The Impact Poster

What is the purpose of this poster type?

Unlike the scientific posters that DEVELOP has traditionally produced, this new type is meant to face a public, non-scientific audience. It doesn't need to include everything about your projects! Consider focusing on the aspects of feasibility and project impact. Steer clear of jargon, keep things simple, and be creative with how you display information!

Ground Rules

- You are creating this type of poster either because (a) your team opted to create an Impact Poster instead of a Scientific Poster, and the PC Team approved that choice or (b) you want to optionally create one in addition to your required Science Poster.
- Avoid large areas of color when possible and keep the background white. Posters can become too expensive to print with that much color!

DO NOT include:

- Abstract
- Detailed, tech-heavy methodology
- Overuse of graphs, charts, etc.

DO include:

- Plain language summary (optional)
- Study area (map is not required)
- Concise highlights of community concerns, project purpose, and/or objectives (does not need to include everything from the project summary)
- Limited methodology if you see fit
- Earth observations (satellite illustrations or in text)
- Results/Conclusions presented in a simplified and visually-appealing manner (e.g., maps, charts, infographics)
- Team members, end users, and other acknowledgements

Formatting Guidelines

- Use only Century Gothic (headlines/titles) and Garamond (body text) typefaces.
- Font size minimum is 24 point for body text and 16 point for captions, etc.
- Stay inside boundaries and retain the template header and footer
- Use the align tool and automatic gridlines
- When making your poster colorful, use the application area color the most with 1-2 highlight colors maximum (maps/figures can have more)

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What should I highlight from my project?

We want to be clear that the examples provided, derived from the Western Montana Ecological Forecasting (Spring 2021) and California Agriculture (Spring 2022) projects, are not "fill-in-the-blank" templates. You might be including totally different things in a different format! Below are some guiding questions that might help your team to determine what to highlight on your poster.

- Who is most interested in and impacted by your project? What level of familiarity does this audience have with Earth observations and geospatial sciences?
- How would you describe your project findings to a friend or family member?
- What is most novel about your project?
- Is the study period / timeline notable? (e.g., before and after a hurricane)
- Are there exciting quantitative results to share?
- Can your main takeaway be summarized in a single sentence?
- What might surprise people about your project or findings?
- If you want people to learn and remember one thing, what would it be?

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Scientific vs Impact Visual Poster Comparison

The following slides have examples of both the Scientific and Impact posters. Ultimately, everyone's poster will look different and the examples are meant to be used as inspiration. When making an Impact version, try to keep these tips in mind.

Icons

- Use icons to help convey information and use less text (great for lists).
- Instead of a circle or rectangle, try using an icon as the frame. (see the Eco Forecasting example)
- Avoid using too many icons as this can make the poster feel cluttered.
- It is recommended that the icons stay the same color (can be either the application area or highlight from a map).

Placement

- Keep Acknowledgements and Team Members at the bottom of the poster.
- Group similar items and information together to help when rearranging.
- Avoid having text or graphics go past the margin lines.

Sizing & Color

- Make numbers larger than the body text for emphasis.
- For graphs and charts, make sure the Legend is legible.
- Other than color, **bold** and *italicized* font can also add impact to a section.
- Keep most of the poster background white.
- Additionally, make sure there is a good amount of blank space available.

Charts & Graphs

- When using a bar graph, keep the bars skinny to help use less ink for printing.
- Experiment with using SmartArt – List, Process, and Cycle are good options.

Information

- Highlight about 3-5 parts from your project.
- Remember to keep the text short and easy to read.
- Proofread and double-check dates, names, descriptions, etc.

Overall Advice

- Take breaks and save often – looking at so much information at once can get daunting.
- If you decide to try a different layout, make a duplicate of your previous version as back up.
- **Don't be afraid to ask for input or feedback from your Node Fellow or the Project Coordination team!**

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SCIENTIFIC

Using Earth Observations to Estimate the Age and Carbon Stock of Perennial Agriculture

Abstract

California seeks to become a carbon neutral state by 2045. To track progress toward this goal, it is important to quantify the amount of carbon stored by various landcover types across the state. Vineyards and orchards make up a large portion of California's agricultural landcover and store considerable amounts of carbon. For this project, NASA DEVELOP partnered with the California Air Resources Board to estimate the age and carbon stock of crop-specific agricultural regions across California between 1984 and 2021. The DEVELOP team created the Perennial Agriculture Age and Carbon Estimation Tool (PAACET), a Google Earth Engine tool that employs Earth observation from the Landsat 5 Thematic Mapper (TM), Landsat 7 Enhanced Thematic Mapper Plus (ETM+), and Landsat 8 Operational Land Imager (OLI) to estimate the age and carbon stock of vineyards and almond, walnut, pistachio, and orange orchards. The team used an ocular sampling accuracy assessment consisting of 53 sample vineyards and orchards and found that on average, PAACET estimated ages within ±4.3 years of their actual age. The tool estimated that vineyards and walnut orchards are the oldest woody croplands, and almond orchards store the largest total carbon.

Project Partners

The NASA DEVELOP team partnered with the **California Air Resources Board (CARB)**, which is one of six boards, departments, and offices under the umbrella of the California Environmental Protection Agency. CARB is California's lead agency on climate change and is responsible for planning a roadmap to achieve the state's climate change goals and implementing programs to reduce greenhouse gas emissions.

Objectives

- **Develop** a Google Earth Engine tool to map crop age and biomass of perennial agriculture in California
- **Estimate** the total carbon stock of California's vineyards and almond, pistachio, walnut, and orange orchards
- **Compare** the carbon stock and ages of the different crop types

Earth Observations

Study Area & Period

- Crop-specific agricultural regions of California
- March 1984 – December 2021

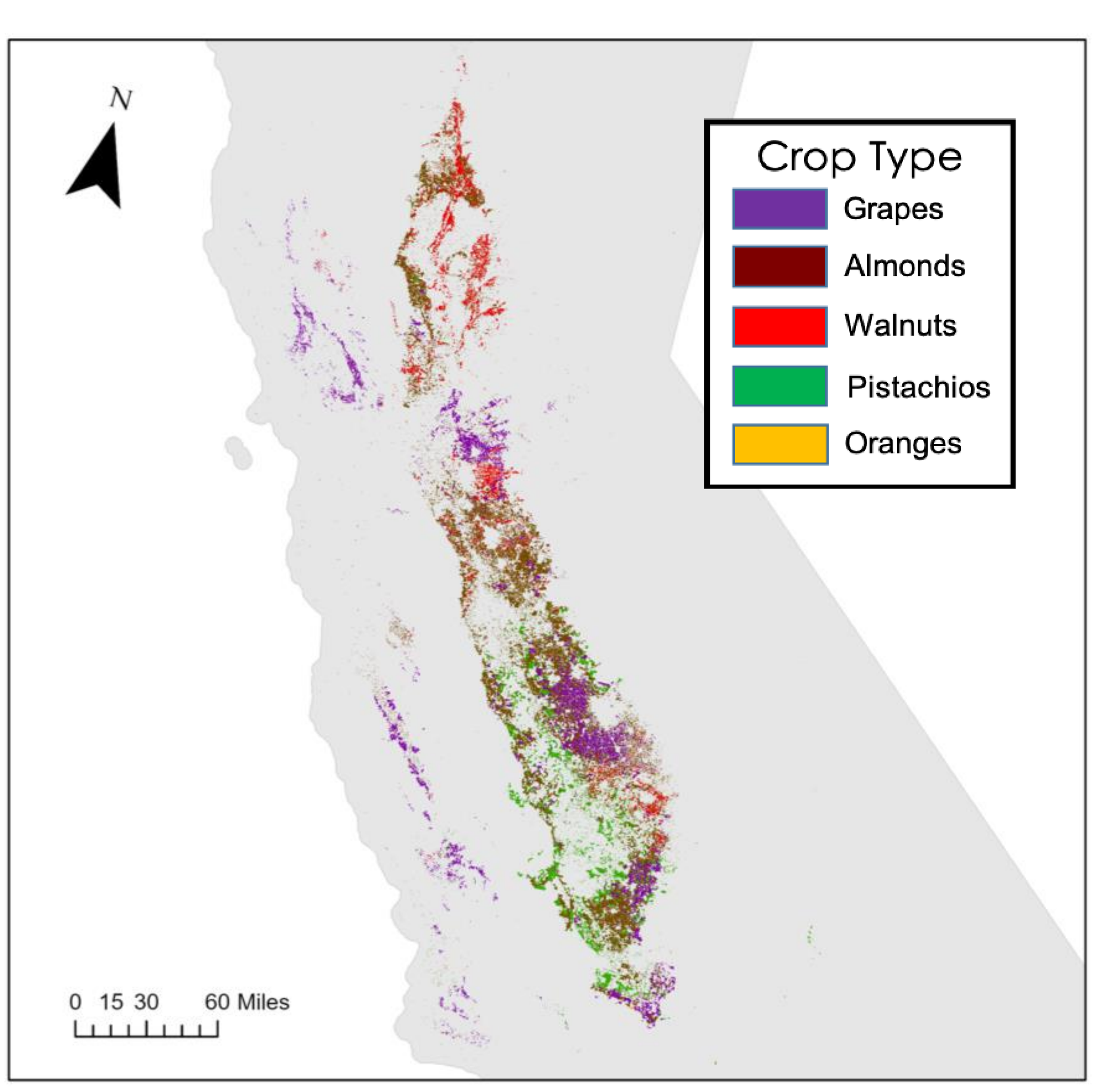
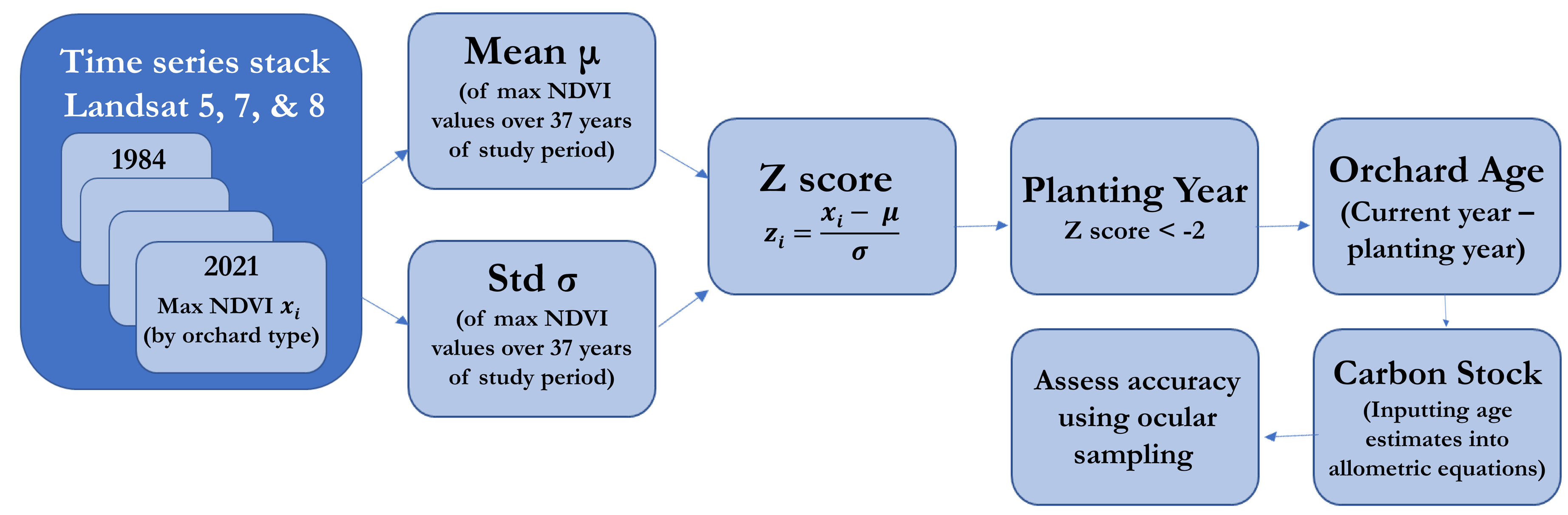


Fig. 1. Map of study area including vineyards and almond, walnut, pistachio, and orange orchards in 2021.

Methodology



Results

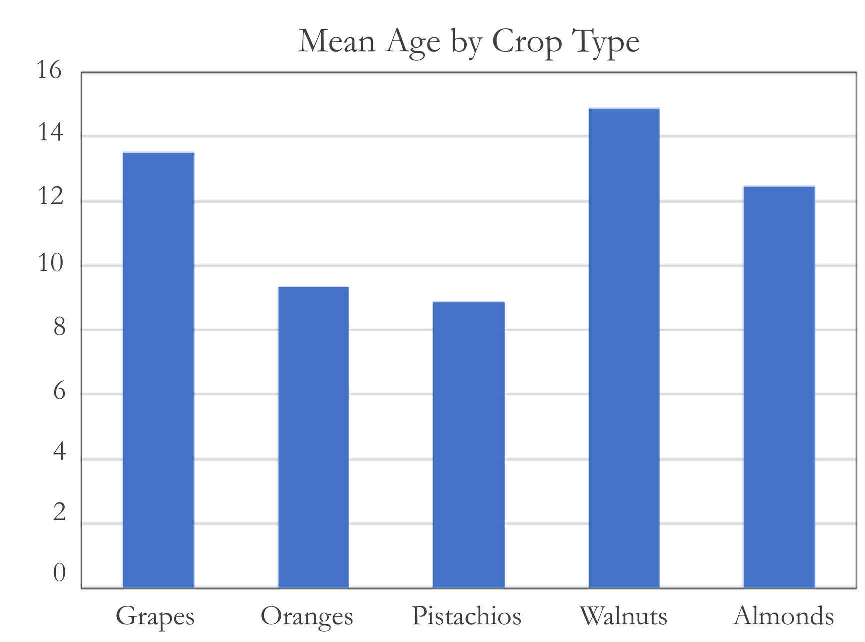


Fig. 2. Distribution of mean age by crop type in 2021.

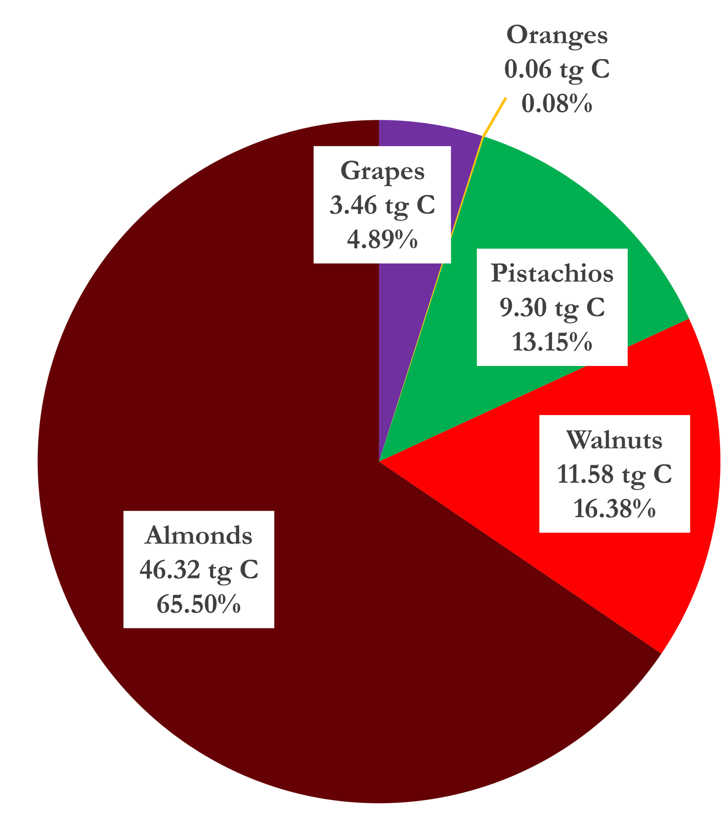


Fig. 3. Distribution of carbon stock by crop type in 2021.

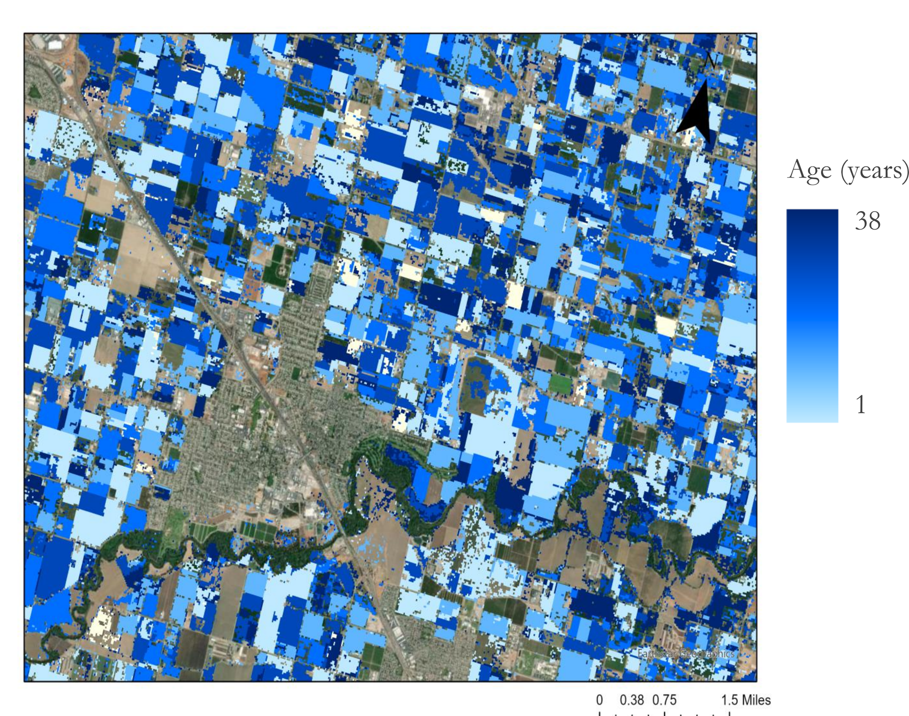


Fig. 4. PAACET cropland age estimates near Modesto, California in 2021.

Fig. 5. PAACET cropland carbon stock estimates near Modesto, California in 2021.

Conclusions

- PAACET can detect the planting years of most orchards and vineyards in California.
- The accuracy of the tool is limited by Landsat data availability (starting in 1984) and the accuracy of the USDA-NASS Cropland Data Layer in defining orchard boundaries.
- The accuracy of the tool may be improved by incorporating satellite imagery with better spatial resolution.

Acknowledgements

The team would like to thank everyone who made this project possible:

- **Partners:** California Air Resources Board
- **Advisors:** Dr. Juan Torres-Pérez (NASA ARC), Dr. Kenton Ross (NASA LaRC)
- **Fellows:** Britnay Beaudry (DEVELOP ARC), Hayley Pippin (DEVELOP ARC)
- **Special thanks:** Dr. Lee Johnson (NASA ARC), Dr. Forrest Melton (NASA ARC)

Team Members

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Project Lead

Alex Posen

Shreya Suri

Stefanie Mendoza

California Agriculture

Spring 2022 | California – Ames

DEVELOP

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IMPACT

Using Earth Observations to Estimate the Age and Carbon Stock of Perennial Agriculture

Model Input Variables

Crop Type
different plants store different amounts of carbon

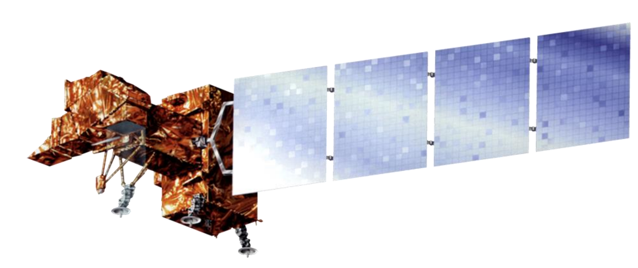
Age
the older the field, the more carbon accumulated

Area
more landcover = more storage space

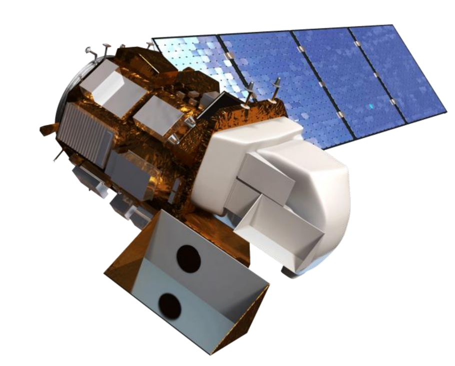
California seeks to become a **carbon neutral state by 2045.**

How much carbon are agricultural lands storing away? **Satellites can tell us.**

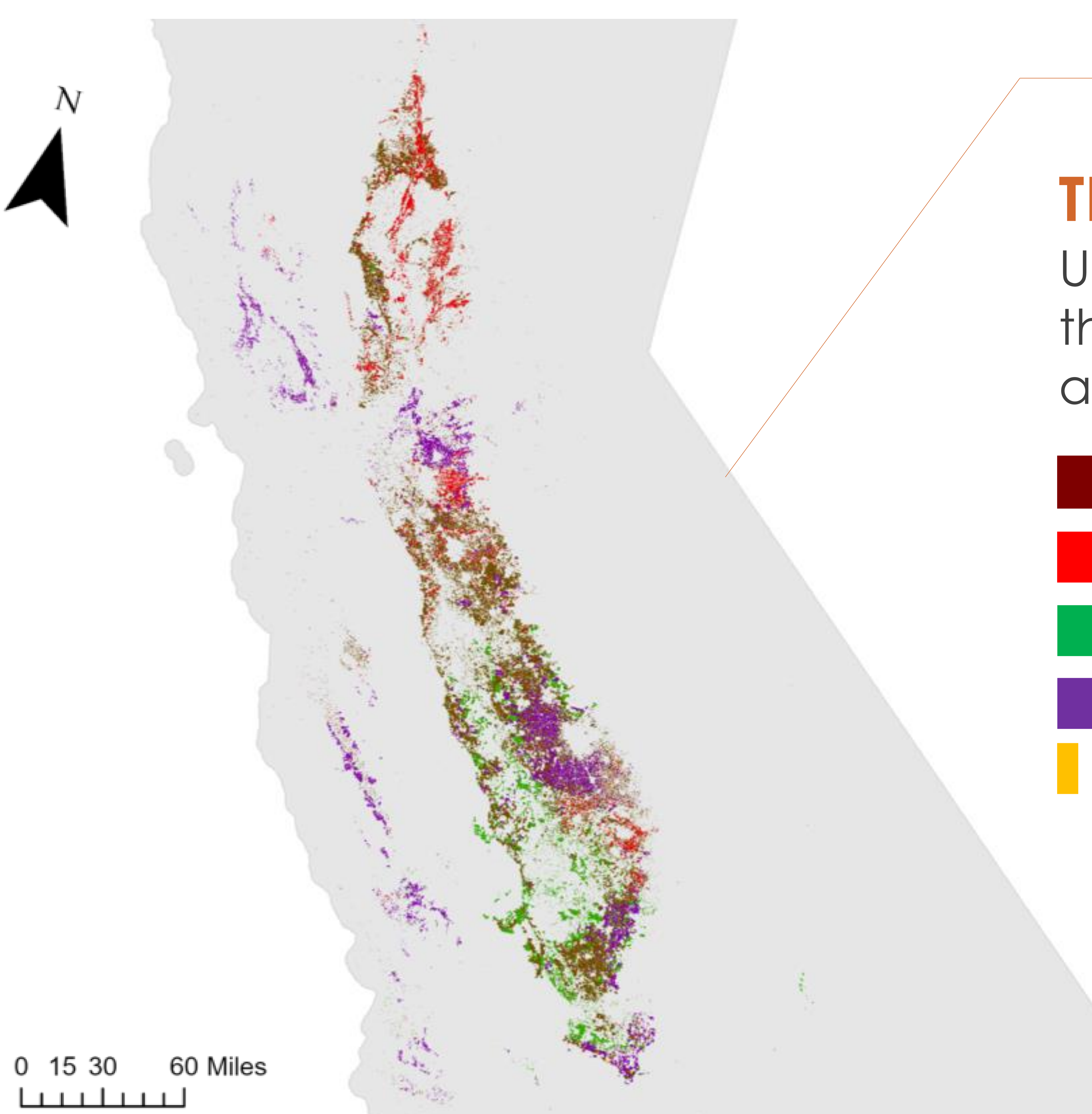
Landsat 5 TM



Landsat 7 ETM+



Landsat 8 OLI



Almonds | Walnuts | Pistachios | Grapes | Oranges

70.72

TERAGRAMS OF CARBON

Using our model, we estimated this much stored by California agricultural lands in 2021.

- **46.32** Almonds
- **11.58** Walnuts
- **9.3** Pistachios
- **3.46** Grapes
- **.06** Oranges

Taking inventory is a necessary step toward attaining **carbon neutrality.**

California Agriculture

Rachael Ross
Project Lead

Alex Posen

Shreya Suri

Stefanie Mendoza

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Spring 2022 | California – Ames

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SCIENTIFIC

Modeling Habitat Suitability of Mustelid Species to Guide Detection Dog Surveys for Contaminants Monitoring, via Collected Scats, in River Systems in Western Montana

Western Montana Ecological Forecasting

Abstract

Environmental contaminants are becoming increasingly prevalent in riverine ecosystems. The status of contaminants in western Montana's relatively pristine river systems is largely unknown. Monitoring for heavy metals, brominated flame-retardants (BFRs), and pharmaceuticals is important due to their negative effects on ecosystems. Exposure to these contaminants can have significant endocrine, neurological, and reproductive effects. Contaminants easily travel up the food chain and bioaccumulate in apex predators. As predators with a largely aquatic diet, American mink (*Mustela vison*) and North American river otter (*Lontra canadensis*) serve as reliable indicator species of environmental health and the status of contaminants. Analysis of scat from these species is a noninvasive method to measure contaminant levels, and detection dogs from Working Dogs for Conservation (WD4C) have been used to locate these scat samples. To aid in the search of these samples, habitat suitability models were created for mink and otter for the years 2013-2020 and projected to 2040 using the random forest algorithm in the Software for Assisted Habitat Modeling (SAHM). Predictor variable data were acquired from Landsat 8 Operational Land Imager (OLI), Terra Moderate Resolution Imaging Spectroradiometer (MODIS), Global Precipitation Measurement Integrated Multi-satellite Retrievals for GPM (GPM IMERG), Shuttle Radar Topography Mission (SRTM), and Soil Moisture Active Passive (SMAP). Within these models, the most important variable for mink and otter habitat was distance to river. Suitable habitat also corresponded with emergent herbaceous land cover and deeper river locations. These habitat suitability models will inform sampling site section for further contaminant analysis.

Objectives

- **Create** habitat suitability models for American mink and North American river otter to facilitate contaminant monitoring in Western Montana
- **Project** habitat suitability models to 2040 based on changing climate conditions
- **Develop** tools to determine future survey locations based on proximity to contaminant sources and availability of suitable habitat

Methodology

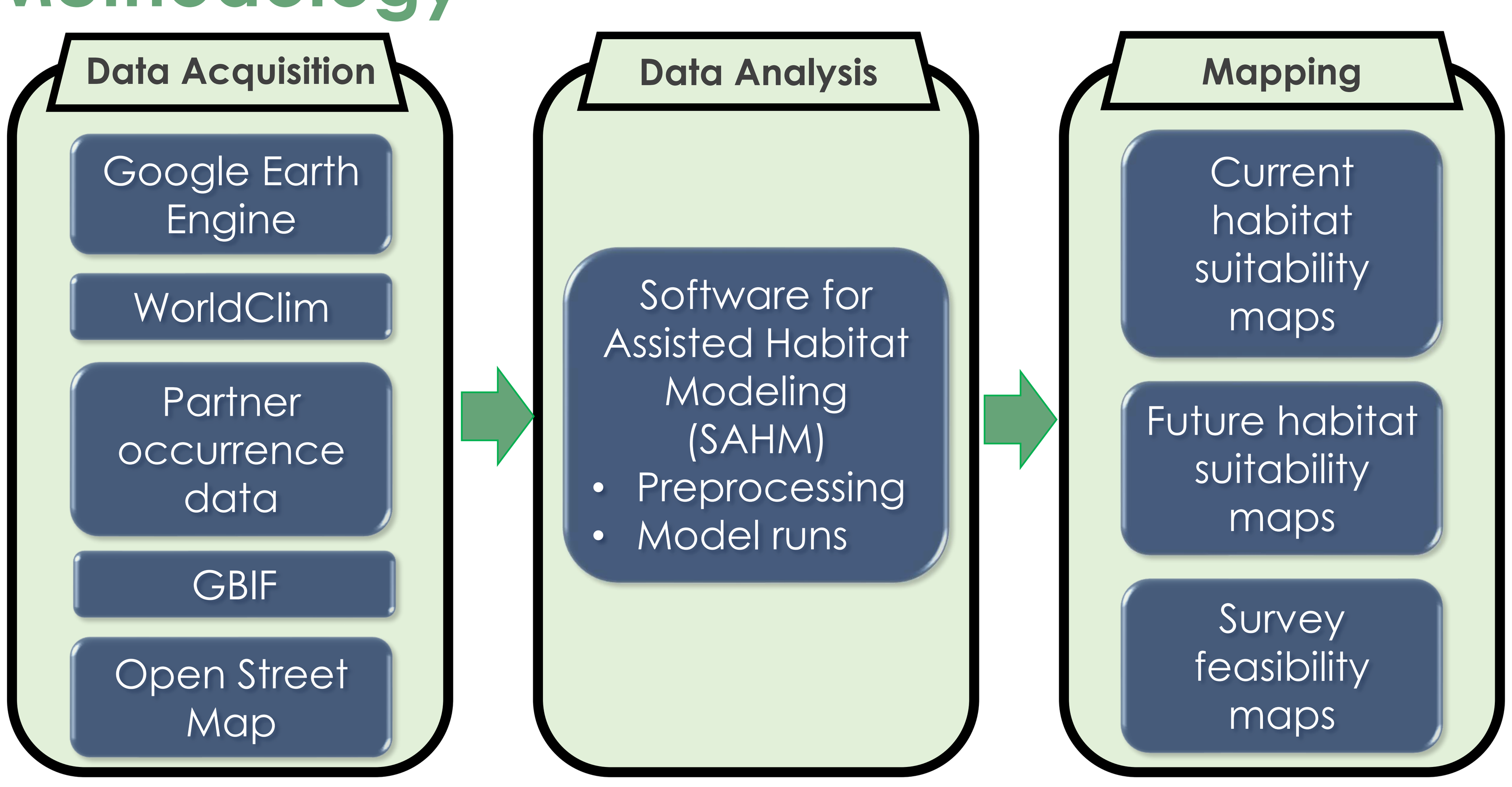


Figure 1. General project workflow. GBIF stands for Global Biodiversity Information Facility.

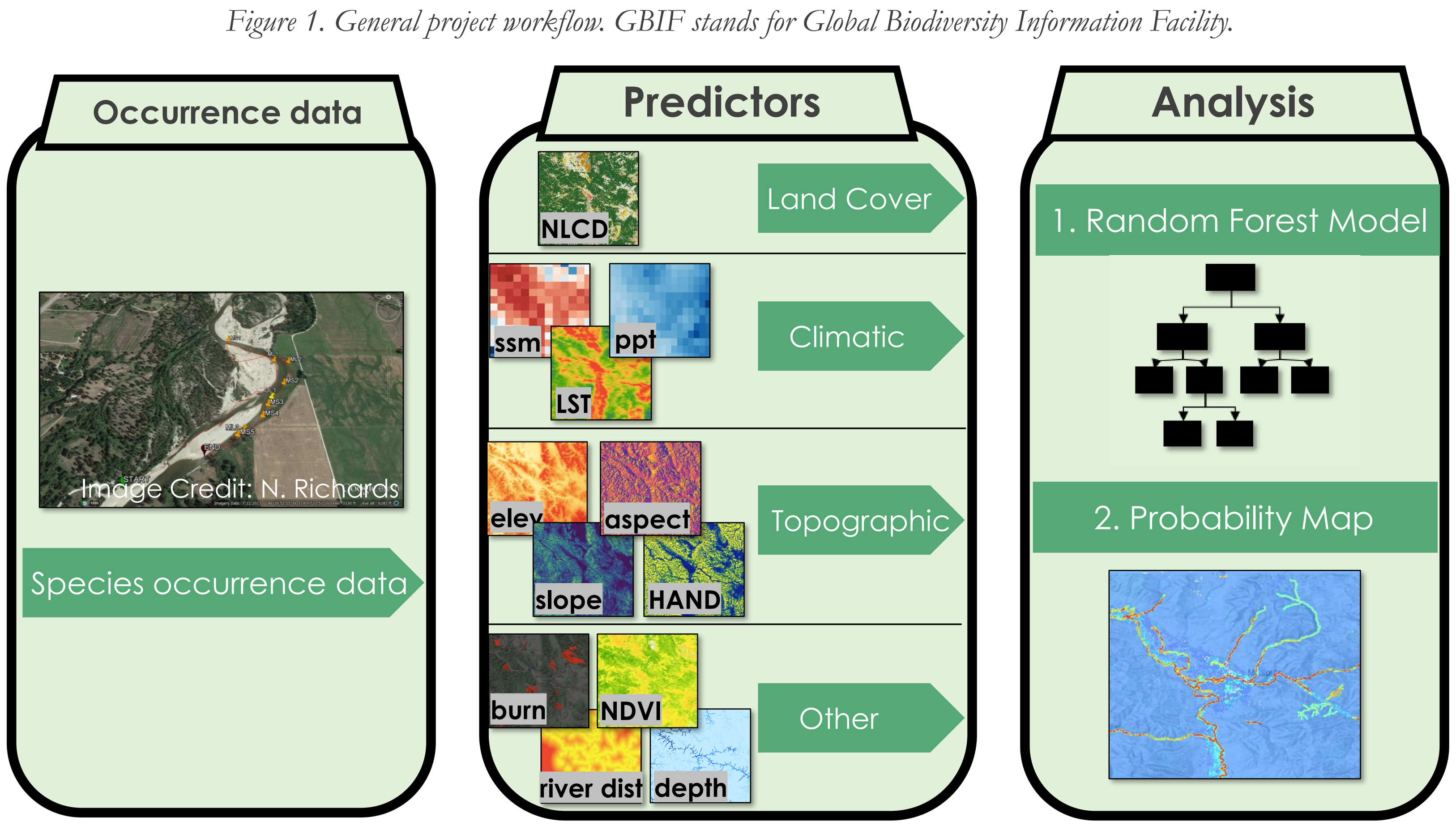


Figure 2. Workflow for current habitat suitability models. Predictors defined as follows: NLCD- National Land Cover Database, LST- Land Surface Temperature, NDVI- Normalized Difference Vegetation Index , SSM- Surface Soil Moisture

Study Area

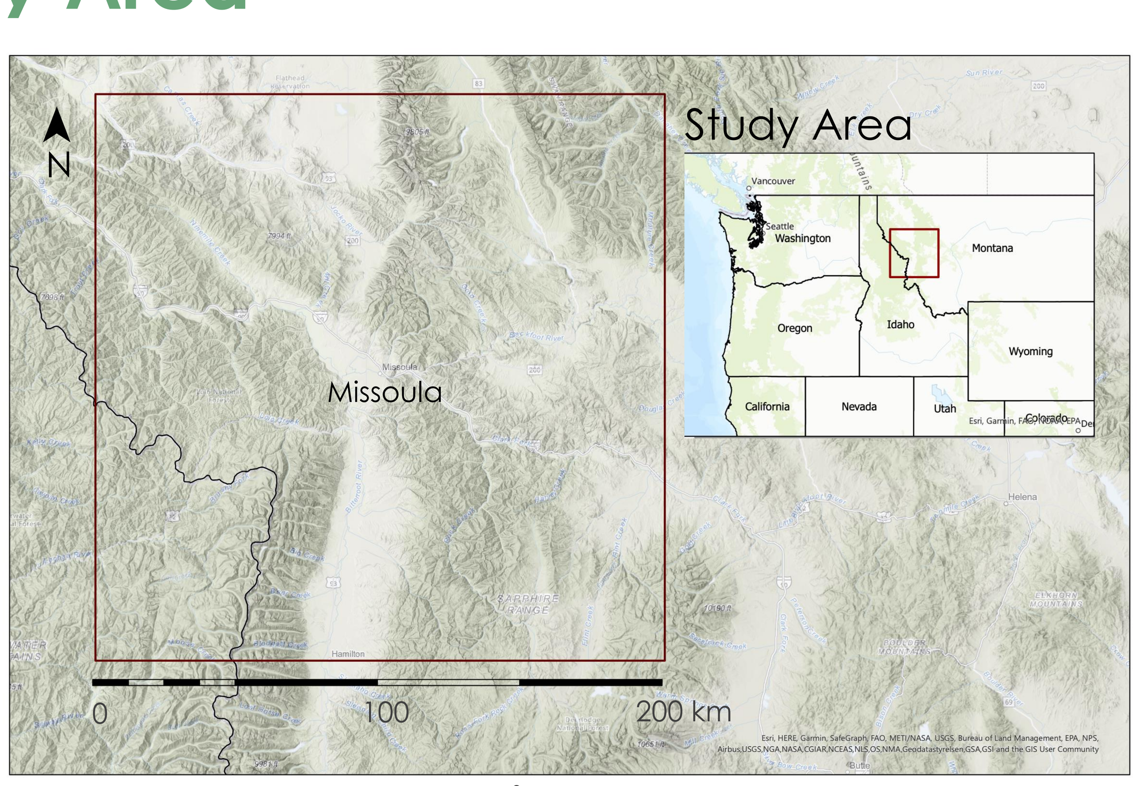
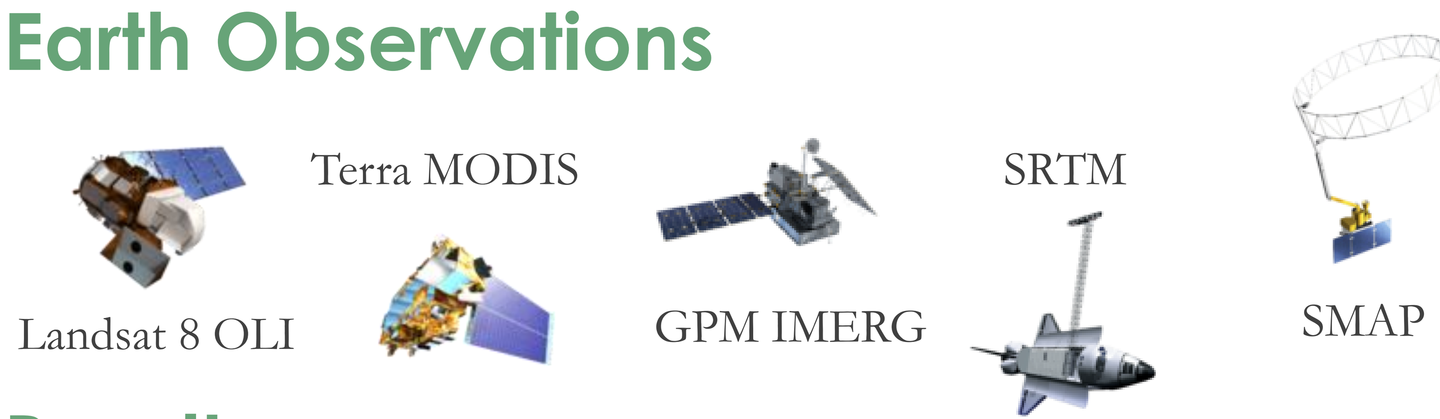


Fig. 3. A depiction of the $200km^2$ study area centered on Missoula, Montana.

Earth Observations



Results

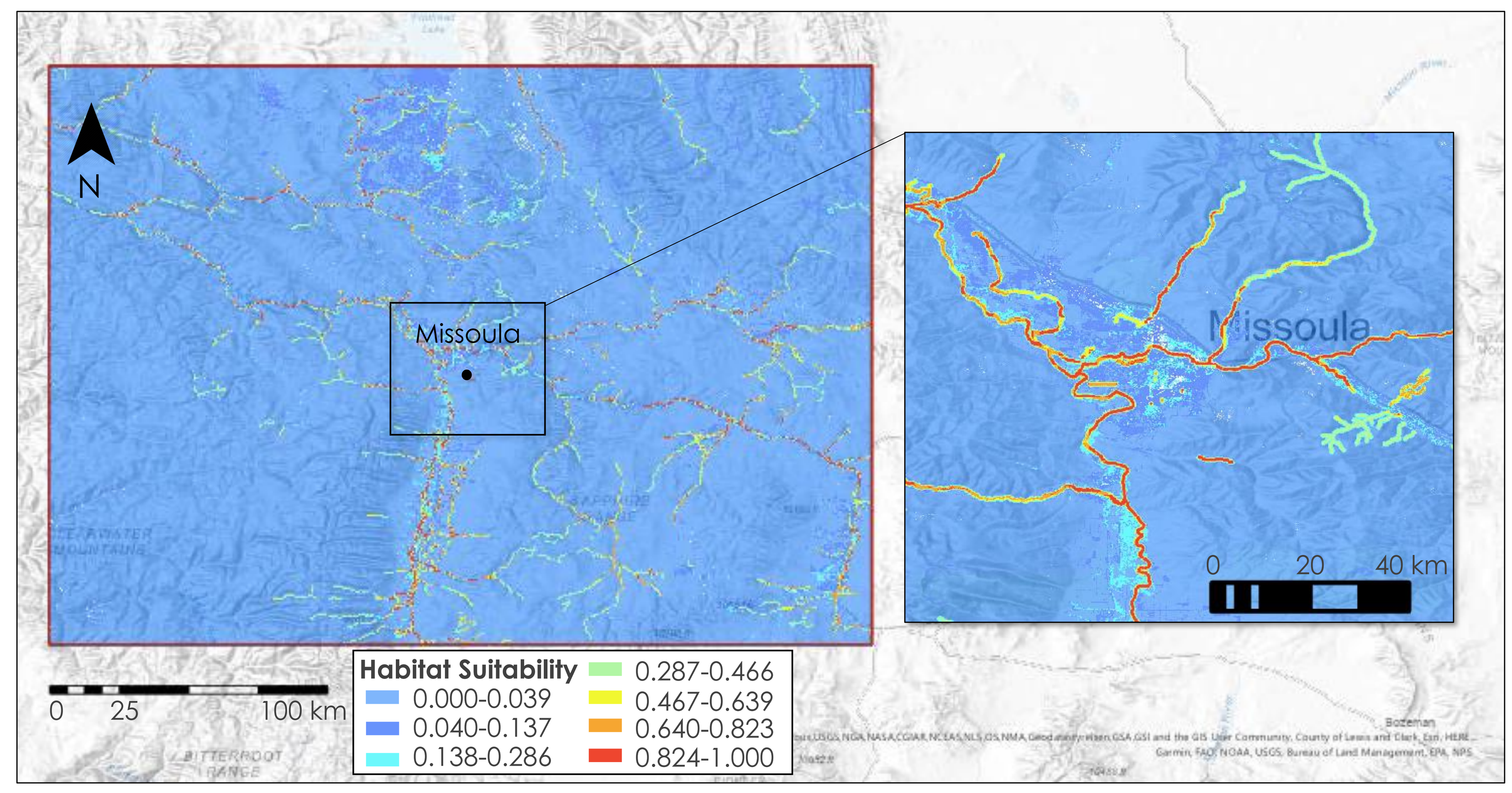


Fig. 4. Habitat suitability map focused on Missoula, Montana. Habitat suitability is measured in probability of mink and otter occurrence throughout the study area. Blue indicates low probability and red indicates high probability.

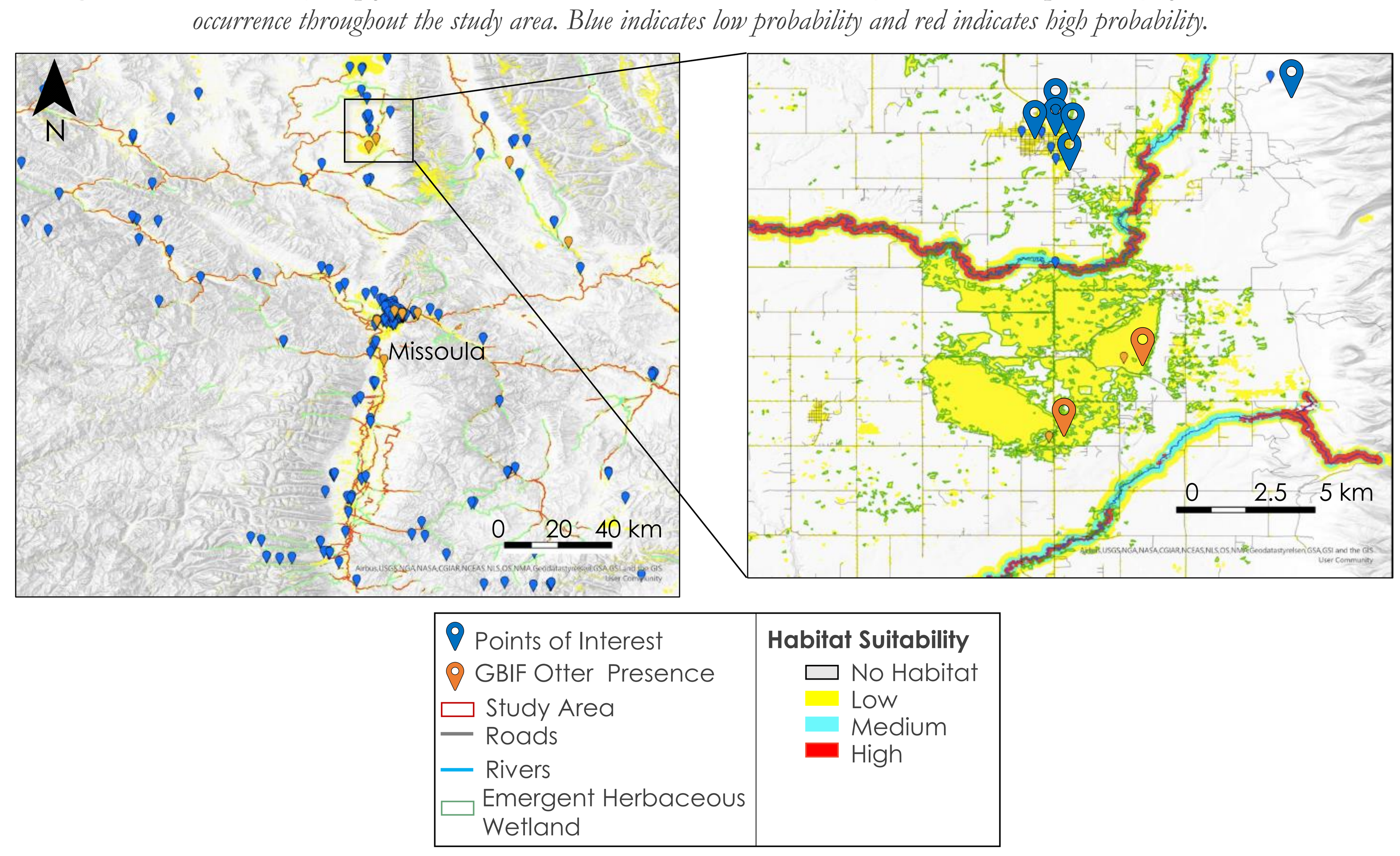


Fig. 5. Habitat suitability final model with points of interest (potential contaminant sources) and additional occurrence data. Areas of lowest probability were removed to focus on likely survey areas. The inset map highlights one suggested survey site.

Conclusions

- Mink and otter occurrence was most strongly correlated with distance to rivers, river depth, land surface temperature, and land cover, in that order of importance.
- We identified multiple regions of Western Montana that WD4C should survey based on availability of habitat, proximity to contaminant sources, and proximity to other known otter sightings.
- The habitat suitability maps, research site feasibility maps, and Google Earth package created in this project will help guide WD4C in future survey site selection.

Acknowledgements

- **Dr. Allison Howard** – University of Georgia
- **Dr. John Bolten** – NASA Goddard Space Flight Center
- **Dr. Kenton Ross** – NASA Langley Research Center
- **Dr. Peder Engelstad** – Colorado State University
- **Dr. Nicole Ramberg-Pihl** – NASA GSFC Node Fellow

Project Partners

- **Dr. Ngaio Richards** – Working Dogs for Conservation
- **Dr. Mark LaGuardia** – The Virginia Institute of Marine Science

Team Members

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Spring 2021 | Maryland – Goddard

DEVELOP

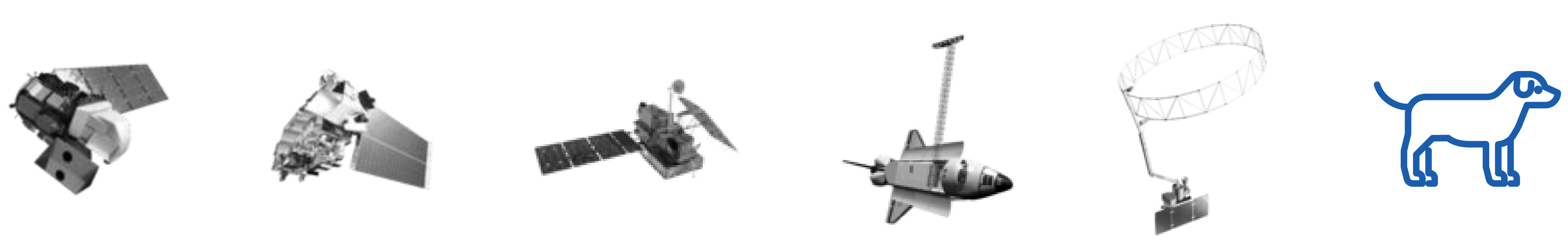
IMPACT

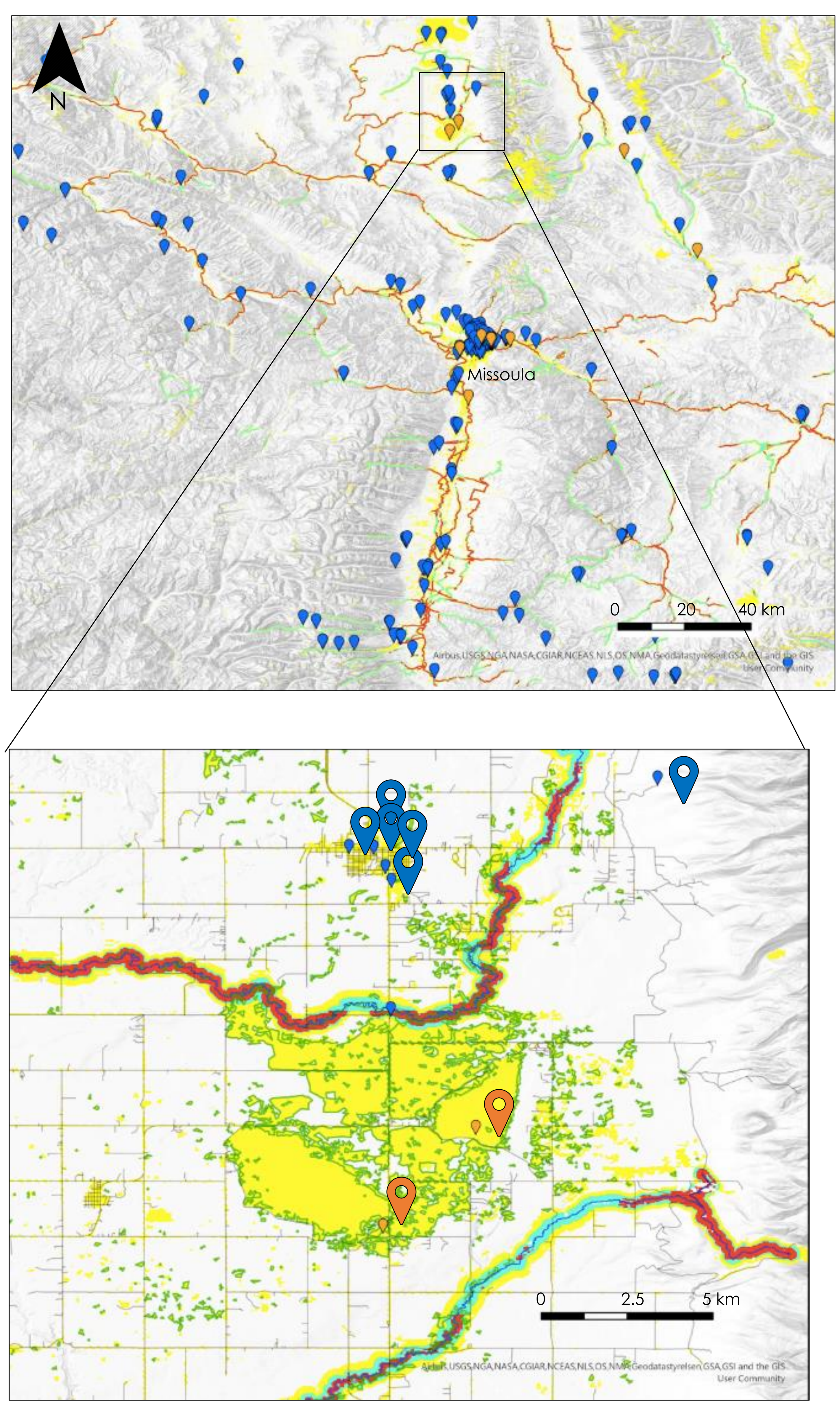
Modeling Habitat Suitability of Mustelid Species to Guide Detection Dog Surveys for Contaminants Monitoring, via Collected Scats, in River Systems in Western Montana

Environmental contaminants, such as heavy metals, brominated flame-retardants (BFRs), and pharmaceuticals, are harming riverine ecosystems. These contaminants bioaccumulate, working their way up the food chain and causing significant endocrine, neurological, and reproductive effects.

Scientists can measure contaminant levels in the scat of American mink (*Mustela vison*) and North American river otter (*Lontra canadensis*). Trained detection dogs can sniff out scat, but it can be hard to know where to start looking!

NASA DEVELOP is using satellite data to help **Working Dogs for Conservation (WD4C)** sniff out scat more efficiently.





- Potential Contaminant Sources
- GBIF Observed Otter Presence
- Study Area
- Roads
- Rivers
- Emergent Herbaceous Wetland

Mink & River Otter Habitat Suitability

- No Habitat
- Low
- Medium
- High

Habitat suitability is based on 2013-2020 environmental conditions. Areas of lowest probability were removed to focus on likely survey areas. The inset map highlights one suggested survey site.

Mink and otter presence is most strongly correlated with:

Distance to rivers → River Depth → Land surface temperature → Land cover

NASA DEVELOP identified multiple regions of Western Montana that WD4C should survey based on availability of habitat, proximity to contaminant sources, and proximity to other known otter sightings.

Partners: **Dr. Ngaio Richards** – Working Dogs for Conservation
Dr. Mark LaGuardia – The Virginia Institute of Marine Science

Advisors: **Dr. Allison Howard** – University of Georgia
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Western Montana Ecological Forecasting

Spring 2021 | Maryland – Goddard

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