

Health & Air Quality Team Meeting 2019

Rapid City, South Dakota

Sept 9-11, 2019

National Aeronautics and
Space Administration



Building Capacity to Use Earth Observations

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&

Zach Bengtsson (SSAI/Ames)

NASA Capacity Building Program

Capacity Building Program

- ▶ Improves skills and capabilities of individuals and institutions to access and apply NASA Earth science to decision making
- ▶ Pursues different approaches to building capacity: trainings, feasibility projects, and product co-development
- ▶ Supports three elements: ARSET, DEVELOP, and SERVIR, along with a pilot initiative focused on Indigenous Peoples
- ▶ **2018 Reach:**



8,600
Individuals



2,944
Institutions



146
Countries



*Depth of
Engagement*

Improved
AWARENESS of
EO Resources

Enhanced Access
to EO Resources

Strengthened
Capacity to Use
EO Resources

Increased **USE** of
EO in Decision
Making

CBP Elements & Initiatives



ARSET

Provides online and in-person trainings that cover available NASA data, products, and tools related to specific thematic topics. Courses are appropriate for policy makers, regulatory agencies, NGOs, and other applied science professionals.



DEVELOP

Conducts 10-week feasibility studies that integrate NASA Earth observations into environmental decision making. Interdisciplinary teams of students and early career professionals partner with organizations involved in environmental decision making.



SERVIR

A joint development initiative of NASA and USAID that works in partnership with leading regional organizations around the globe to connect space to village by empowering developing countries to apply geospatial information.

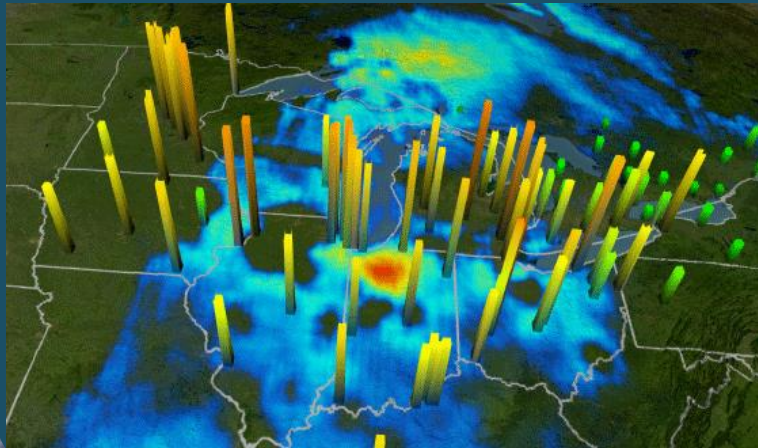
Indigenous Peoples Pilot

Focuses on building relationships across NASA and indigenous communities through remote sensing training, community engagement, and research opportunities.

CBP 2019 Health & AQ Portfolio

2 Trainings

- ▶ May-June 2019: Advanced Webinar: High Resolution NO2 Monitoring From Space with TROPOMI
- ▶ Oct 2019: Application of Satellite Observations for Air Quality and Health Exposure



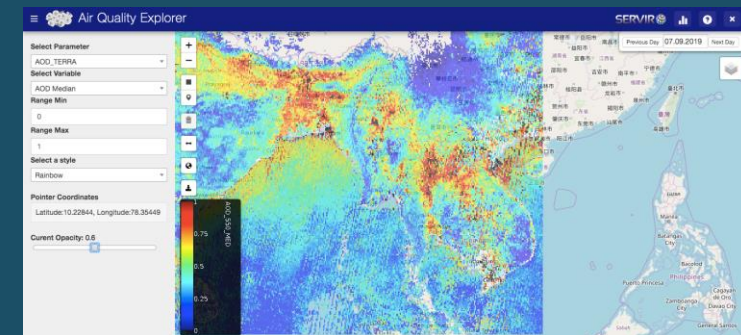
3 Feasibility Studies

- Examining Tick-Borne Illness Risk by Evaluating Land Cover and Tick Habitat Suitability in Southern Maine
- Evaluating Urban Heat Islands and Flooding to Enhance Green Infrastructure Initiatives in Coastal Communities in Mobile, Alabama
- Utilizing NASA Earth Observations to Explore Heat and Flood-Related Vulnerability in Providence, RI & Elizabeth, NJ



1 Co-Development

- ▶ Satellite-Based Air Quality Monitoring Service in Thailand in partnership with SERVIR MEKONG, Thai Pollution Control Department and SERVIR SCO





ARSET

NASA's Applied Remote Sensing Training Program (ARSET)

<http://arset.gsfc.nasa.gov/>

- Empowering the global community through remote sensing training
- Part of NASA's Applied Sciences Capacity Building Program
- Goal: increase the use of Earth Science in decision-making through training for:
 - policy makers
 - environmental managers
 - other professionals in the public and private sector
- Trainings offered focusing on applications in:



Disasters



Eco (LULC)



Health & Air Quality



Water Resources

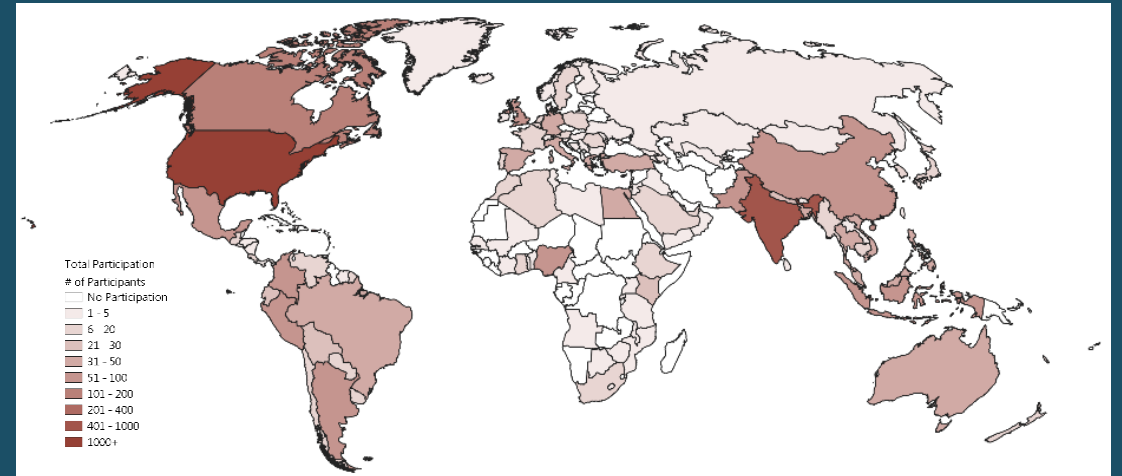


ARSET Health & Air Quality Impacts

<https://arset.gsfc.nasa.gov/airquality>

- ▶ In 10 years, provided 63 trainings
- ▶ 4,685 instances of participation
- ▶ Participants have come from 1,700 organizations and 111 countries

2019 Air Quality Participants



“Now I know where to search for the data I am looking for, how to select only the data I really need (e.g. special regions) and where to find documentations for the data sets and variables.”
– Attendee, Germany Federal Government



ARSET Air Quality Trainings

<https://arset.gsfc.nasa.gov/airquality>

Provides in-person and online trainings focusing on remote sensing applications for health and air quality. Topics can include:



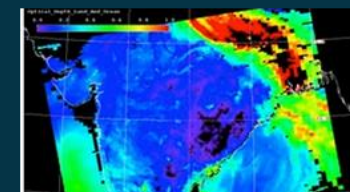
Remote Sensing



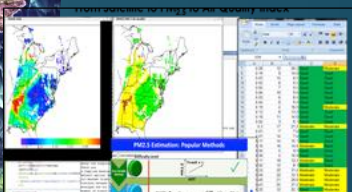
Satellites



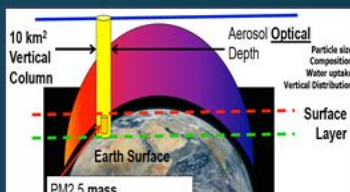
Imagery



Algorithms



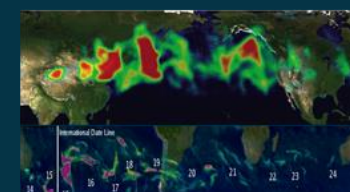
Data & Tools



Column to Surface



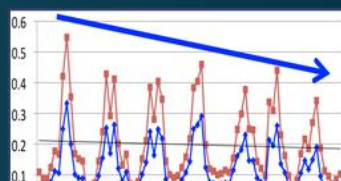
Dust & Smoke



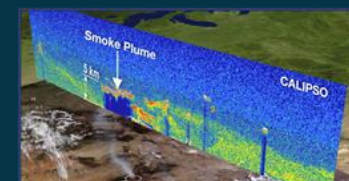
Plume Transport



Satellite & Model Comparison



Air Quality Trends



Vertical Profiles

Advanced Webinar: High Resolution NO₂ Monitoring from Space with TROPOMI

Provided May 28-June 3, 2019

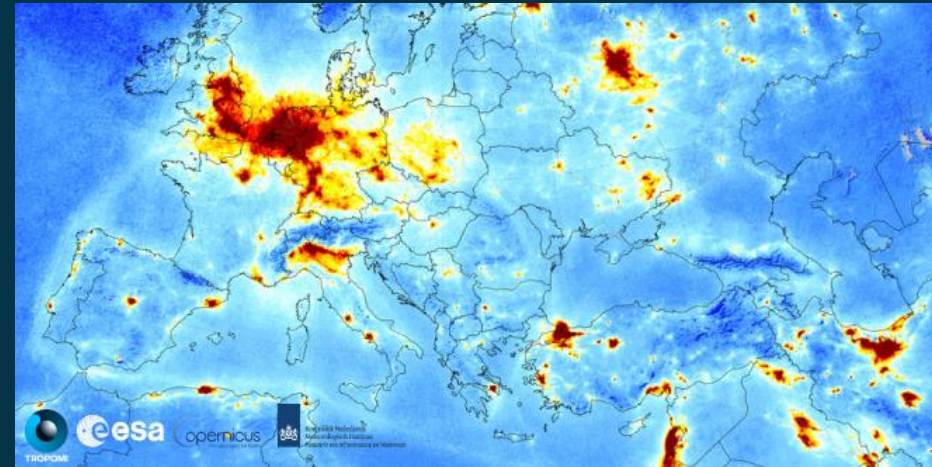
Community Problem: The TROPOMI sensor onboard Sentinel-5 has improved spatial resolution over Aura's OMI sensor. Need for more information on how to transition to TROPOMI and access and analyze TROPOMI data.

ARSET Training:

- Provided an Advanced Webinar series
- Objectives: understand available data products, access and download TROPOMI data, and analyze the data using Python tools

Outcome:

- Reached 551 participants from 410 organizations and 76 countries
- 96% of participants in a post-training survey identified that their knowledge of specific remote sensing products and ability to access the data products improved



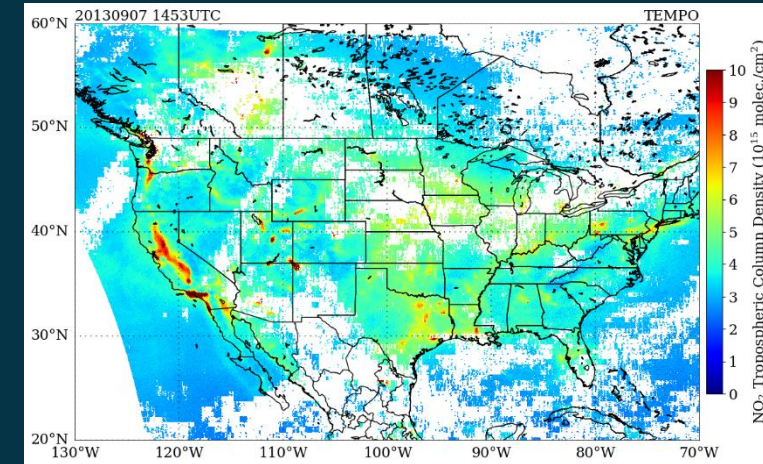
Application of Satellite Observations for Air Quality & Health Exposure

Huntsville, Alabama; October 9 & 11

Community Problem: To support TEMPO early adopters for health and air quality applications

ARSET Training:

- In-Person training, Introductory & Advanced
- Developed in coordination with the TEMPO Health Applications Conference
- Topics will include:
 - Air quality monitoring & forecasting
 - Smoke, fire, and PM_{2.5} monitoring
 - Image Interpretation
 - Data access for modeling efforts
 - Introduction to AQ data from geostationary satellites



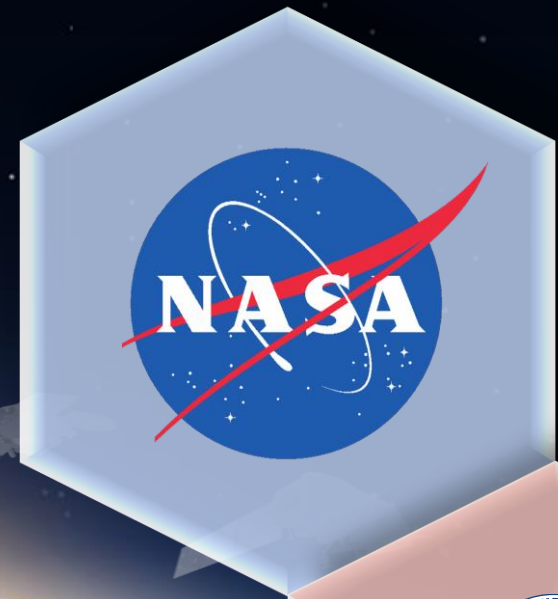


SERVIR



SERVIR

SERVIR connects space to village by helping developing countries use satellite data to address critical challenges in food security, water resources, weather and climate, land use, and natural disasters.



A partnership of **NASA**, **USAID**, and **leading technical organizations**, SERVIR develops innovative solutions to improve livelihoods and foster self-reliance in Asia, Africa, and the Americas.



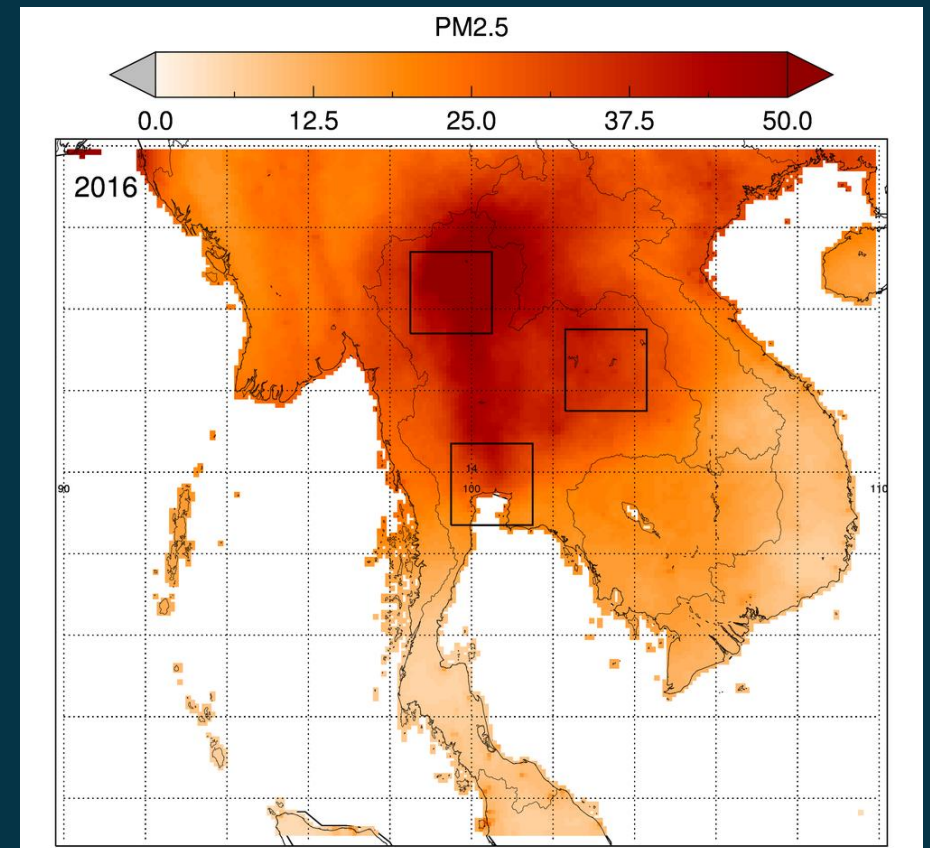
SERVIR

www.servirglobal.net

Satellite Based Air Quality Monitoring in Thailand: A prototype service

- Air quality is a growing problem in the region with seasonal fires, increased urban pollution, and transport with significant impact on health and the economy of the region.
- SERVIR MEKONG hub partnered with Thai Pollution Control Department to develop prototype service with the understanding of ground data sharing.

Responding to the needs of developing nations, SERVIR's global partners help decision makers manage their relationship with natural resources to improve global health.





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www.servirglobal.net

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AQ Training for SERVIR Mekong hub, July 22-25, 2019, Total 11 participants

- Training covered basics of remote sensing, satellite, sensors, data sets, tools and applications
- Combination of lectures, demo, hands-on exercises, and case study analysis
- Built awareness and skills on available satellite data and tools for air quality monitoring
- Developed codes and performed case study analysis to help achieve proposed workplan.



An aerial topographic map of a mountainous region, showing various shades of green, yellow, and brown representing different elevations and vegetation. A large, semi-transparent teal circle is overlaid on the left side of the image, partially obscuring the map. The word "DEVELOP" is written in large, white, bold, sans-serif capital letters across the center of the teal circle.

DEVELOP



DEVELOP

<https://develop.larc.nasa.gov>

- ▶ DEVELOP's Health & Air Quality projects address partner concerns and decision processes related to topics such as
 - ▶ air quality
 - ▶ vector-borne disease
 - ▶ urban heat islands
- ▶ Projects occur over the course of 10 weeks and engage interdisciplinary teams in the creation of deliverables generated in cooperation with partner organizations.





SOUTHERN MAINE HEALTH & AIR QUALITY

Examining Tick-Borne Illness Risk by
Evaluating Land Cover and Tick
Habitat Suitability in Southern Maine

Celeste Gambino

Britnay Beaudry

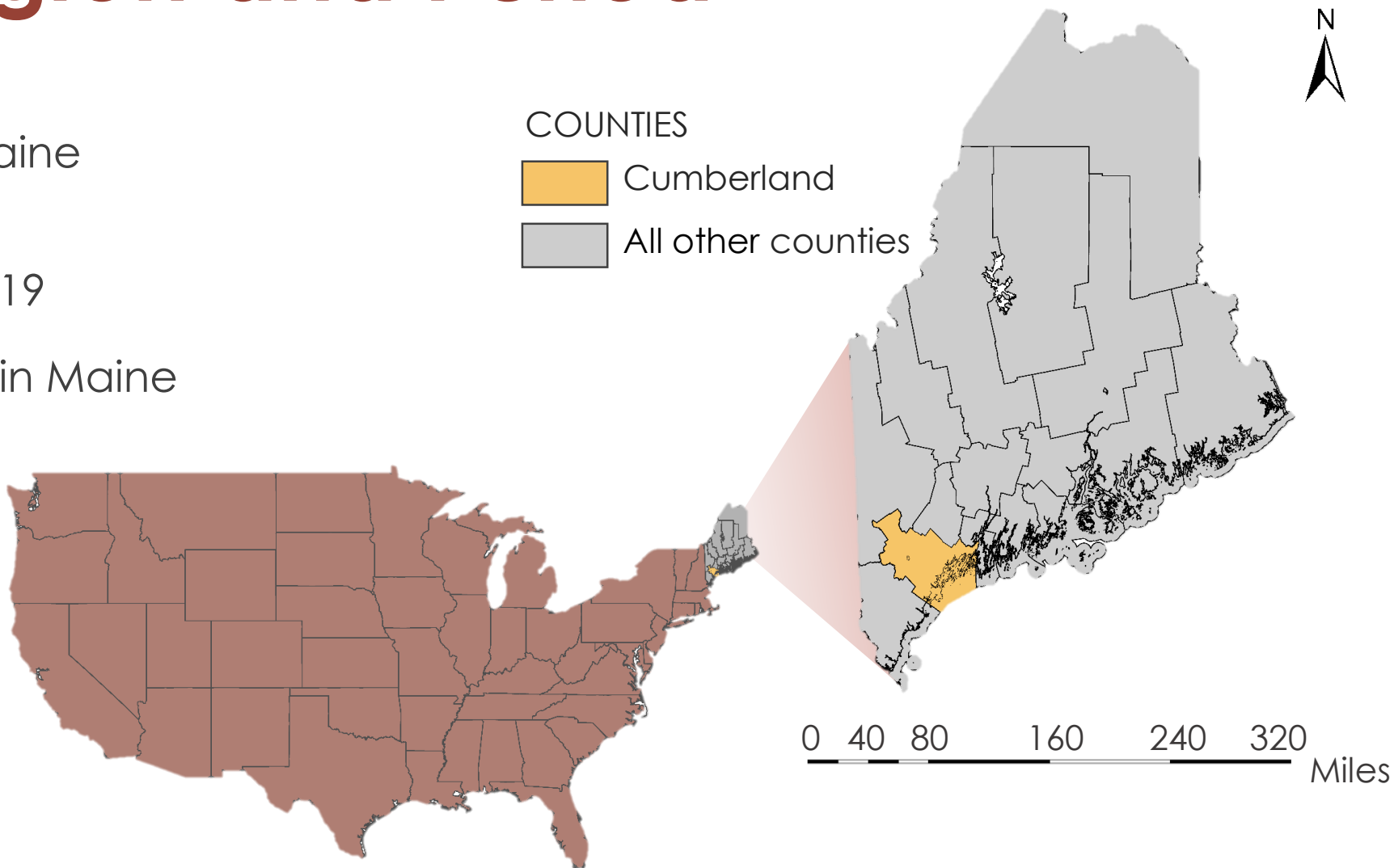
Madison Berman

Monica Colmenares



Study Region and Period

- ▶ **Study Region:**
Cumberland County, Maine
- ▶ **Study Period:**
January 2008 to June 2019
- ▶ Most populated county in Maine
- ▶ Destination of hundreds of thousands of visitors every year



Source: DEVELOP Southern Maine Health & Air Quality Team

Community Concerns

- ▶ Tick-borne illnesses are a public health issue in Southern Maine
- ▶ There is a tendency to underreport cases of tick-borne illness
 - ▶ Estimates project that only 1 in 10 cases of Lyme disease are actually reported
- ▶ Local communities require increased efforts to identify locations of high tick encounter risk



Objectives

- ▶ **Create** land cover maps of Cumberland County that identify the main land cover types known to increase likelihood of tick encounter
- ▶ **Examine** the relationship between environmental factors and the estimation of actual disease incidence
- ▶ **Improve** public awareness of high disease risk locations while also informing future research related to tick-borne illness mitigation



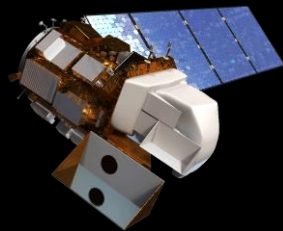
Source: Mike Lindsey (Flickr)

Partners

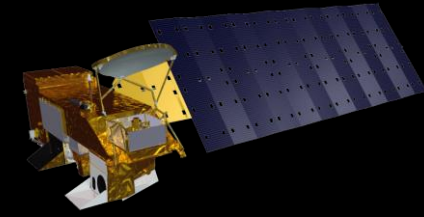


- ▶ Maine Medical Center Research Institute, Lyme & Vector-Borne Disease Laboratory
- ▶ Maine Vector-Borne Disease Working Group
- ▶ Bigelow Laboratory for Ocean Sciences

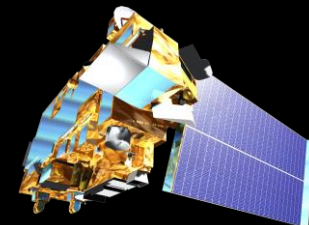
Satellite Sensors Used



Landsat 8 OLI



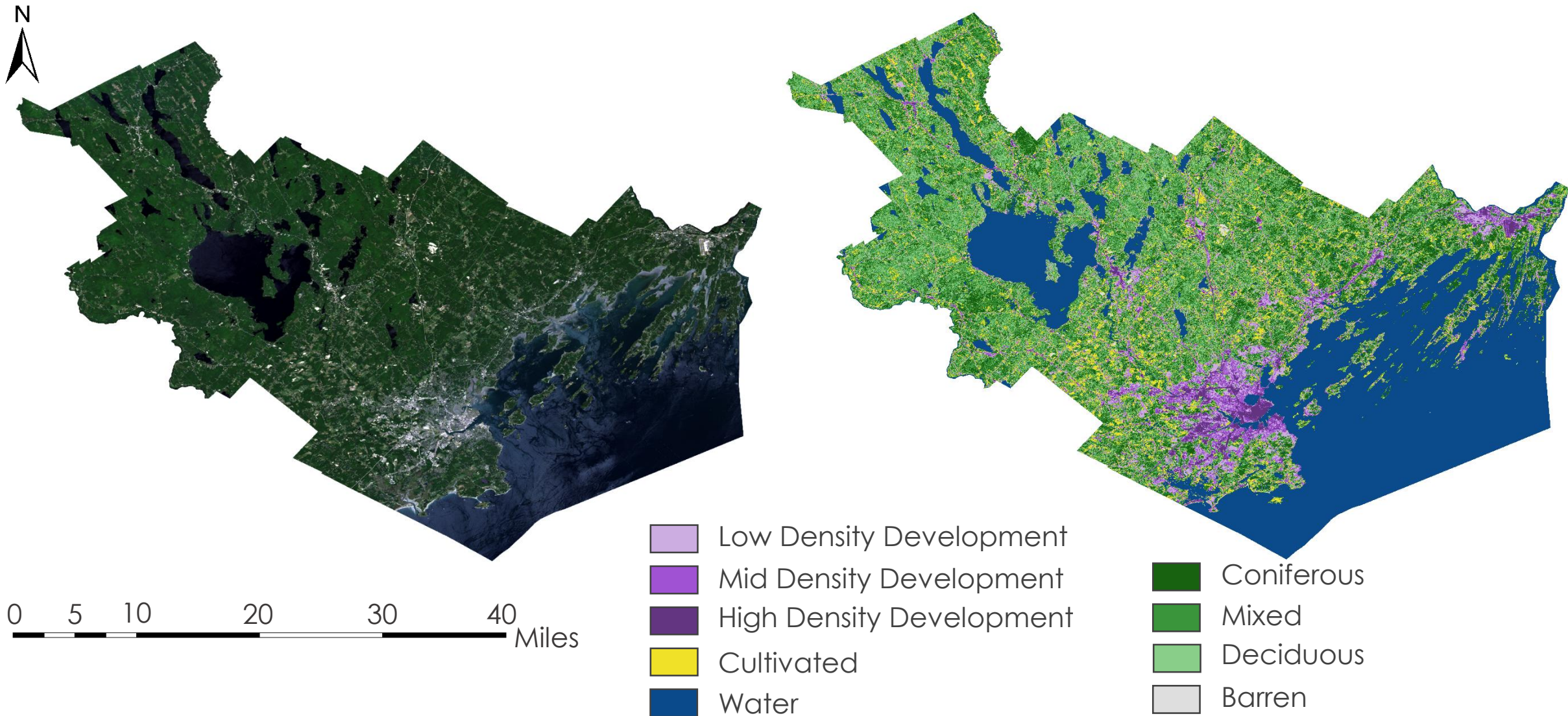
Aqua MODIS



Terra MODIS

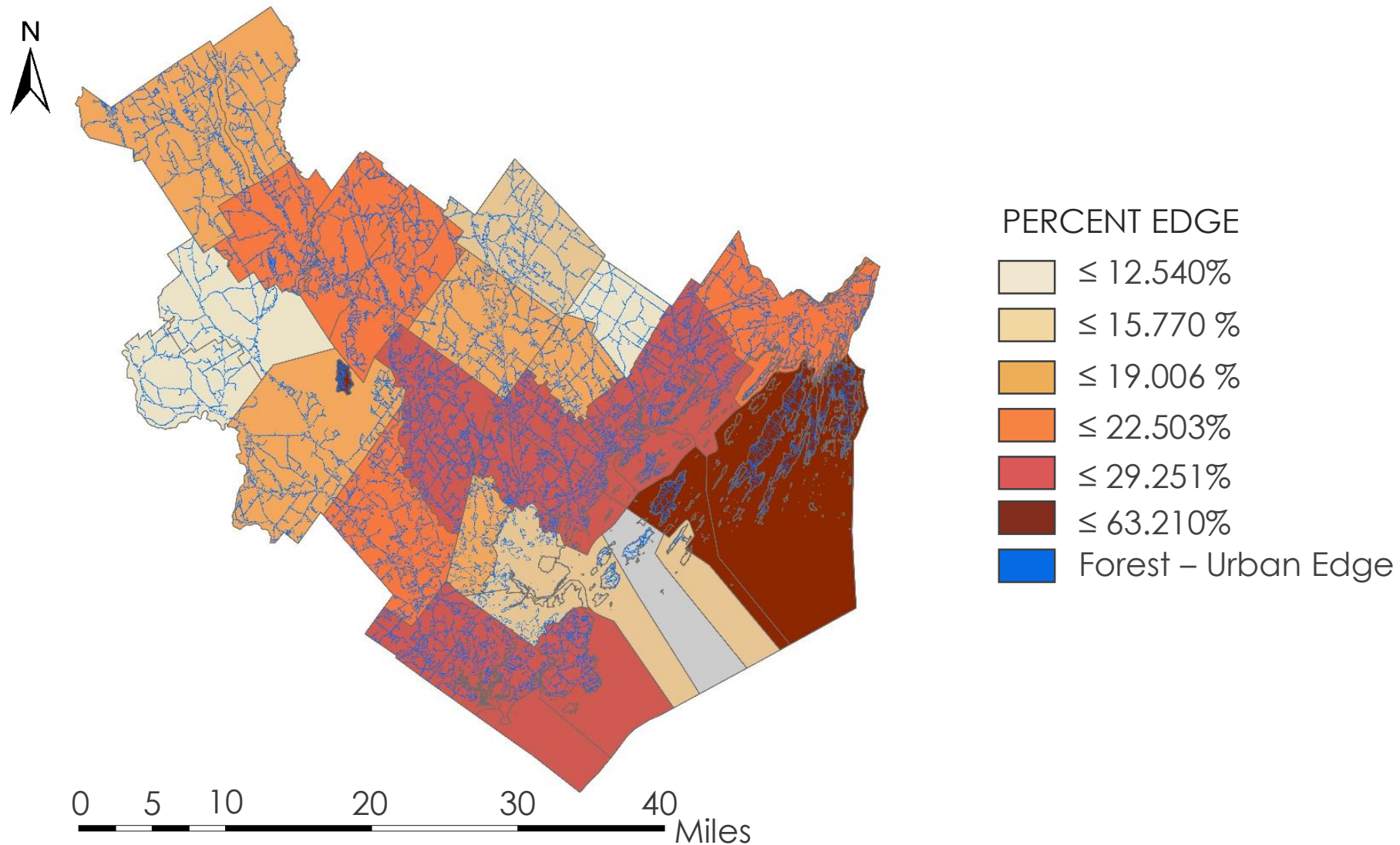
Source: NASA Scientific Visualization Studio

Land Cover Results

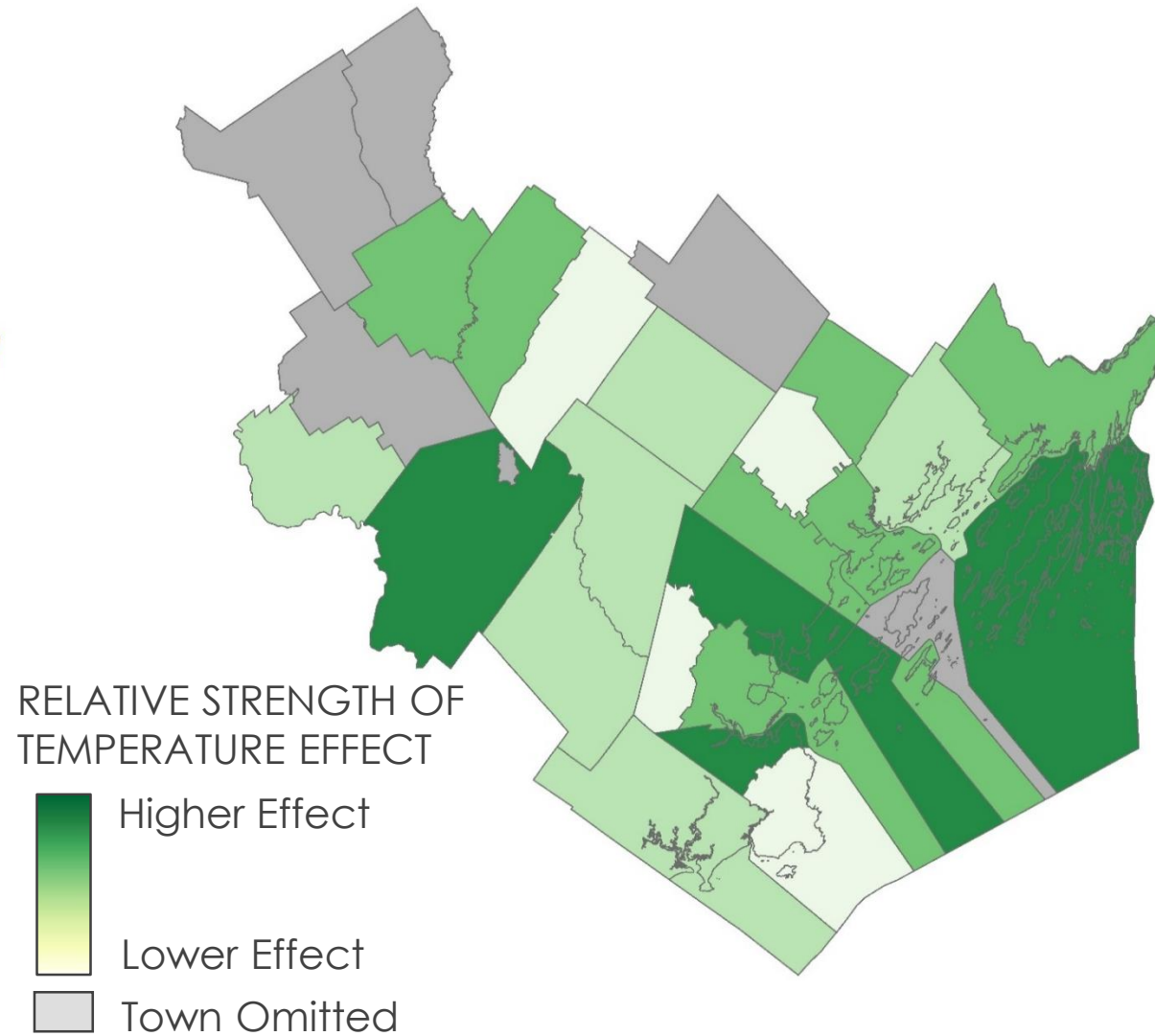
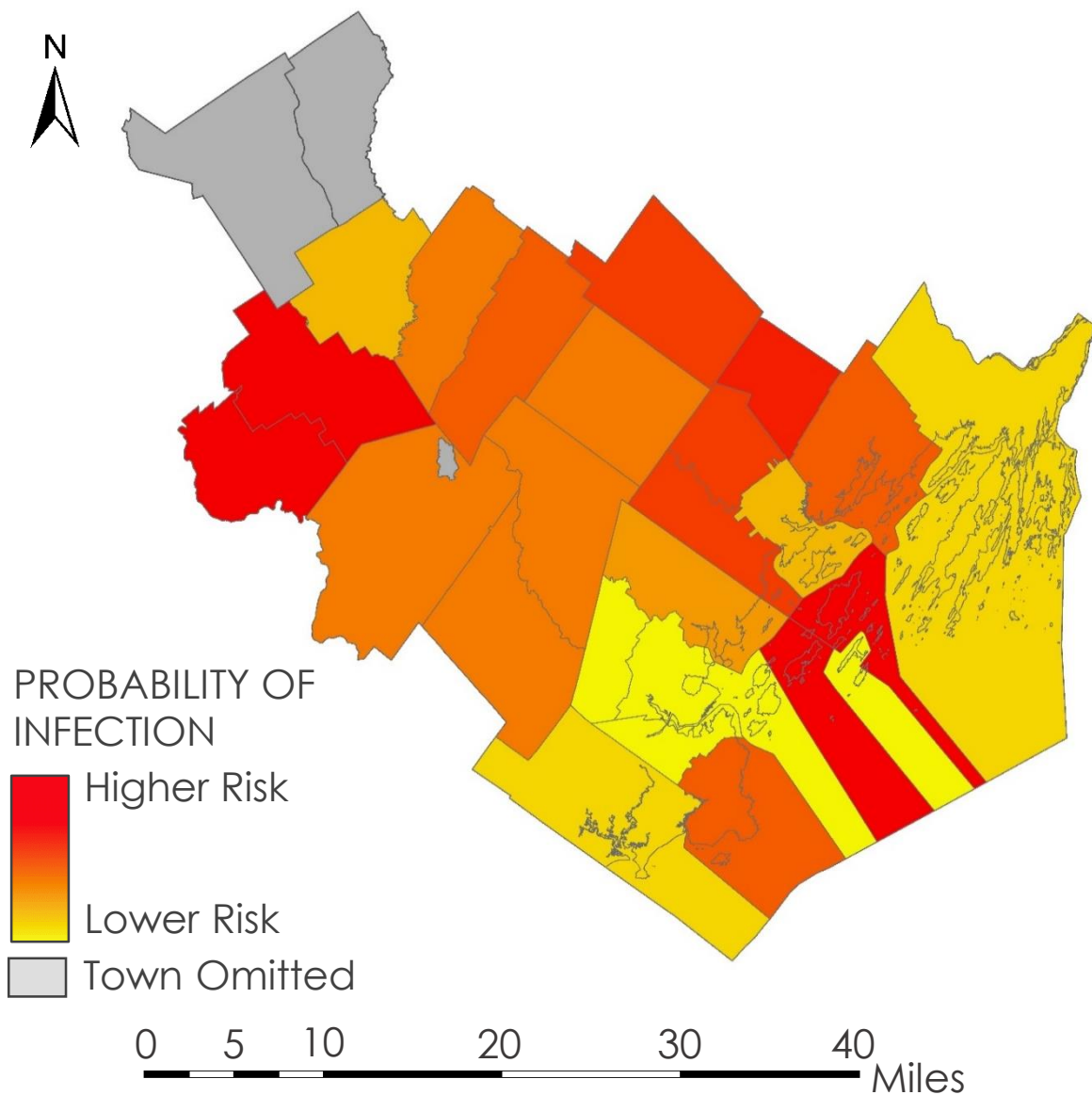


Source: DEVELOP Southern Maine Health & Air Quality Team

Edge Map Results



Modeling Results



Conclusions

- ▶ The land cover map demonstrated that vegetation classes were more mixed than expected and impervious surface was a subjective proxy for urbanization.
- ▶ Frye Island, Chebeague Island, and Long Island had the highest percent edge features, and should be targeted for increased public awareness.
- ▶ New Gloucester, North Yarmouth, and Cumberland were found to have the highest modeled tick-borne disease incidence risk per person.
- ▶ Temperature's strength of effect was stronger in towns such as Standish, Harpswell, and South Portland. Humidity was not predictive of Lyme cases.

Engage with CBP...

- ▶ **Take an ARSET training:** visit <https://arset.gsfc.nasa.gov/> for more information about upcoming trainings list and access the archive of past trainings.
- ▶ **Collaborate with DEVELOP on a feasibility project:** complete a project request form, found at <https://develop.larc.nasa.gov/projects.php> and email to NASA-DL-DEVELOP@mail.nasa.gov.
- ▶ **Collaborate with SERVIR on international project**

Resources

- ▶ ARSET offers an archive of past training materials at <https://arset.gsfc.nasa.gov/webinars> in both English and Spanish, across a broad set of thematic focus areas.
- ▶ SERVIR's Global Product Catalogue can be accessed at <http://catalogue.servirglobal.net/> for more access to a searchable collection of user-tailored products and tools using Earth Observations and NASA Products to inform resilient development.
- ▶ DEVELOP hosts a code repository at <https://github.com/NASA-DEVELOP> providing access to scripts and code that support the integration of Earth observations across a variety of applications.
- ▶ DEVELOP's archive of past projects (2014 to the present) is available at <https://develop.larc.nasa.gov/project-archive.php>.



Thank You!

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