eMammal as an example of a data pipeline, repository, and outreach tool for wildlife images and metadata.
www.emammal.si.edu
launched 2015
eMammal Ecosystem

Data for Current Research on Mammals

Youth Education and Participation

Citizen Science

Archive and Curate Biodiversity Data for Future

Biodiversity Data Journal
124 eMammal Projects (Dec 2018)

80 Currently Active Projects; 24 Countries

Over 18,000 Camera Deployments

1,294,170 Detections

Over 1,000 Active Volunteers
17 Mid-Atlantic Projects
Who is Audience for Data?

- **Scientist, Conservation Biologist, Regional Manager:**
  - Data access – across projects; set permissions for others
  - Statistics: overall richness, diversity and relative abundance; detection rate; single species occupancy; Wildlife Picture Index; Activity cycle; Royles-Nichols Point Abundance model, comparisons across projects
  - Graphics - all

- **Protected Area Manager**
  - Data upload,
  - Data access – within project
  - Statistics: overall richness, diversity and relative abundance, detection rate, species accumulation curve, Wildlife Picture Index, activity cycle
  - Graphics: Map of project, Wildlife Picture Index, all metrics displayed over time
  - Links to environmental covariates and standard packages, report writing capacity, communications with staff/volunteers

- **Staff, Volunteer, Field Workers, Public:**
  - View Photographs
  - Data upload and access – within project
  - Statistics: overall richness, diversity and relative abundance, species accumulation curves, activity cycle (for project and self?)
  - Graphics: Bar graphs of results, map of project, feedback on effort, access to reports
The Major Requirements for Data

- Metadata structure captures all relevant information
- Level of data access; limit access and embargos
- Ability to sort and select subsets of data based on metadata structure
- Ability to download data in multiple formats
- Ability to clean data before download
  - Will you edit data within repository?
  - or create work space for temporary files (need to be able to save)
- Combine with covariates from other sources (Landsat, NDVI, DEM)
  - Inside or outside repository?
- Report writing capacity – bar graphs, figures, charts, tables
Data analysis has 3 goals*:

• Summary statistics on effort for PI (species accumulation curves, trap effort, species lists, relative abundance)
• Summary statistics for volunteer (pie chart and summary table of species, new species, comparisons to all volunteers)
• Download for work outside of site (csv file, occupancy format)
• Education materials (Diversity, Relative Abundance, Activity Cycle, Compare between 2 sites or species)

*Relies on ability to select and sort by area, projects, species, and periods of time. Relies on unique identifier for each image and sequence (across projects)
Project overview (automated stats to review your project and others)

• Project details (PI, location, time span, data rights, etc.)
• Sample descriptions (number of camera nights, deployments, detections, species list)
• Map of deployments (index of effort, spatial metrics)
• Project covariates available (vegetation, other sign)
• Project specific details (bait, lure, trails, random placement, camera model, human photos)

You have 2 choices:
either standardize data collection protocols or collect metadata for each project
Data Selection

• Select by Location and/or project and/or drop down list of projects
• Select by key metadata
• Select by date range
• Select by species detected and/or # of detections and/or # of deployments
• Identify embargoed data, data owner and contact info
• Select by site level covariates
• Select by species covariates
• Ability to set detection interval
• Species aggregator (Genus level)
Data clean (no data are ready for analysis)

- Ability to map and view locations to identify outliers
- Add or subtract species from analysis
- Combine species (genus level)
- View photos and edit species name
- Review deployment dates and edit/drop/add deployments
- Save data and settings in work space
- Ability to change times relative to sunrise/sunset
- How to deal with location of protected species?
Data export (no canned program can do all things)

• Export raw sequence/event data
• Export site detection history (deployment length, start and finish date and time)
• Export spatial data
• Export non-spatial covariates
• Export species co-occurrences
• Again – export of altered locations

CSV format most useful; R data format?
NORTH CAROLINA’S CANDID CRITTERS

Roland Kays
North Carolina State University
NC Museum of Natural Sciences
Citizen Science Model:
Loaning 500 camera traps through local libraries

50 Library Locations across the state
Training and Equipping

# of signups: 3,064
# trained volunteers: 1,328
# trained volunteers with at least one deployment: 538
# of long-term volunteers (>1 year or over 9 deployments): 95
4000+ locations sampled in 3 years across all 100 counties; 1.8 Million Pictures; 106K animal detections
39 Mammal Species

**Perspective**
10 recently published camera trap ecology papers average sample size: 99 camera sites (25-221)
TOP 12 SPECIES

Deer

- Grey Fox
- Red Fox
- Eastern Cottontail
- Black Bear
- Opossum
- Coyote
- Dog
- Turkey
- Raccoon
- E Gray Squirrel
- Cat
- Bobcat
Mapping Distributions: coyote, bobcat, bear, chipmunk
Real-time relative abundance results: deer
Compare Spatially Varying Coefficient model with State Estimate

2015 North Carolina White-Tailed Deer Density

Brent Pease, NCSU
Focus on Fawns

Hailey Boone, NCSU
Poster at ASM
A new platform providing data, technology and science-based tools for conserving wildlife
That's All Folks!!