Motus Wildlife Tracking System
motus@birdscanada.org
http://motus.org/
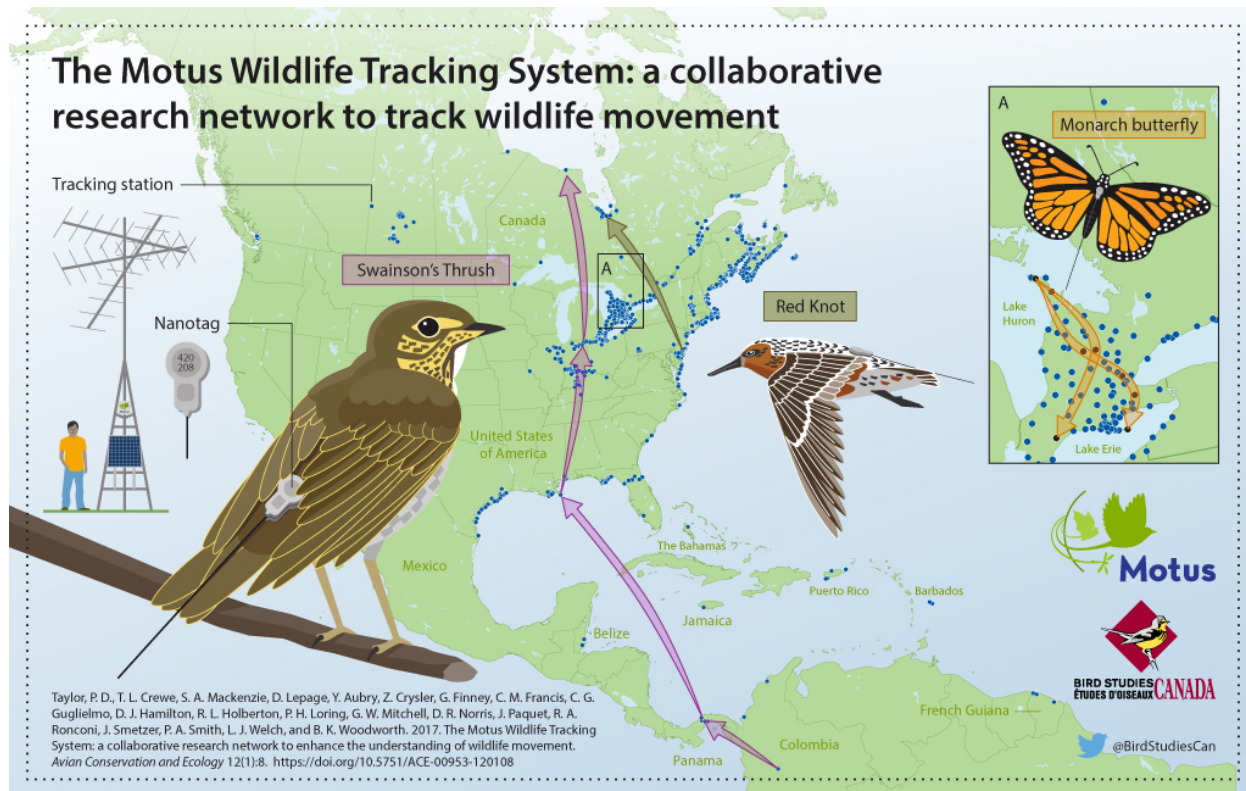
Introduction:

Some of the largest barriers to effective conservation and management of migratory animals is our ability to determine the importance of various landscapes and how they are utilized throughout their annual cycle. Our landscape includes numerous geographic (e.g. Gulf of Mexico, Great Lakes, mountains) and anthropogenic features (major urban centers, industrial, utility and transportation infrastructure) that might influence migratory animals use of and movement through the landscape. Gaining a better understanding of these processes will help decision-makers and other stake holders make informed and ecologically sound decisions with regards to wildlife management, policy, and regulation.

Automated radio-telemetry systems allow researchers to track the movements of radio-tagged birds, bats and insects throughout the land and seascape with unprecedented temporal precision. The Motus Wildlife Tracking System (Motus | http://motus.org/) is a coordinated hemispheric collaboration of researchers maintaining a network of automated receiving stations throughout the Americas, and recently Europe. Motus is a program of Bird Studies Canada (BSC), Canada's leader in bird research and conservation, in partnership with collaborating researchers and organizations. The purpose of Motus is to facilitate landscape-scale research and education on the ecology and conservation of migratory animals.

The current Motus array comprises over 375 stations across the globe operated by more than 75 collaborators. The configuration of each telemetry station is described below, Figure 1 shows a picture of a typical telemetry station. Figure 2 shows the current distribution of stations.

Since 2013, more than 10,000 animals of more than 100 species have been monitored using the system. Data collected from these arrays feed into a master database at BSC's National Data Centre where it is archived, visualized, and distributed to researchers and the general public.

For more detailed information you can read our research paper in Avian Conservation and Ecology - http://www.ace-eco.org/vol12/iss1/art8/

Landowner contributions:

We are seeking assistance from individual landowners to:

- Grant permission to install one or more telemetry stations on suitable land
- Grant access to project staff for periodic inspections, downloads, and maintenance throughout the life of the project (minimum once a year, max 3 times a year)
- Provide a point of contact to facilitate the process
- Site specific: When amenable and appropriate, allow the use of current infrastructure to affix antenna and store hardware in lieu of independent towers
- Site specific: When amenable and appropriate, supply minimal power required to run equipment
- Site specific: When amenable and appropriate, supply internet access to allow automatic data download
- When possible, fund the equipment, installation, and maintenance of Motus stations.

Funding a Motus Station:

The cost of the equipment ranges from about $3,000 to $10,000 depending on the type of setup (e.g. solar vs. power, tower vs. building, number of antenna, etc.). Annual maintenance

costs range from $100 to $5,000 per station/year depending on the remoteness of the station, whether or not they are powered or have internet access.

Landowners or interested parties can also fund a station which enables Motus and collaborators to expand and maintain the system elsewhere, and help to support the fundamental database management, web tools, program and project coordination that keep the whole system operating.

For more information visit https://motus.org/donate/, or contact motus@birdscanada.org.

Average cost of Motus station components, setup, and maintenance.

Equipment	Quantity	Cost	Total (typical station)
Receiver	1	~$1500	**$1500**
Tower/Mast	1	~$800 – pop-up mast ~$1-2,000 bracketed tower	**$800**
Antenna and Cables	1-6 per station	~$600 per antenna (*price will vary depending on length of cable*)	**$1,200**
Solar Power	1, 100W solar panel 1, 110 amp/hr battery 1, charge controller 1, wiring and fuses	~$750-1,000	**$1,000**
Miscellaneous parts	Waterproofing, hardware, cables, fasteners, storage box, rebar.	~$500	**$500**
Total			**$5,000**
Approximate procurement and setup cost ~ $2,000			*$2,000*
Approximate annual Maintenance cost ~ $500			*$500*
Total			*$7,500*

Procurement, setup, and annual maintenance costs can vary substantially depending on the specifics of each installation.

**Telemetry Station Equipment, Setup, and Maintenance:**

Project technicians will need to access equipment throughout the year for routine inspections, downloads of data, and maintenance. BSC takes full responsibility for the setup and maintenance of the telemetry stations.

The dedicated and approved frequency used for the project is 166.380 MHz.

Specific details regarding our automated telemetry systems can be found at **www.sensorgnome.org.**

Basic System Components:

1) SensorGnome Receiver - see www.SensorGnome.org / https://compudata.ca/sensorgnome/
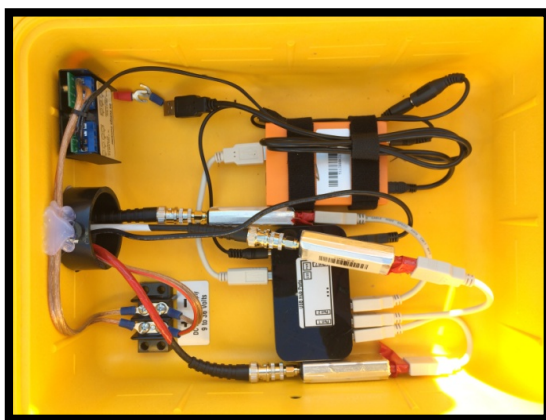
2) Antenna - a combination of 5 or 9-element Yagi antenna and associated cables.

3) Power Source: Either solar panels and batteries, or 120/240V standard electric supply.

4) Connectivity: If the receiver has wired or wireless internet access, then data will stream automatically to the Motus server. Otherwise manual downloads will have to occur every 3-4 months.

Existing infrastructure:

How antenna are affixed to existing infrastructure varies with each location. Typically, they are affixed to a steel pole that is secured to the infrastructure with u-bolts. A variety of examples of station setups on current infrastructure can be found here - https://sensorgnome.org/Automated_VHF_Telemetry/4._Receiver_Station_Set-up

Free-standing Tower:

Telemetry stations comprise a 20-30' pop-up tower, 2-4, 9' yagi antenna, guy lines, SensorGnome receiver and hardware, power supply and solar panels. The towers are not permanent structures and can be taken down or moved at anytime.

The footprint of the tower tripod, power supply and computer box is about 3'x3'. Depending on the height of the tower, the guy-lines extend from a minimum of 14' to a maximum of 20' from the tripod, which cover a ground area of approximately 98 to 220 square feet. Guy lines will be marked with reflective tape and appropriate yellow wire covers.

Timeline:

Telemetry station installations can begin as soon as all permissions are granted. It is our preference that permanent stations be established for at least 5-10 years. At any point the agreement can be revaluated and stations taken down or moved.

Preferred Sites:

Sites with high elevation (highest locations within ~ 20 km in each direction) and open areas with direct line-of-sight to intended targets are strongly preferred. Secluded, somewhat rural areas are helpful, but not essential. We welcome suggestions about potential locations. Specific details are unique to each site and will be determined after consultation and approval of landowners.

Insurance:

Bird Studies Canada holds $5 million public liability insurance to cover staff and volunteers during the installation of the equipment, as well as all public and private landowners from liability created by installed equipment throughout the duration of the project.

Benefits to the Landowner:

- Supporting one of the largest migratory animal conservation science and research initiatives in the world
- Access to visualizations of animal movement data collected from your and other sites
- Opportunities to utilize the system to collaborate or participate on local or broad research and monitoring projects
- Opportunities for mutual outreach, promotion and community engagement in collaboration with BSC.
- Conversation starter/piece
- Decorative landscape art
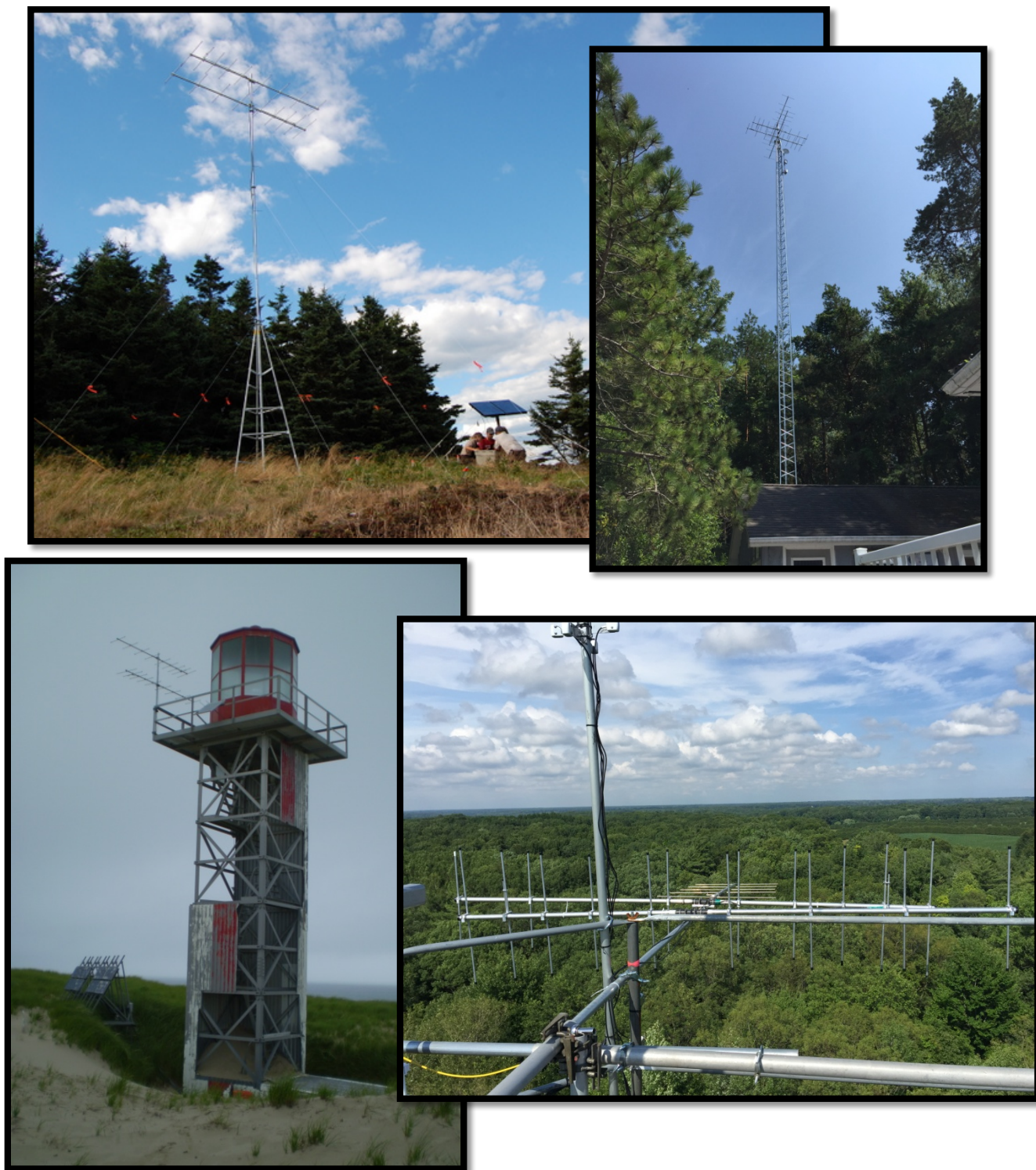
Figure 1. Examples of automated radio telemetry stations.

Figure 2. Current configuration of Motus stations. Active nodes in Colombia, Texas, and Saskatchewan are not displayed. By 2016 stations will be active in the south-east USA, including Florida and the Bahamas.