

# Bridging the Gap Between Science and Decision Making Through Data Integration & Software Development

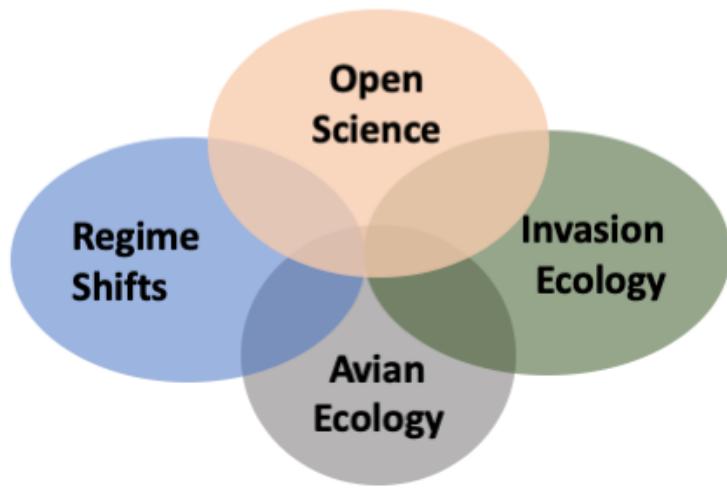
**Jessica L. Burnett**

Research Ecologist, Mendenhall Postdoctoral Fellow

Science Analytics and Synthesis | Core Science Systems  
U.S. Geological Survey, Lakewood CO

October 13, 2019

# Brief Overview of Past and Ongoing Research





**Avian  
Ecology**



Florida Field Naturalist 44(4):157-168, 2016.

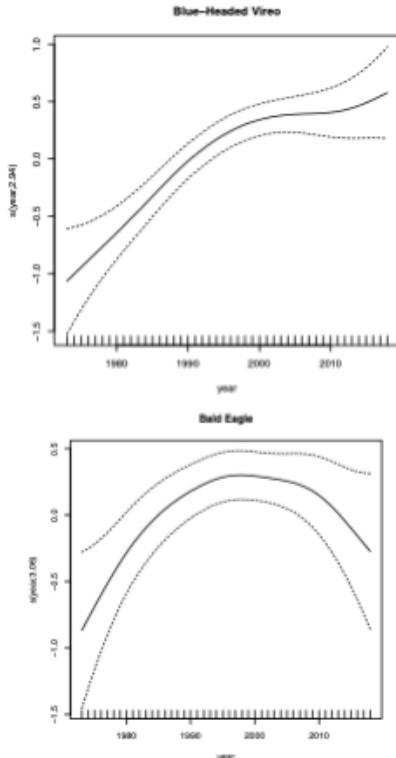
**SONGBIRD DISTRESS CALLS AS AN  
IMPROVED METHOD FOR DETECTING RED-  
SHOULDERED HAWKS (*Buteo lineatus*)**

JESSICA L. BURNETT<sup>1</sup> AND KATHRYN E. SIEVING

*Department of Wildlife Ecology and Conservation, University of  
Florida, Gainesville, Florida 32611*



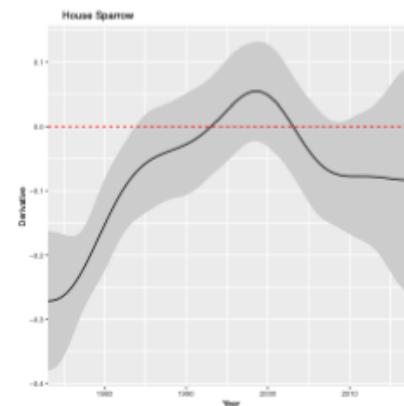
**Avian  
Ecology**



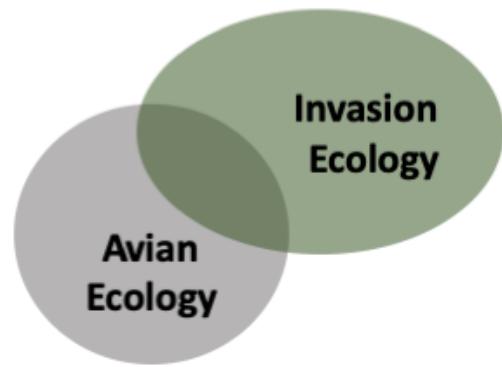
## USING A CHRISTMAS BIRD COUNT TO UNDERSTAND LOCAL AND REGIONAL CHANGES IN BIRD POPULATIONS IN NORTHCENTRAL FLORIDA

Jessica Burnett<sup>1</sup>, Andrew Kratter<sup>2</sup>, Scott Robinson<sup>2</sup>

<sup>1</sup> Science Analytics and Synthesis, Core Science Systems, US Geological Survey; <sup>2</sup> Florida Museum of Natural History, University of Florida



(in prep) intended for submission to *Florida Field Naturalist*





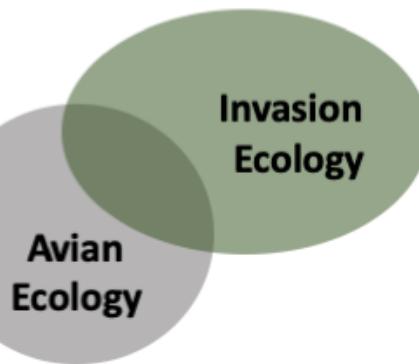
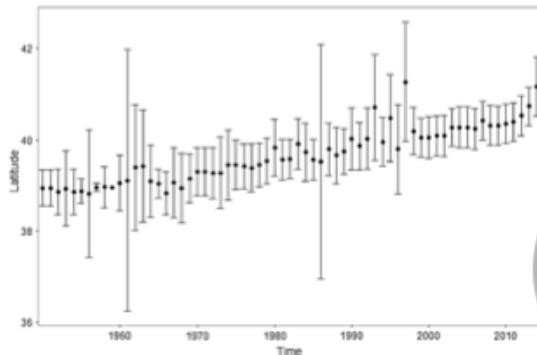
Biol Invasions (2017) 19:5–9  
DOI 10.1007/s10530-016-1273-4



INVASION NOTE

## Range expansion by *Passer montanus* in North America

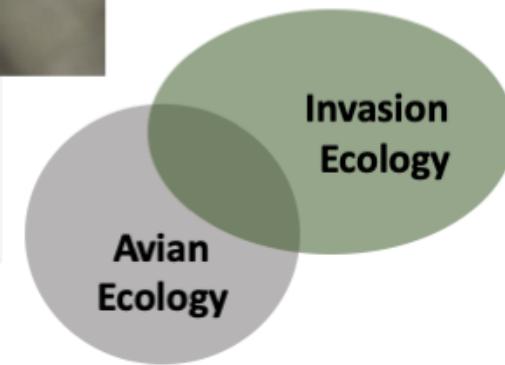
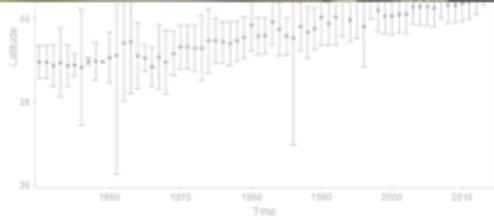
J. L. Burnett · C. P. Roberts · C. R. Allen · M. B. Brown · M. P. Moulton



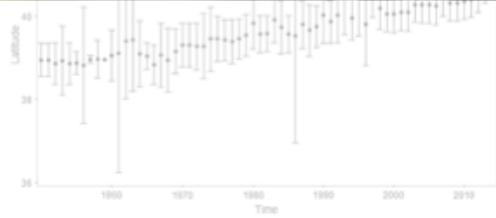


## Introductions by *Passer montanus* in North America

J. N. Gilbert • N. Anich • J. Burnett • C. R. Allen • M. B. Brown • M. P. Moulton



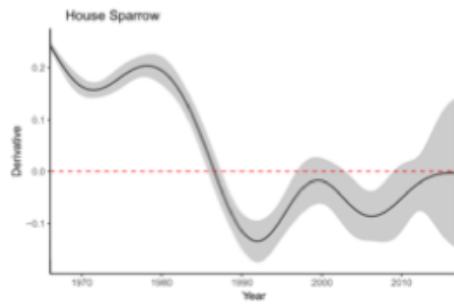
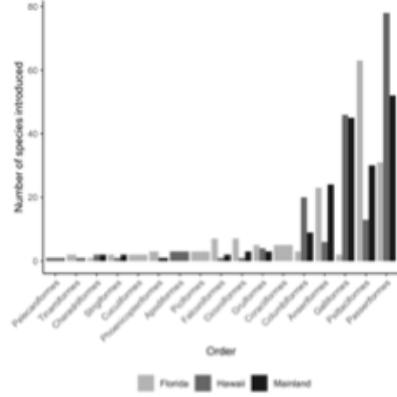
[1] Burnett, J, N Gilbert, N Anich (*in prep*) Great Tit introductions to and distribution in North America.



**Avian  
Ecology**

**Invasion  
Ecology**

- [1] Burnett, J, N Gilbert, N Anich (*in prep*) Great Tit introductions to and distribution in North America.  
Burnett, J, L Wszola, N Mirochnitchenko, E Stuber, M Bomberger Brown, J Carroll (*in prep*). [2] Gray Partridge distribution in North America: Changing landscapes for an introduced species. For submission to *Wildlife Biology*

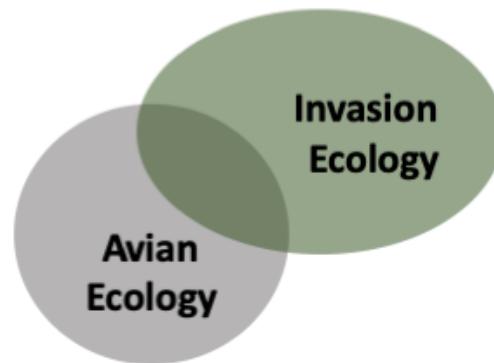


## CHAPTER 38

### Continental analysis of invasive birds: North America

Jessica L. Burnett\* and Craig R. Allen

Citation: Burnett, J.L. and Allen, C.R. (2019). Continental analysis of invasive birds: North America. In Downs, C.T. and Hart, L.A. (eds), Global trends and impacts of alien invasive birds. CABI, Wallingford, UK, pp. x-xx.





## Thermal Tolerance Limits of the Chinese Mystery Snail (*Bellamya chinensis*): Implications for Management

Authors: Jessica L. Burnett, Kevin, L. Pope, Alec Wong, Craig R. Allen, Danielle M. Haak, et. al.

Source: American Malacological Bulletin, 36(1) : 140-144

Upper limit: ~ 45°C

Lower limit: < 0 °C

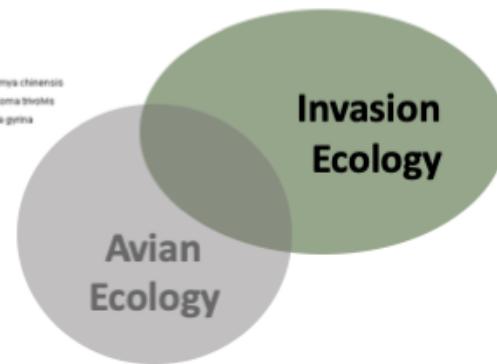
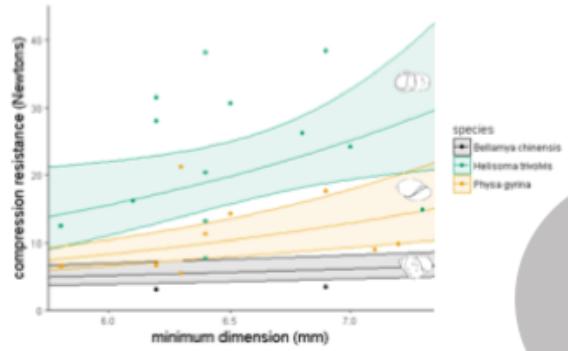




Shell strength does not limit predation of an invasive snail species (*Bellamya chinensis*) by  
native fish

Shell strength and predation of *Bellamya chinensis*

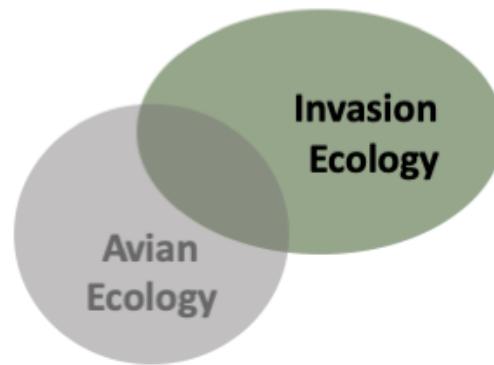
Jessica L. Burnett<sup>1</sup>, Rebecca C. Wilcox<sup>2</sup>, Bruce J. Stephen<sup>1</sup>, Daniel R. Uden<sup>1,\*</sup>, Craig R. Allen<sup>3</sup>,  
Patricia W. Freeman<sup>4</sup>, and Kevin L. Pope<sup>3</sup>

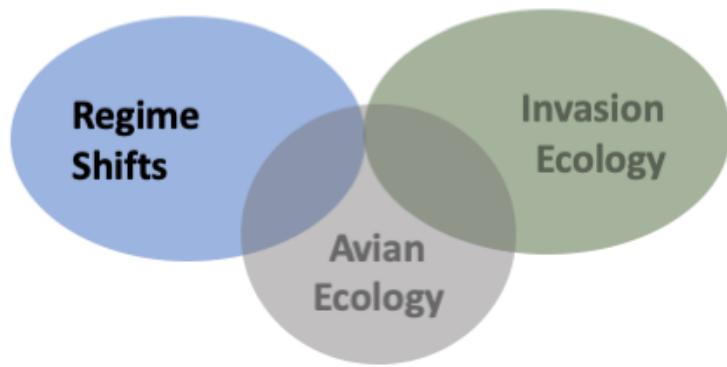


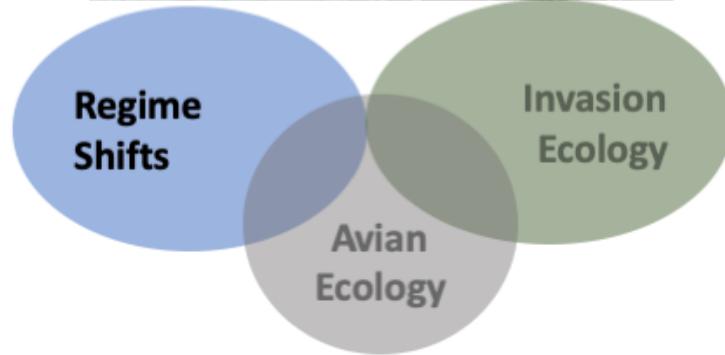
[1] Burnett et al. (under revision) American Malacological Bulletin.

## Social-ecological landscape patterns predict woody encroachment from native tree plantings in a temperate grassland

Victoria M. Donovan<sup>1</sup> | Jessica L. Burnett<sup>2</sup> | Christine H. Bielski<sup>1</sup> |  
Hannah E. Birge<sup>2</sup> | Rebecca Bevans<sup>2</sup> | Dirac Twidwell<sup>1</sup> | Craig R. Allen<sup>3</sup>



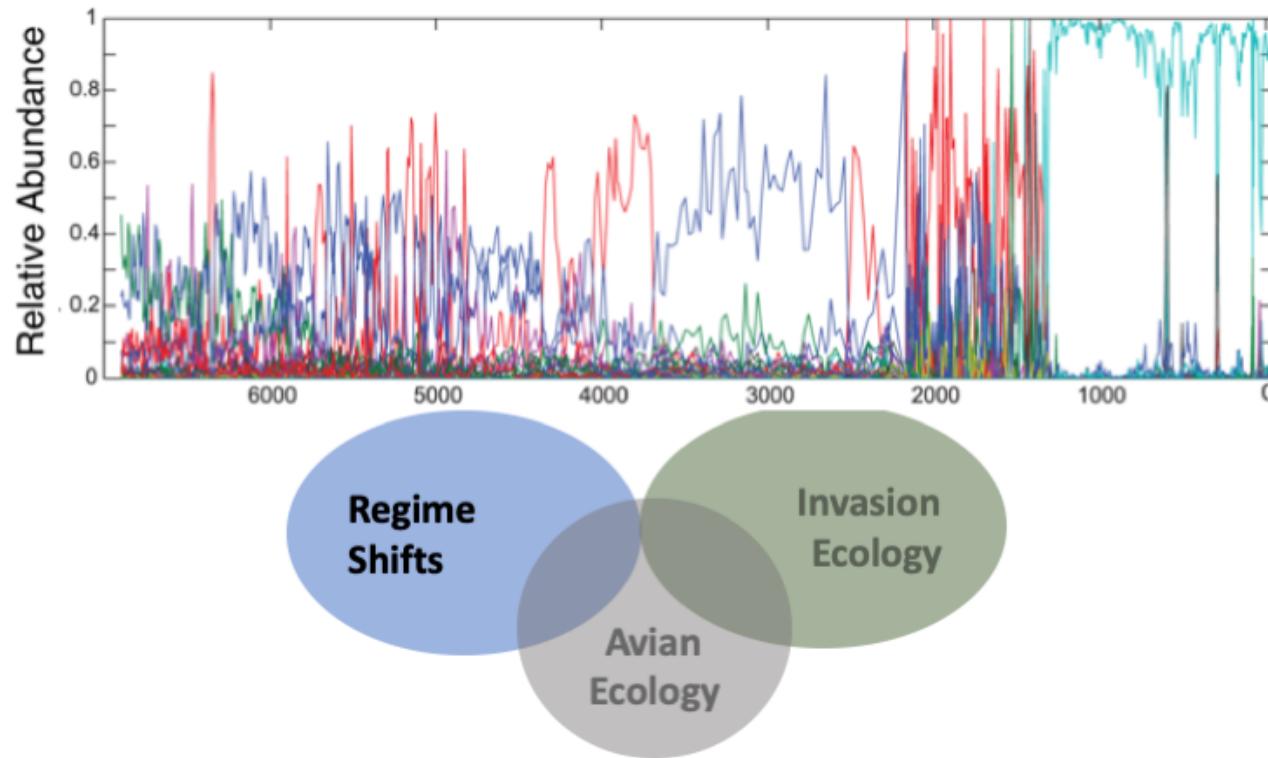


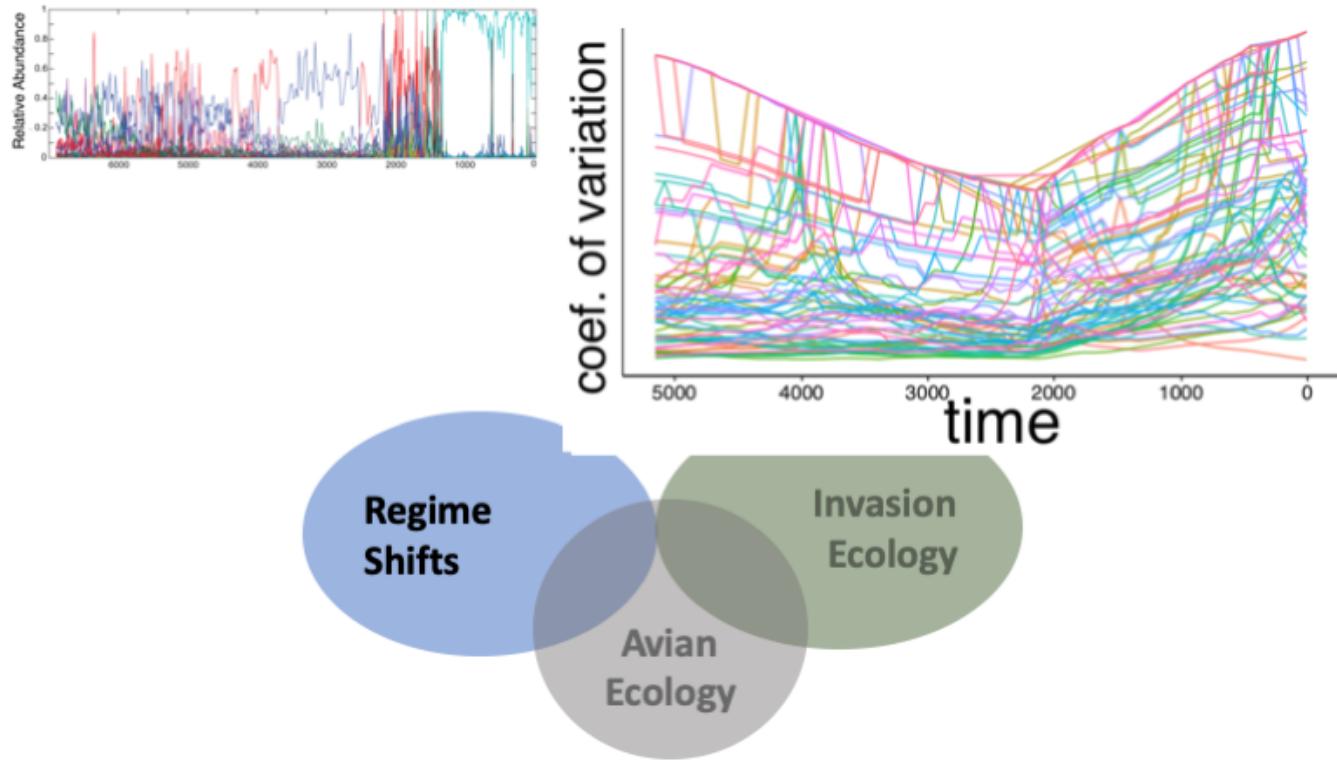


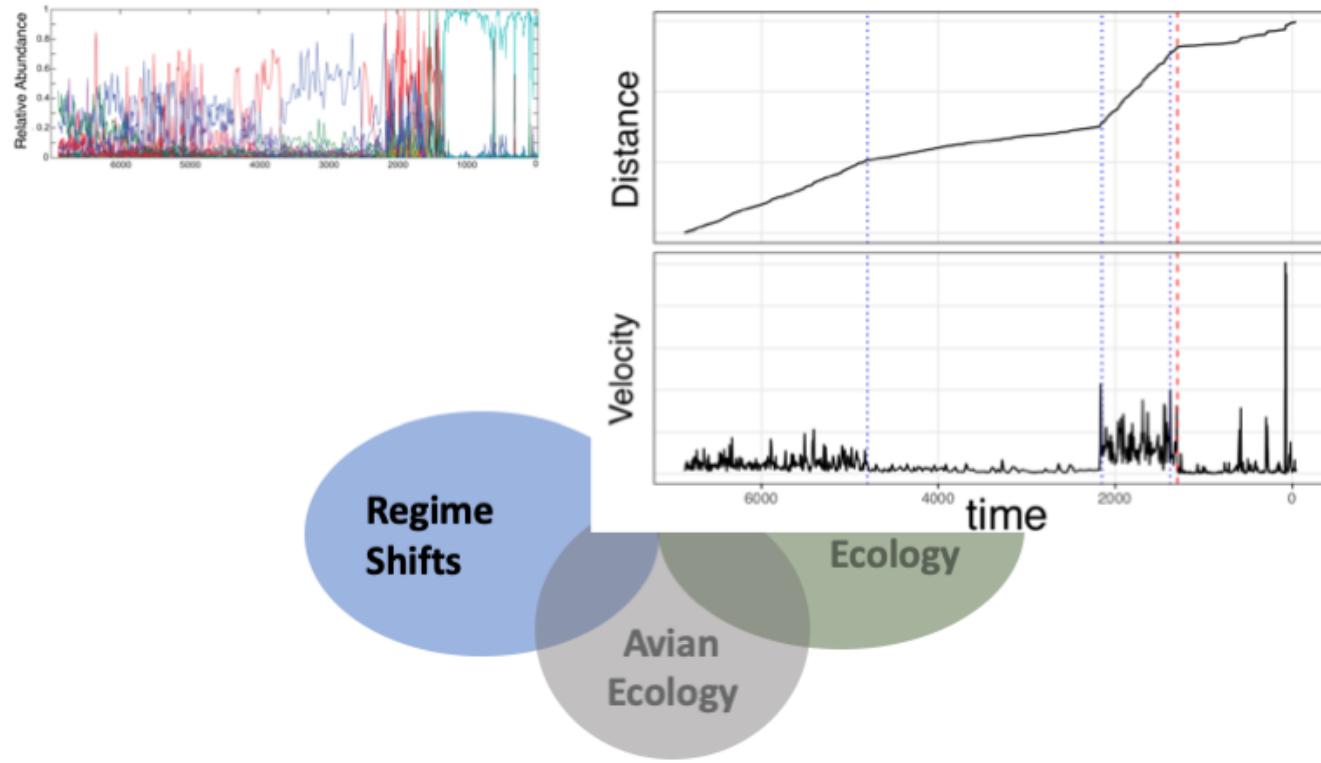
**Theme 1**: Synthesize and review regime shift methods and literature

**Theme 2**: Test the utility and efficacy of methods

**Theme 3**: Improve method accessibility

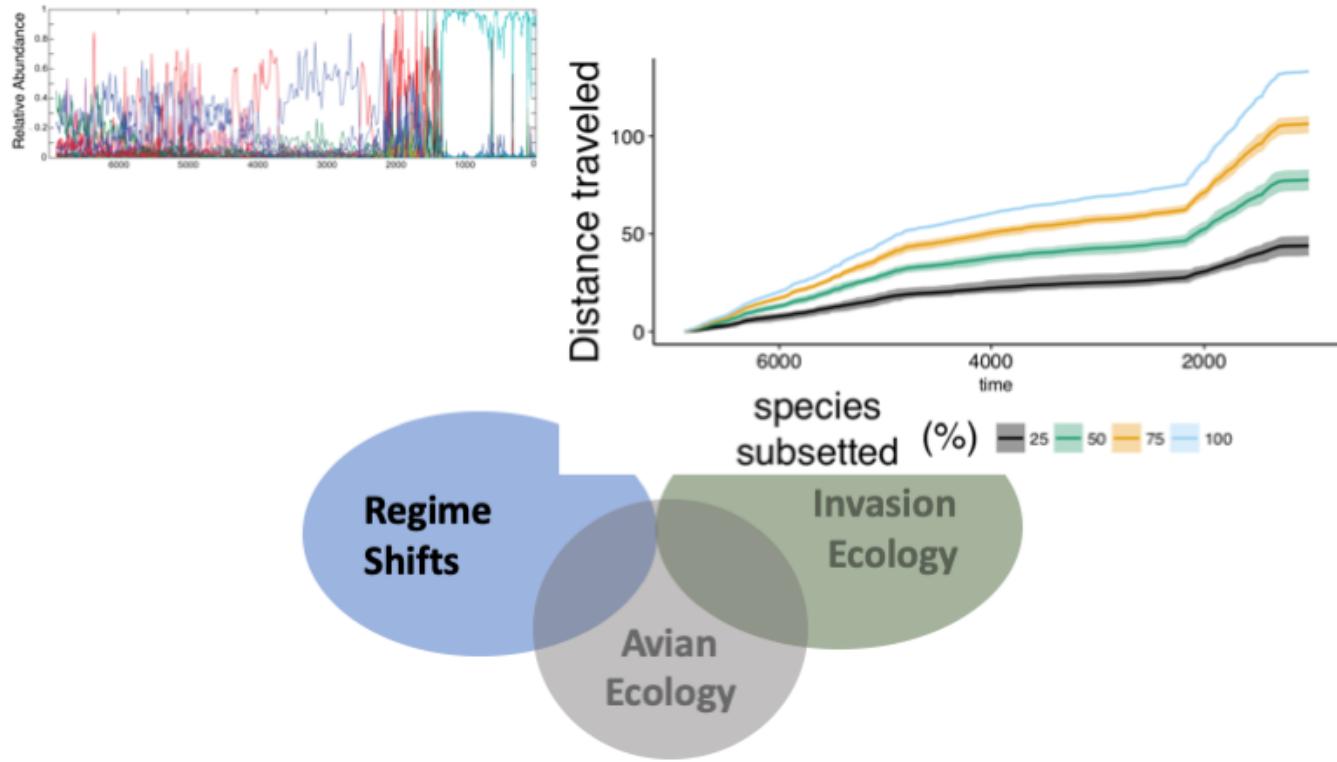


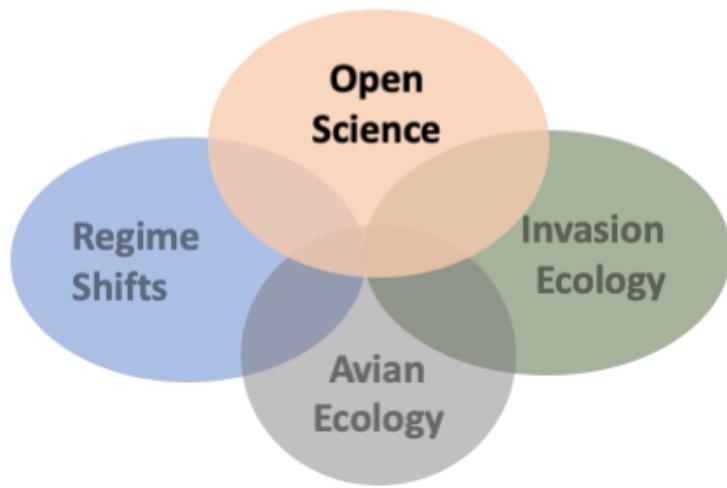




[1] Burnett, J, N Price, and A Tyre. (*in prep*). Distance travelled and velocity of distance travelled as a measure of abrupt change in multivariable ecological data.

[2] Burnett, J and N Price (2018). `regimeDetectionMeasures`: An R package for calculating univariate and multivariate regime detection measures.

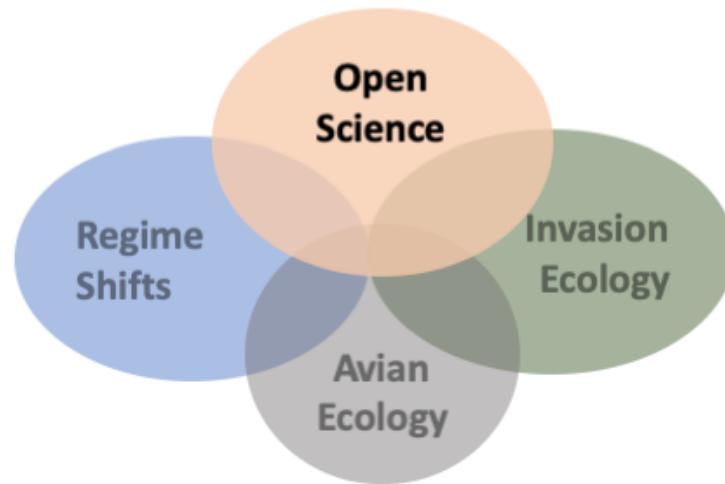






# regimeDetectionMeasures: An R Package for Calculating Multiple Regime Detection Measures

Jessica L. Burnett Last updated: 2019-10-13



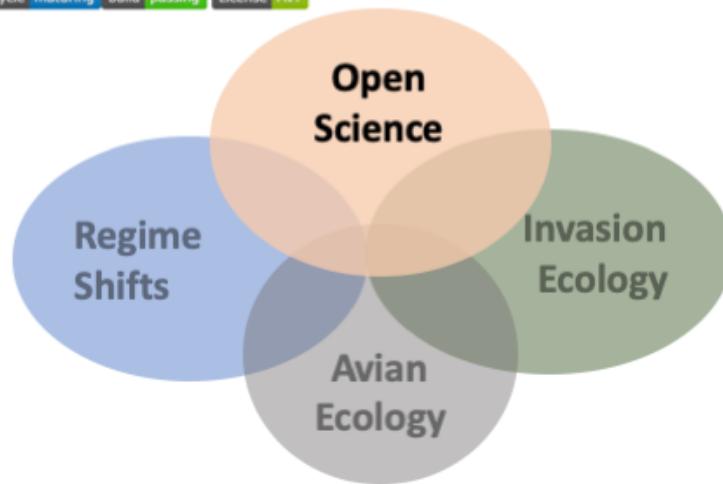
[github.com/trashbirdecology/regimedetectionmeasures](https://github.com/trashbirdecology/regimedetectionmeasures)



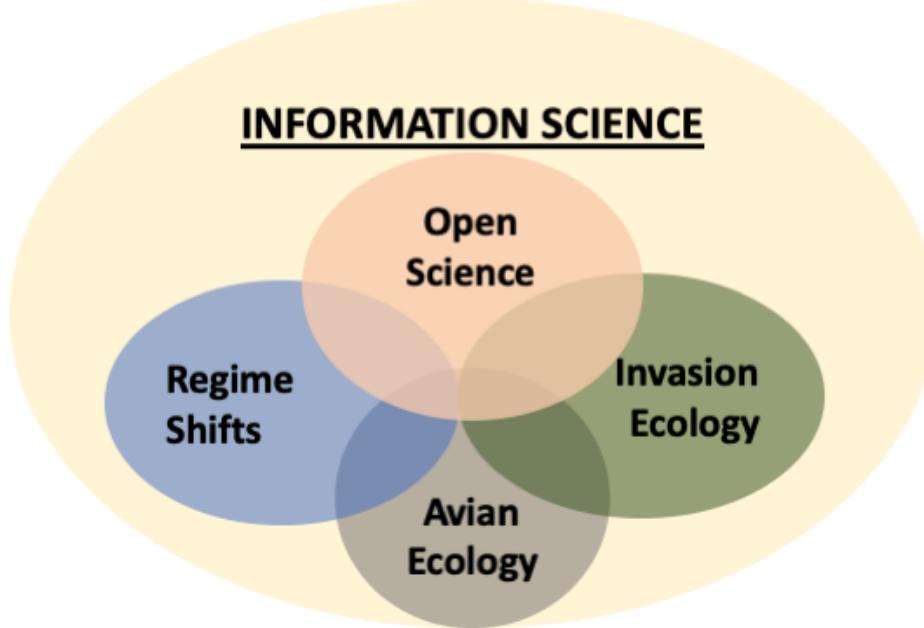
- **bbsAssistant: An R package for downloading and handling data and information from the North American Breeding Bird Survey.**

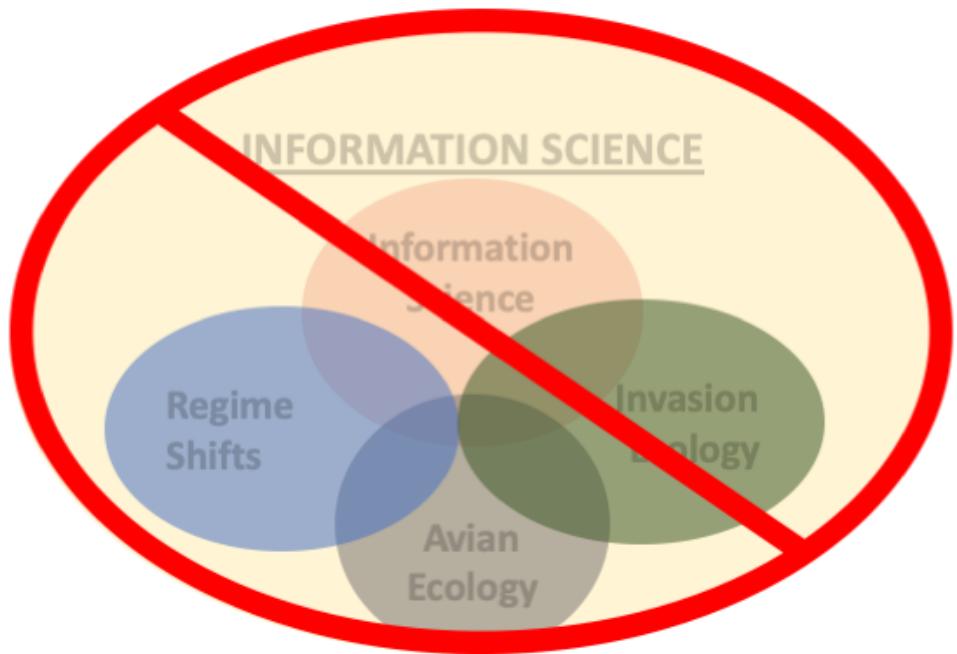
Last updated: 2019-08-16

lifecycle maturing build passing License MIT



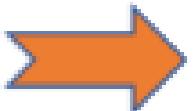
[github.com/trashbirdecology/bbsAssistant](https://github.com/trashbirdecology/bbsAssistant)





- 
- End-users
  - Practitioners
  - Decision Makers

Data Curation  
&  
Management



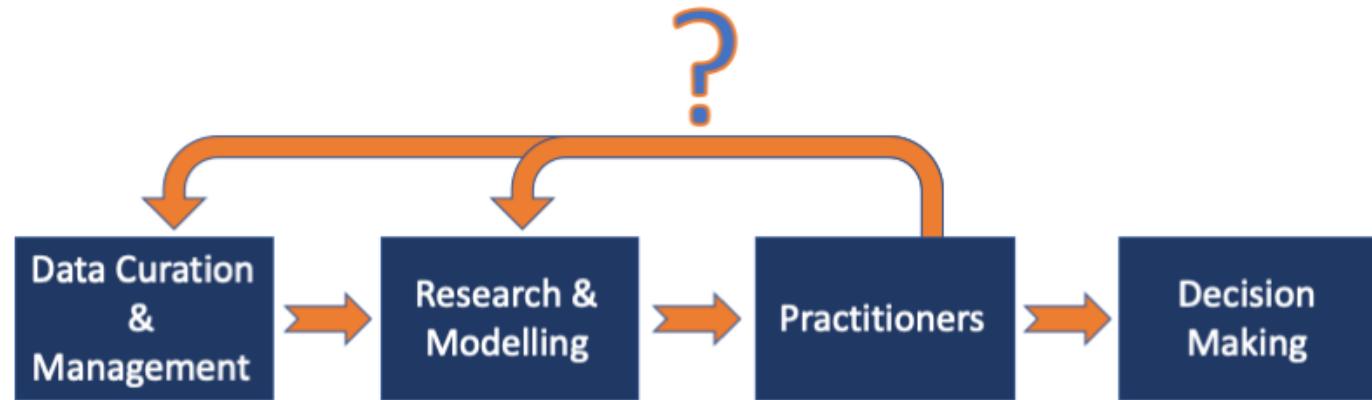
Research &  
Modelling

# Flow of Science Products and Knowledge

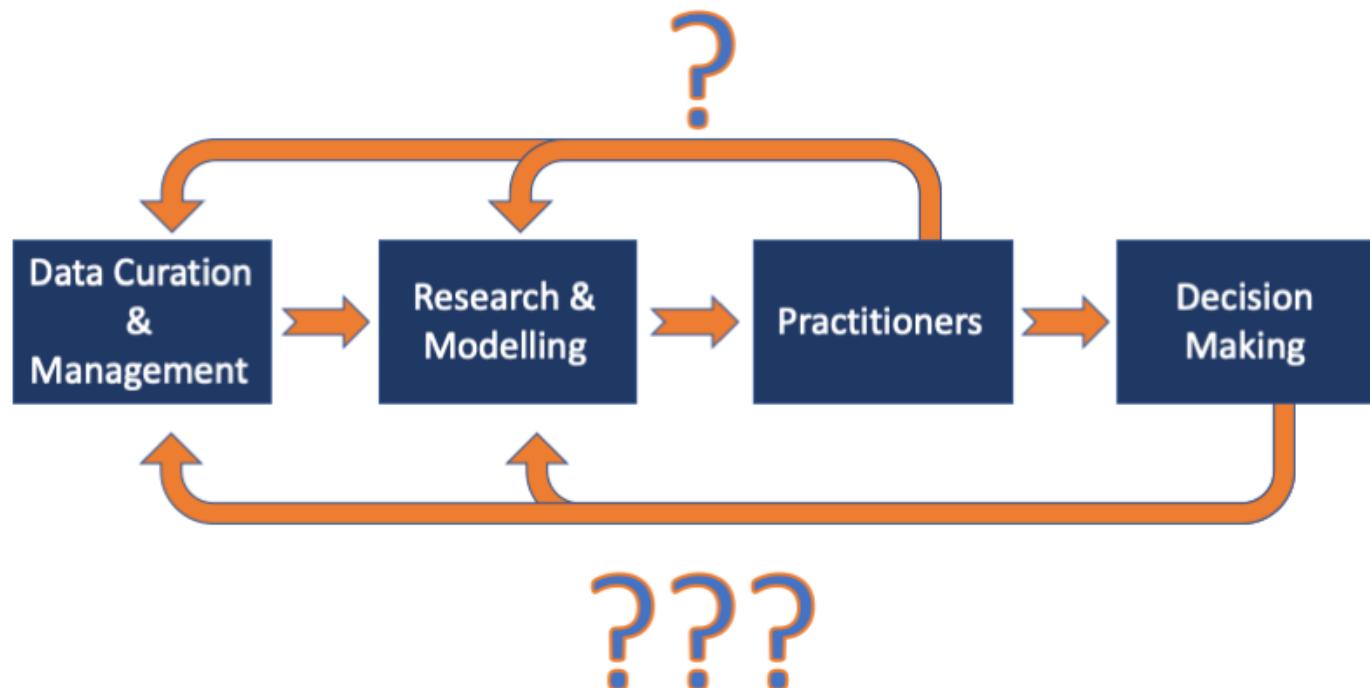
# Data and Science Products Often Flow Linearly



# Data and Science Products Often Flow Linearly



# Data and Science Products Often Flow Linearly



'Most models in ecology are intended for other ecologists, cooked up by scientists for consumption by other scientists'  
*Roughgarden (1979)*

- **data**
- **results**
- **papers**
- **presentations**

[1] Theory of population genetics and evolutionary ecology: an introduction.

# Avoiding the Linear Trajectory of Data and Science Products



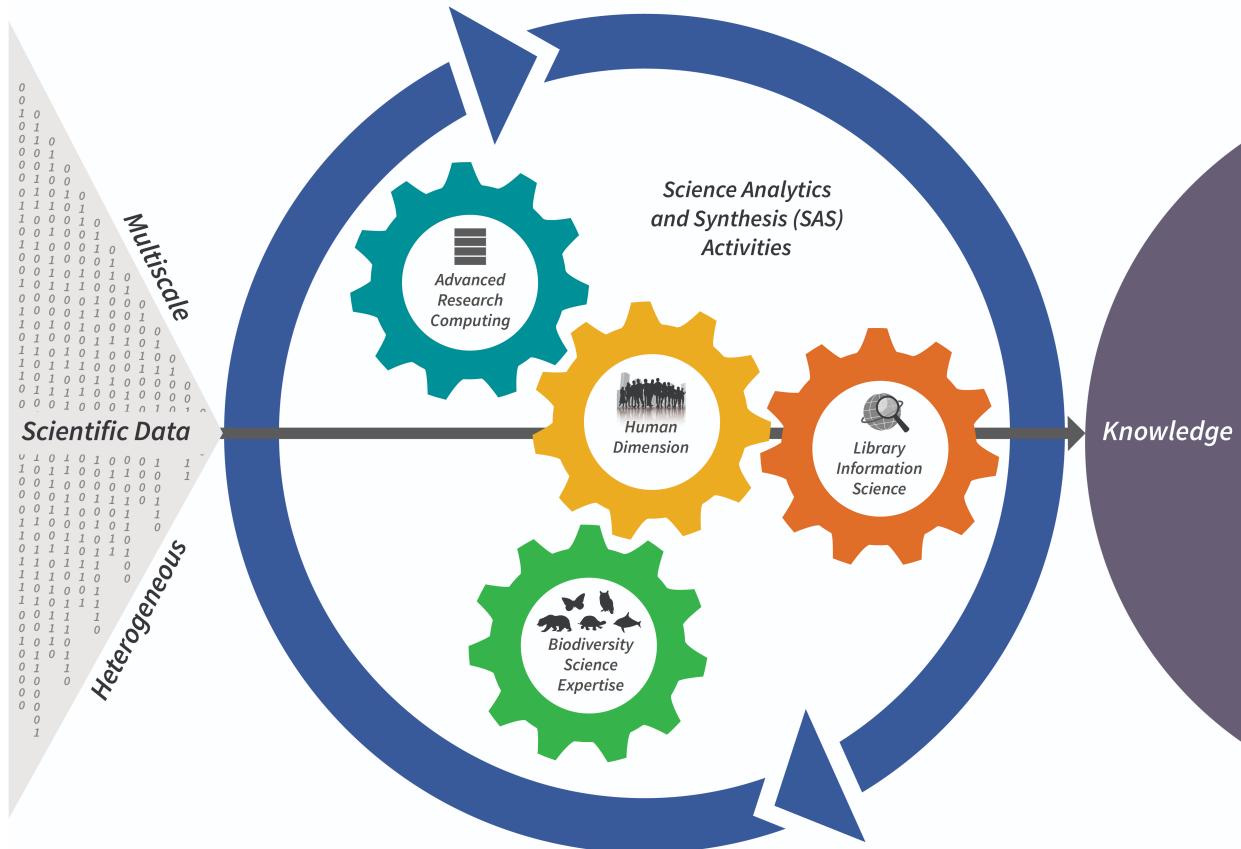
# USGS Science Analytics & Synthesis

**Vision:** Synthesize and deliver Earth system data and information.

**Mission:** Accelerate research and decisionmaking through data science, information delivery, advanced computing, and biodiversity analytics.

# Data Science

*Converting Data into Actionable Knowledge*



# Data and Science Products at the USGS:

F.indable

A.ccessible

I.nteroperable

R.eusable

# USGS Science Analytics & Synthesis: Integrated Science Products



## Gap Analysis Project

### Home

**How well are we protecting common plants and animals?** Gap Analysis is the science of answering this question. Developing the data and tools to support that science is the mission of the Gap Analysis Project (GAP). Check out our SCIENCE section on the left to begin exploring GAP products: [Species](#), [Land Cover](#), and [Protected Areas Database of the United States](#).

#### Species Data



GAP has delineated species range and predicted distribution maps for more than 2,000 species that occur within the continental U.S. as well as Alaska, Hawaii, and Puerto Rico.

[Download Data](#)

#### Land Cover Data



The GAP-4 AND FIRE National Terrestrial Ecosystems data set includes detailed vegetation and land cover patterns for the continental United States. This data set incorporates the Ecological System classification system developed by NatureServe.

[Download Data](#)

#### Protected Areas Data

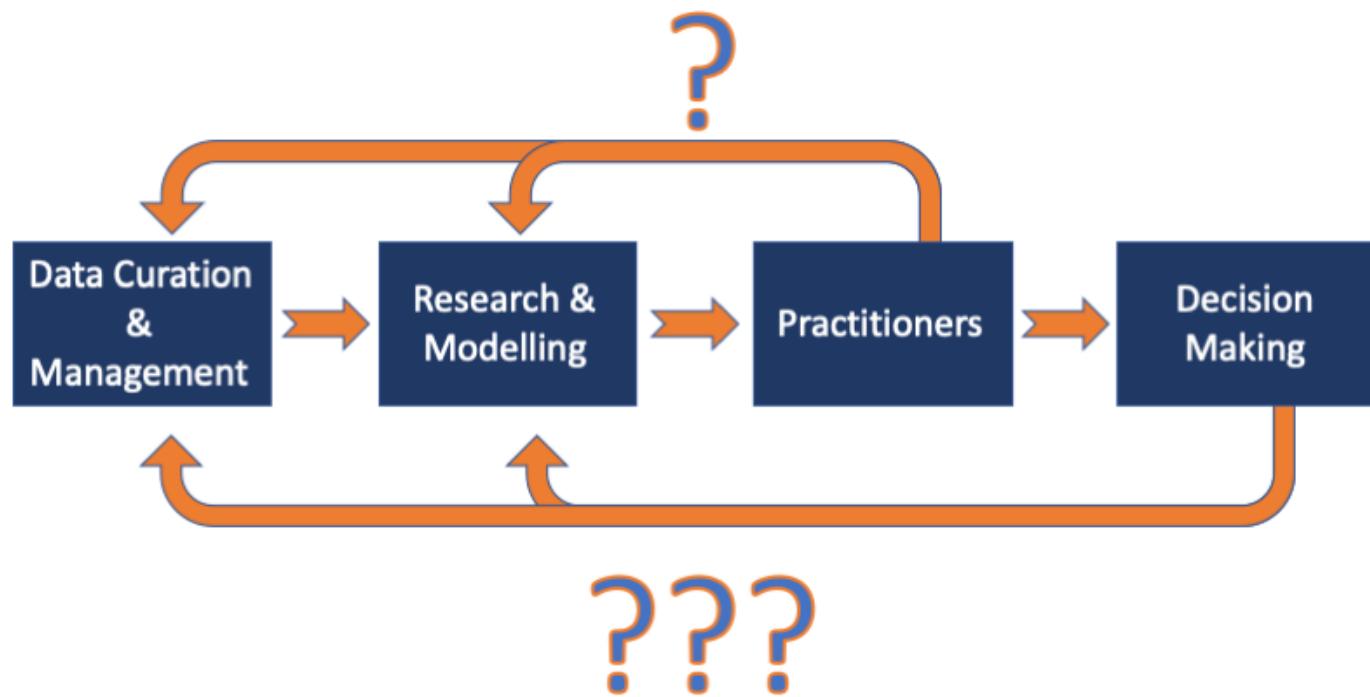


PAD-US is America's official national inventory of U.S. terrestrial and marine protected areas (List of National Geospatial Data Assets).

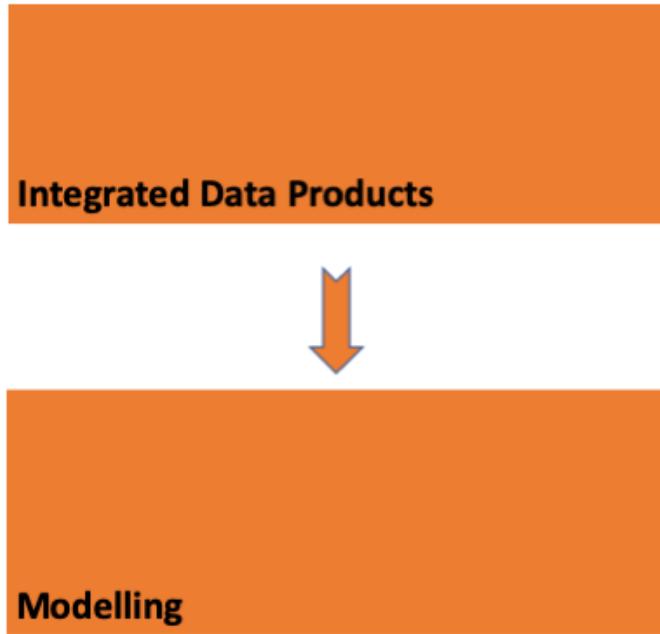
[Download Data](#)



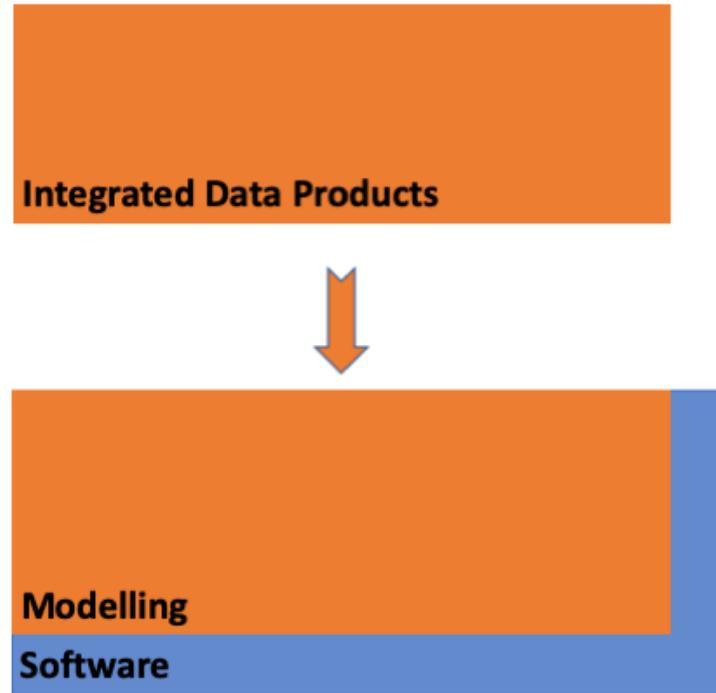
# Project Overview



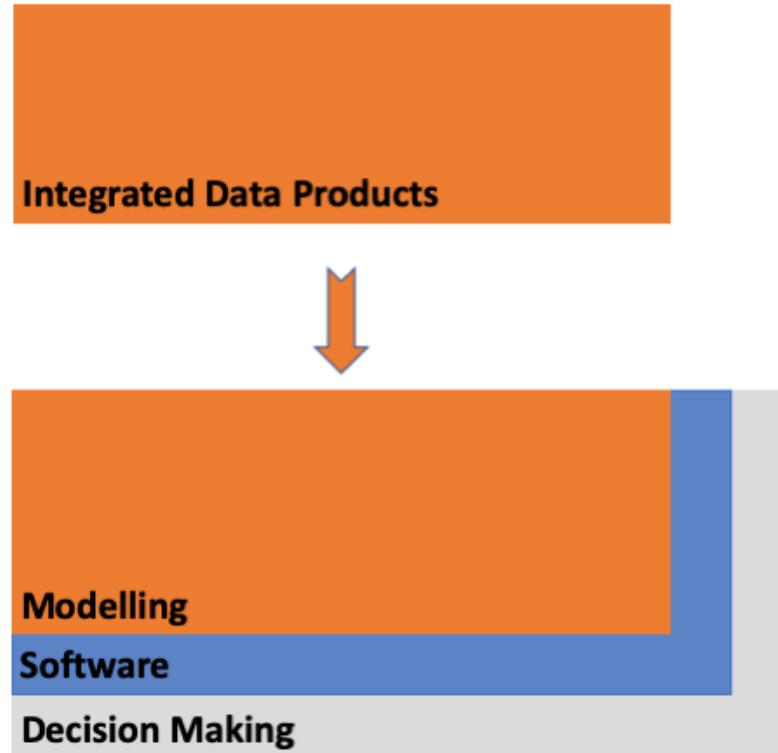
# Project Overview



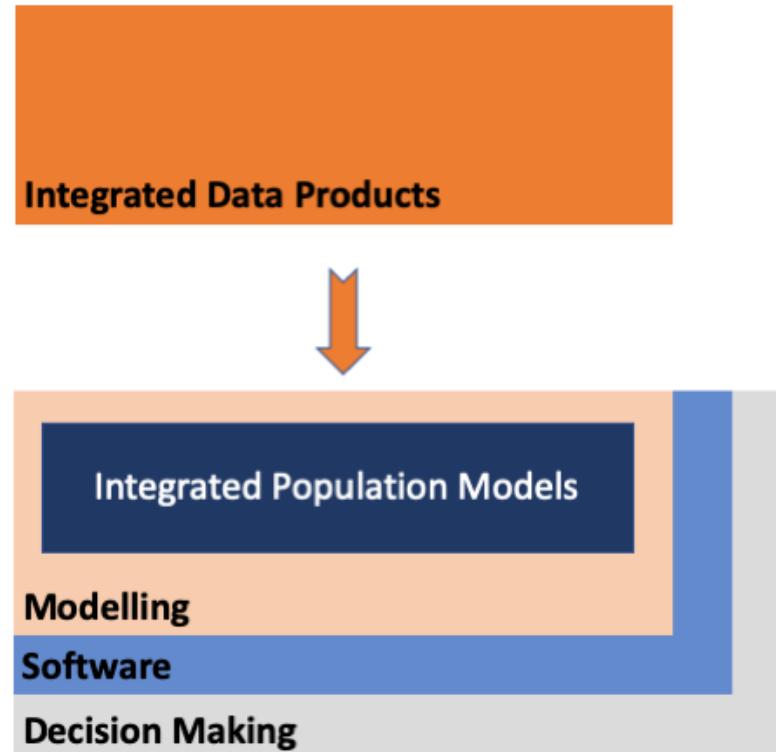
# Project Overview



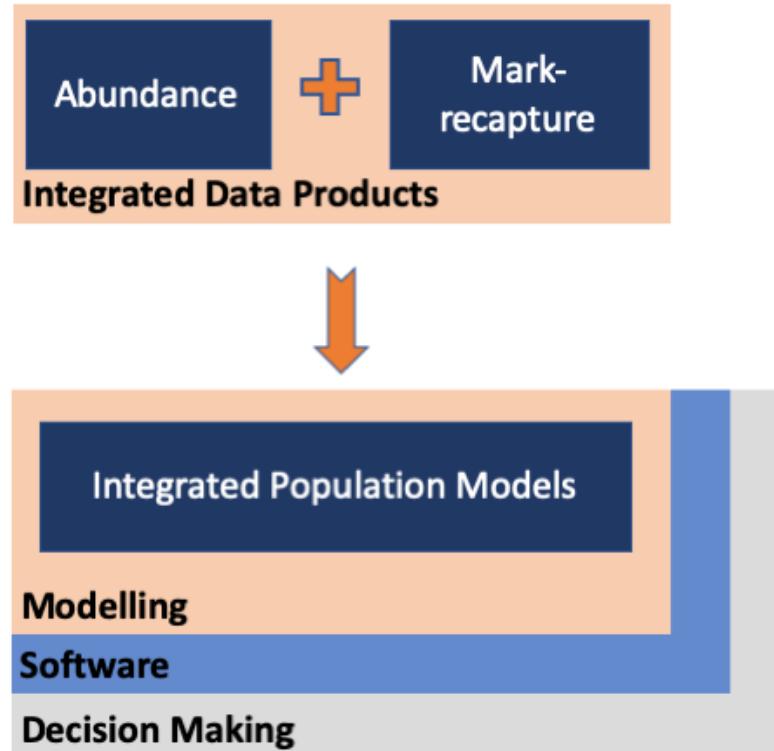
# Project Overview



# Project Overview



# Project Overview



1. Data Integration

2. Integrated Population Models

3. Software

4. End-user Needs

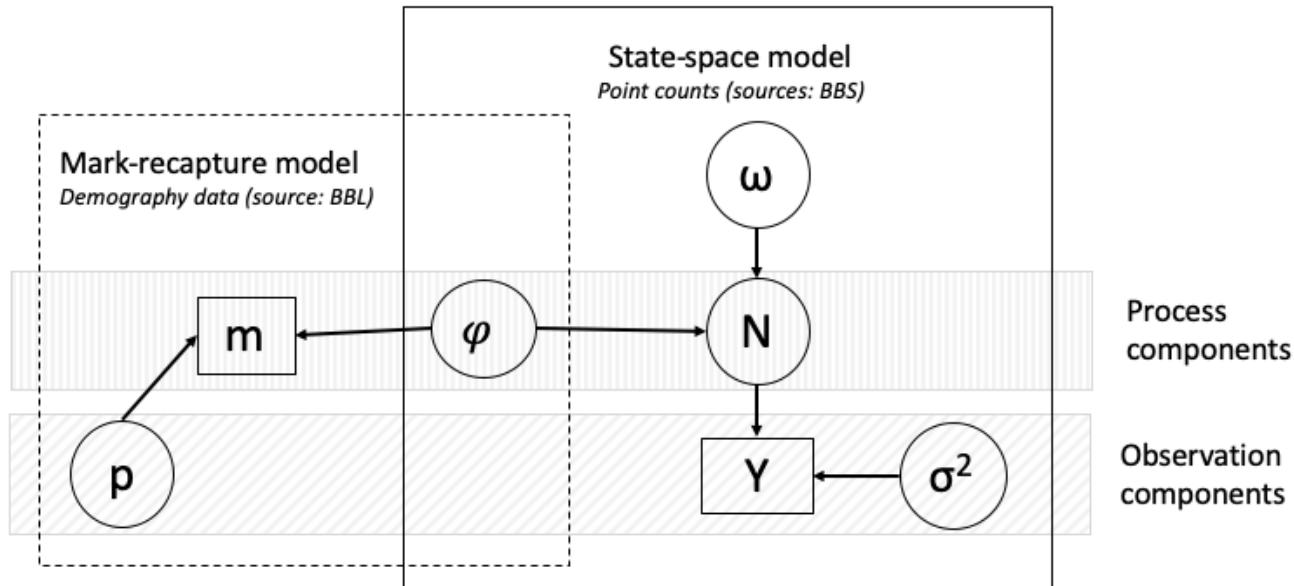
1. Data Integration

2. Integrated Population Models

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# Integrated Population Models



# Abundance Data: USGS Breeding Bird Survey



Barbara Dowell (U.S. Geological Survey)

Distribution

Status

Trends

# Encounter Data: USGS Bird Banding Lab



Demographic  
parameters

Distribution

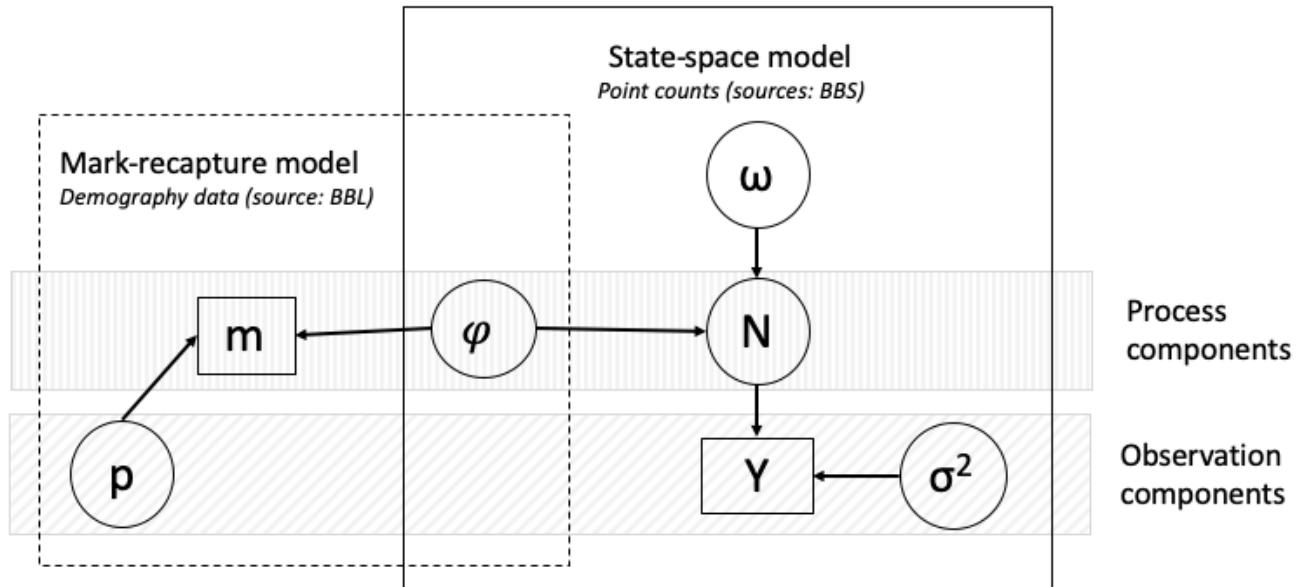
1. Data Integration

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# Integrated Population Models



1. Data Integration

2. Integrated Population Models

3. Software

4. End-user Needs

# Software Goals

## Short-term

1. Munge, integrate BBS and BBL data
2. Integrate at multiple spatial scales
3. Place-based, limited extents
4. Off-line

## Long-term

5. Incorporate land use/land cover
6. Run integrated population models
7. Broad-scale (U.S., Canada)
8. On-line

1. Data Integration

2. Integrated Population Models

3. Software

4. End-user Needs

# Identify and Incorporate End-user Needs

## Challenges

1. Who are the end-users? 2. Who the data and science feasibly serve? 3 Iterative feedback to identify end-user
  - **needs**
  - **actual use**
2. Producing adaptable products

# Identify and Incorporate End-user Needs

## Approach

1. Working groups
  - data curators/managers
  - modellers/analysts
  - back-end developers
  - practitioners
  - decision makers
2. Iterative feedback

# Anticipated Products

## 1. Software

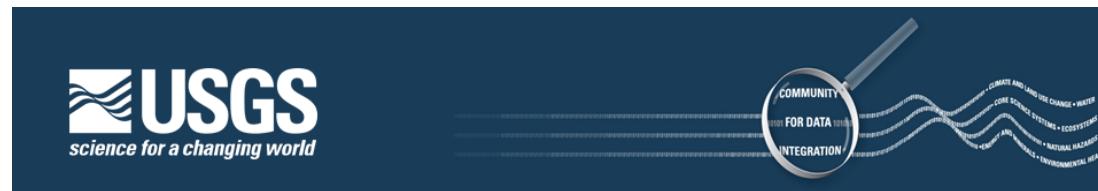
- Data integration
- Integrated population models2. **Roadmap**
- Integration for population models
- Identify and incorporate end-users

# Collaborators

- Tristan Wellman
- Karen Jenni
- Sky Bristol
- Steve Aulenbach
- Ken Bagstad
- Andy Royle
- Kevin Pope
- Drew Tyre
- Lyndsie Wszola
- Gabby Palomo
- Nat Price
- Brian Fath
- Christie Bahlai
- Eric Pedersen
- Easton White
- Xavier Benito

# Some Relevant Plugs

<https://www.usgs.gov/centers/cdi>



- ▼ Collaboration Areas
  - Artificial Intelligence/Machine Learning
  - CDI Collaboration Areas 101
  - Citizen-Centered Innovation Community
  - Communication Working Group (CWG)
  - Connected Devices Working Group (CDWG)
  - Data Management Working Group
    - Data Science at the USGS
  - Earth-Science Themes Working Group
    - General Project Workspaces
    - Interagency Collaborative for Environmental Modeling and Monitoring
  - Semantic Web Working Group
  - Software Development Cluster
  - Technology Stack Working Group (TSWG)
  - USGS DevOps Working Group

# Funding/Opportunities: Grad Students

## Summer Program in Austria: Systems Analysis



International Institute for  
Applied Systems Analysis  
IIASA [www.iiasa.ac.at](http://www.iiasa.ac.at)

### Application Information

**Registrations for the 2020 program are open from 7 Oct 2019 - 11 Jan 2020.**



#### Who should apply?

The program is designed for PhD students (ideally about 2 years prior to receiving their PhD) working on a topic compatible with ongoing research at IIASA and a wish to explore the policy implications of their work.

Participants will be working under the direct supervision



#### CONTACT DETAILS

Tanja Huber

YSSP Coordinator & Team Leader  
Young Scientists Summer Program  
T +43(0) 2236 807 344  
huber@iiasa.ac.at

# Funding/Opportunities: All Students!

## USGS Pathways

- For undergraduate & graduate students
- Leads to permanent employment

### Pathways Internship Program

#### **DOI - USGS Pathways Internship Program**

*Effective 07/10/2012*

The USGS Internship Program is designed to provide students enrolled in a wide variety of educational institutions, from high school to graduate level, with opportunities to work in agencies and explore Federal careers while still in school and getting paid for the work performed.

### Contacts

[USGS Pathways Program](#)

[USGS Pathways Program](#)

Email: [pathways@usgs.gov](mailto:pathways@usgs.gov)

# Funding/Opportunities: Grad Students

## Summer Program in Austria: Systems Analysis



International Institute for  
Applied Systems Analysis  
IIASA [www.iiasa.ac.at](http://www.iiasa.ac.at)

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# Funding/Opportunities: Postdocs

[usgs.gov/centers/mendenhall/](http://usgs.gov/centers/mendenhall/)

- For senior graduate students and post-docs



## Mendenhall Research Fellowship Program

# Theoretical, Quantitative Ecology Ph.D. Assistantship

Tenhumberg Lab, University of Nebraska-Lincoln

## PhD Candidate Theoretical or Quantitative Ecology – Nebraska

Agency	University of Nebraska-Lincoln
Location	Lincoln NE
Job Category	Graduate Assistantships
Salary	see <a href="https://biosci.unl.edu/financial-aid-incoming-graduate-students">https://biosci.unl.edu/financial-aid-incoming-graduate-students</a>
Start Date	08/01/2020
Last Date to Apply	12/01/2019