**NASA DEVELOP National Program**

****NASA Goddard Space Flight Center/NASA Marshall Space Flight Center/ Wise County

**Summer 2015**

**Short Title: Yanomami Health & Air Quality**

**Subtitle:** Utilizing NASA Earth Observations to Locate Remote Yanomami Indian Villages in the Amazon Rainforest for Targeted Eradication of River Blindness Disease from the Americas

**VPS Title:** Wiping out Disease with Remote Sensing: The Eradication of Onchocerciasis with the Help of NASA Earth Observations

**Project Team & Partners**

**Project Team:**

Goddard Space Flight Center

Amanda Rumsey (Project Lead), Amanda.c.rumsey@nasa.gov

Kyle Sowder

Timothy Larson

Marshall Space Flight Center

Constance Kennedy (Project Lead), cek0006@uah.edu

Sara Amirazodi

Wise County and City of Norton Clerk of Court's Office

Rajkishan Rajappan (Project Lead), rajkishan16@gmail.com

Zachary Tate

Annabel White

**Advisors & Mentors:**

Dr. John D. Bolten (NASA Goddard Space Flight Center)

Dr. Jeff Luvall (NASA at NASA Space Science and Technology Center)

Dr. Kenton Ross (NASA DEVELOP)

Dr. Robert Griffin (University of Alabama in Huntsville)

**Partner Organizations**

The Carter Center, End-User, POC: Dr. Frank Richards

Goddard Space Flight Center, Collaborator, POC: Dr. Jim Tucker

SERVIR, Collaborator, POC: Dan Irwin

**Project Details**

**Applied Sciences National Applications Addressed:**

Health and Air Quality, Ecological Forecasting

**Study Area:** Yanomami Territory near the border of Brazil and Venezuela

**Study Period:** 2011- Present, November to February & May to August

**Earth Observations & Parameters**

Landsat 8 Operational Land Imager (OLI) - Normalized Difference Vegetation Index (NDVI)

Terra Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) - Land Cover, DEM

Suomi NPP Visible Infrared Imaging Radiometer Suite (VIIRS) - Night Lights

NASA Shuttle Radar Topography Mission (SRTM) - Digital Elevation Model (DEM)

WorldView-1, WorldView-2, GeoEye-2, QuickBird, Digital Globe - Land Cover

**Ancillary Datasets Utilized**

* The Carter Center, Brazil and Venezuela Governments - Known locations of Yanomami Villages

**Software Utilized**

ENVI 5.1 - Remote sensing formatting and derived vegetation indices

ESRI ArcGIS 10.2.1 - Raster Manipulation/Analysis, data processing of ASTER DEM and Landsat data, land cover classification of Landsat imagery, and map creation

**Project Overview**

**80-100 Word Objectives Overview**

This project focused on supporting The Carter Center in its mission to eradicate Onchocerciasis in the Americas by using Earth observation data and image processing tools to identify remote villages of the Yanomami tribe along the border between Brazil and Venezuela. Mapping villages will allow The Carter Center to pinpoint locations for treatment of the disease.

**Abstract**

Onchocerciasis (*Onchocerca volvulus)* is a treatable disease caused by a vector-borne parasite transmitted through bites from infected black flies of the genus *Simulium*. Once inside the human host, *O. volvulus* migrates to the skin, various organs, and eyes, causing debilitating itching and rashes, disfigurement, visual impairment, and complete blindness. The border along Brazil and Venezuela is the last remaining area for active transmission of Onchocerciasis in the Americas. The indigenous Yanomami tribe occupies this area in secluded rainforest villages and migrates frequently due to shifting cultivation, flooding, and food shortages. This project faced a unique set of public health challenges in locating a group of nomadic people whose survival depends on relocating regularly and living in isolation. The MSFC project team analyzed NASA’s Landsat 8, Terra, and Suomi NPP data from 2011 to 2015 and mapped suspected locations of Yanomami villages. Ultimately, this project assisted The Carter Center River Blindness Elimination Program in targeting its efforts to eliminate river blindness in the Americas by the end of 2015. Mapping villages allowed The Carter Center to pinpoint locations for medical treatment distribution.

**Community Concerns**

* Onchocerciasis (river blindness disease) is classified as one of 17 debilitating Neglected Tropical Diseases (NTD) that the World Health Organization (WHO) and The Carter Center are working to eradicate.
* The WHO estimates more than 1 billion people (1/6th of the world’s population) are currently affected by at least one crippling NTD.
* Globally, there are an estimated 120 million people at risk of Onchocerciasis infection.
* River blindness disease is the second leading cause of blindness due to infection, second only to Trachoma.
* The majority of cases occur in developing countries among the world’s poorest communities. This is, in part, due to lack of access to adequate health care and treatment.
* The crippling effects of Onchocerciasis reinforce the cycle of poverty by impacting a person's quality of life, ability to work, and ability to learn.

**Current Management Practices & Policies**

Currently, The Carter Center’s Onchocerciasis Elimination Program for the Americas (OEPA) has been working with the Ministries of Health in Latin America and the 2013 World Health Organization mandate CD52/INF4 Towards the Elimination of Onchocerciasis (River Blindness) in the Americas by the end of 2015. The targeted Yanomami Territory has presented significant difficulties in distribution of effective treatment due to remote physical locations, rigid political boundaries, and limited research options. In the past, village identification has been performed by costly helicopter field surveys that were ineffective in predicting the migrations of the villages. More recently, The Carter Center purchased high resolution data and partnered with the University of Southern Florida in an attempt to use remote sensing methods for village identification.

**Decision Support Tools & Benefits**

|  |  |  |
| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Yanomami Village Location Map | Landsat 8 OLI/TIRS | Accurately locates targeted areas for efficient planning of disease eradication missions. |
| Unsupervised Land Classification | Landsat 8 OLI/TIRS | Identifies villages by comparing intact forested areas to anthropogenically impacted areas |
| Night Lights Map | Suomi NPP VIIRS | Increases certainty of Yanomami activity in specific areas |
| Land Cover Change Detection | Terra ASTER | Helps identify the migratory patterns of the Yanomami. |

**Project Imagery**

**[Insert image here]** To be added later.

**Caption:**

**Image:**