Plant invaders vs. Birds: What can recreational camera traps tell us?
(a citizen scientist's inquiry) by Michelle Medina

I am on my afternoon break and I head down to the river. As I climb down an embankment, one of my camera traps comes into view. My anticipation grows as I wonder, what images might my camera reveal? For these 15 minutes, I switch into my citizen scientist mode.

Camera traps have been used for over fifty years to study wildlife. They are now commercially available and relatively inexpensive. Most of us have viewed amazing camera trap photos and videos of rarely seen animals and their behavior. It can be enchanting to view images from wildlife biologists studying elusive species, like snow leopards in the Himalayas. Camera traps are also used by hunters to learn the patterns of deer and enjoyed by hobbyists, for simply looking at the critters visiting the area surrounding our homes. Like many hobbyists, I purchased my first recreational camera trap not only because of my interest in photography, but largely due to my curiosity in what wildlife visited my home. Soon, I wanted to explore more than just my backyard.

The Bronx River, a larger 'backyard'

Within 400 feet from where I work at the Bronx Zoo, flows the Bronx River. For years, I've considered it like my second backyard. The Bronx River is New York City's only freshwater river. It begins in southern Westchester County, flows through the Bronx Zoo, and empties into the Long Island Sound. The river forms a corridor for urban wildlife as well as migrating birds. Similar to many riparian habitats in eastern North America, it is battling against an invasion of Japanese knotweed.

Japanese knotweed

Originally imported into the United States in the late 1800s as ornamental plants, Japanese knotweed is currently one of the most prolific invasive species of vegetation.

These plants quickly form large stands, which displace and overrun native vegetation and can dominate riparian habitats. Japanese knotweed is extremely difficult to remove once it has taken hold in an area. In riparian habitats, the principal method of reproduction of Japanese knotweed is via the growth of large underground rhizomes. During flooding events, small pieces of rhizome can easily break off and be carried downstream. Small pieces can quickly grow into large plants, so cutting and completely removing all remaining pieces in efforts to remove the plant is labor intensive and can take years. While some herbicides have been effective, using them along rivers and streams is not suggested because they are non-selective and a risk to aquatic communities.

Negative effects of this Japanese knotweed have been well studied and it has been directly associated with decreased invertebrate biomass. Scientists believe this may lead to long-term, detrimental consequences further up the food chain. Researchers studying Japanese knotweed in Broome County, New York found that green frogs inhabiting areas dominated by this invasive had lower body mass, due to decreased feeding success, when compared to frogs in areas without the plant. Upon finding Japanese knotweed along the Bronx River, and learning about the damage this plant causes, I wanted to learn more about the impact it may have on urban wildlife.

Setting up the research process

I wanted to explore how the presence of Japanese knotweed along the Bronx River affected urban wildlife and whether camera traps could be used to tell a story. To investigate my query, I set out to compare the occurrence and abundance of urban wildlife. I found two sites along the Bronx River which shared similar habitat characteristics, except one was adjacent to a stand of Japanese knotweed. I set up the same model motion-triggered camera trap at each of the two sites; they were set up identically and placed at the same height from the ground. If this invasive plant negatively impacts the diversity and abundance of wildlife, I predicted a lower rate of wildlife encounters would be detected by the camera adjacent to the Japanese knotweed.

I simultaneously deployed both cameras from mid-September through October 2016. I checked the cameras once a week to ensure they were functioning correctly. Upon reviewing the cameras' memory cards and downloading the image files, I quickly learned how overwhelming it can be to deal with the large amount of data (images) collected in a relatively short time. My cameras detected over 1,000 wildlife events and accumulated more than 10,000 images. The cameras at both sites were triggered by mammals and birds. No reptiles or amphibians, which I know inhabit the Bronx River, triggered the camera.

Urban mammal species detected included the usual suspects of raccoons, grey squirrels, opossum, chipmunks, striped skunks and the occasional feral domestic cat. On two occasions zookeepers searching for browse, i.e. edible vegetation, for our collection animals, triggered a camera. Birds observed included wood ducks, mourning doves, woodpeckers, Northern cardinals, tufted titmouse, blue jays, gray catbirds, common grackles, house sparrows, and a Cooper's hawk.

I noted the species and number of individuals for each detection event. For those animals that were not easily individually identified, I used a '30-minute' rule. I counted multiple detections of the same species within a 30-minute time frame as one event because it could have been the same animal. For example, if a chipmunk was detected, and another chipmunk was detected within 30 minutes, I counted them as the same chipmunk. Using this method, I then totaled the events for each species I observed at each site. Along with the total number of days each camera was deployed, I calculated the encounter rate for each species detected at each site.

What story did my cameras tell?

Upon review of my images, it became apparent that a family of raccoons inhabited a fallen tree near the site of Japanese knotweed. Since the same raccoons were counted every night, this consequently affected my number of raccoons and total mammals detected at that site.

However, the data obtained from the images containing birds told a different story. From the number of different species, or species richness, and the abundance of birds observed at each site from the images, I calculated two relative diversity statistics for birds. I found there was a decline in species richness, relative abundance and diversity of birds at the site with Japanese knotweed. My results not only support the previously reported detrimental impact of this plant, it also demonstrates a negative effect higher up the trophic level, with birds.

From my results of my original question, new questions naturally arose. This is how the scientific process works. To further explore my prediction, I am now exploring what effect removing the invasive vegetation will have on birds. In September 2017, I deployed a camera at the initial site adjacent to the Japanese knotweed and collected images for one month. In October 2017, with the assistance and hard work of some co-workers armed with shovels and pitchforks, we manually removed the stand of Japanese knotweed which encompassed an area of about 800 square feet. We dug up and removed as much of the plants as we could, being careful to collect all the pieces we could find. I did not have any native vegetation to plant at the site, which has been found by researchers to help mitigate re-colonization. This is something I may do in the future.

In September 2018, I plan to collect additional images to compare bird diversity post-removal, which I predict will increase. At the end of April 2018, just six months after the initial removal attempt, there were already many shoots of knotweed returning, a testament to how resilient this invasive plant is. I try to remove what I find growing each time I check my camera.

In the meantime, the camera remains at the site, and I continue to capture and share images and video of visiting birds and mammals (https://aperegrination.weebly.com/bronx-river-camera-trap-images-of-note).

What story can *your* camera trap tell?

Through this research, I have demonstrated how invasive Japanese knotweed can have a negative effect on the relative abundance and diversity of birds. If you deploy camera traps as a hobby, remember you are collecting visual data. These observations and data can be used to tell a story.

Do you have a question you have formed from your observations? Do you have a prediction that you think can be tested? Have you noticed patterns or relationships? Time of day? Temperature? Amount of shade versus sun? Or type of vegetation? Have you found similarities or differences? Perhaps there is something you can measure with your data. For example: how many of a species, or number of offspring, what sex, the duration of an event or how often an event occurs? These can lead to comparison questions. To initiate your query do some background research and construct a hypothesis, then design an experiment to test your prediction, and share your findings. You may find something to share which can help with the conservation of wildlife.

Note: To learn more about invasive plants and animals in New York State, check out the New York Invasive Species Information website, http://www.nyis.info. To learn about training and volunteer programs and activities near you, check out your local partner of NYS DEC. You can find them at Partnerships for Regional Invasive Species Management (PRISM), https://www.dec.ny.gov/animals/47433.html. Citizen scientists are also encouraged to map invasive secies with your smartphone using the iMapInvasives mobile app, https://sites.google.com/site/nyimapinvasives/ or the iNaturalist mobile app, https://www.inaturalist.org.

Bio: Michelle Medina is a zookeeper at the Bronx Zoo, and currently pursuing a Masters of Art degree in Biology from Miami University's Global Field Program. She enjoys photography, motorcycles and mountain biking.

Japanese knotweed growing along the Bronx River

Camera trap set up along the Bronx River

Cooper's hawk

Striped skunk

Red fox captured on video mode during winter after initial removal of the Japanese knotweed