National Aeronautics and Space Administration

NASA Earth Science Division Applied Sciences Program

DEVELOP National Program

Vector Borne Disease: Risk Mapping

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Mobile County Health Department – April 22, 2011

Vector Borne Disease: Risk Mapping

Community Concerns

- Higher prevalence of West Nile and EEE cases in Mobile County as opposed to other areas
- Efficiency of adulticiding and spraying routes
- Long-term health effects of WNV and EEE

Project Partner

- Mobile County Health Department
- Department of Vector Control

Decision Making Process / Partner Needs

- Identify high risk areas
- Public awareness of higher risk populations and locations for preventative measures

Decision Support Tools for Partner

- WNV and EEE Risk Maps
- Tutorial

Public Health

Advisors

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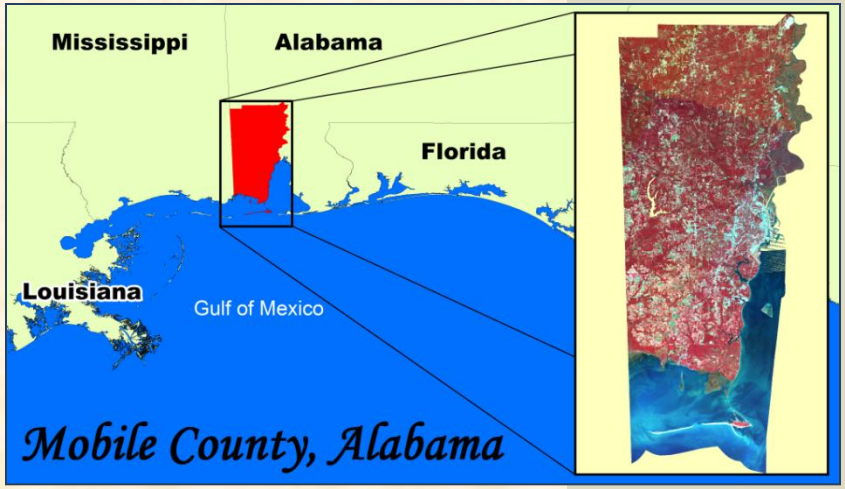
Vector Borne Disease - Overview

Project Objectives

- Identify habitats of reservoirs using land classification techniques
- Identify habitats of vectors using hydrologic and geologic resources
- Identify areas of vulnerable populations using Census data
- Produce WNV and EEE risk maps



Study Area & Period

- Mobile County, AL
- May through November

Benefits to Partners

- Identified areas of risk can result in:
  - More efficient spraying routes
  - Internal education
  - Development of public awareness strategies
  - Decrease prevalence of WNV and EEE by public awareness
- Detailed land classification to be used in later terms
- Data user workshop

Vector Borne Disease - Data

Satellites / Sensors

- Terra – ASTER
- Landsat 4 and 5 – Thematic Mapper
- TRMM

Ancillary Data

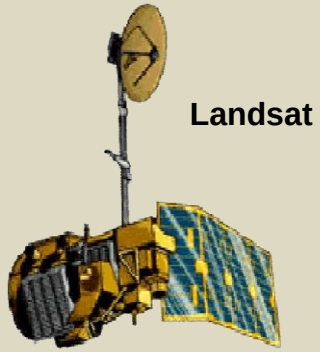
- Mobile county GIS layers
- USDA soil maps
- US Census data

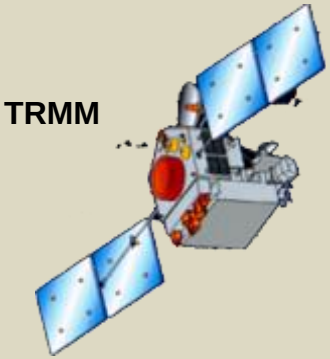
Data Acquisition

- WIST ASTER
- GloVis Landsat 4-5 TM
- Giovanni TRMM
- Ancillary data from MCHD, USDA, Mobile County, Census Bureau

Data Processing & Analysis

- ASTER, Landsat
- TRMM
- Public Health data





Vector Borne Disease: Vectors

Aedes albopictus

Habitat

- Urban, suburban areas, tire disposal sites
- Strict container-breeder

Blood-feeding Preference and Style

- Humans (~83%) or Birds (~7%)
- Opportunistic feeder
- Aggressive biter

Transmission Style

- Vertical transmission (transgenerational) is possible but not efficient
- Anterior-Statin transmission through saliva

Preferred Landing Sites

- Low –flying (1m above ground)
- Feet and hands, when in the sitting and supine positions, are most vulnerable to bites

Culex quinquefasciatus

Habitat

- Rural and wooded areas near water
- Landfills, disposal sites
- Breeds in shallow water

Blood-feeding Preference and Style

- Prefers birds (~50-60%) but second choice is humans (~20-35%)
- Opportunistic feeder

Transmission Style

- Vertical transmission (transgenerational) is common
- Horizontal transmission (anterior-statin)

Preferred Landing Sites

- Low –flying (1-3m above ground)
- Most common are lower portions of the legs and feet

Vector Borne Disease: Medical Aspects of WNV & EEE

West Nile Virus

Types of Infection

- Asymptomatic (80%)
- Systemic—flu-like (20%)
- Encephalitic (<1%)

Long Term Affects

- Fever, fatigue, myalgia, neck stiffness
- Tremors, acute flaccid paralysis, movement disorders
- Encephalitis, meningitis

Those at Risk

- Elderly (50+)
- Young children (Under 15)
- Those with compromised immune systems
- Those who are in the outdoors often

Eastern Equine Encephalitis

Types of Infection

- Asymptomatic
- Systemic
- Encephalitic

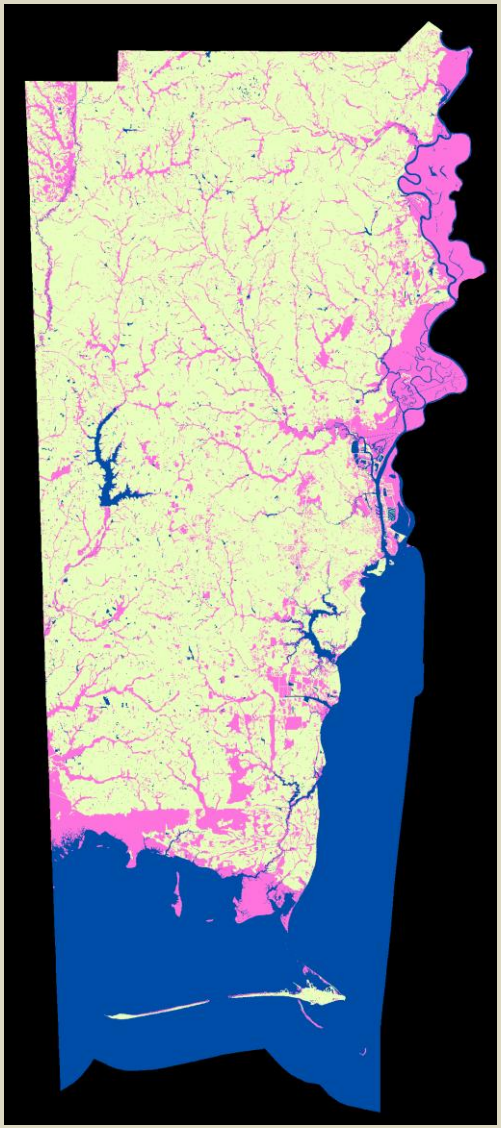
Long Term Affects

- 1/3 of all cases end in death
- Progressive mental and physical illnesses
- Encephalitis, meningitis

Those at Risk

- Elderly (50+)
- Young children (Under 15)
- Those with compromised immune systems
- Those who are in the outdoors often

Vector Borne Disease - Results

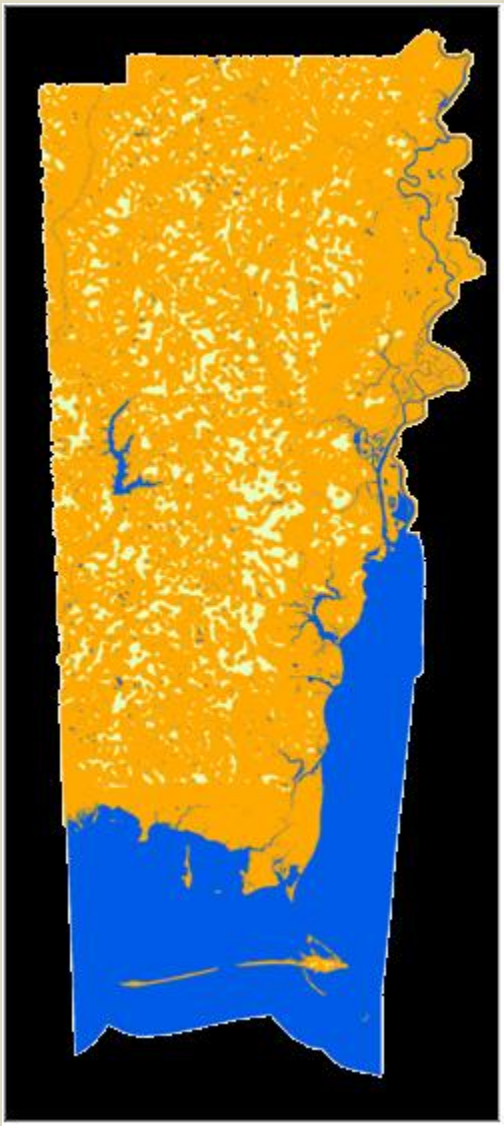


Total Breeding Sources & Vector Habitat

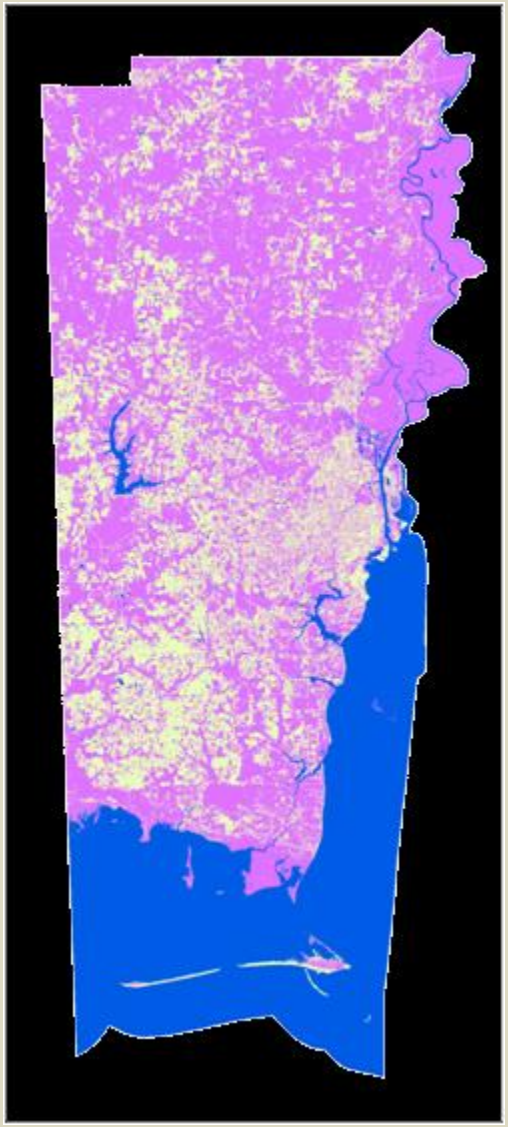
Legend

Total Habitat

Total Source



Vector Borne Disease – Results

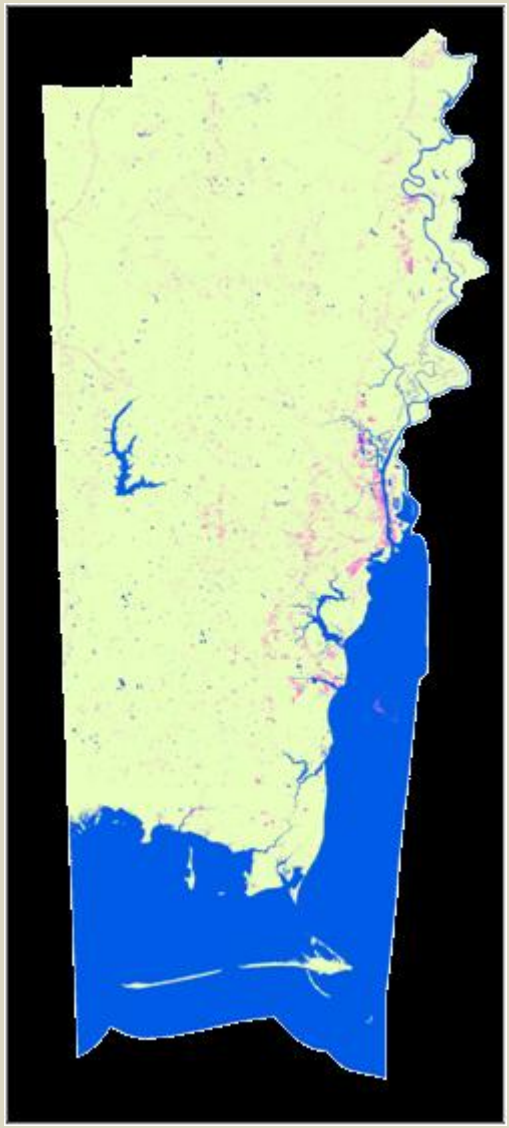


Reservoirs

Legend

Bird Reservoir

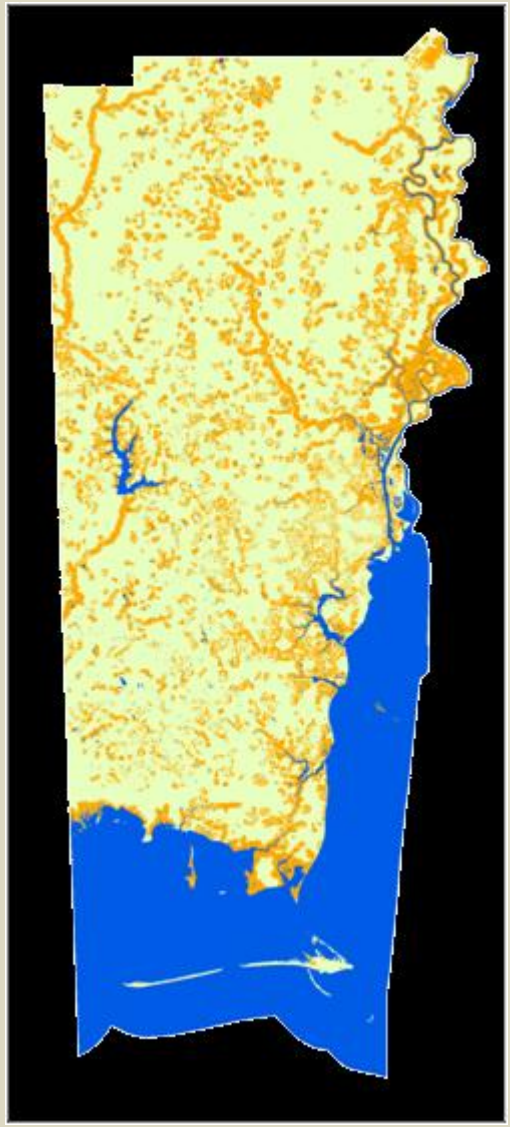
Vector Borne Disease - Results



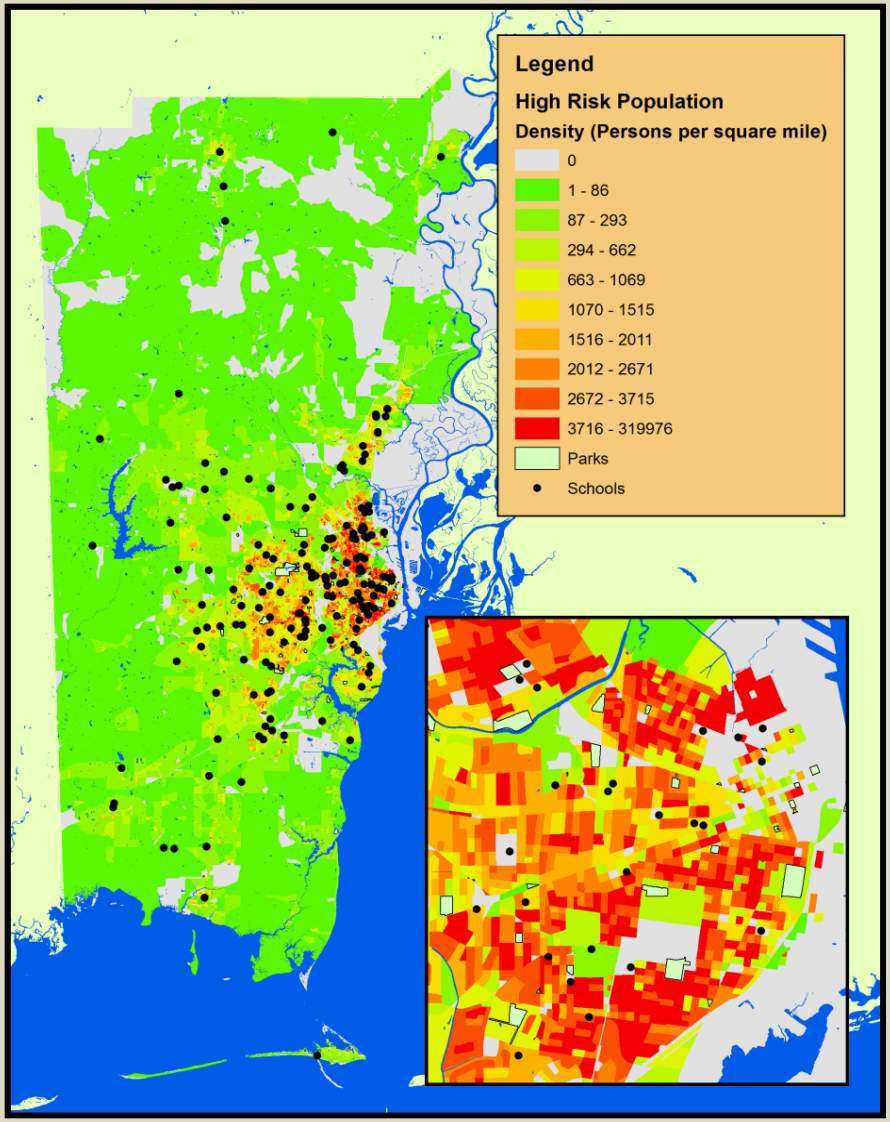
Mosquito and Reservoir Habitats

Legend

- Bird and Mosquito Source
- Bird and Mosquito Habitat

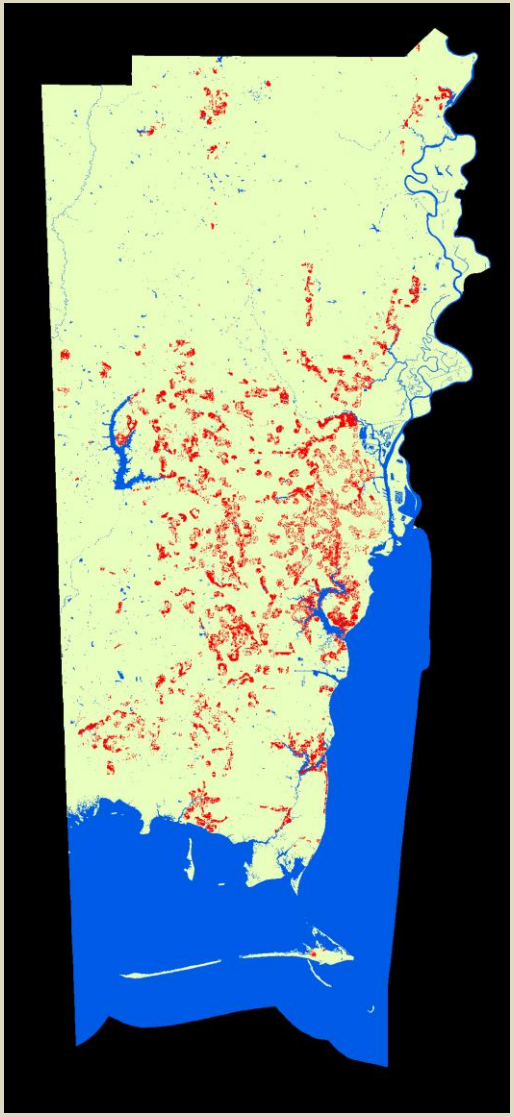


Vector Borne Disease: Results



At Risk Population Map

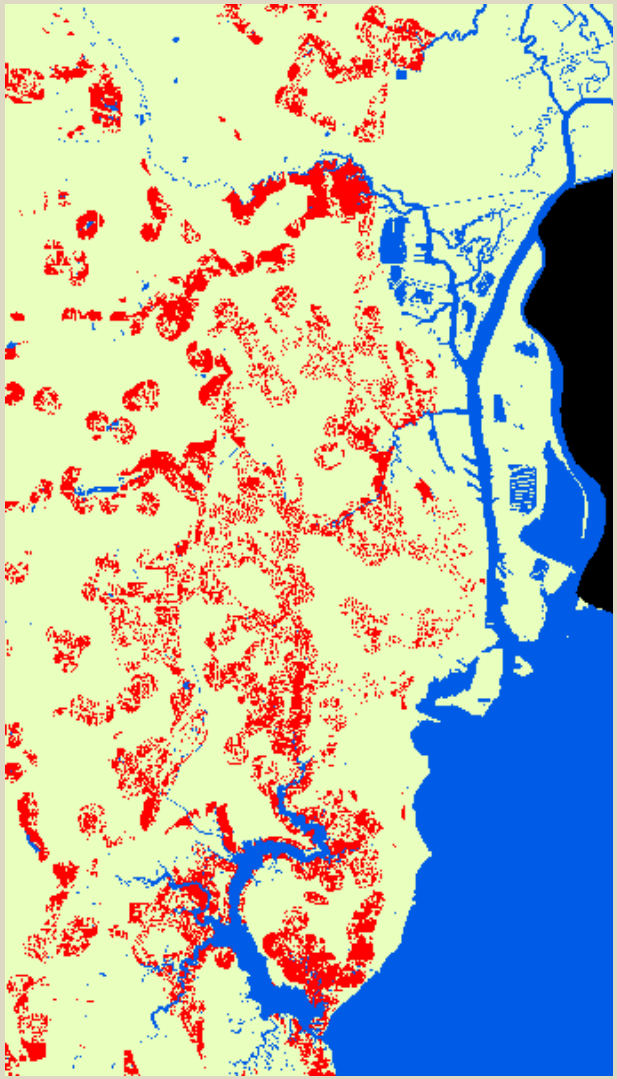
Vector Borne Disease - Results



Chain of Infection Map

Coinciding vectors, reservoirs, and an at risk population density over 100

Zoomed view



Vector Borne Disease – Discussion & Conclusions

- Vector breeding sources and habitat maps were successfully produced for Mobile County
- Probable WNV and EEE infected reservoir habitats were identified using ASTER and Landsat imagery
- Vulnerable Populations can be identified using census and point data
- The combination of these maps can be used to identify areas where a chain of infection is present
- Vectors and reservoirs cohabitate the majority of the county, making genesis of WNV and EEE possible across the county.
  - All individuals in Mobile County are at risk of WNV and EEE, and should take preventative measures to protect against mosquito bits
- These results can be used to provide a targeted approach in vector control efforts