USING GROUND AVIAN RADAR AND ACOUSTIC REMOTE SENSING TO MAP FLIGHT TRACKS 24/7 OVER THE GREAT LAKES COASTAL ZONE

U.S. Fish and Wildlife Service
Region 3 Ecological Services
Funded by the Great Lakes Restoration Initiative
www.fws.gov/radar
Spring and Fall

Move between breeding and wintering grounds

Travel up to 15,000 miles annually

Up to 600 miles per day, 50 mph

Some species migrate at night others during the day
  - Night – Songbirds
  - Day – Hawks, Ducks, Cranes

Four main routes in North America
Problems Studying Migration

- Occurs at night
- Broad scale
- Pulsed pattern
- Short time period
- Birds and bats hard to detect
Project Goals

- Determine if migration occurs along the shorelines of the Great Lakes
- Determine how wide the migration corridor along the lakeshore is
- Determine start and end of migration season for birds and bats
- Determine times of day and weather conditions that may elevate risk to migrants from wind facilities
Project Components

Avian Radar Units

Acoustic and Ultrasonic Monitors

Bird Surveys

Historic Bird Banding Data
Radar Types

NEXRAD

- Large range (50 miles)
- Sample at high altitudes
- Tracks large densities of birds and bats
- Free and historical data
- Widespread but fixed locations

MARINE (AVIAN) RADAR

- Small range (2-6 miles)
- Sample from the ground up to 3,000 m
- Tracks individual targets and small flocks
- Must collect own data
- Mobile radar units
Why We Chose Avian Radar

- Small scale allows for higher resolution
  - Track individual birds and bats or small flocks

- Provides data on flight heights as well as flight direction

- Resolution is better in the area of concern
  - Rotor Swept Zone – 30 to 130m

- Mobility
  - Can site radars to answer specific questions
Avian Radar Specifications

- Marine radar
- S-band – 10cm wavelength
- Doppler Horizontal Antenna
- Non-doppler Vertical Antenna
- 26° Beam Width
Raw Radar Video

1 mile

1 mile
Trackplots

Hourly Summaries

HORIZONTAL RADAR

VERTICAL RADAR
Sheboygan County, WI
August 22-23, 2013
Average hourly target passage rate during Fall 2011 and 2012 on Lake Huron.
Seasonal Patterns

Target Counts by Hour - Fall, 2011
August 18 – November 13
Activity is greatest around midnight.
Migration is not consistent every night.

Each date on X-axis is centered at midnight
Seasonal Patterns

Targets Per Hour Fall 2011 Huron County, Michigan

- Vertical Counts
- Horizontal Counts

Dates:
- 8/18/2011
- 8/25/2011
- 9/1/2011
- 9/8/2011
- 9/15/2011
- 9/22/2011
- 9/29/2011
- 10/6/2011
- 10/13/2011
- 10/20/2011
- 10/27/2011
- 11/3/2011
- 11/10/2011
Seasonal Patterns

Targets Per Hour Fall 2011 Huron County, Michigan

- Vertical Counts
- Horizontal Counts

Targets Per Hour Fall 2011 Huron County, Michigan
Wisconsin Timeline, Fall 2013

Target Counts Per Hour

BatDarwin VSR
BatDarwin HSR

Preliminary data. Subject to change.
Acoustic/Ultrasonic Monitors
Call Types

ACOUSTIC BIRD CALL

- Audible
- Used for communication between birds in flight at night

ULTRASONIC BAT CALL

- Inaudible – High Frequency
- Used to navigate and feed in the dark
Acoustic Monitors

ADVANTAGES

- Continuous monitoring
- Possible to identify birds and bats to species
- Cheaper and easy to set up and maintain

DISADVANTAGES

- Short range (~100m)
- May be affected by nearby habitat
Acoustic Movies

LAKE ERIE - SPRING

Nightly Bat Passes at Lake Erie Monitor Sites: Spring 2012

Date: May 01, 2012

Bat Passes Per Night

- 0
- 1 - 238
- 239 - 468
- 469 - 904
- 905 - 2882