that arose during this process.
    1. Can you share a story about this?
    2. Do you feel the relationships you built within FKP were significant?
        1. If not, why not?

Ecological Interconnectedness

8. Sense of ecological interconnectedness:
    1. How would you describe the concept of ecological interconnectedness?
    2. Did working as a nest box monitor enhance or alter your sense of connection to the natural world? In what ways?
        1. If not, why not?
    3. Was there a moment during your involvement with this project that made you feel more connected to the natural world? Can you tell me about that?
    4. What did you know about ecological interconnectedness before participating in FKP monitoring?
    5. What do you know about ecological interconnectedness now?

Skills Building and New Learning

9. What did you learn as a result of working with FKP?
    1. Can you describe any new skills you have gained as a result of participating in FKP monitoring?

        1. If you do not feel you learned new skills, what skills might you have wanted to learn?
    2. If you did learn new skills, do they make you feel more encouraged to participate in conservation?
        1. If you did not, what skills might make you feel more encouraged to participate in conservation?

Likelihood of Future Conservation Work

10. Did participating in this project make you interested in doing more conservation?
    1. What was it about this experience that made you feel that way?
11. Do you believe yourself likely to participate in conservation in the future? If so, in what way(s)? If not, why not?