Biodiversity Monitoring Protocol

Site selection:

- To assess mammalian community structure using trail cameras we established three sampling transects, each extending 50 km from the urban core (Fig. 1). Note that 50km was chosen due to the relative size of Chicago—in other cities, other transect lengths will be more relevant. The key is to ensure they capture an urban to rural (or less urban) gradient.
- Our transects originate at the center of the Chicago loop and roughly follow the DesPlaines River/Milwaukee Avenue to the northwest (DPT), Roosevelt Road to the west (RST), and the Sanitary & Ship canal to the southwest (SCT). These transects were selected to encompass changes within the landscape that occur across an urban-to-rural gradient.
- Each transect is sectioned into 5 km segments to ensure an even distribution of sampling effort across the entire gradient. Camera sites are located within 2 km of the transect lines and are at least 1 km apart, except where transects converge in downtown Chicago (Fig. 1.)

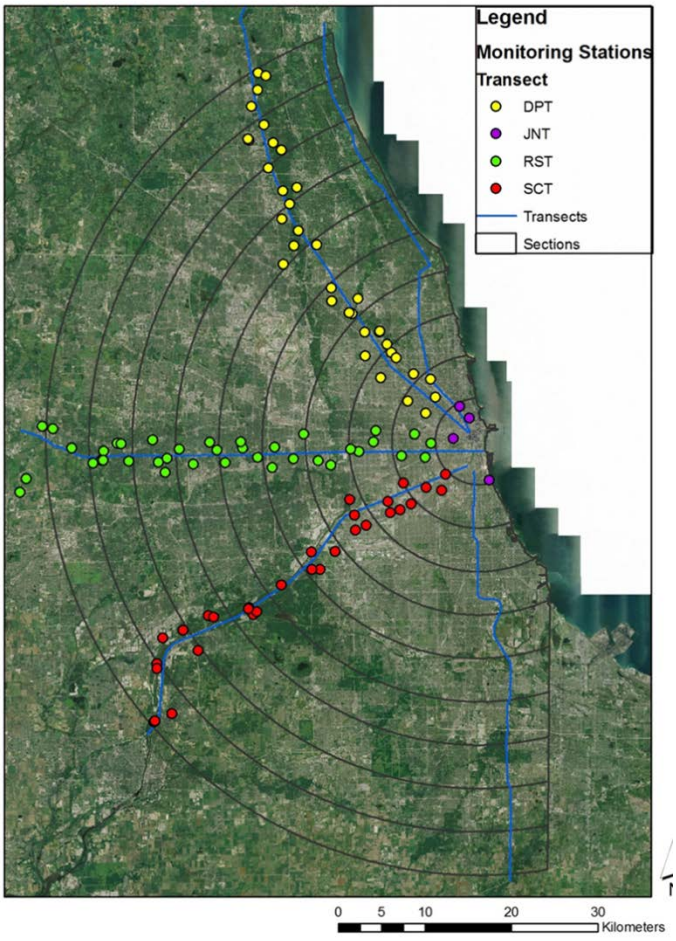

Fig. 1. *Monitoring stations located along three sampling transects (DPT, RST, SCT) extending 50 km from downtown Chicago, as well as the converged transect section (JNT). Black lines delineate 5 km sampling*

- Sites were randomly selected from state and county land holdings (e.g. Illinois Nature Preserves and forest preserves in Cook, Lake, DuPage and Will county), and private property such as golf courses, cemeteries, and parks.
- Within a site, cameras were randomly placed when possible. Otherwise we attempt to find locations where there are trees, within animal movement pathways, and away from human traffic. Often landowners have suggestions about good camera locations.
- We currently sample a total of 120 monitoring stations across the greater Chicago area. However, sampling in partner cities does not have to be this extensive. Roughly 10-20 sites in varied habitat types would be a sufficient sample size.

Camera deployment:

- One camera (or two, if sufficiently spaced at least 1 km apart) is deployed at each site for four weeks during each season (spring: March-May, summer: June-August, autumn: September-November, winter: December-February), for multiple years in order to detect variation in wildlife community composition and habitat use across seasons and years. The study has no termination date—it is intended for long-term urban wildlife monitoring.
- Cameras are set out during the first week of the season, checked two weeks later (during which time batteries and memory cards are refreshed), and all items are removed after four weeks.
- We generally work in teams of 2, and can visit up to 20 sites per day, depending on traffic.
- Cameras are strapped to trees or existing posts that allow for secure attachment. We position cameras angled down approximately 45 degrees toward a lure (commercially available fatty acid disc enclosed in a zip-tied mesh screen pouch), located 3-5 m from the camera tree (Fig. 2).
- The lure pouch is either nailed to a tree, log, or fence post.

Fig. 2. *Typical camera setup. Camera is tied to a tree, secured with a cable lock, and aimed at lure pouch 3-5 m away.*

Equipment details:

- We use Bushnell TrophyCams with a metal security case, cable lock, 8 rechargeable batteries, and 2 GB SD cards. The entire setup costs approximately $200 per camera.
- Bushnell TrophyCams use an infrared sensor to trigger so there is no flash.
- Because some batteries need to be changed at the check (especially during the winter), we recommend purchasing batteries for 1.5x the number of cameras. You will also need battery chargers.
- It is possible to download photos in the field, but that requires bringing laptops or IPads with sufficient storage or cloud storage capabilities. We find that switching out memory cards and downloading once your return to the office is the easiest and fastest method. We recommend purchasing SD cards for 2x the number of cameras.
- We recommend purchasing lure for 1.5x the number of cameras to account for missing lure pouches during the check (usually raccoons or coyotes). We do not replace lure unless it is missing at the check.

Camera settings:

- First turn camera on to "Setup" mode (middle setting between On and Off; Fig. 3.)
- Press the Menu button on the RH side
- Scroll through the menu options using the < and > buttons.
    - Set Mode = Camera
    - Image Size = 5M Pixel
    - Capture Number = 1 Photo
    - Video Size = 640x480 (doesn't matter unless you use video)
    - Video Length = 30S (doesn't matter unless you use video)
    - Interval = 30S
    - Sensor Level – Normal (if your camera over triggers, you can set to Low)
    - Format = Execute (to clear all images from the SD card; Press OK and then Yes using the ^ button and OK. Wait for it to return to the Execute screen)

Fig. 3. *Setup screen of Bushnell TrophyCam*

  - TV Out = NTSC
  - Time Stamp = On
  - Set Clock = Set (24H, Year-Mo-Day. Be sure to press OK!)
  - Default Set = Cancel
- Once you have returned to the first menu option, press Menu to exit and verify that the time and date are correct and the memory card is empty (0/xxxx).
- Switch camera to ON and you are ready to go! Infrared sensor will blink three times and will then start taking photos every 30s if there is constant motion.

Data entry:

- Data detailing site visits (date, time, camera condition, camera ID, etc.) are entered via IPad or Smartphone using customized forms created with IForm. Paper forms are fine too.
- Data are then exported from IForm, or entered by hand into an Access database.
- Species identifications are entered via users on Chicago Wildlife Watch (www.chicagowildlifewatch.org), or by staff/interns using Adobe Photoshop (to tag the photos) and Infopath forms, which allow for simultaneous data entry into Access by multiple users.
- We have an existing database structure and data entry system that can be shared and customized to the needs of partners.