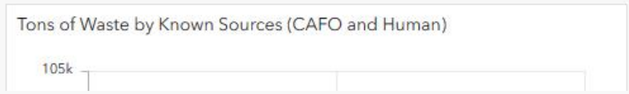

MISSOURI RIVER
BIRD OBSERVATORY

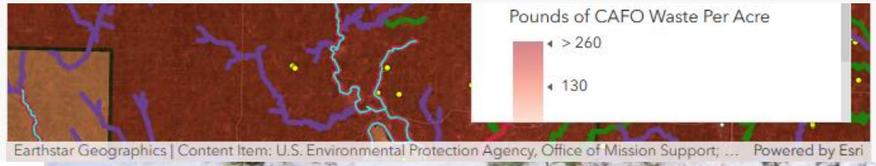
Ethan Duke

MRBO - Co-Founder / Co- Director

Originally from Western NY

Studied birds in:
New York
Michigan
Tennessee
Arkansas
Wyoming
Missouri





ACKNOWLEDGEMENTS

People that see the vision for more effective conservation through tech

A HUGE LIST OF MISSOURI PARTNERS

MRBO SUPPORTERS, DONORS, AND BOARD

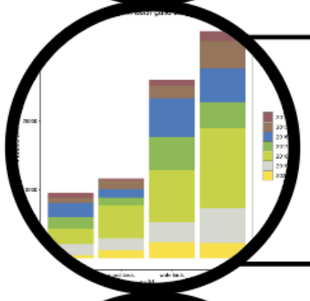
DANA RIPPER

THE BIRDS!

Our Mission

Conservation

To contribute to the conservation of Missouri's migratory and resident birds through scientific research, education, and conservation policy advocacy.



Science

To gather information about avian communities and habitat use that will assist state, federal, and private natural resource managers in their efforts to implement conservation programs.

Education & Outreach

To provide opportunities for people of all ages to learn about species and their habitats.

Advocacy

To advocate for sound, science-based conservation policies that benefit birds, other wildlife and environmental quality.

SOLUTIONS TO MATCH THE CHALLENGES

Acres Lost

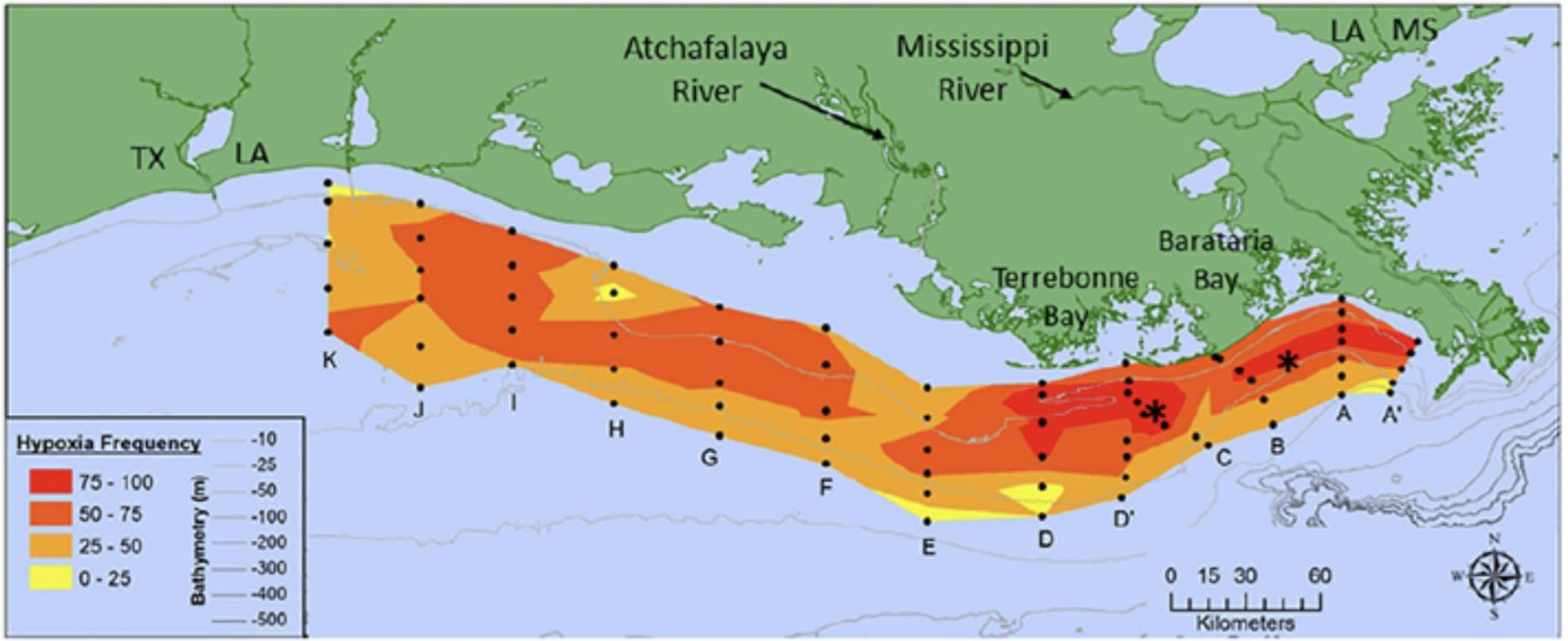
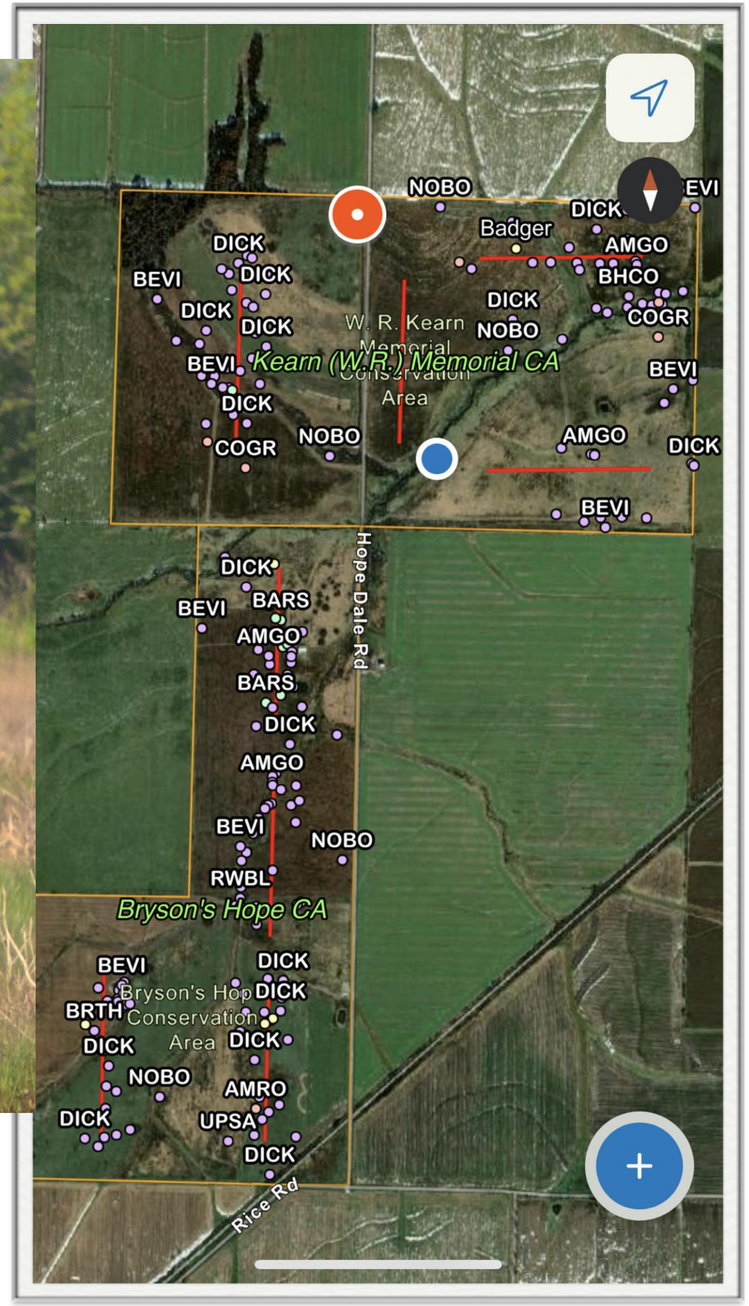


FIG. 1. The frequency of bottom-water hypoxia from shelf-wide hypoxia mapping (1985–2014) (updated from Rabalais et al. (2007b); frequency is determined from stations for which there are data for at least half of all cruises. Asterisks (*) indicate locations of near-bottom oxygen meters; transects C and F identified. Data source: N. N. Rabalais and R. E. Turner.

“A Look Into The Future”

Northern Bobwhite Quail Photo by Mark Ramsey



Modern Data Collection and workflows

MISSOURI RIVER • BIRD OBSERVATORY •

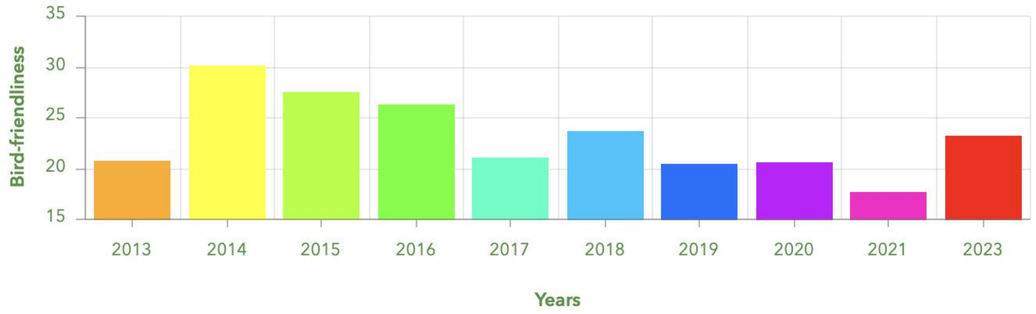
SOLUTIONS TO MATCH THE CHALLENGES

Bird-friendliness Scores on Public, Missouri Prairie Foundation, and The Nature Conservancy Lands

Combined grassland-obligate species densities, conservation concern values, and diversity metrics.

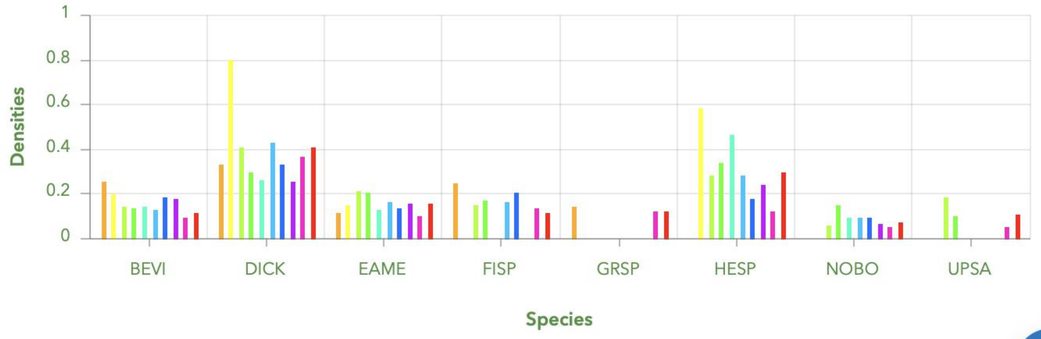
bitly

Bird-friendliness Scores by Year Since 2012: Best used for site-level, year-to-year comparisons.



Last update: 14 seconds ago

Grassland-obligate Species Densities: Densities are sums, so examine this data on site-level only.



Last update: 14 seconds ago

Grassland Bird Survey Results on Public Lands

as well as partner-owned lands such as the Missouri Prairie Foundation and The Nature Conservancy

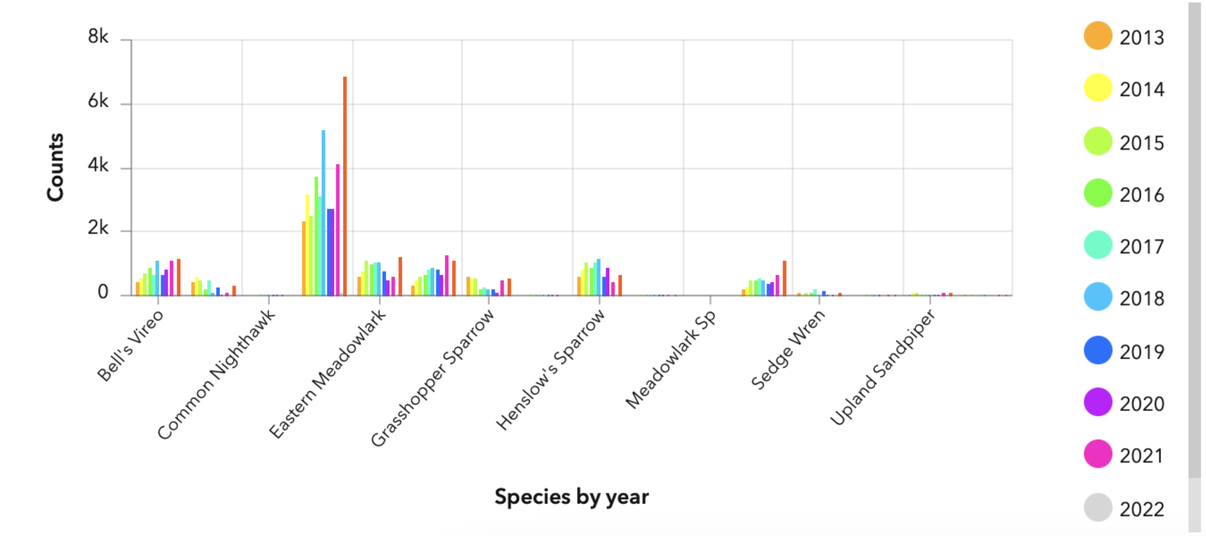
Grassland Birds on Public Lands 2023

Counts of bird species detected in 2023

Species	Counts
	7
Acadian Flycatcher	16
Alder Flycatcher	12
American Bittern	1
American Coot	1
Total	**23,530**

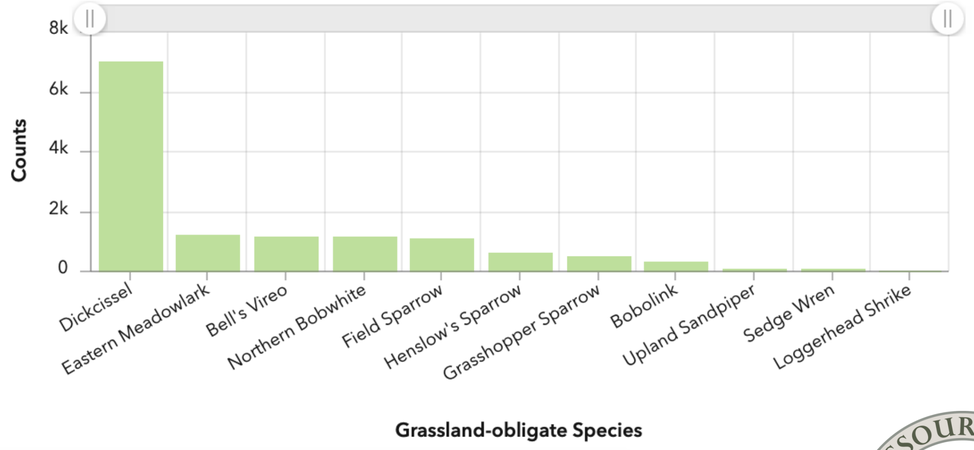
Last update: 14 seconds ago

Counts of grassland-obligates by year since 2012



Last update: 14 seconds ago

Grassland-obligate species detected in 2023

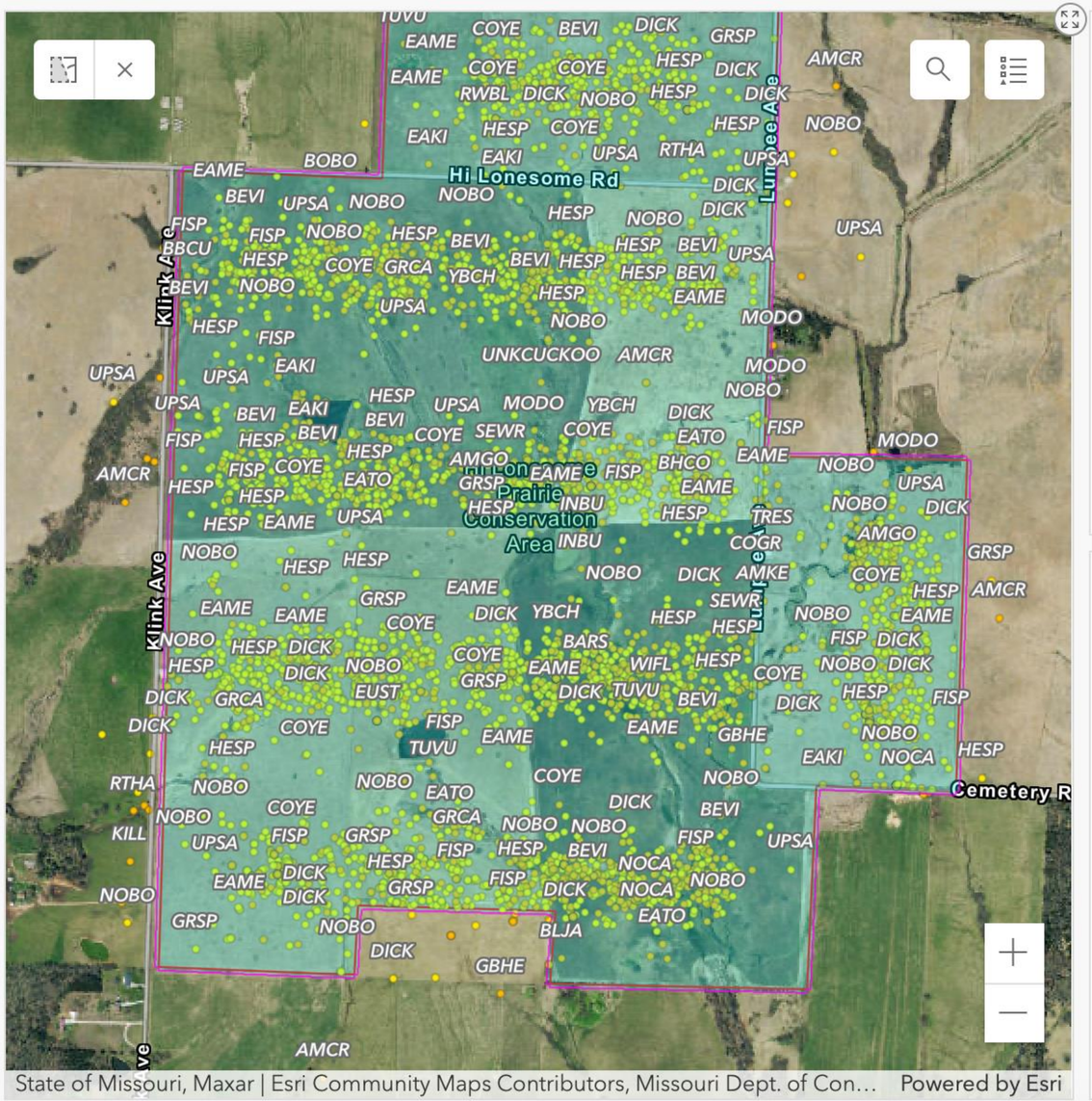


Last update: 14 seconds ago

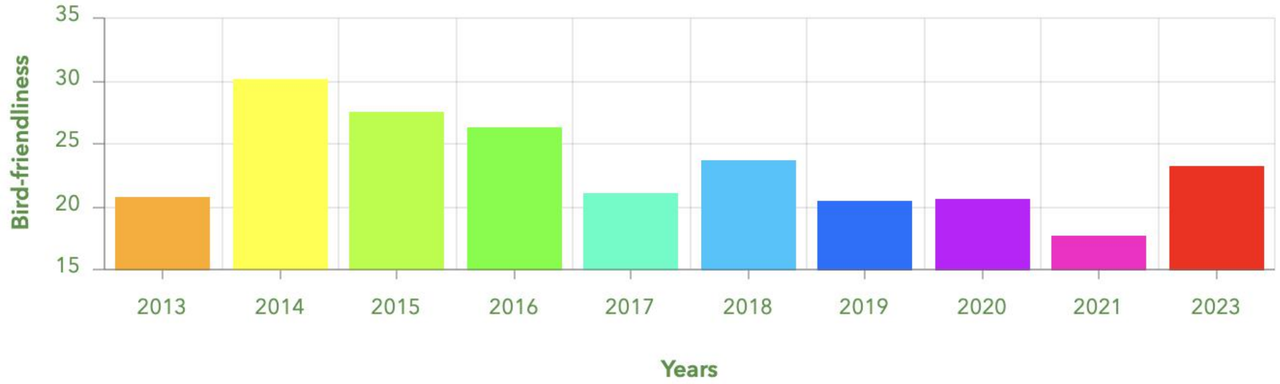
Automated deliverables

Bird-friendliness Scores on Public, Missouri Prairie Foundation, and The Nature Conservancy Lands

Combined grassland-obligate species densities, conservation concern values, and diversity metrics.

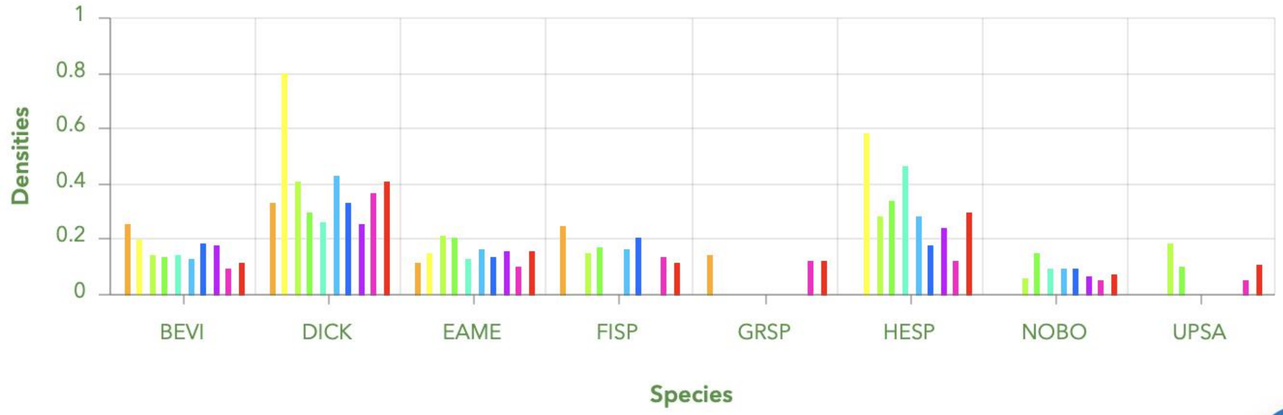


Bird-friendliness Scores by Year Since 2012: Best used for site-level, year-to-year comparisons.



Last update: 14 seconds ago

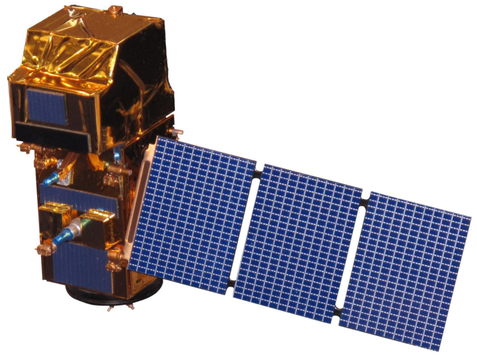
Grassland-obligate Species Densities: Densities are sums, so examine this data on site-level only.



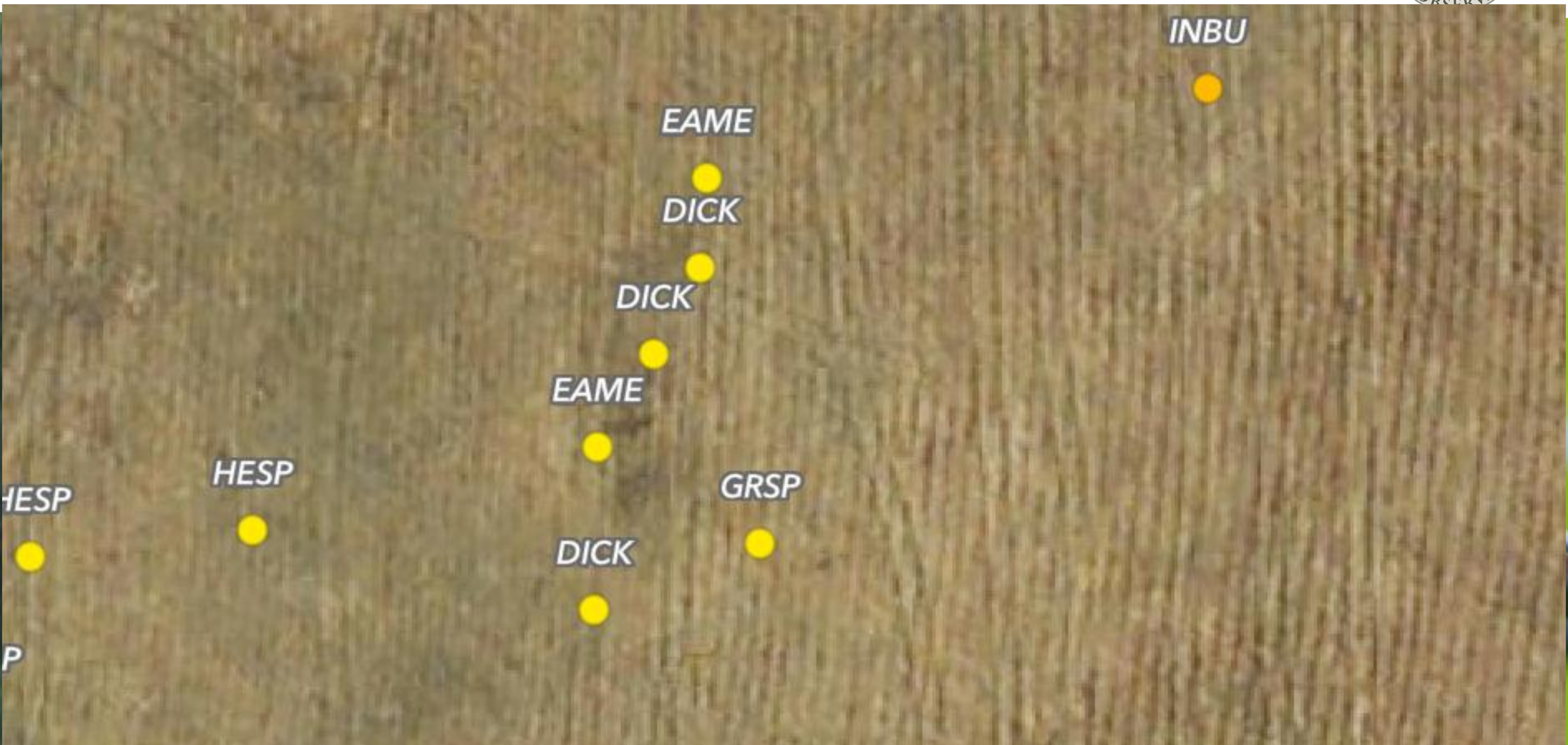
Last update: 14 seconds ago

Bird-friendliness Dashboard

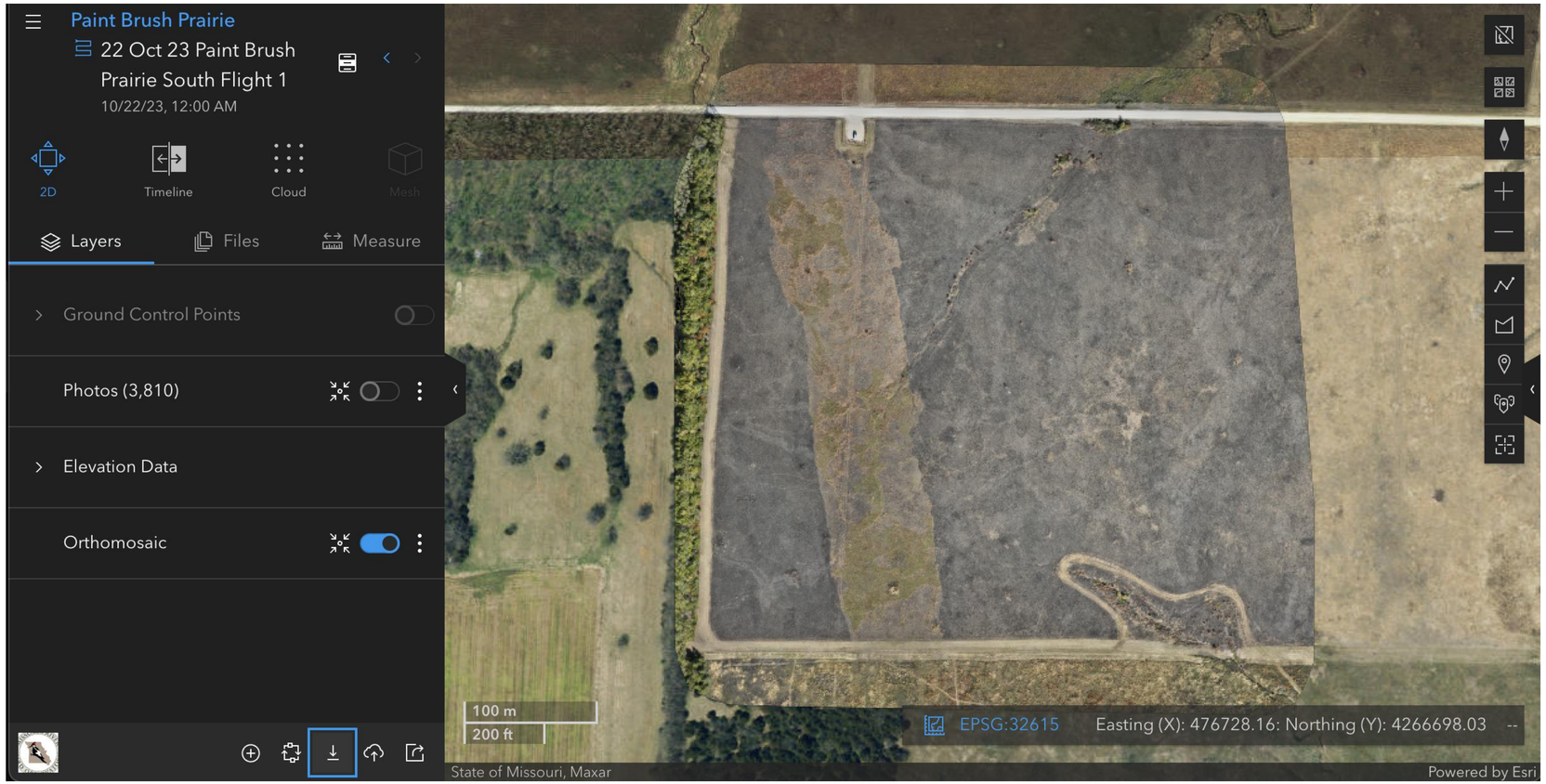
REMOTE SENSING: FUTURE (AND CURRENT) POSSIBILITIES FOR GRASSLAND CONSERVATION



SAVING TIME AND MONEY….. AND HAVING BETTER DATA



STANDARD DELIVERABLES



RASTER DATA
Orthomosaic (.tiff)
Orthomosaic preview (.png)
DSM (.tiff)
DTM (.tiff)
Multispectral Ortho (.tiff)

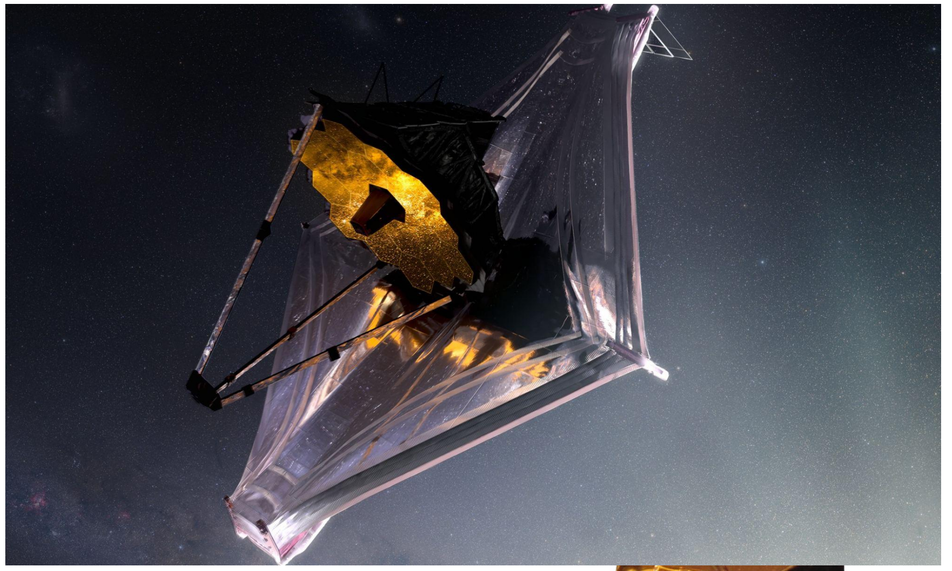
CONTOURS
Contour (.shp.zip) -DTM
Contour (.dxf) -DTM
Contour (.shp.zip) -DSM
Contour (.dxf) -DSM

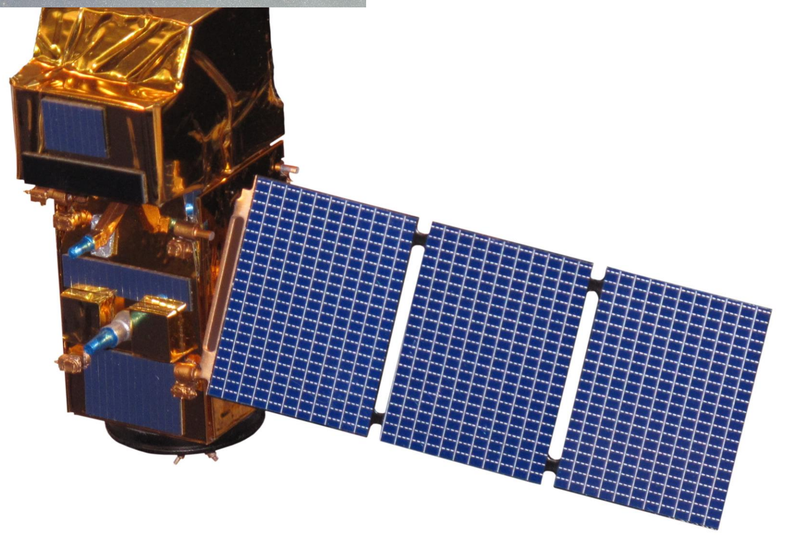
POINT CLOUD
Point Cloud (.las.zip)
Point Cloud (.laz)

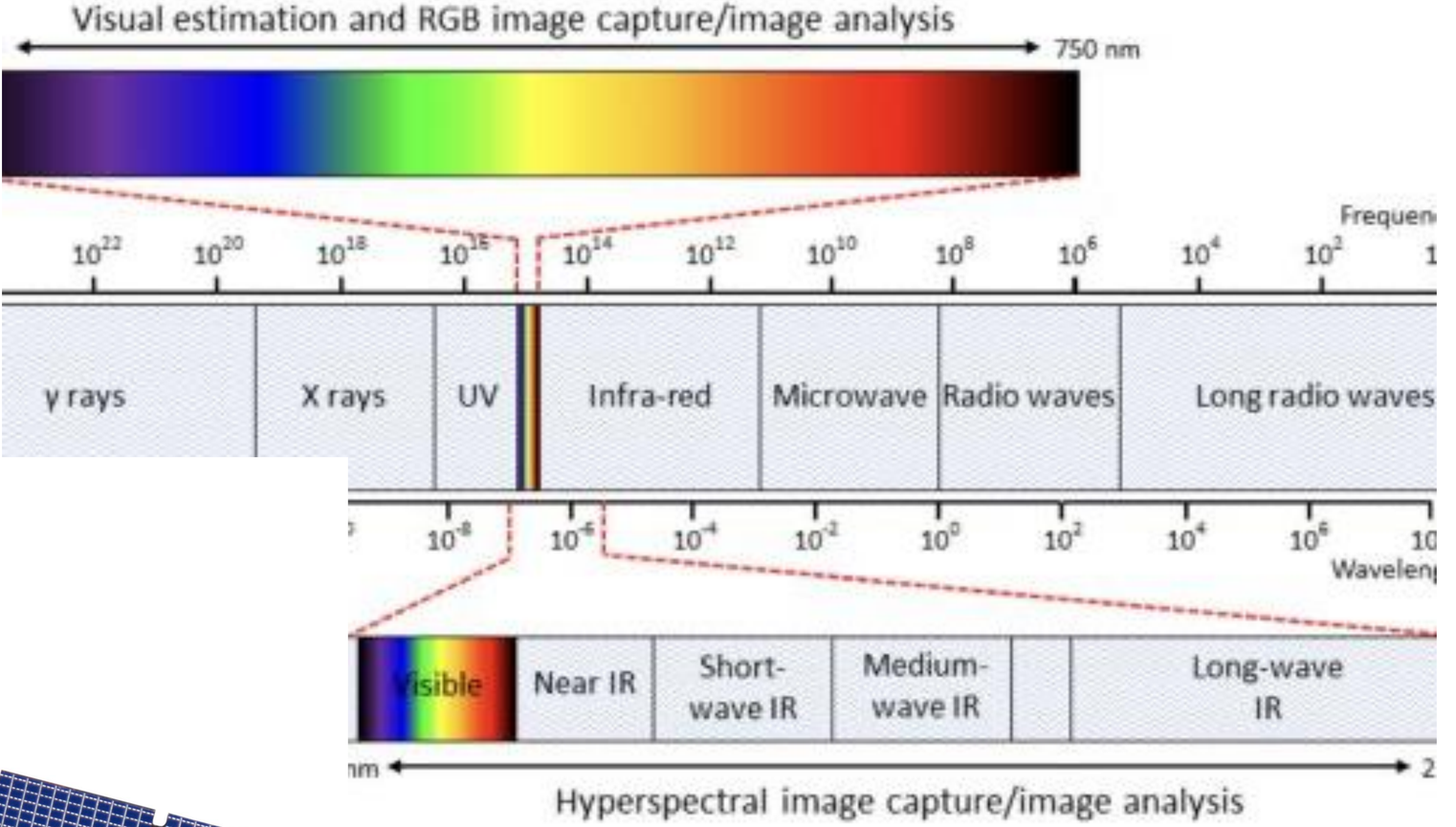
PROCESSING REPORT
Processing Report (.pdf)

All Photos
Photos (.zip)

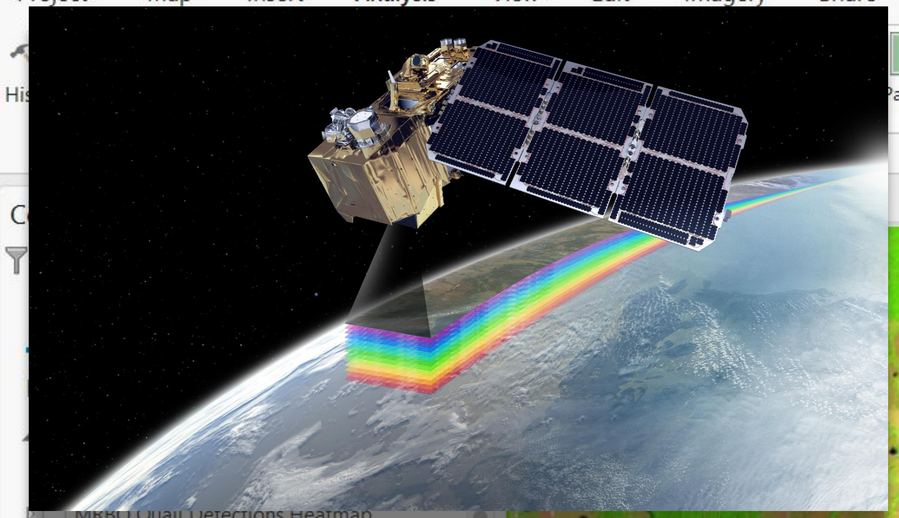
NOT SO STANDARD DELIVERABLES







- Multispectral



Quail | Command Search (Alt+Q) | Ethan - Missouri River Bird Observatory

Project | Map | Insert | **Analysis** | View | Edit | Imagery | Share | Time | Image Service Layer | Data | Linear Referencing

Pairwise Clip | Optimized Hot Spot Analysis

Feature Analysis | Raster Analysis — Portal

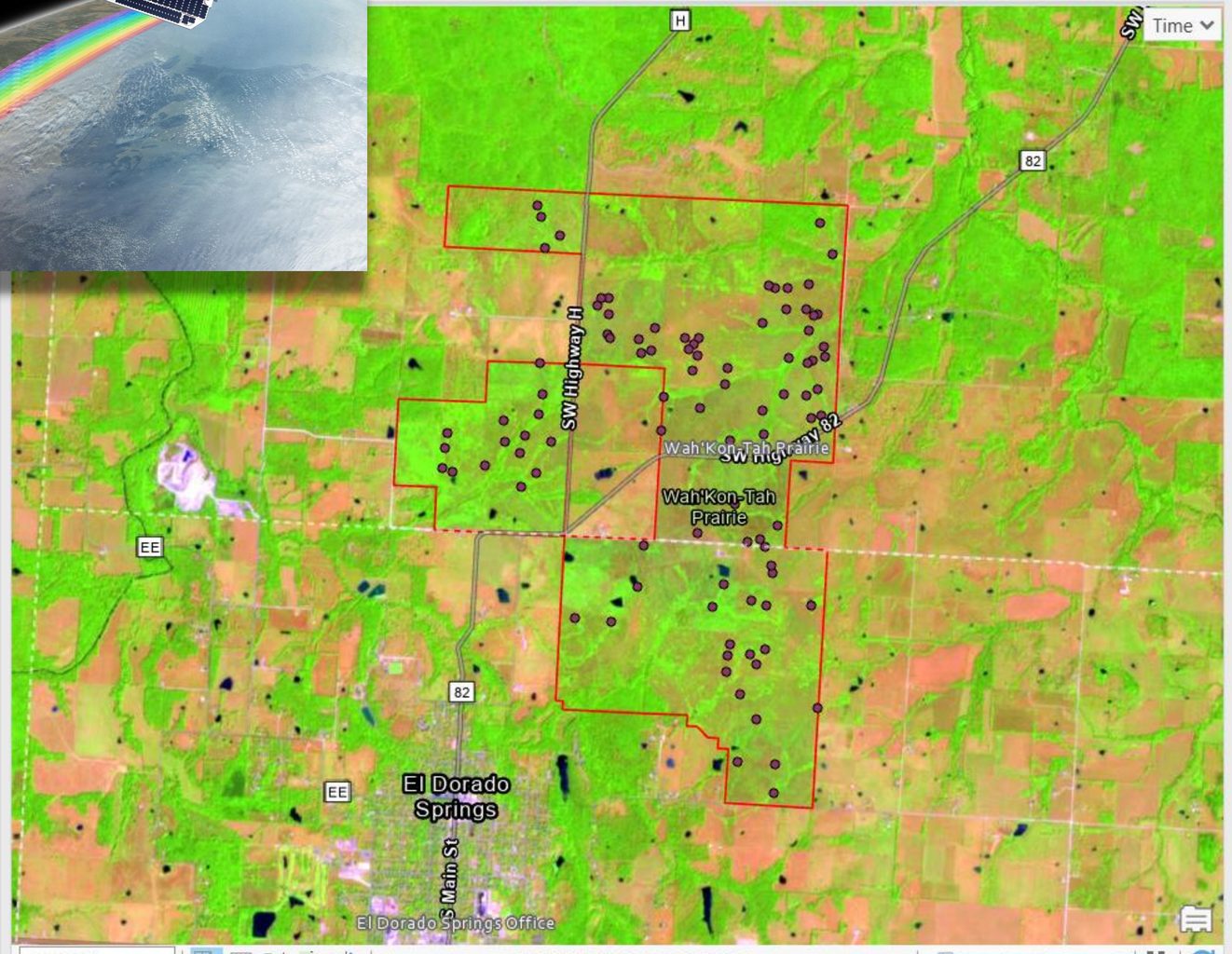
Data Engineering | Suitability Modeler | Visibility Analysis | Exploratory 3D Analysis | Network Analysis | Geostatistical Wizard | Business Analysis | Data Interop — Workflows

Raster Functions | Function Editor — Raster

MRBO Quail Detections Heatmap
- [x] MRBO Quail Detections
- [ ] MRBO Quail Detections
- [x] Priority_Geographies
- [x] MDC Lands
- [ ] Tiered_Approach_to_Natural_Community_an
- [ ] NAIPClipWKT
- [ ] easements\imagery2021
- [ ] USA NAIP Imagery: NDVI
- [ ] USA NAIP Imagery: Natural Color
- [ ] Soil Depth, root depth of all components
- [ ] USA NLCD Land Cover
- [x] Sentinel-2 Views

RGB
- Red: B11_ShortWaveInfraRed
- Green: B8_NearInfraRed
- Blue: B2_Blue

- [ ] Sentinel layer - April 26, 2022 - Vegetation I
- [x] World Imagery



1:55,122 | 93.9412849°W 37.8837674°N | Selected Features: 0

Catalog

Project | **Portal** | Favorites

Living Atlas

sentinel2

Search Results

- Sentinel-2 Views
- Sentinel-2 10m Land Use/Land Cover Time Series
- Sentinel-2 Level-2A
- Sentinel-2 10m Land Use/Land Cover Change from 2018 to 2021
- India: Sentinel-2 10m Land Use/Land Cover 2021
- Tratamiento de imágenes Sentinel-2 con ArcGIS
- Sentinel-5P - Nitrogen Dioxide (NO2)
- European Space Agency WorldCover 2020 Land Cover
- Sentinel-5P - Sulfur Dioxide (SO2)
- Cloud Mask Generation (Sentinel-2)
- Land Cover Classification (Sentinel-2)
- Corine Land Cover 2018
- Human Settlements Classification (Sentinel-2)
- Sentinel-2 10-Meter Land Use/Land Cover Time Series
- Well Pad Detection - Permian Basin
- Solar Photovoltaic Park Classification -

Find more items...

Catalog | Export Raster

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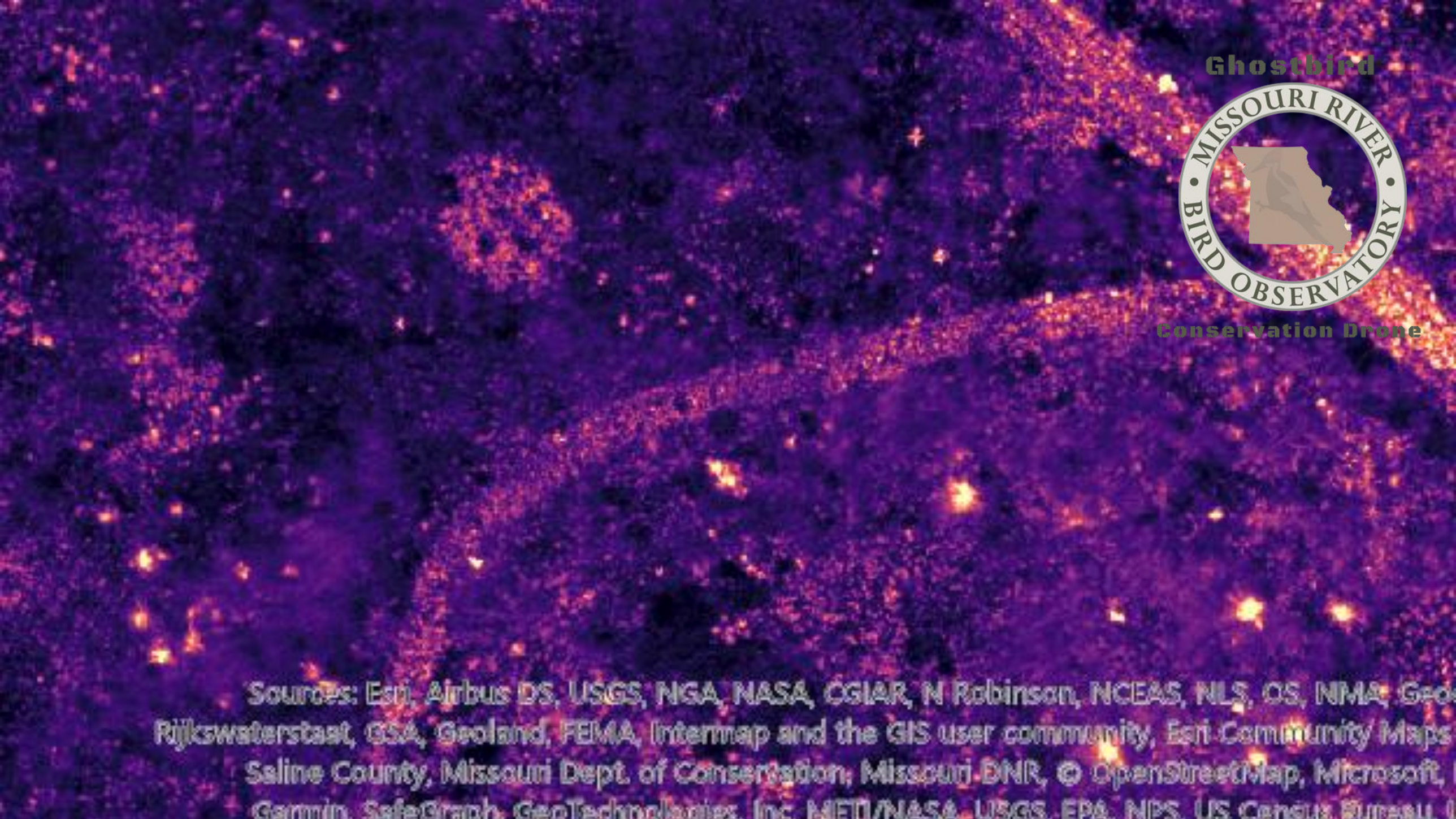
NOT SO STANDARD DELIVERABLES


MISSOURI RIVER
BIRD OBSERVATORY


Ghostbird
MISSOURI RIVER
BIRD OBSERVATORY
Conservation Drone
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geo
Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps
Saline County, Missouri Dept. of Conservation, Missouri DNR, © OpenStreetMap, Microsoft,
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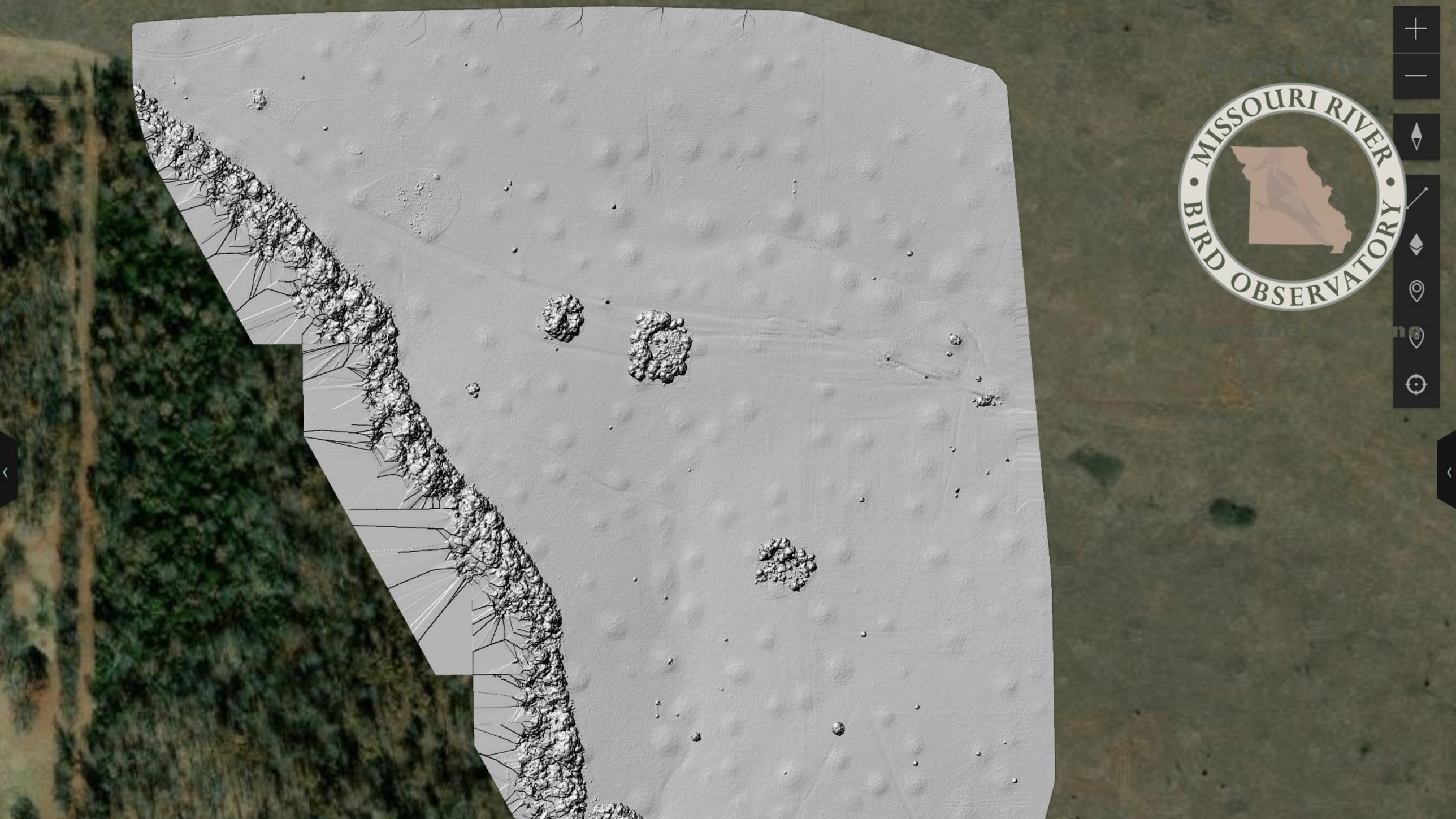
MISSOURI RIVER
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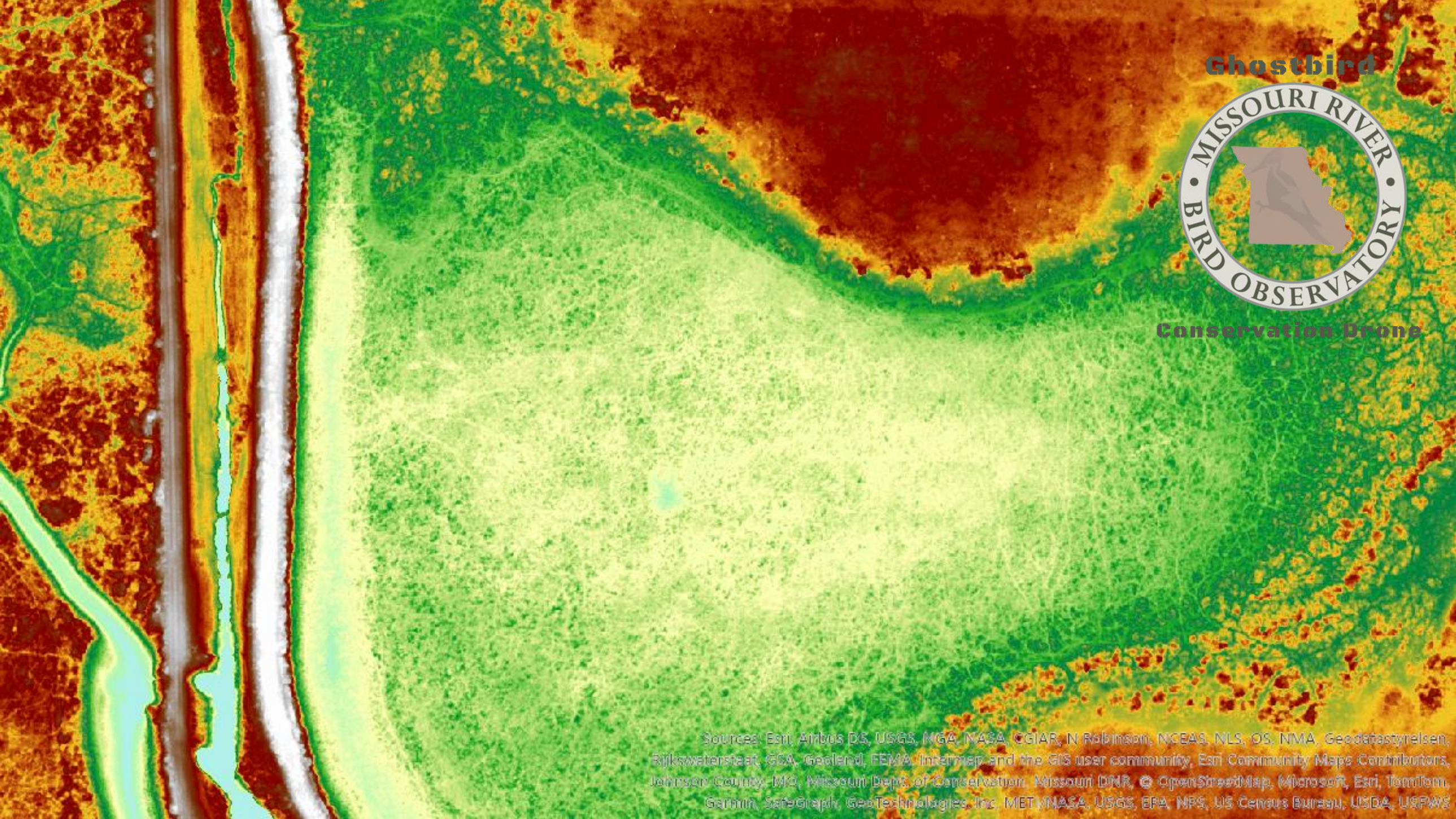
Ghostbird
MISSOURI RIVER
BIRD OBSERVATORY


Ghostbird
MISSOURI RIVER
BIRD OBSERVATORY
Conservation Drone
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Johnson County, MD, Missouri Dept. of Conservation, Missouri DNR, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Project Map Insert Analysis View Edit Imagery Share Ortho Mapping Raster Layer Data

New Workspace | Georeference | Raster Functions | Function Editor | Change Detection | Classification Wizard | Classification Tools | Point | Distance | Area | Results

rtho Mapping | Alignment | Mensuration

Segmentation

Group neighboring pixels together based on their similarity, to create objects that are then used in image classification.

Training Samples Manager

Create and manage training samples for supervised classification.

Label Objects for Deep Learning

Create and manage labeled objects for deep learning.

Classify

Categorize pixels into classes.

Contents

Search

Ortho Mapping

location

Flight Path

path

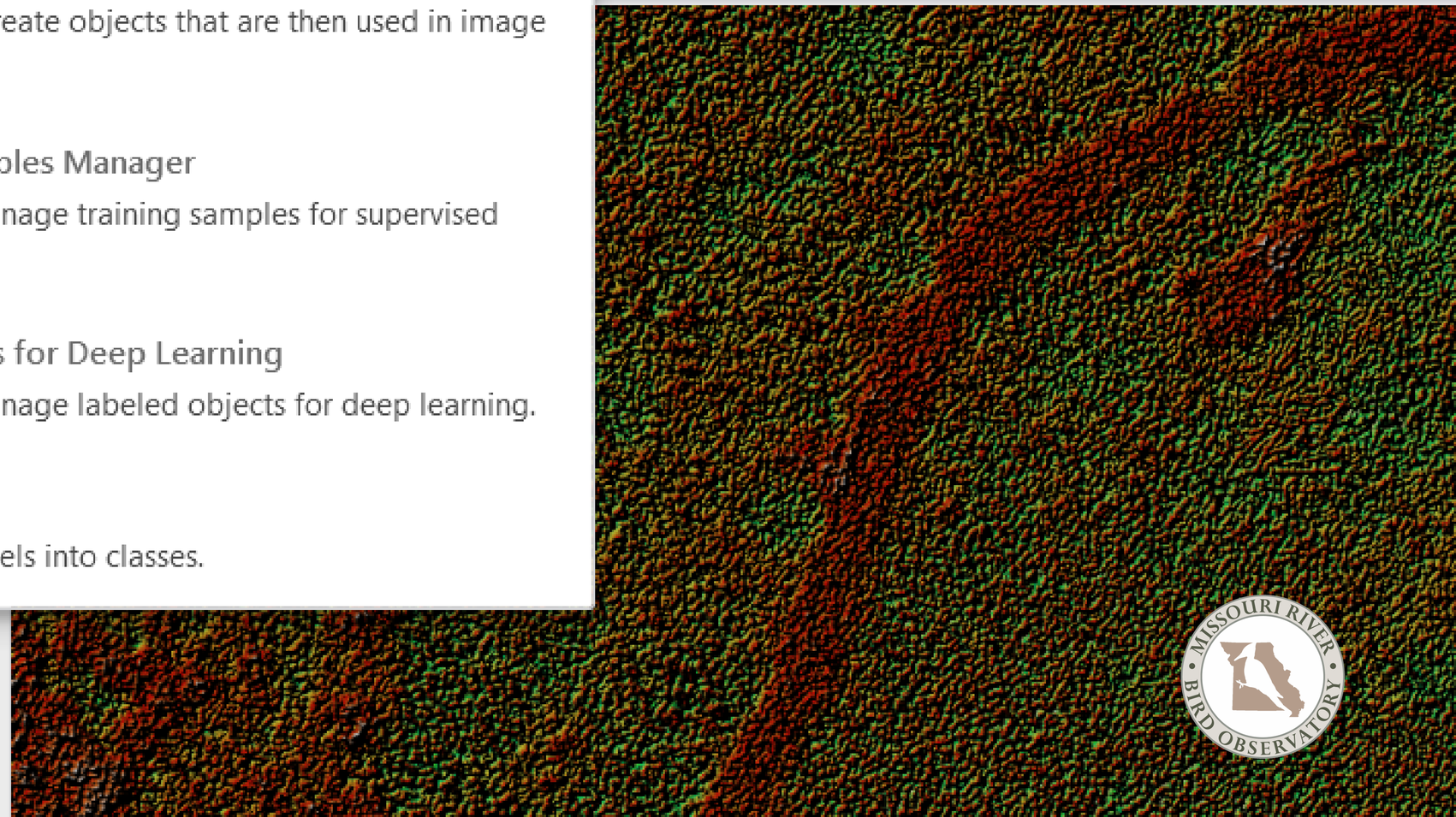
Source Data

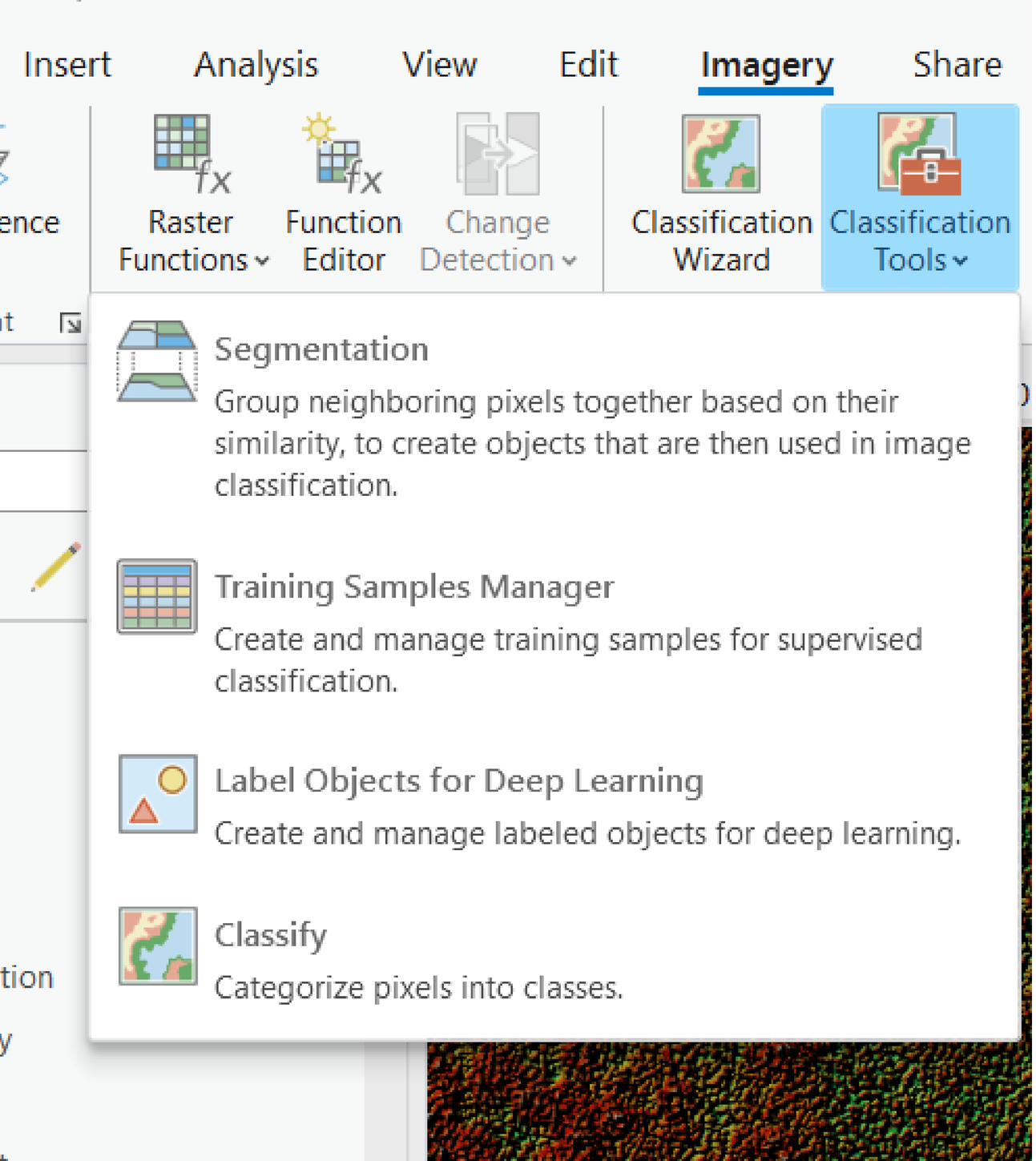
Image Collection

Boundary

Footprint

GB Acres Planting 23 June 22 70m





USES OF DEEP LEARNING

- Quantify Native Plant Area
- Quantify Invasive Species Area
- Quantify Pollen Availability

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OTHER NOT SO STANDARD DELIVERABLES

Remote Sensing in Ecology and Conservation
Open Access

Research Article | Open Access

Automating sandhill crane counts from nocturnal aerial imagery using deep learning

Emilio Luz-Ricca, Kyle Landolt, Bradley A. Pickens, Mark Koneff

First published: 18 October 2022 | https://doi.org/10.1002/rse2.301

Editor: Temuulen Sankey
Associate Editor: Francesco Rovero

SECTIONS

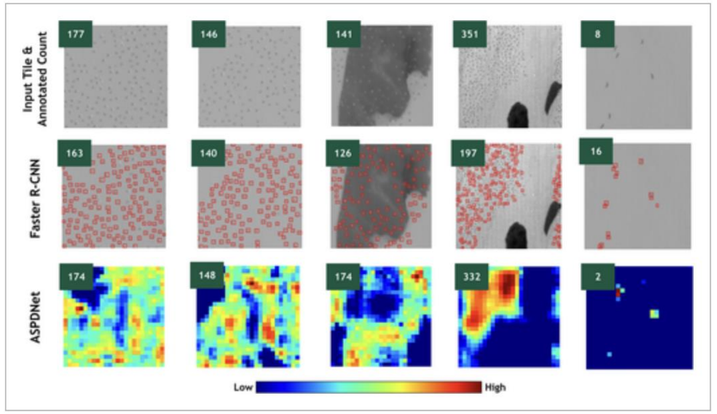

Figure 4 Open in figure viewer | PowerPoint

A sampling of 200 × 200 pixel input tiles derived from our test imagery with each column also containing the annotated count and predictions for both deep learning models. Counts are included in the top left corner for each cell of the grid. Depicted are both high-quality predictions (predicted count is very close to annotated count) and tiles with high prediction error (large difference between predicted and annotated). In predicted density maps, densities range from low (dark blue) to high (dark red), but the scale differs between tiles.

APPLICATIONS AND IDEAS

More Quantifying Stuff:

- True Extent of burns and management
- Cattle impacts on woodies
- Invasive species
- Natives Species
- Pollen availability
- Elevation profiles (i.e. beaver dam and catchment holding capacity)
- Erosion
- Crawfish burrows
- Carbon Sequestration
- Stream Temperatures

10:18 PM Sat Jul 30

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Diagnostic Feed Values of Natural Grasslands Based on M... | fpls-12-774965-g007.j

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Rangeland Ecology & Management

Volume 72, Issue 6, November 2019, Pages 916-922

Diagnostic Feed Values of Natural Grasslands Based on Multispectral Images Acquired by Small Unmanne Aerial Vehicle ☆

Rui Gao [a], Qingming Kong [a], Hongguang Wang [b], Zhongbin Su [a]

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https://doi.org/10.1016/j.rama.2019.06.005 Get rights and con

Abstract

Grasslands are the largest renewable source of terrestrial chlorophytes. Furthermore, grasslands can be both fiber sources and the primary metabolizable energy source for ruminants. Therefore, rapid, accurate, and large-scale monitoring of grassland ecosystems is important to provide spatial information on forage quality control and rangeland management. In this experiment, 100 grassland sites were

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Drones | Free Full-Text | Quantification of Grassland Biom... | fpls-12-774965-g007.jp

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Search: Title / Keyword | Author / Affiliation | Drones | All Article...

Journals / Drones / Volume 6 / Issue 3 / 10.3390/drones6030073

Open Access | Editor's Choice | Article

Quantification of Grassland Biomass and Nitrogen Content through UAV Hyperspectral Imagery—Active Sample Selection for Model Transfer

by Marston H. D. Franceschini [1,2], Rolf Becker [3], Florian Wichern [2,*] ar Lammert Kooistra [1,*]

[1] Laboratory of Geo-Information Science and Remote Sensing, Wageningen University and Research, P.O. Box 47, 6700 AA Wageningen, The Netherlands

[2] Faculty of Life Sciences, Rhine-Waal University of Applied Sciences, Marie-Curie-Str. 1, 47533 Kleve, Germany

[3] Faculty of Communication and Environment, Rhine-Waal University of Applied Sciences, 47475 Kamp-Lintfort, Germany

[*] Authors to whom correspondence should be addressed.

Academic Editor: Diego González-Aguilera

Drones **2022**, *6*(3), 73; https://doi.org/10.3390/drones6030073

Received: 20 January 2022 / Revised: 2 March 2022 / Accepted: 7 March 2022 / Published: 11 March 2022

(This article belongs to the Section **Drones in Agriculture and Forestry**)

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Abstract

Accurate retrieval of grassland traits is important to support management of pasture production a phenotyping studies. In general, conventional methods used to measure forage yield and quality re on costly destructive sampling and laboratory analysis, which is often not viable in practi applications. Optical imaging systems carried as payload in Unmanned Aerial Vehicles (UAV platforms have increasingly been proposed as alternative non-destructive solutions for cr characterization and monitoring. The vegetation spectral response in the visible and near-infrar wavelengths provides information on many aspects of its composition and structure. Combini

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Full article: An open source workflow for weed mapping in... | fpls-12-774965-g007.jpg 1,084×202 pixels

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European Journal of Remote Sensing ›

Volume 54, 2021 - Issue sup1: Special Issue: Digital Earth Observation

Open access

3,489 Views | 6 CrossRef citations to date | 4 Altmetric

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Review Article

An open source workflow for weed mapping in native grassland using unmanned aerial vehicle: using *Rumex obtusifolius* as a case study

Olee Hoi Ying Lam, Marcel Dogotari, Moritz Prüm, Hemang Narendra Vithlani, Corinna Roers, Bethany Melville, ...show all

Pages 71-88 | Received 31 Oct 2019, Accepted 05 Jul 2020, Published online: 04 Aug 2020

Download citation | https://doi.org/10.1080/22797254.2020.1793687 | Check for updates

Full Article | Figures & data | References | Citations | Metrics | Licensing | Reprints & Permissions

PDF | EPUB

ABSTRACT

Formulae display: MathJax

Weed control is one of the biggest challenges in organic farms or nature reserve areas where mass spraying is prohibited. Recent advancements in remote sensing and airborne technologies provide a fast and efficient means to support environmental monitoring and management, allowing early detection of invasive species. However, in order to perform weed classification, current studies mostly relied on object-based image analysis (OBIA) [illegible]ry software which required substantial human inputs. This paper proposes an [illegible]kflow for automated weed mapping using a commercially available unmanned aerial vehicle (UAV). The UAV was flown at a low altitude between 10 m and 20 m, and collected RGB imagery

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A VISION: WHAT ITS GOING TO TAKE

Search Examples

All | Trending | Basemaps | Imagery | Boundaries | People | Infrastructure | Environment

All content types | All time | All regions | Esri-only content | Authoritative-only content | Sort by: Relevance

55 Results

Car Detection - USA

Deep Learning Package By esri_analytics

Deep learning model to detect cars in high resolution imagery.

Authoritative

Car Detection - New Zealand

Deep Learning Package By eaglegis

New Zealand car detection Deep Learning Package to detect cars in high resolution imagery.

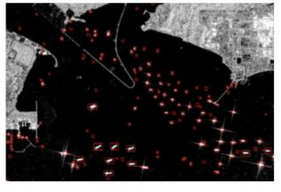
Authoritative

Tree Detection

Deep Learning Package By esri_analytics

Deep learning model to detect trees in high resolution imagery.

Authoritative



Ship Detection (SAR)

Deep Learning Package By esri_analytics

Deep learning model to detect ships from Sentinel-1 C band SAR data.

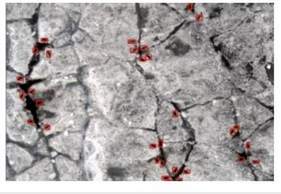
Authoritative

Pool Detection - USA

Deep Learning Package By esri_analytics

Deep learning model to detect swimming pools in high-resolution aerial or satellite imagery.

Authoritative

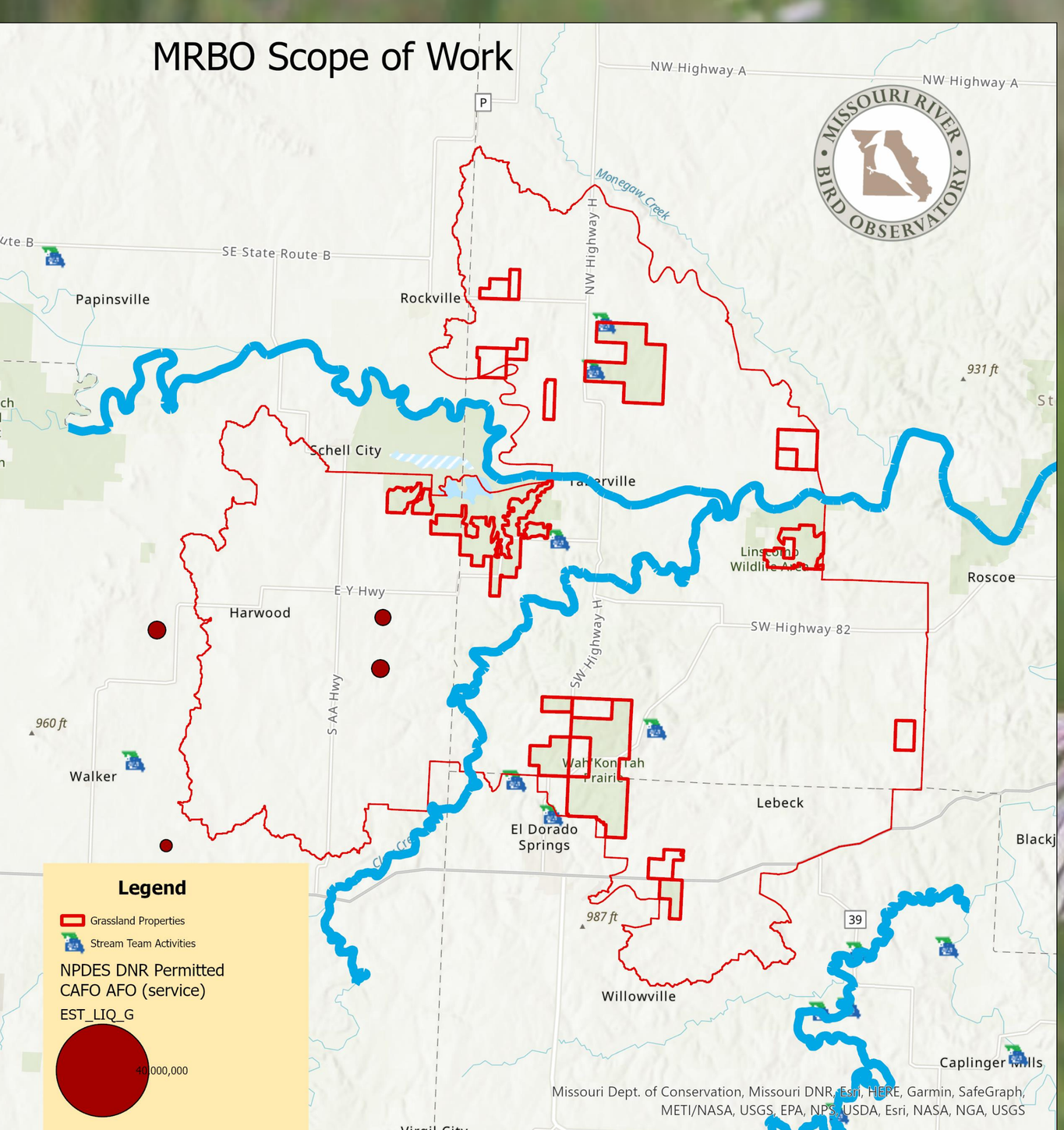


Arctic Seal Detection

Deep Learning Package By esri_analytics

Deep learning model to detect Arctic seals using drone imagery.

Authoritative



Mutually Reinforcing Activities

Addressing shared challenges


IDEAS?
QUESTIONS?
Thank you
Ethan.Duke@mrbo.org
MISSOURI RIVER
BIRD OBSERVATORY