Microsoft

Planetary Computer

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Principal Scientist, AI For Earth

Computing, Data, and Cyberinfrastructure for a Systems Approach to Studying the Earth
A Two-Part Virtual Workshop
Part 2: Friday, February 12, 2021, 12:00 - 3:00pm ET

The National Academies of Sciences, Engineering, and Medicine committee on "*Advancing a Systems Approach to Studying the Earth: A Strategy for the National Science Foundation*" has been tasked to develop a compelling vision for a systems approach to studying the Earth in order to inform approaches to integrated research at NSF and to provide guidance as to how NSF can support the research community. The final report will also identify the facilities, infrastructure, coordinating mechanisms, computing, and workforce development needed to support a more integrated approach for studying components of the earth system. This two-part workshop seeks feedback on computational, data, and analytic support for Earth systems research, including guidance on harnessing existing, planned, and future NSF-supported cyberinfrastructure. The workshops will focus on and answer the following critical questions:

Investing to build the leading platform for technology solutions to environmental challenges

Environmental Sustainability

CARBON

2030 Carbon Negative

WATER

2030 Water positive

WASTE

2030 Waste free

ECOSYSTEMS

Planetary Computer

2025 Land positive

Support and advocate for public policy initiatives

Pillars

Grants

Increase access to cloud and AI technologies through grants

aka.ms/ai4egrants

Technology

Build ML tools that support and accelerate the work of environmental scientists

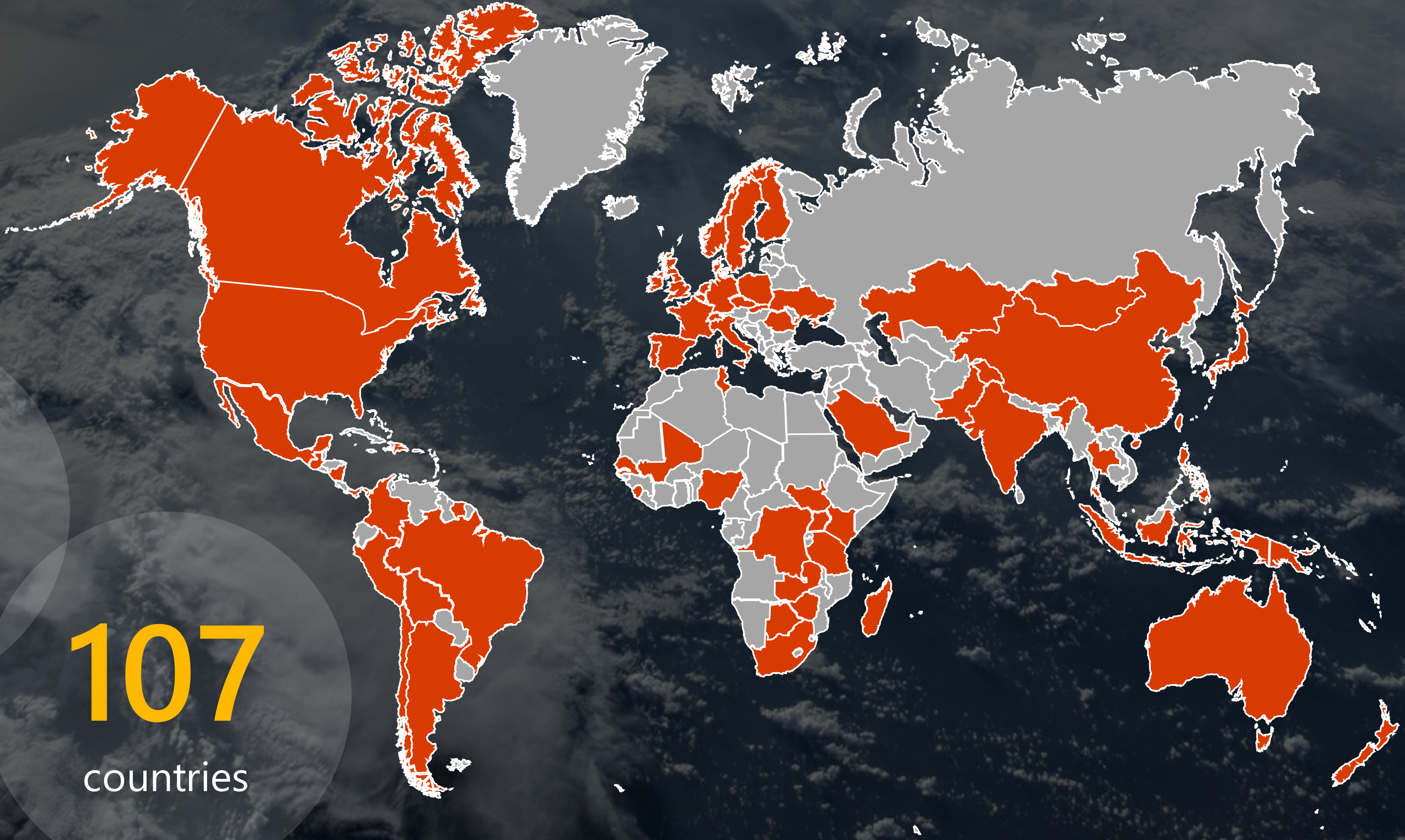
aka.ms/ai4etech

Data

Host key environmental and conservation datasets

aka.ms/ai4edata

AI for Earth



701
projects

107
countries

Featured AI for Earth Partners


iNaturalist


Wild Me


Conservation Metrics


SilviaTerra


SunCulture


Terrafuse


Ag-Analytics


OceanMind


PAWS

Strategic Partnerships

TECHNOLOGY PARTNERS

iNaturalist · OCEAN MIND · WILDBOOK · Conservation Metrics · SunCulture · SILVIATERRA · CONSERVATION INTERNATIONAL · Ag-Analytics · Met Office · Terrafuse AI · NOAA · esri · eMammal See Wildlife, Do Science

SIGNATURE PROJECTS

CSIRO · World Mosquito Program · Starbucks · Arab Republic of Egypt Ministry of Communications and Information Technology · sustainable coastlines

ACADEMIC INSTITUTIONS

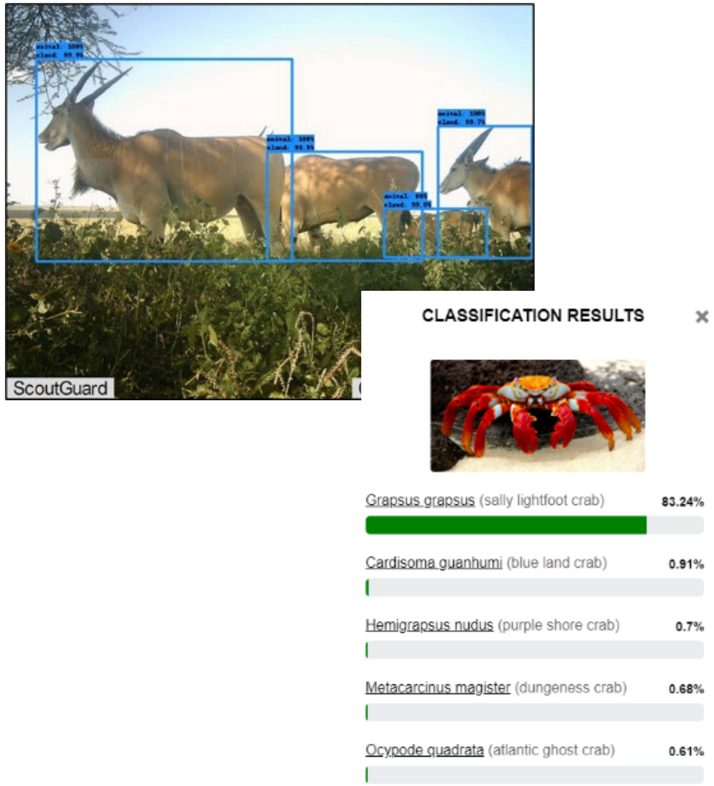
USC Center for Artificial Intelligence in Society · OOI Ocean Observatories Initiative · WAGENINGEN UNIVERSITY & RESEARCH · University of Minnesota Driven to Discover · University of Pittsburgh

GRANTS & COMPETITIONS

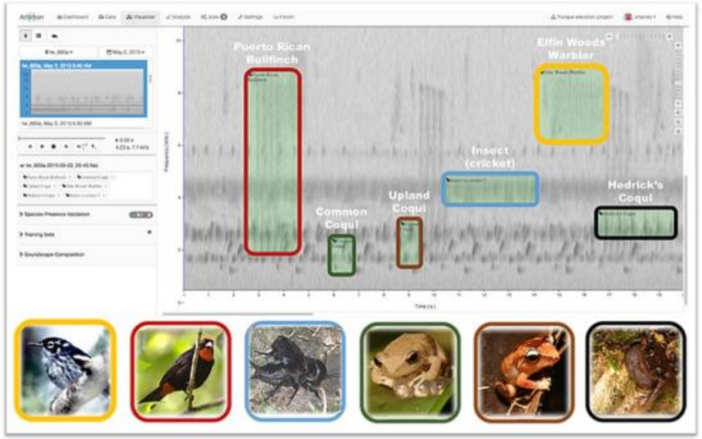
NATIONAL GEOGRAPHIC SOCIETY · WORLD RESOURCES INSTITUTE · CONSERVATION X LABS · DRIVENDATA · LEONARDO DICAPRIO FOUNDATION

AI for Earth Data Science – some examples

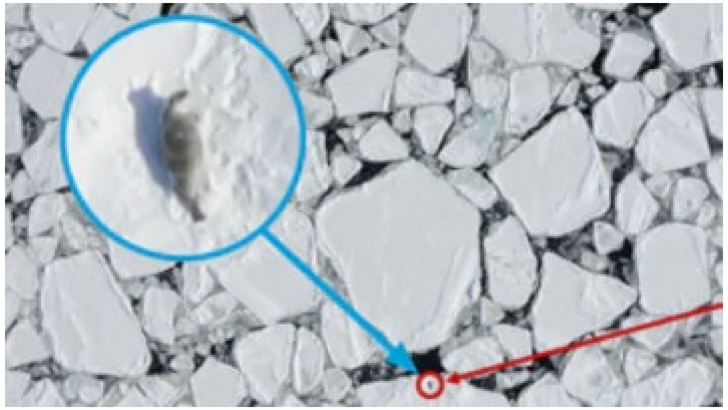
Accelerating camera trap surveys



Multi-species bioacoustics classification for wildlife surveys

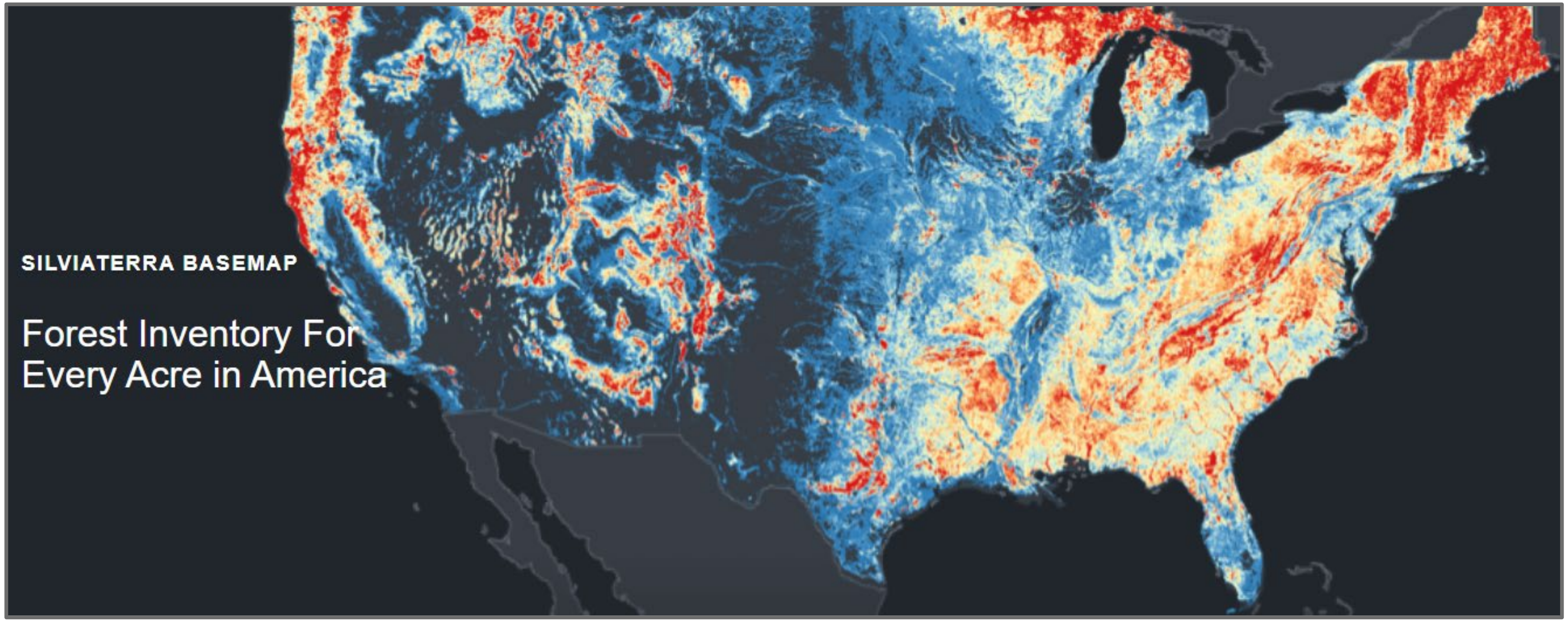


Accelerating aerial wildlife surveys in Alaska

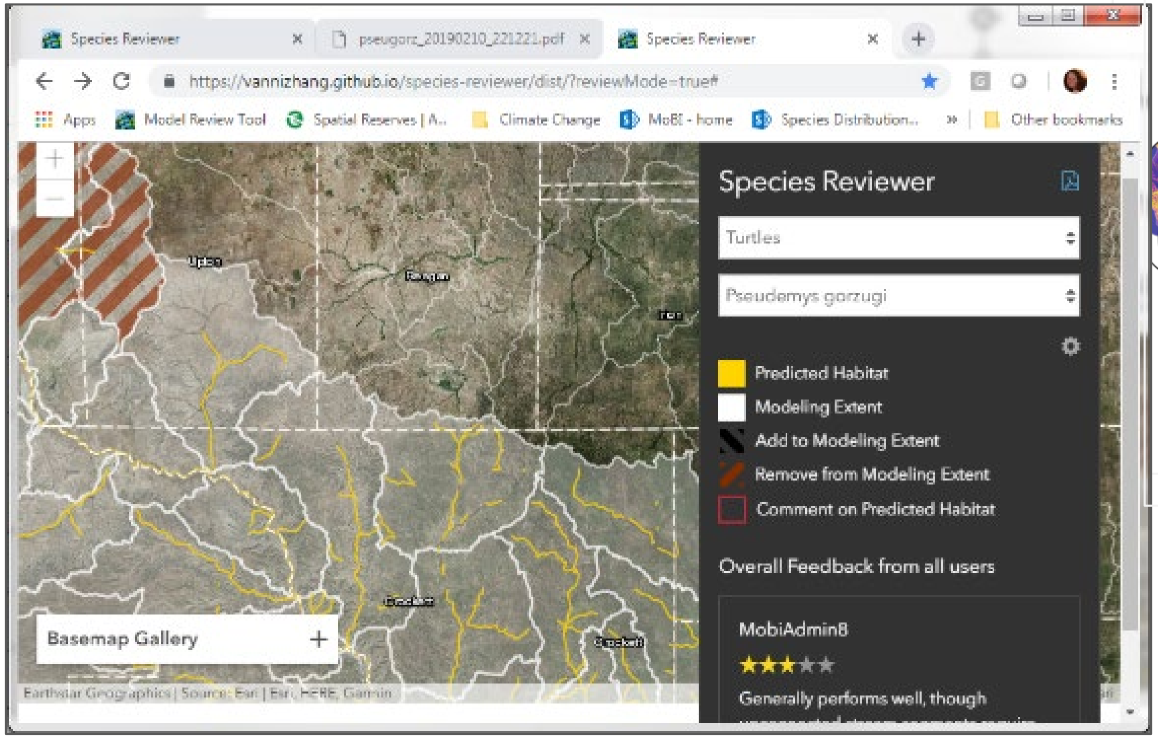


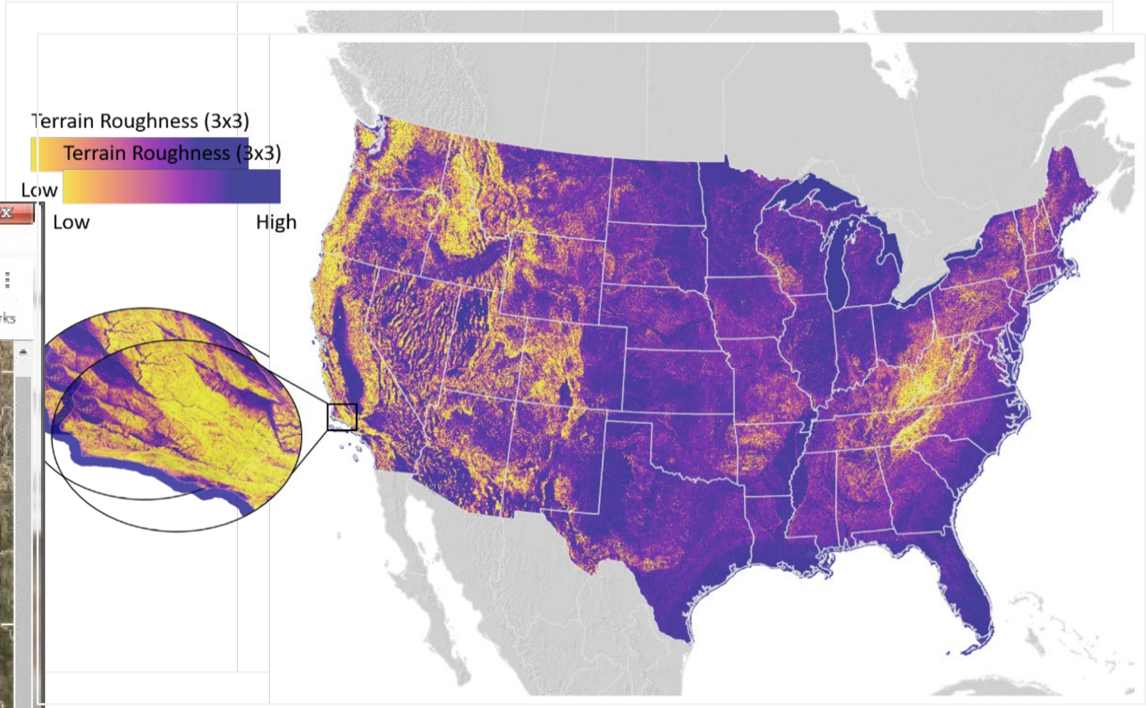
Carbon Markets: SilviaTerra

92B trees mapped on 537M acres



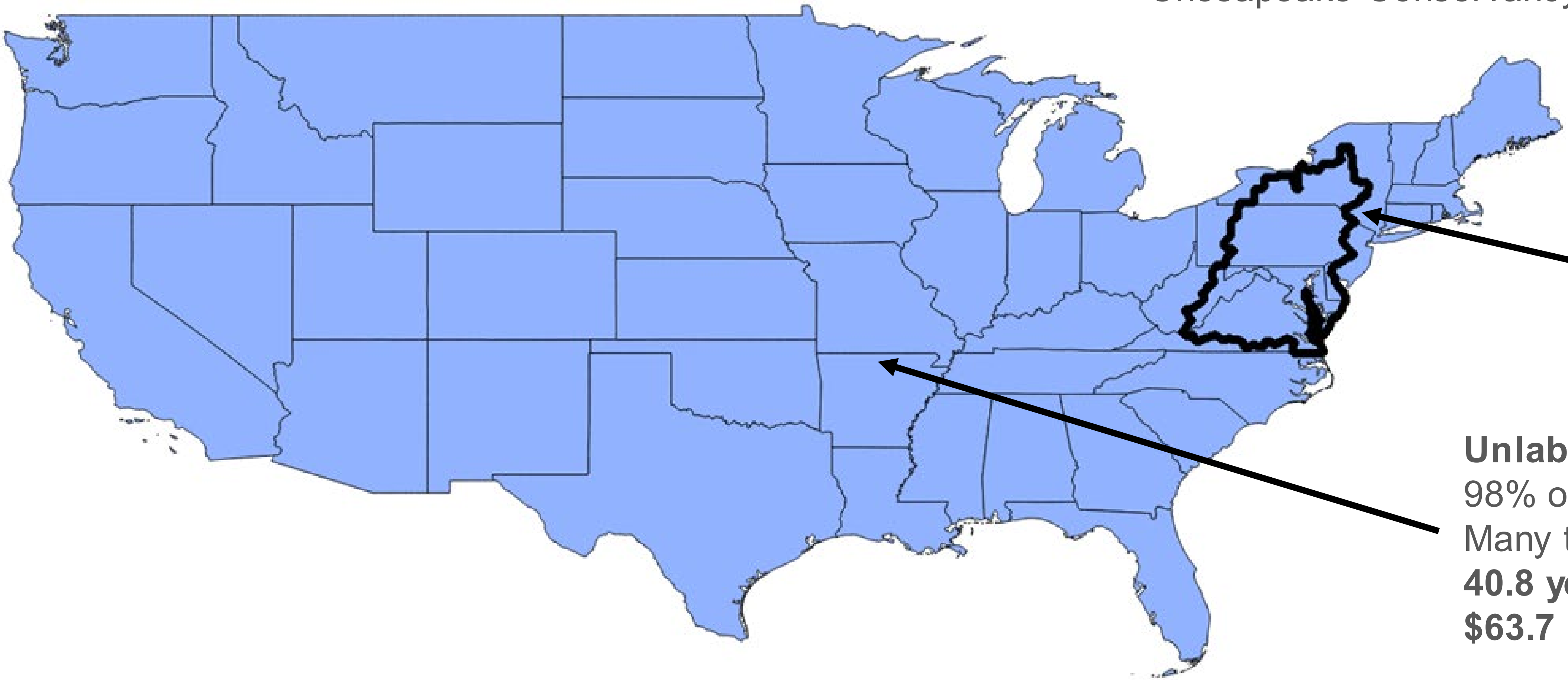
NatureServe Map of Biodiversity Importance





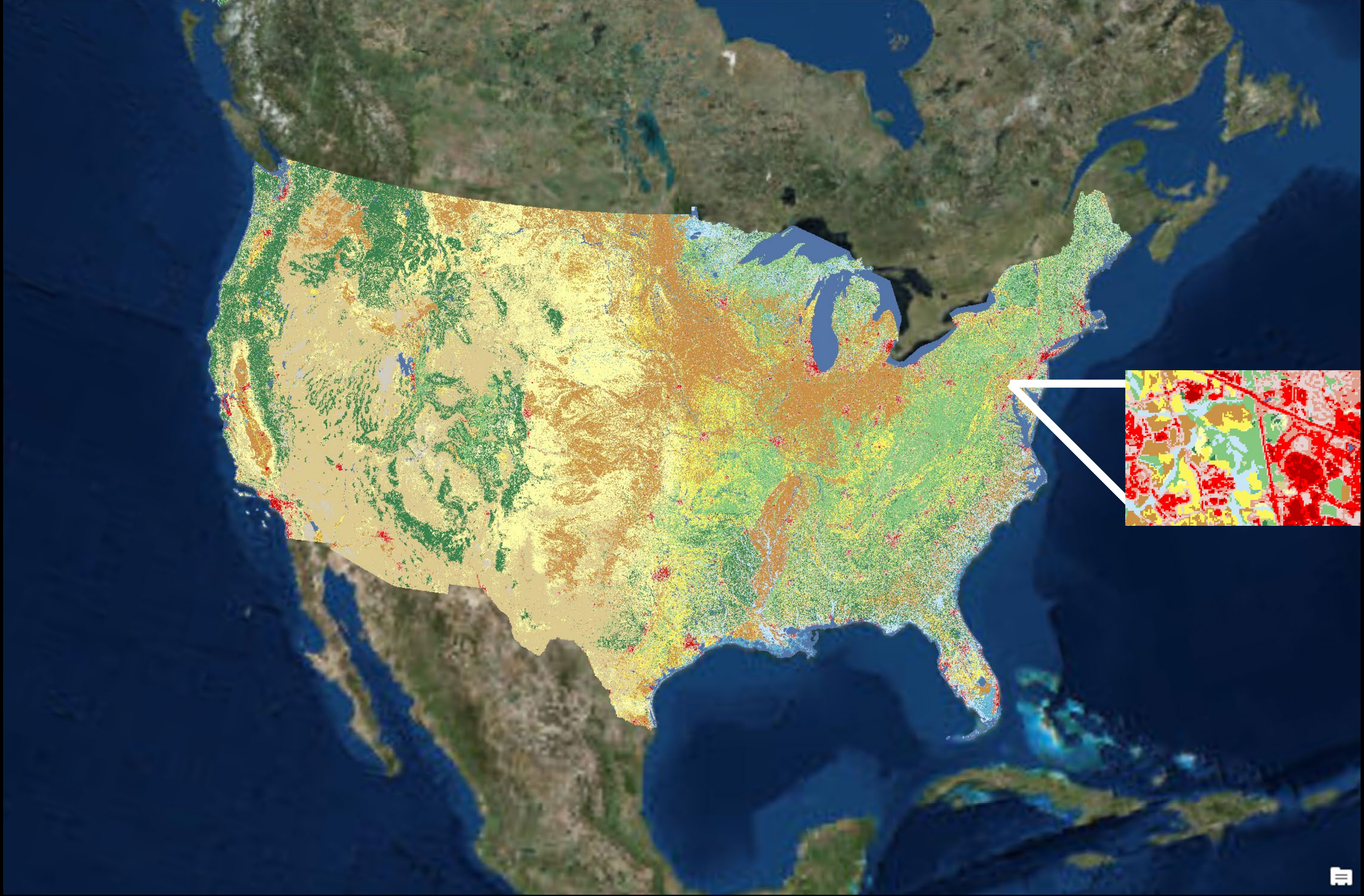
Need ML to scale human effort

Chesapeake Conservancy



Labeled
2% of area
1 time point
10 months
$1.3 million

Unlabeled
98% of area
Many time points
40.8 years?
$63.7 million?



LILA

LILA BC

Labeled Information Library of Alexandria: Biology and Conservation

Home Data Sets FAQ

Home

LILA BC is a repository for data sets related to biology and conservation, intended as a resource for both machine learning (ML) researchers and those that want to harness ML for biology and conservation.

Machine learning depends on labeled data, but accessing such data in biology and conservation is a challenge. Consequently, everyone benefits when labeled data is made available. Biologists and conservation scientists benefit by having data to train on, and free hosting allows teams to multiply the impact of their data (we suggest listing this benefit in grant proposals that fund data collection). ML researchers benefit by having data to experiment with.

LILA BC is intended to host data from a variety of modalities, but emphasis is placed on labeled *images*; we currently host over ten million labeled images.

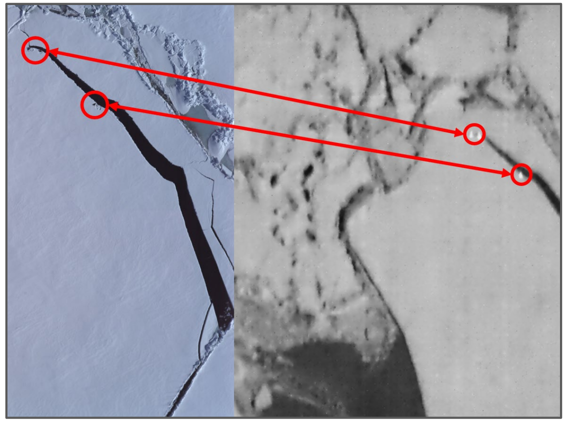
We ask that if you use a data set hosted on LILA BC, you give credit to the data set owner in the manner listed on the data set's landing page.

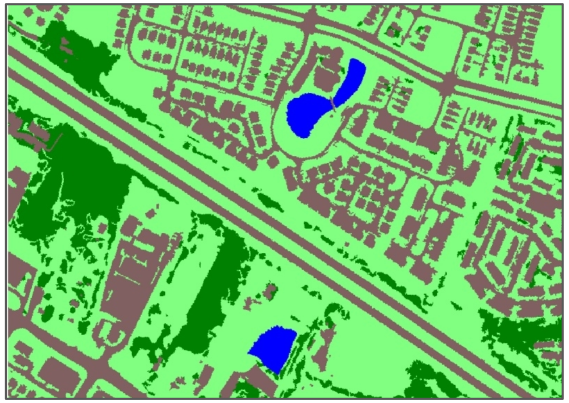
For more information, or to inquire about adding a data set, email info@lila.science.

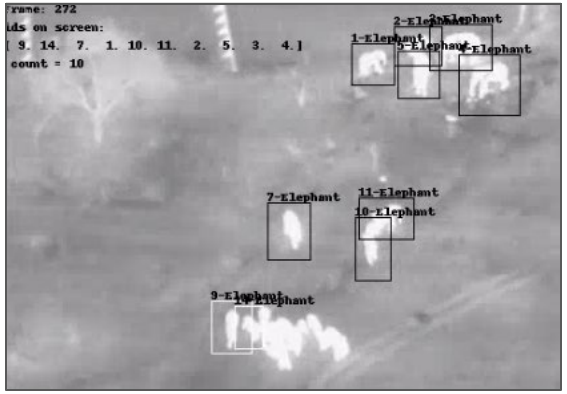
We also maintain a list of other labeled data sets related to conservation.

LILA BC is maintained by a working group that includes representatives from Zooniverse, the Evolving AI Lab at the University of Wyoming, the University of Minnesota Lion Center, Snapshot Safari, and Microsoft AI for Earth. Hosting on Microsoft Azure is provided by Microsoft AI for Earth.

University of Minnesota | Snapshot Safari | Evolving Artificial Intelligence Laboratory | AI for Earth Microsoft

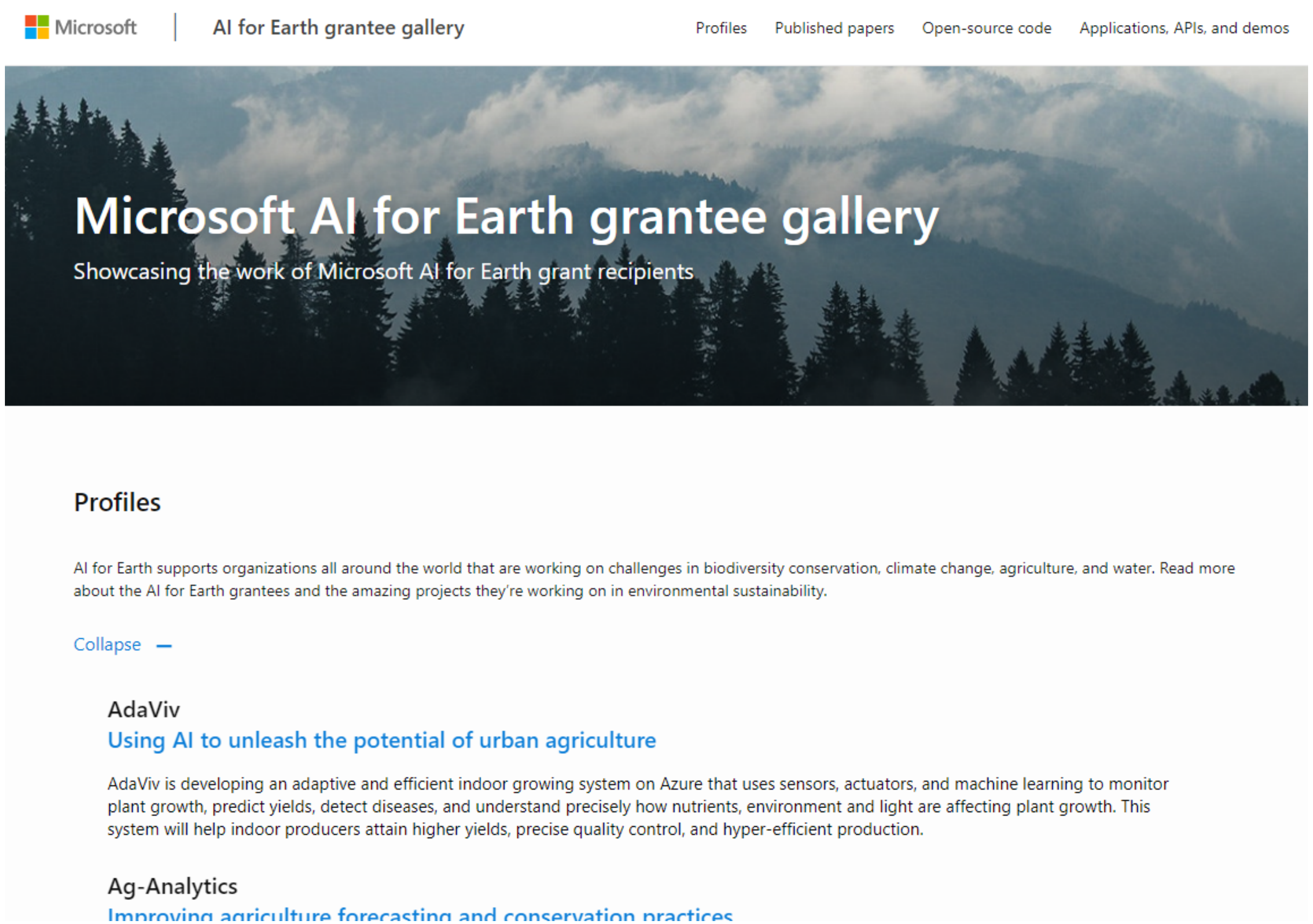






http://lila.science

AI for Earth: grantee stories


Microsoft | AI for Earth grantee gallery

Profiles   Published papers   Open-source code   Applications, APIs, and demos

Microsoft AI for Earth grantee gallery

Showcasing the work of Microsoft AI for Earth grant recipients

Profiles

AI for Earth supports organizations all around the world that are working on challenges in biodiversity conservation, climate change, agriculture, and water. Read more about the AI for Earth grantees and the amazing projects they're working on in environmental sustainability.

Collapse —

AdaViv

Using AI to unleash the potential of urban agriculture

AdaViv is developing an adaptive and efficient indoor growing system on Azure that uses sensors, actuators, and machine learning to monitor plant growth, predict yields, detect diseases, and understand precisely how nutrients, environment and light are affecting plant growth. This system will help indoor producers attain higher yields, precise quality control, and hyper-efficient production.

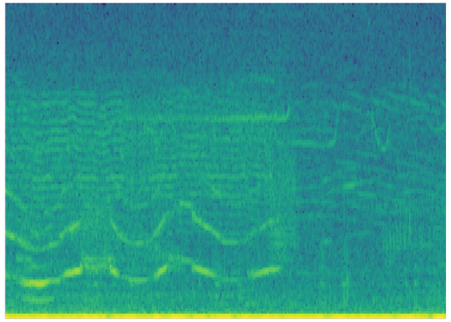
Ag-Analytics

aka.ms/ai4egrantees

AI for Earth data science:

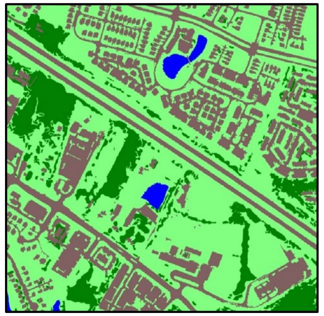
Using ML to help conservation scientists spend *less time clicking stuff*, and *more time doing conservation*.

Accelerating *camera trap* surveys
github.com/microsoft/cameratraps



Accelerating *acoustic* wildlife surveys
github.com/microsoft/belugasounds
github.com/microsoft/multi_species_bioacoustic_classification

Accelerating *aerial* wildlife surveys
github.com/microsoft/aerial_wildlife_detection
github.com/microsoft/arcticseals



Accelerating *land cover* surveys
aka.ms/landcovermapping

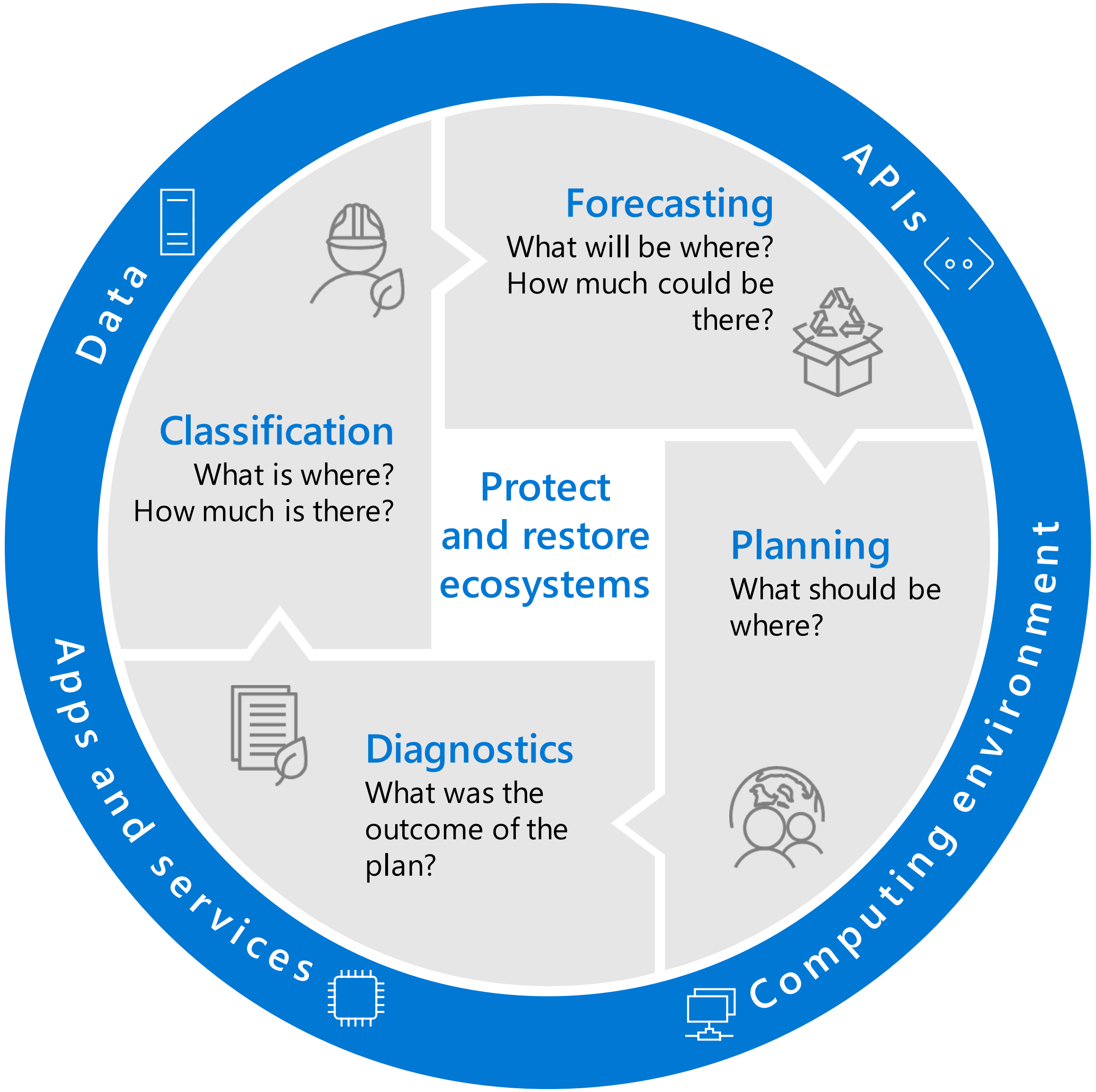
All the fun animal-related work in one place
aka.ms/biodiversitysurveys

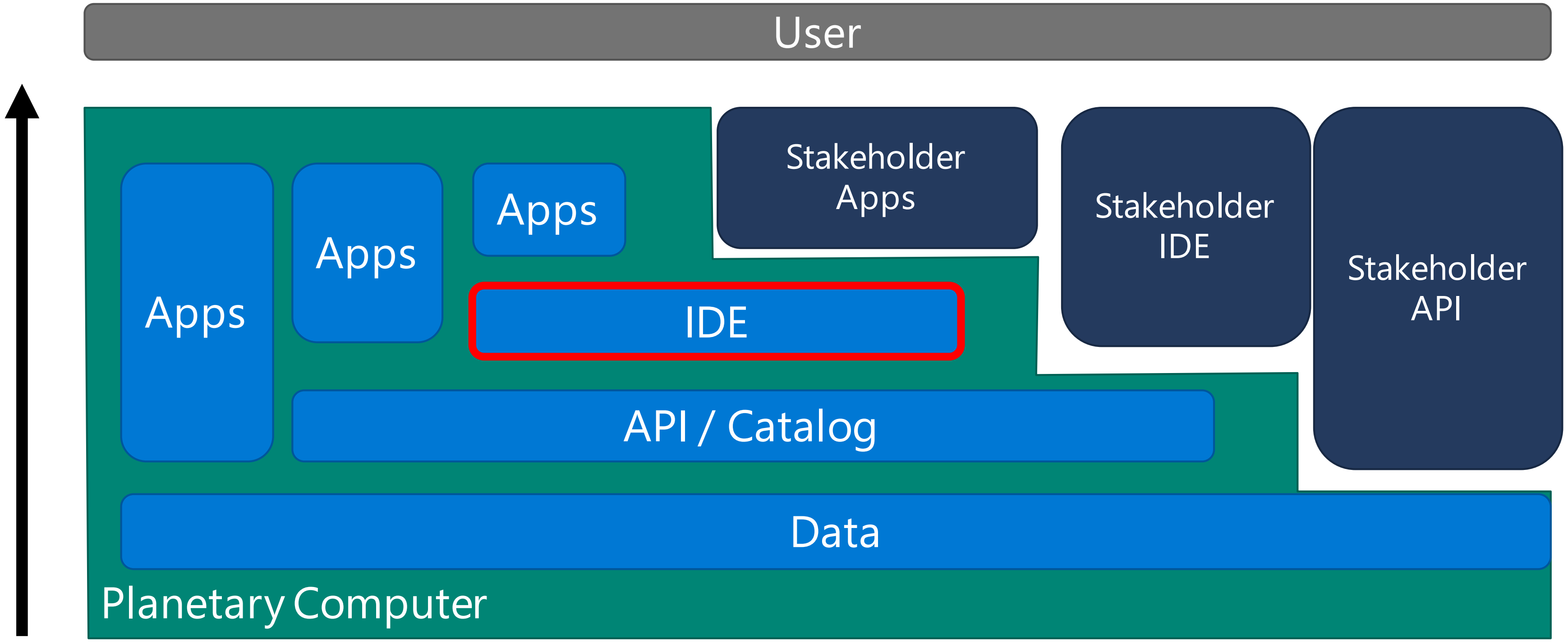
Planetary Computer

From research to operations…

… to protect and restore ecosystems through cloud-based geospatial analytics and AI.

Speed | Scale | Efficiency | Effectiveness




User
Stakeholder Apps
Stakeholder IDE
Stakeholder API
Apps
Apps
Apps
IDE
API / Catalog
Data
Planetary Computer

Microsoft’s Planetary Computer

...protecting and restoring ecosystems through geospatial analysis and AI

Data

Selected data sets

Remote sensing data

Landsat 4, 5, 7, 8

Sentinel-1, -2, -3, -5P

MODIS

GOES-16, -17

NAIP

ASTER

Weather/climate data

CMIP6, ERA5

GFS, ISD, NEXRAD, GHE

Land cover data

CCI, Corine, CCAP, NLCD, CDL, USGS GAP

Data access APIs

Key features

Spatiotemporal queries

...for tiles

...for stitched pixels

STAC catalog

Tiling/visualization

Change notifications

Access to Esri Living Atlas and user-imported data

Computing environment

Key features

Jupyter front-end

Synchronous batch processing

Asynchronous batch processing

Single login/auth for user-provided data and access to Living Atlas/AGOL data

Data export to blob storage

Applications and services

Classification

What exists at (x/y/t), for t <= 0?

Initial applications...

Land use assessment

Biodiversity surveys

Human modification evaluation

Forecasting

What might exist at (x/y/t), for t > 0?

Initial applications...

Flood risk mapping

Deforestation prediction

Water availability prediction

Planning

What do we *do* about a change in f(x,y)?

Initial applications...

Conservation spatial planning

Prioritizing carbon offset projects

Diagnostics

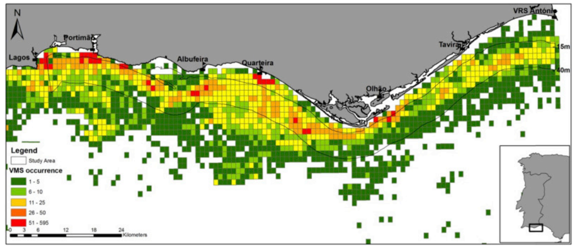
What is causing f(x,y) to change or not change?

Initial applications...

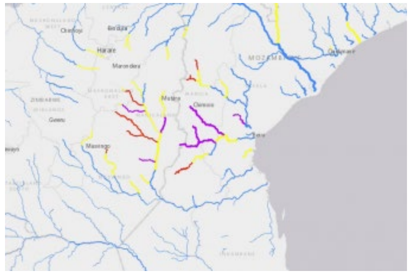
GHG emissions monitoring

Carbon offset program evaluation

Some of our launch applications

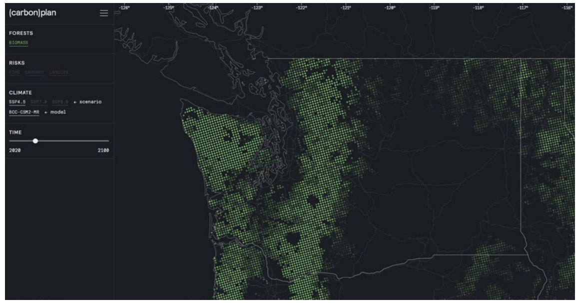


Conservation planning

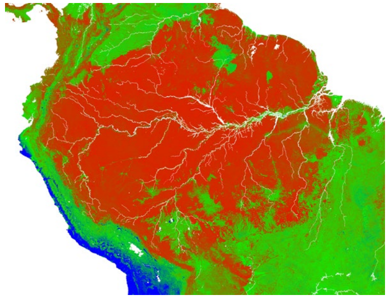


Water availability forecasting

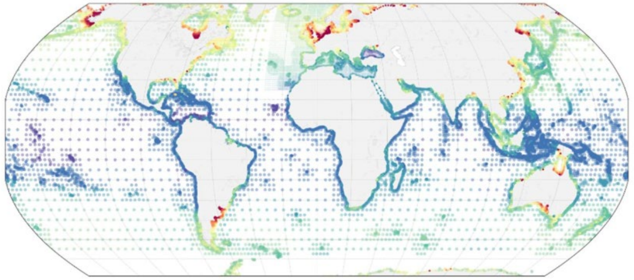
Land cover mapping



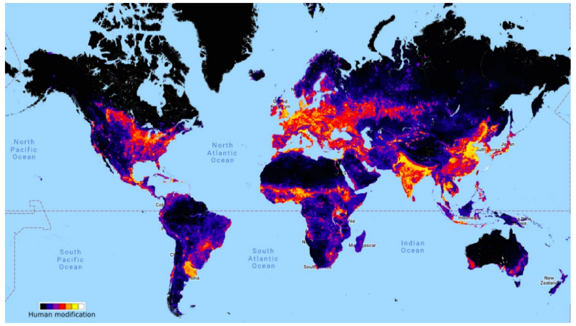
Forest carbon offset risk



Deforestation prediction

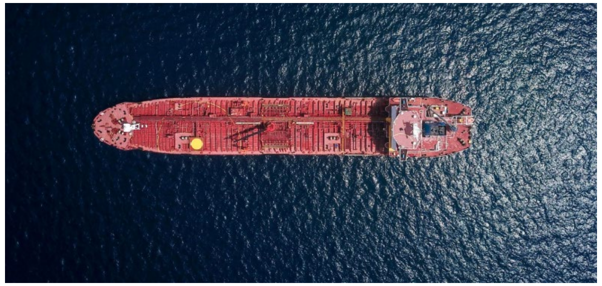


Flood risk assessment



Human footprint mapping

Accelerating biodiversity surveys



Shipping emissions estimation

Planetary Computer Data

...hosting geospatial data sets on Azure that are critical to sustainability and environmental science

Remote sensing data

- Landsat 4, 5, 7, 8
- Sentinel-1,-2, -3, -5P
- GOES-16, -17
- MODIS, NAIP, ASTER

Weather/climate data

- CMIP6, ERA5, GFS, ISD, NEXRAD, GHE

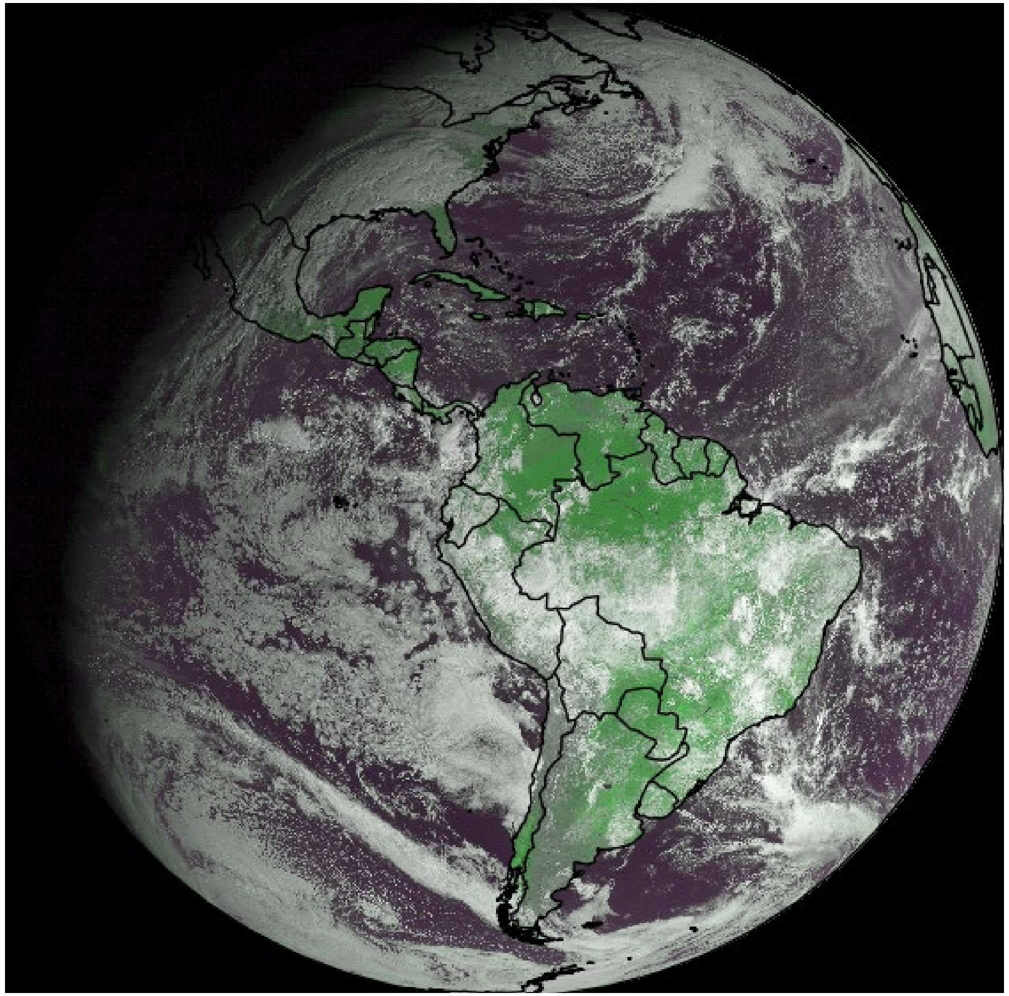
Land cover data

- CCI, Corine, CCAP, NLCD, CDL, USGS GAP

External data sources

- Esri Living Atlas

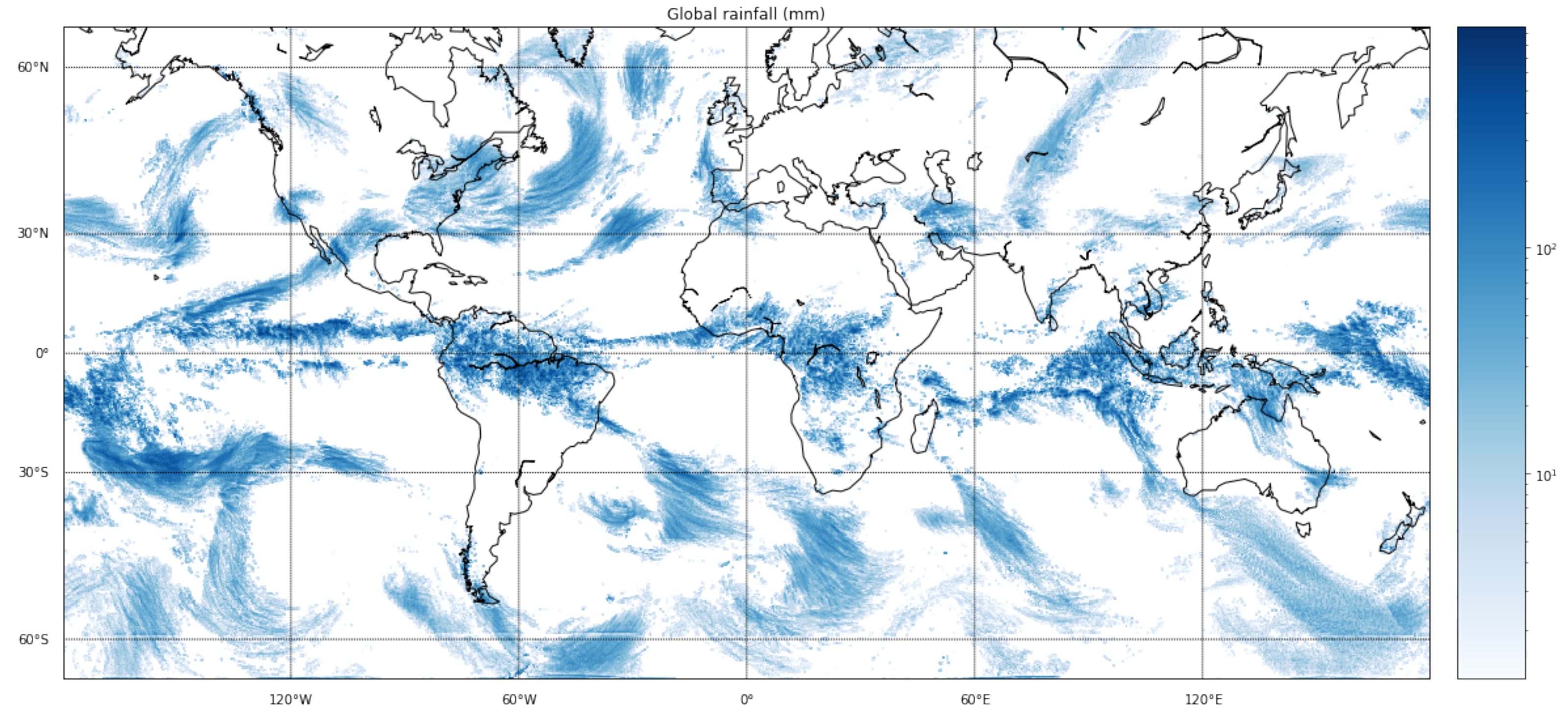
User-contributed data



Planetary Computer APIs

...facilitating discovery and access for large geospatial data catalogs

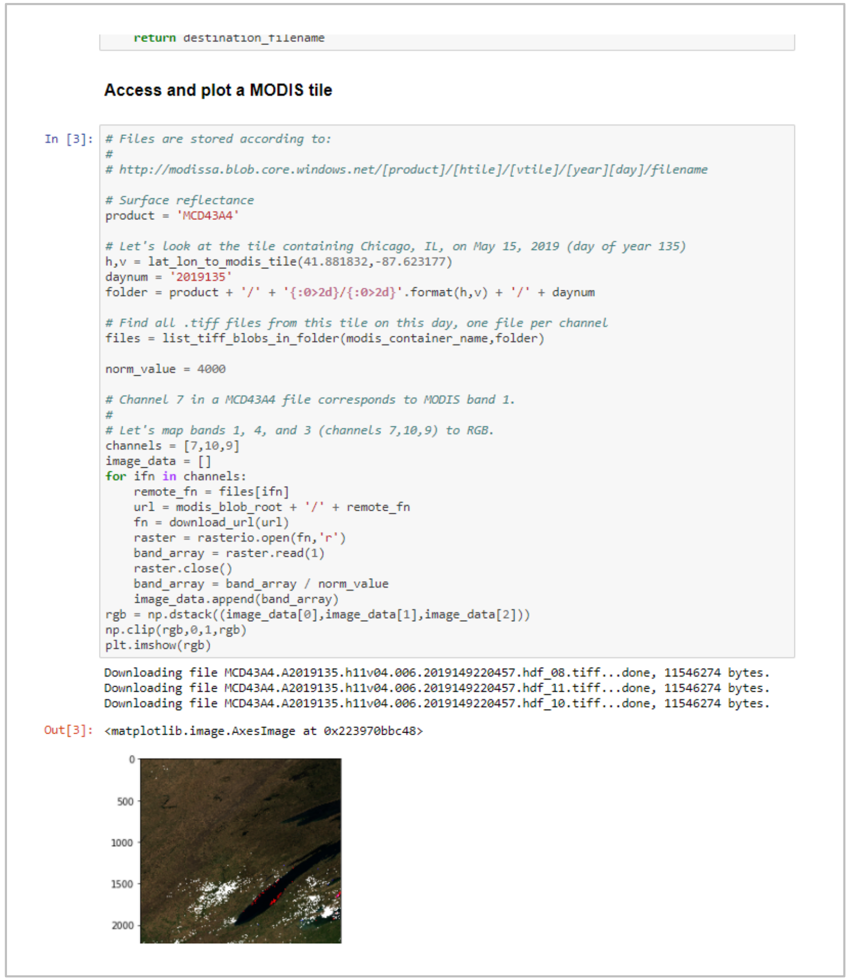
- Spatiotemporal queries for images
- Spatiotemporal queries for stitched pixels
- Data discovery via a public STAC catalog
- Tiling/visualization services
- Change notifications
- Resampling to new grids



Planetary Computer Computing Environment

…abstracting away the complexity of distributed processing for global-scale analysis

- Jupyter front-end
- Compute provisioning
- Synchronous processing
- Asynchronous batch processing and job management
- Single login/auth for Microsoft-hosted data, user-provided data, and Esri Living Atlas data
- Data export to blob storage



Planetary Computer Application Area: Classification

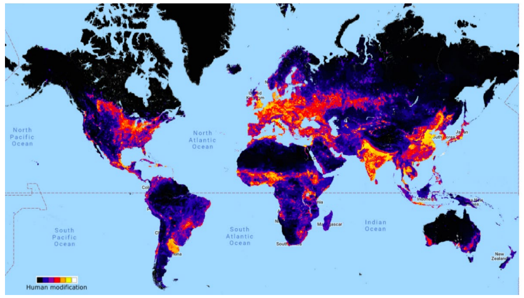
What is where, and how much is there?

Example application: land use and land cover assessment

Accelerating geospatial image analysis with cloud-based AI

Example application: human modification evaluation

Mapping the footprint of human land use



Example application: accelerating biodiversity surveys

Leveraging AI to help conservation biologists spend more time planning conservation, and less time annotating data

Planetary Computer Application Area: Forecasting

What might be where in the future?

Example application: flood risk mapping

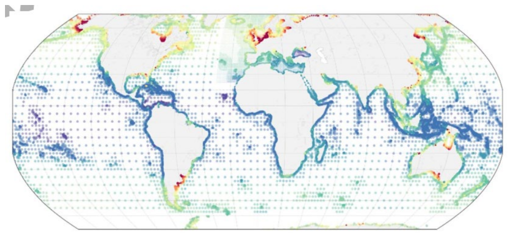
Leveraging historical data and modeled climate data to assess flood risk zones

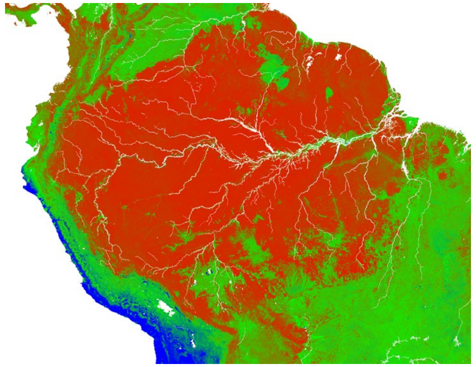
Example application: deforestation prediction

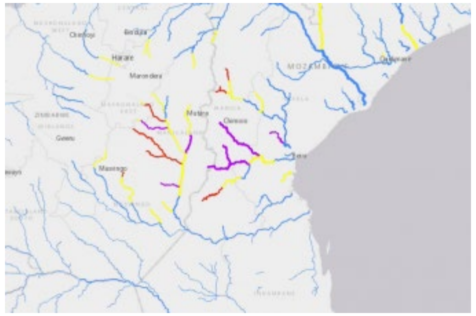
Leveraging remote sensing data to facilitate rapid response to expected tree canopy loss

Example application: water availability prediction

Leveraging weather imagery and ground station data to predict surface water availability





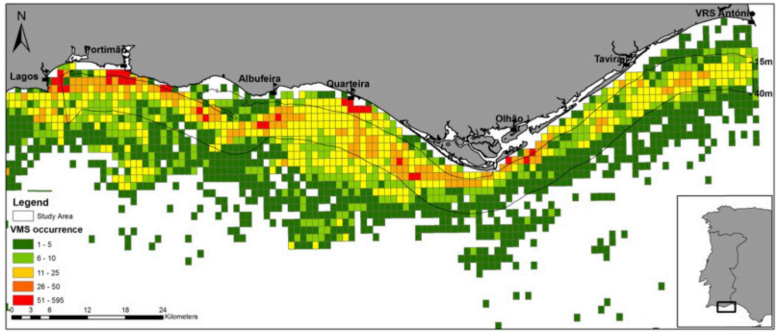


Planetary Computer Application Area: Planning

What land planning policies will optimally protect natural carbon sinks and global biodiversity?

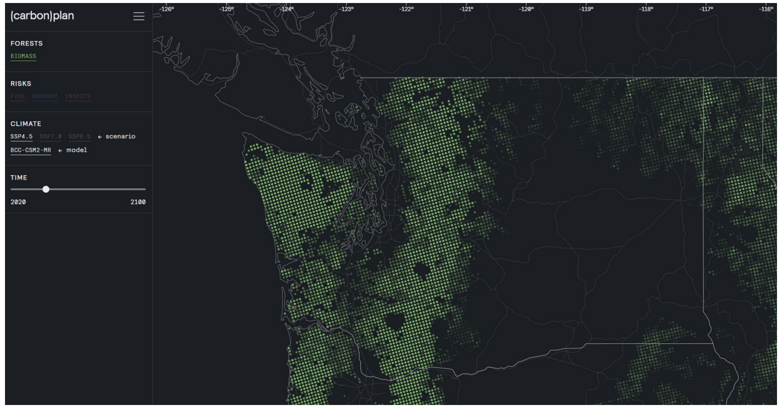
Example application: conservation spatial planning

Using global biodiversity data and remote sensing data to plan conservation policy in critical ecosystems



Example application: prioritizing carbon offset projects

Leveraging climate and fire risk models to inform decisions about forest protection projects



Planetary Computer Application Area: Diagnostics

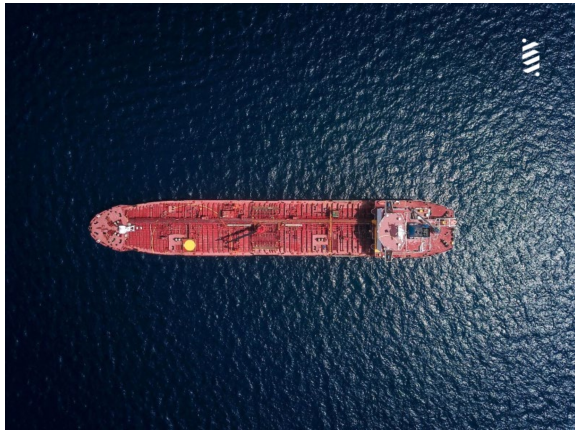
What was the actual impact of intentional or unintentional human intervention on ecosystems and climate?

Example application: carbon offset credit retrospective analysis

Reviewing carbon offset programs in light of new data, to quantify the true utility of individual programs

Example application: GHG emissions monitoring

Attributing GHG emissions responsibility to operators in the global shipping industry



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