Separating Signal from Noise: Using Citizen Science for Regulatory Decision Making

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USA: >75% Unprotected
Source: USGS
USA: >50% of at-risk spp are > 90% unprotected

Source: USGS
Environmental Regulation

Examples relevant to at-risk species

• Permit and license applications
• Infrastructure siting
• Extractive activities
• Pesticide use
Natural Heritage Program Review

- Project boundaries
- Occurrences of at-risk species
Element Occurrences

[Map showing the distribution of various elements such as Amphibians, Birds, Plants, Mammals, and Reptiles in a coastal region. The map is credited to NatureServe and its Natural Heritage member programs, 2014.]
US Element Occurrences

Point Locations for All Tracked Species
NatureServe and its member programs, July 2011
This fish helped sink a proposed multi-billion dollar development project in New York City.
Use of Citizen Science Data in Regulatory Review

NatureServe Network survey: Sept 2018
Citizen Science Schemes Used

NatureServe Network survey: Sept 2018
New York Natural Heritage Program Example

- Conservation Status
- Element Occurrences
## Effect of eBird Data on Ranking Factors

<table>
<thead>
<tr>
<th>Species</th>
<th>Pre eBird</th>
<th>Post eBird</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range Extent (km²)</td>
<td>Area of Occupancy (km²)</td>
</tr>
<tr>
<td>Black Tern</td>
<td>46,147</td>
<td>820</td>
</tr>
<tr>
<td>Harlequin Duck</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Red-headed Woodpecker</td>
<td>142,301</td>
<td>412</td>
</tr>
<tr>
<td>Seaside Sparrow</td>
<td>3,854</td>
<td>124</td>
</tr>
<tr>
<td>Upland Sandpiper</td>
<td>156,026</td>
<td>1,060</td>
</tr>
<tr>
<td>Yellow-breasted Chat</td>
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</tr>
</tbody>
</table>
New Element Occurrences from eBird Data
New York State:

• Reviewed **27,605** eBird observations for these 6 priority birds

• Added **27** element occurrence records (19% increase)
Challenges in Extracting Signal from Noise

• Large number of records
• Most records not useful:
  o Observer reliability
  o Locational uncertainty
  o Limited ancillary data
  o Spatial bias
Data to Decision

Field Observation → Data Entry → Data Product

Citizen Scientist

Citizen Scientist Scheme

API

Biodiversity Database

Quality Control

Natural Heritage Program or Analog

AI?

Selection of Records of Interest

Species identification
Habitat appropriateness
Locational accuracy

Species
Year range
Seasonal date range
Geographic region
Survey protocol
Locational precision
Observers
Two Approaches

• Harvest from mass schemes, automate as possible

- eBird
- iNaturalist
- HerpMapper
- BugGuide
- Odonata Central

• Establish bespoke schemes for targeted species

- Long-billed Curlew Survey 1.1
- Oregon Biodiversity Information Center
- Form for LBCU Surveys
- Rare Species of Oregon
Citizen science data are already influencing regulatory decisions...

... we need to get better at extracting the signal from the noise