Collaborative Capacity Building and Sovereign Science with NASA and the Navajo Nation

Amber McCullum, PhD (BAERI/NASA Ames Research Center)
Nikki Tulley (University of Arizona)

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Water Resources Research Center Brown Bag
NASA’s Applied Sciences Program

- Ecological Forecasting
- Disasters
- Wildland Fires
- Health and Air Quality
- Water Resources
- Capacity Building
Mapping Application for Penguin Populations and Projected Dynamics

http://www.penguinmap.com/
http://dnr.wi.gov/topic/research/projects/snapshot/
Deer
Lightly built, whitetail deer are grayish brown to reddish brown in color. The underside of the tail is white. Adult males have antlers which curve forward and fork off a main branch. Young are reddish brown in color with white spots.

Often confused with:

- Elk

Young
- 1
- 2
- 3
- 4
- 5
- 6+

Adult antlered
- 1
- 2
- 3
- 4
- 5
- 6+

Adult antlerless
- 1
- 2
- 3
- 4
- 5
- 6+

Adult head not visible
- 1
- 2
- 3
- 4
- 5
- 6+

Behavior
- Vigilant
- Moving
- Foraging
- Resting
- Interacting
- Camera stare

No animals present
NASA’s Capacity Building Program

SERVIR

ARSET

DEVELOP

Indigenous Peoples Initiative
Capacity Building: SERVIR

A joint NASA-USAID network, SERVIR works in partnership with leading regional organizations world-wide to help developing countries use information provided by Earth observing satellites and geospatial technologies for managing climate risks and land use.

https://www.servirglobal.net/

Connecting Space to Village
Capacity Building: ARSET

- Promotes efforts to discover and demonstrate innovative and practical applications of Earth Observations
- 4 application areas:
  - Air Quality
  - Disasters
  - Eco
  - Water Resources
- Seeks to increase the use of Earth science in decision-making through training for:
  - policy makers
  - environmental managers
  - other professionals in the public and private sector

https://arset.gsfc.nasa.gov/
Capacity Building: DEVELOP

DEVELOP: addresses environmental and public policy issues by conducting interdisciplinary feasibility projects that apply the lens of NASA Earth observations to community concerns around the globe.

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

Individuals + Earth Observations + Institutions
Apply for DEVELOP

Summer 2021 Application Window: Jan 18 – Feb 26th, 2021

https://develop.larc.nasa.gov/apply.php

DEVELOP Locations

Projects: Water Resources, Health and Air Quality, Disasters, Land Mgmt, and more!
Capacity Building: IPI

Indigenous Peoples Initiative: In-person remote sensing training, place-based approaches, community engagement, all focused around Indigenous Knowledge systems
INDIGENOUS KNOWLEDGE SYSTEMS

COMMUNITY ENGAGEMENT
Engaging with Indigenous Communities through tribally-focused conferences and meetings with regional governmental agencies, Climate Science Centers, and universities.

PLACE-BASED APPROACHES
Integrating traditional ecological knowledge towards natural resource/natural element management and conservation.

TECHNICAL WORKSHOPS
Partnering with tribes, government agencies, and affiliated groups to develop technical remote sensing workshops and trainings applied to specific regions and/or thematic areas.
IPI: Community Engagement
IPI: Group on Earth Observations (GEO)
Indigenous Alliance

First Indigenous-led session at the GEO Ministerial Summit
Canberra, Australia, November 2019

GEO Indigenous Summit
Online, December 2019

We co-develop place-based, in-person training workshops focused on content relevant to Indigenous lands and territories.
AN INTRODUCTION TO REMOTE SENSING FOR TRIBAL LANDS

https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/

**Wk 1: Intro to Remote Sensing & NASA Data**
Download Week 1 materials [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Tuesday, October 8th**
  - Session 1 recording
    - Introduction to the Navajo Nation
    - Lecture: Introduction to remote sensing
    - Exercise 1: Investigating color in a satellite image
  - Complete assignment for exercise 1 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/) (required for CEUs)

**Wk 2: Land Cover Classification**
Download Week 2 materials [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Tuesday, October 13th**
  - Session 3 recording
    - Introduction to the Sault Ste Marie Band of Chippewa Indians
    - Lecture: Land cover classification
    - Exercise 4: Unsupervised classification
  - Complete assignment for exercise 4 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Thursday, October 15th**
  - Session 4 recording
    - Exercise 5: Supervised classification
    - Lecture: Accuracy assessment
    - Exercise 6: Accuracy assessment
  - Complete assignment for exercise 5 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)
  - Complete assignment for exercise 6 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

**Wk 3: Change Detection & Time Series**
Download Week 3 materials [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Thursday, October 22nd**
  - Session 6 recording
    - Lecture: Time series analysis
    - Exercise 8: Time series analysis
    - Complete assignment for exercise 8 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Tuesday, October 20th**
  - Session 5 recording
    - Introduction to the Rosebud Sioux Tribe
    - Lecture: Overview of change detection
    - Exercise 7: Change detection
  - Complete assignment for exercise 7 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)

- **Thursday, October 29th**
  - Session 8 recording
    - Lecture: Time series analysis
    - Exercise 11: Global Forest Watch
    - Course Summary and Feedback
    - Complete assignment for exercise 11 [here](https://uttc.edu/introduction-to-remote-sensing-for-tribal-lands/)
CAPACITY BUILDING AS EMPOWERMENT

INDIGENOUS MAPPING WORKSHOP

The Firelight Group and its partners are proud to present the largest international geospatial conference for Indigenous Nations and organizations on Indigenous-led geospatial research

OUR STORY WORKSHOPS

https://www.indigenousmaps.com/
Future Engagement Opportunities

Inter-American Academy of Geosciences & Applications

https://academy.amerigeoss.org/

- Engaging with Indigenous Peoples Training (Feb 2021)
- Geospatial Technology for Indigenous People (Spring/Summer 2021)
Drought Severity Evaluation Tool

A collaboration of Sovereignty and Science for the Navajo Nation

Project Team:
Amber McCullum (BAERI/NASA Ames Research Center)
Carlee McClellan (NN DWR)
Justin Huntington (DRI)
Britta Daudert (DRI)
Nikki Tulley (University of Arizona)

DSET Website Link
https://app.climateengine.org/dset
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DSET Website Link
https://app.climateengine.org/dset
Improve NNDWR drought reporting through Earth Observations and *in-situ* data within a user-friendly web application
Space connection to Navajoland

- Culture context of Indigenous relationship to land
- Preexisting knowledge system
- Communication mechanisms
Navajo Nation Drought Severity Evaluation Tool

Introductory Video
A view of the Navajo Nation

3 States
5 Agencies
110 Chapters
Population ~200,000
On-Demand Cloud Computing and Visualization of Climate and Remote Sensing Data

Analyze and interact with climate and earth observations for decision support related to drought, water use, agricultural, wildfire, and ecology

LAUNCH THE WEB APPLICATION

Drought Monitoring  Agriculture & Ecosystems  Wildfire
DSET Overview

- NASA Western Water Applications Office (WWAO)
- Co-developed with the Navajo Nation Division of Water Resources (N.N. DWR), and the Desert Research Institute (DRI)

Free Web Application

User Friendly

Time & Storage Saver

Analyzing & Visualizing Data made easier
Navajo Rain Gauge Data

Satellite Data

Modeled Data and Drought Indices

Drought Severity Evaluation Tool
DSET Capabilities

Easy to use interface

On-the-fly maps and times series
What were the rain gauge totals from the 2019 summer monsoon?
What was the precipitation percent of average last Northern Water Year?
DSET Drought Examples
Asáasyii Lake Fire grows to about 1,000 acres

By Alastair Lee Balsal and Terry Bowman
Navajo Times
NASCHITTI, N.M., June 16, 2014

After three days of charring approximately 1,000 acres, the Assayii Lake Fire has reached the summit of the Chuska Mountains and the inferno is moving in a northeastern direction toward the communities of Naschitti and Sheep Springs, N.M.

The fire will be categorized as a Type II National and State Level Fire, according to the Southwest Area Incident Management Team.

“I got scared,” said Eleanor Largo, who had to evacuate...
Partner-driven tools start with **relationships**

- April 2019: 2-Day hands-on training in Flagstaff, AZ
- Multiple Navajo Nation Natural Resources Departments
- Feedback/Discussion session

- Dec 2019: 1-Day hands-on training in Window Rock, AZ
- Focus on Department of Agriculture new personnel
Future Partnerships and Projects

OpenET Project Now Underway

Continued Work

- DSET training
- OpenET case-study
- Partnerships with Dept. of Agriculture and/or NAPI
- Use of OpenET for consumptive water use estimates
- Student internships

Continue to strengthen relationships.
Thank You!

Amber McCullum, PhD
Amberjean.McCullum@nasa.gov

Nikki Tulley, MWR
nikkitulley@email.arizona.edu
Welcome to NASA's Western Water Applications Office.

Our mission is to improve how water is managed in the arid western U.S. by getting NASA science, data and technology into the hands of water managers and decision makers.

WWAO partners with water managers, identifies pressing water issues and delivers solutions to these issues based on NASA science.