Fostering partnership, conservation, and regulatory compliance through shared data: Collaborations through the Avian Knowledge Network

Geoffrey Geupel and John Alexander
(with Katie Koch, Meghan C. Sadlowski, Jaclyn Johnson, Michael Fitzgibbon, Jenny Barnett and many others)

March 7 2019, Denver, CO
Advancing conservation of birds, other wildlife and ecosystems through science, partnerships, outreach

150 Scientists and Staff
Founded in 1965 (as Point Reyes Bird Observatory)
2018 budget: ~$14 million
Manage >1 billion ecological observations
Alaska to Antarctica
Sierra to the Sea

Advancing bird and habitat conservation through science, education, and partnerships

8 Scientist and Staff
Founded 2000 (1992 data)
2018 budget $750,000 K
Manage > 3 millions ecological observation
Pacific Northwest
Throughout the range of migratory birds
• Vision and Mission
• People and Partnerships
• Nodes
• Data
  • Types
  • Protocols
  • Architecture & processing
• Examples
VISION

A world where bird populations thrive through conservation and management informed by a network of avian knowledge.
MISSION

AKN Vision

People

Data

Tech
Brief History of the AKN

Avian Knowledge Network Origins

• **Asilomar Partners in Flight** (2002)
  Organizing avian data resources

• **Oregon-Washington / California Partners in Flight** (ORWACA PIF)
  Tools for bird conservation (2005)

• **Cornell Lab of Ornithology**
  and museum experts
  Darwin Core (2005)

• **National Science Foundation (NSF)**
  Grant to create AKN 1.0 (2006)
  Bird Monitoring Data Exchange

• **Point Blue Conservation Science**
  NodeDB, R-Avian, Distributed Nodes
Citizen Scientists
Biologists
Programmers
Researchers
Wildlife agencies
Land Managers
Private landowners
Conservation Practitioners
The AKN organized around nodes: Geographic or thematic partnerships dedicated to regional conservation.

“Partners work collaboratively to share and access data and tools at multiple scales that support bird and habitat conservation.”
BADC website 2019.
Types of data in AKN

- Scientific Design Metadata
- Observations
- Landscape Models
- Land Management Activities
- Climate Futures
- Other Covariates

Rangeland Monitoring Network
Current Protocol Types

- **Point Counts** – where an observer records all the birds detected from fixed locations along a route under set period of time.

- **Area Searches** – where an observer records all the birds detected (often with other behavior characteristics) within a specific boundary in a recorded period of time.
  - Checklist – a specific type of Area Search where bird counts are not collected.
  - Specialized Area Search for shorebirds, waterbirds and thrashers with specific data warehouses.

- **Fixed Transects** - Surveys where an observer records all the birds detected while moving along a linear route in a recorded period of time.

- **Secretive Marshbird Surveys** – Repeated count surveys of marshbirds, involving recorded sequence playback of marsh bird calls.
TECHNOLOGY

• Preserve Data
• Discover Data
• Summarize Data
• Deliver Data

Make a Difference (Decision Support)
Your Data in The AKN

Data Tables

Events  Observations

Data Entry  Upload
Summary  Edit
Download  ...

Data Owner Access Control
DATA SHARING LEVELS

Raw to Clean to Restricted, Level 1, 2, 3, 4 or 5

Full download data without explicit permission
Simple download data without explicit permission
Download data with permission, show on map
Summaries (eg phenology summary @ 100km**2)
Metadata discoverable
Invisible

Observations

Raw
Clean
Restricted

Data Owner Access Control

full access, always
Project View
Your Data in The AKN

Data Tables

Events | Observations

Data Entry | Upload
Summary | Edit
Download | ...

Warehouses

Data Owner Access Control
Your Data in The AKN

Data Tables

Events | Observations

Warehouses

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Summary | Edit
Download | ...

Data Owner Access Control

Project Leader Tools
Analyst Tools
AKN tools (R-based = sharable)

Data Visualization & Analysis

Trend in Abundance over Year Collected. Generalized additive trend estimate of Abundance by Year with locally weighed (loess) smoother. Estimate for Species = Song Sparrow Using Locally Weighed (loess) Smoother

On-line simple data analysis and visualizations.

Notes:
Data source: Point-level Estimates of Abundance (Birds per Point) from Point Count Data Summarized by Scientific Name and Transect.
Your Data in The AKN

Data Tables

Events  Observations

Data Entry  Upload
Summary  Edit
Download  ...

Warehouses

Data Tables

Data Owner Sharing Levels

Project Leader Tools
Analyst Tools

Data Owner Access Control
Conservation of shrub-steppe bird communities

Bird Conservancy of the Rockies
Great Basin Bird Observatory
Intermountain Bird Observatory
Klamath Bird Observatory
Point Blue Conservation Science

Naval Weapons Systems Training Facility Boardman, Oregon
Northern Basin & Range Ecoregion (5 states)

3,812 Points
8 studies
2000-2016
Custom Formats

**Point Count “Protocol” Variations**

**Unique Metadata Structures**

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<th>Holmes Shrubsteppe</th>
<th>Events</th>
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Bulk Uploader

Custom Formats

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Standard Format

Transform

Cooperator/Partner

Project

Researcher

Sampling Unit

Event

Site Condition

Observation

Sampling Protocol Type
Northern Basin & Range Ecoregion (5 states)

21 Species Distribution Models

Sage-brush Sparrow
## Occurrence within Grouse PACs

<table>
<thead>
<tr>
<th>Species</th>
<th>Percentage</th>
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<tr>
<td>Sage Thrasher</td>
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<tr>
<td>Vesper Sparrow</td>
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<tr>
<td>Horned Lark</td>
<td>1.2</td>
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<tr>
<td>Rock Wren</td>
<td>1.2</td>
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<tr>
<td>Brewer's Sparrow</td>
<td>1.2</td>
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<tr>
<td>Gray Flycatcher</td>
<td>0.8</td>
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<td>Green-tailed Towhee</td>
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<tr>
<td>Western Meadowlark</td>
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<tr>
<td>Sagebrush Sparrow</td>
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<tr>
<td>Black-throated Sparrow</td>
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<tr>
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<tr>
<td>Spotted Towhee</td>
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<tr>
<td>Oregon Junco</td>
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<tr>
<td>Mountain Chickadee</td>
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<tr>
<td>Chipping Sparrow</td>
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<tr>
<td>American Robin</td>
<td>0.2</td>
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<tr>
<td>Lark Sparrow</td>
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★ = Sagebrush Obligate

Holmes et al 2018
Applications of AKN projects

- Tools to keep agencies in compliance with regulations (MTBA, NEPA, and state (e.g. CEQA in California)

- Keeping common birds common – prevent listing under the ESA.

- Share data on listed species to make informed decisions now and in the future
Phenology Tool

- Geographic Area
  - Select Area
  - Create Graph

- Species
  - Use all available species

Phenology Graph

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<tr>
<th>Species</th>
<th>Scientific Name</th>
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<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
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<th>Sep</th>
<th>Oct</th>
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<tr>
<td>Allen's Hummingbird</td>
<td>Selasphorus sasin</td>
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<tr>
<td>American Avocet</td>
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<tr>
<td>American Bittern</td>
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Show Effort
Multi-state thrasher conservation program

Objectives: Range-wide estimate of distribution, density, and population sizes and determine habitat relationships and areas of climate ‘refugia’

LCTH and BETH: one of the fastest declining bird species of STOB ‘arid land indicators” and PIF ‘Red Watch List’ species. (LCTH 67% and BETH 86% loss of global population in the past 44 yrs)

Standardized ‘area search’ all-bird surveys and vegetation assessment coordinated by Desert Thrasher Working Group

Randomly selected plots using annually updated abundance models

On-line data entry in the Avian Knowledge Network

Overlap with Avicaching sites to test efficacy.

State Partners: Arizona GF, California DFW, Utah DWR, Nevada DOW, New Mexico FG.
WAfLS - Western Asio Flammeus Landscape Study

Avian Knowledge Northwest
a node of the Avian Knowledge Network
PLuMA Planning for Landscape Management and Adaptation

Select for:
- Habitat Type
- Species
- Present/future
- Breeding window
Integrated Waterbird Management and Monitoring (IWMM)

Federal & State refuges
7 years
300K observations
Birds, vegetation & management actions

www.iwmmprogram.org

Adaptive Management through Bird Counts, Migration Curves, Bird Use Days, Habitat Reports by Mgmt Unit, Site, Refuge, FWS Region, JV Boundary, BCR, Flyway
States from Maine to Virginia used standardized surveys to estimate numbers of colonial waterbird nests in 2013 & 2018.

Database for 2013 data created & maintained by USFWS & USGS; however, coordinator left & database left unfinished.

At 2018 Avian Conservation Data Management Workshop, selected CWB database as case study and A
Future of AKN

Suite of conservation tools
Multi-purpose for multiple scales

Increase power and utility!

- Address data management challenges
- Fill information and geographic gaps (new YBCU, SW WIFL)
- Add protocol types
- Identify common objectives (state, federal, private, non-profit)
- Develop tools to meet common objectives
  - Data management and delivery
  - Decision support for bird conservation
Protocol Types under development

- **Banding Data and Effort** – working with Midwest Avian Data Center to collect net effort data to use in conjunction with USGS Bird Banding Lab ‘Bandit data’.
- **Colonial Waterbird** – working with KBO and states on surveys of colonial breeding birds and demographics.
- **Territory Mapping** – working with USFWS and partners in Arizona, New Mexico and surrounding states on Willow Flycatcher surveys (a type of Fixed Transect) and their creation of territory maps from those surveys.
- **Vegetation and Soil Data** – working with RMN and others to collect data on vegetation, soil carbon and infiltration
Avian Knowledge Network

People, Data, and Technology for the Conservation of Birds

Logos and emblems of various organizations.
Thank You