



## ARSET

Applied Remote Sensing Training

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

---

# **Creating and Using Normalized Difference Vegetation Index (NDVI) from Satellite Imagery**

---

Instructors: Cindy Schmidt and Amber McCullum

Week 2

# Course Structure

- One lecture per week – every Wednesday from February 10 to March 2 at 12:00-1:00pm EST (-05:00 UTC)
  - Lectures
  - In-class exercise
  - Q&A
  - Homework exercises
- Webinar recordings, PowerPoint presentations, in-class exercises, and homework assignments can be found after each session at:
  - <http://arset.gsfc.nasa.gov/ecoforecasting/webinars/advanced-webinar-creating-and-using-normalized-difference-vegetation-index>
- Q&A: Following each lecture and/or by email ([cynthia.l.schmidt@nasa.gov](mailto:cynthia.l.schmidt@nasa.gov)) or ([amberjean.mccullum@nasa.gov](mailto:amberjean.mccullum@nasa.gov))

# Homework and Certificates

- Homework
  - Hands-on exercise each week
  - Answers must be submitted via Google Form
- Certificate of Completion:
  - Attend all 4 webinars
  - Complete all 4 homework assignments by the deadline (access from ARSET website)
    - Week 2 Deadline: Wednesday March 2nd
  - You will receive certificates approximately 2 months after the completion of the course from: [marines.martins@ssaihq.com](mailto:marines.martins@ssaihq.com)

A screenshot of a Google Form titled "ARSET Advanced NDVI Homework 2". The form is overlaid on a background image of a rocky river. The form text includes: "Please complete all of these questions and submit the form to receive credit. The final two questions refer to the lecture notes and the remaining questions refer to specific topics within the homework material. Homework must be submitted by March 2nd, 2018." Below this, there are three required fields: "Name \*", "Email \*", and "Phone number \*". Each field has a small asterisk indicating it is required.

# Accessing Course Materials

- <http://arset.gsfc.nasa.gov/ecoforecasting/webinars/advanced-webinar-creating-and-using-normalized-difference-vegetation-index>



**NASA ARSET**  
Applied Remote Sensing Training

Earth Sciences Division | Applied Sciences | ASP Water Resources

DISASTERS | ECO FORECASTING | HEALTH & AIR QUALITY | WATER RESOURCES

**Eco Forecasting**  
► Eco Webinars  
Eco Personnel

**Fundamentals of Remote Sensing**  
On-Demand Training on Fundamentals of Remote Sensing

**Upcoming Training**  
Ecoforecasting  
Advanced Webinar:  
Creating and Using  
Normalized Difference  
Vegetation Index (NDVI)  
from Satellite Imagery  
02/16/2016 to 03/02/2016

**Advanced Webinar: Creating and Using Normalized Difference Vegetation Index (NDVI) from Satellite Imagery**  
02/16/2016 to 03/02/2016

October 2015 NDVI

Wednesdays 12:00PM-1:00PM EST (UTC -05:00)  
February 16, February 17, February 24, March 2  
Registration closes on February 8, 2016

**Course Description:** In this advanced webinar, participants will learn how to acquire, use, and derive

Course Materials						
Week	Date	Title	Presentation	Date and Exercise	Recording	Homework
1	February 16, 2016	Introduction to NDVI and QGIS	Week 1 Presentation Week 1 Presentation (Spanish)	Week 1 Date Week 1 Exercise	View Week 1 Recording	Homework 1 Exercise Homework 1 Submission
2	February 17, 2016	Deriving NDVI from Landsat	Week 2 Presentation Week 2 Presentation (Spanish)	Week 2 Date Week 2 Exercise	View Week 2 Recording	Homework 2 Exercise Homework 2 Submission
3	February 24, 2016	MODIS NDVI Time Series	Week 3 Presentation Week 3 Presentation (Spanish)	Week 3 Date Week 3 Exercise	View Week 3 Recording	Homework 3 Exercise Homework 3 Submission
4	March 2, 2016	MODIS NDVI Anomalies	Week 4 Presentation Week 4 Presentation (Spanish)	Week 4 Date Week 4 Exercise	View Week 4 Recording	Homework 4 Exercise Homework 4 Submission

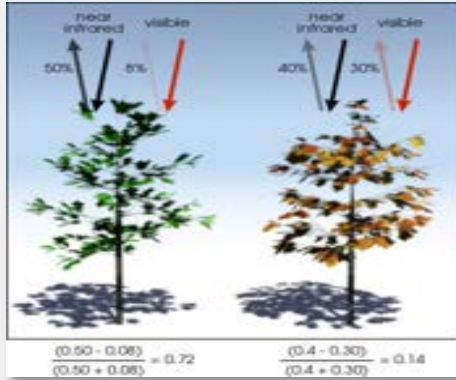
\*Please note that you must register to view all recordings. This includes the requirement to re-register for each separate recording for live webinar participants.

Course materials are provided here using each specified link and will be active after each week

# Course Outline

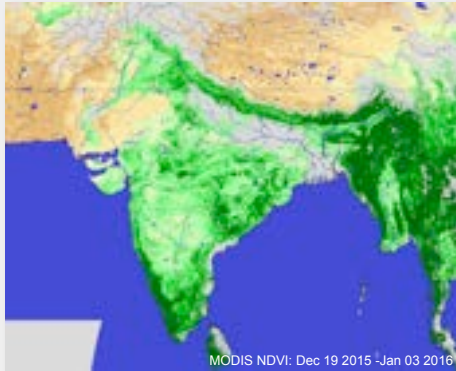
## Week 1

Overview of  
NDVI and  
QGIS



## Week 3

MODIS  
NDVI Time  
Series



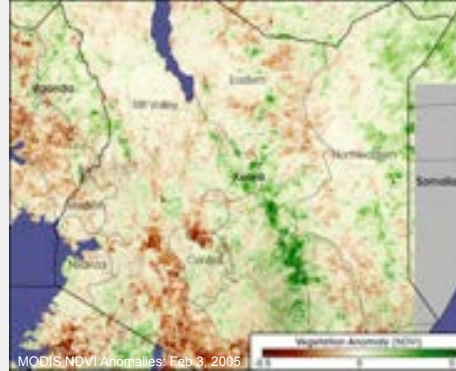
## Week 2

NDVI with  
Landsat



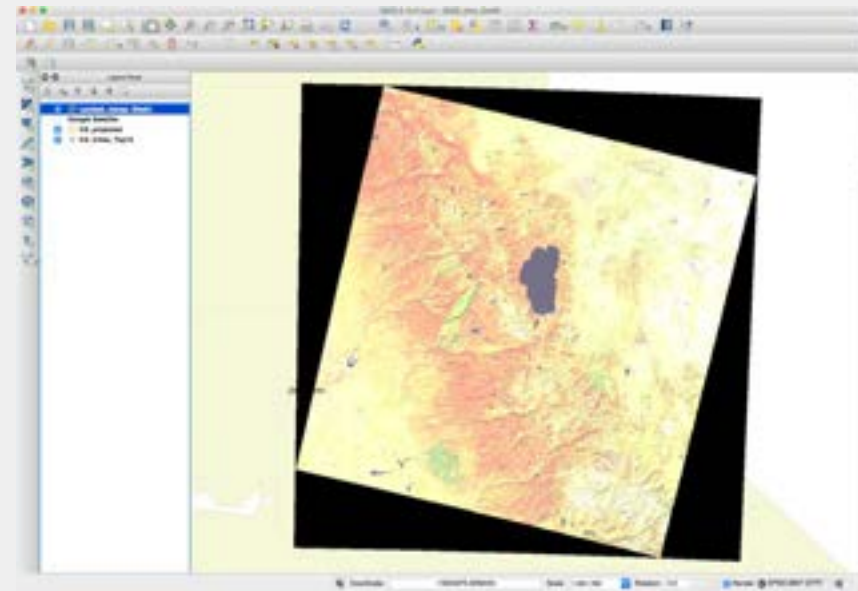
## Week 4

MODIS  
NDVI  
Anomaly  
Mapping



# Week 2 Agenda

- Review of Landsat Bands
- Acquiring Landsat Images
- In-class exercise: Deriving NDVI from Landsat using QGIS
- Q&A





# Week 1 Review

- What is NDVI
- NDVI Applications and Examples
- NDVI Anomalies
- QGIS Introduction

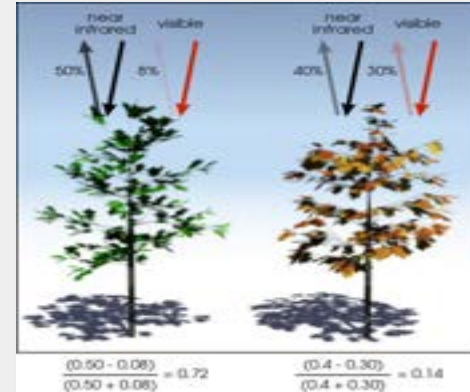
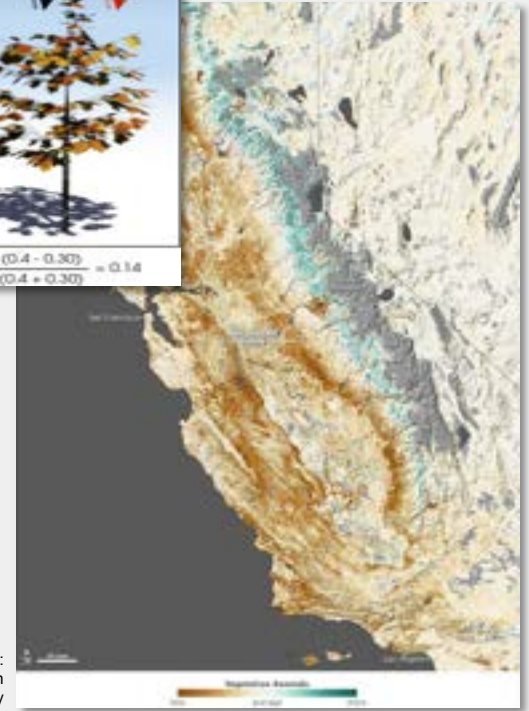


Image Credit: Robert Simmon



Image Credit:  
NASA Earth  
Observatory



A satellite image of a forested landscape with a river and a semi-transparent title box. The image shows a dense green forest with a winding river and several small lakes. A semi-transparent rectangular box is overlaid on the center of the image, containing the text "Landsat Review" and a horizontal line below it.

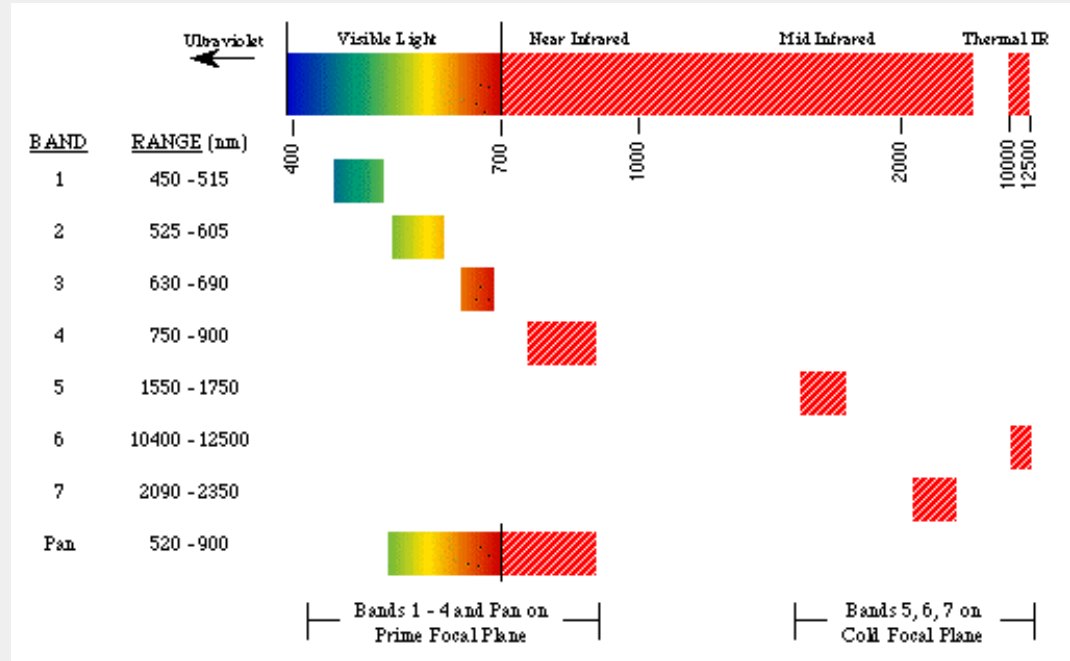
# Landsat Review

---



# Spectral Characteristics of Landsat

- Landsat instruments measure primarily light that is reflected from Earth's surface (with one exception)
- Landsat instruments are designed to detect visible and infrared (near and mid) wavelengths.



Landsat bands of ETM+ (Landsat 7)

# Characteristics of Landsat 4, 5, and 7

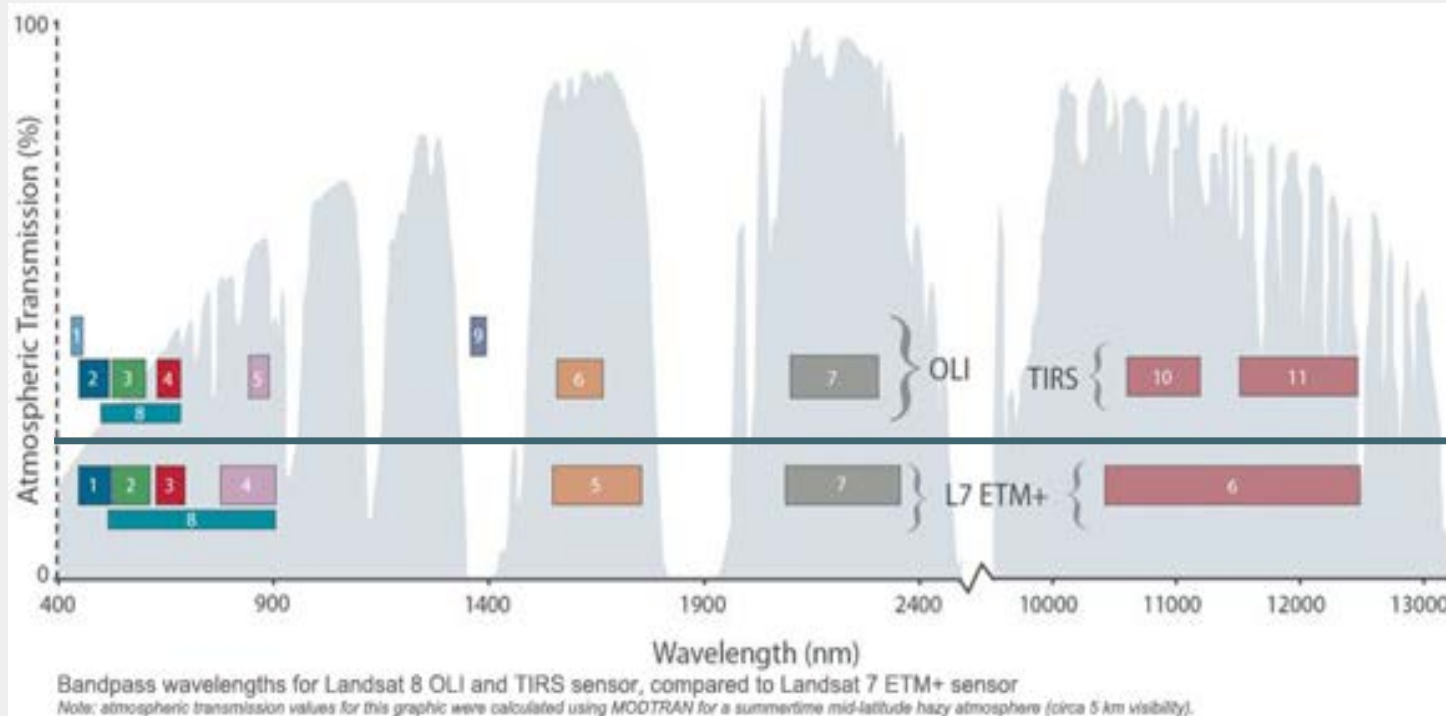
Bands	Wavelength (micrometers)	Resolution (m) Landsat 4-5 (TM)	Resolution (m) Landsat 7 (ETM+)
Band 1-Blue	0.45-0.52	30	30
Band 2 Green	0.52-0.60	30	30
Band 3- Red	0.63-0.69	30	30
Band 4-Near Infrared	0.76-0.90	30	30
Band 5- Shortwave Infrared 1	1.55-1.75	30	30
Band 6- Thermal Infrared	10.40-12.50	120	60
Band 7- Shortwave Infrared 2	2.08-2.35	30	30
Band 8-Pan	0.52-0.90	--	15

# Characteristics of Landsat 8

Bands	Wavelength (micrometers)	Spatial Resolution (meters)
Band 1-Coastal aerosol	0.43-0.45	30
Band 2- Blue	0.45-0.51	30
Band 3- Green	0.53-0.59	30
Band 4- Red	0.64-0.67	30
Band 5- Near Infrared	0.85-0.88	30
Band 6- SWIR 1	1.57-1.65	30
Band 7- SWIR 2	2.11-2.29	30
Band 8-Panchromatic	0.50-0.68	15
Band 9-Cirrus	1.36-1.38	30
Band 10- Thermal Infrared 1	10.60-11.19	100*
Band 11- Thermal Infrared 2	11.50-12.51	100*

\* Resampled to  
30 meters

# Landsat 7 vs. Landsat 8



Landsat 8  
Top

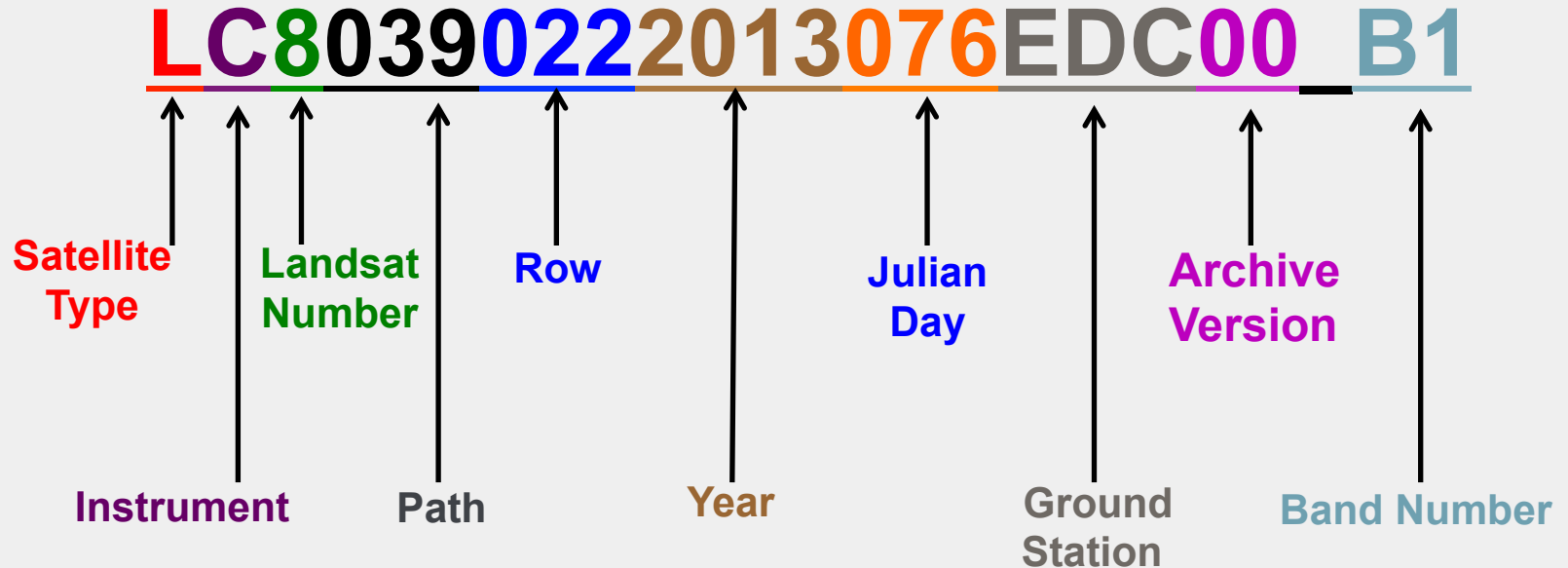
Landsat 7  
Bottom

# Landsat Bands for NDVI

Wavelengths	Landsat 8 Bands	Landsat 4,5, 7 Bands
Coastal aerosol	Band 1	
Blue	Band 2	Band 1
Green	Band 3	Band 2
Red	Band 4	Band 3
Near- Infrared	Band 5	Band 4
SWIR 1	Band 6	Band 5
SWIR 2	Band 7	Band 7
Panchromatic	Band 8	Band 8 (L7)
Cirrus	Band 9	
Thermal Infrared 1	Band 10	Band 6
Thermal Infrared 2	Band 11	



# Landsat Naming Convention



\*Instrument can be C: Combined, OLI: Operational Land Imager, or TIS: Thermal Infrared System

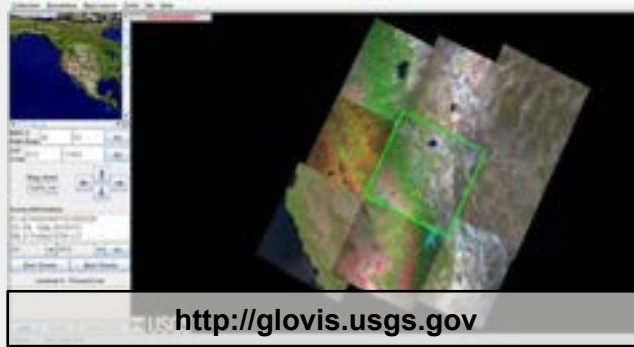
# Where to Obtain Landsat Images

**The LandsatLook Viewer**



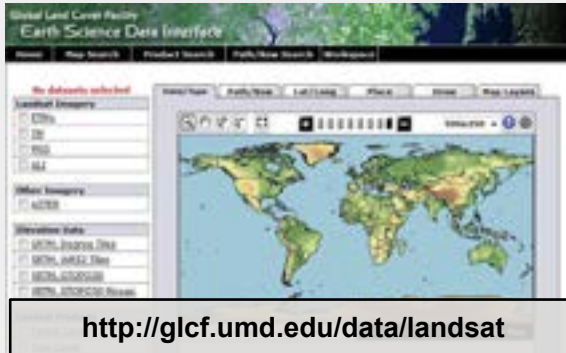
<http://landsatlook.usgs.gov>

**GloVis**



<http://glovis.usgs.gov>

**Global Land Cover Facility**



<http://glcf.umd.edu/data/landsat>

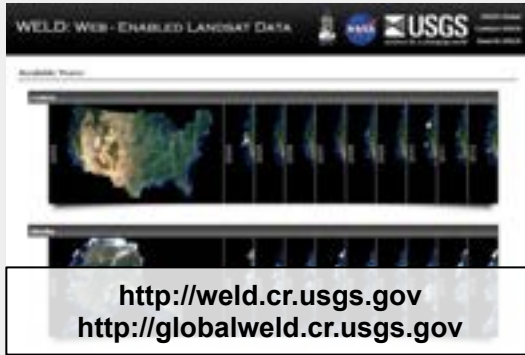
**Earth Explorer**



<http://earthexplorer.usgs.gov>

# Where to Obtain Landsat Images

## WELD

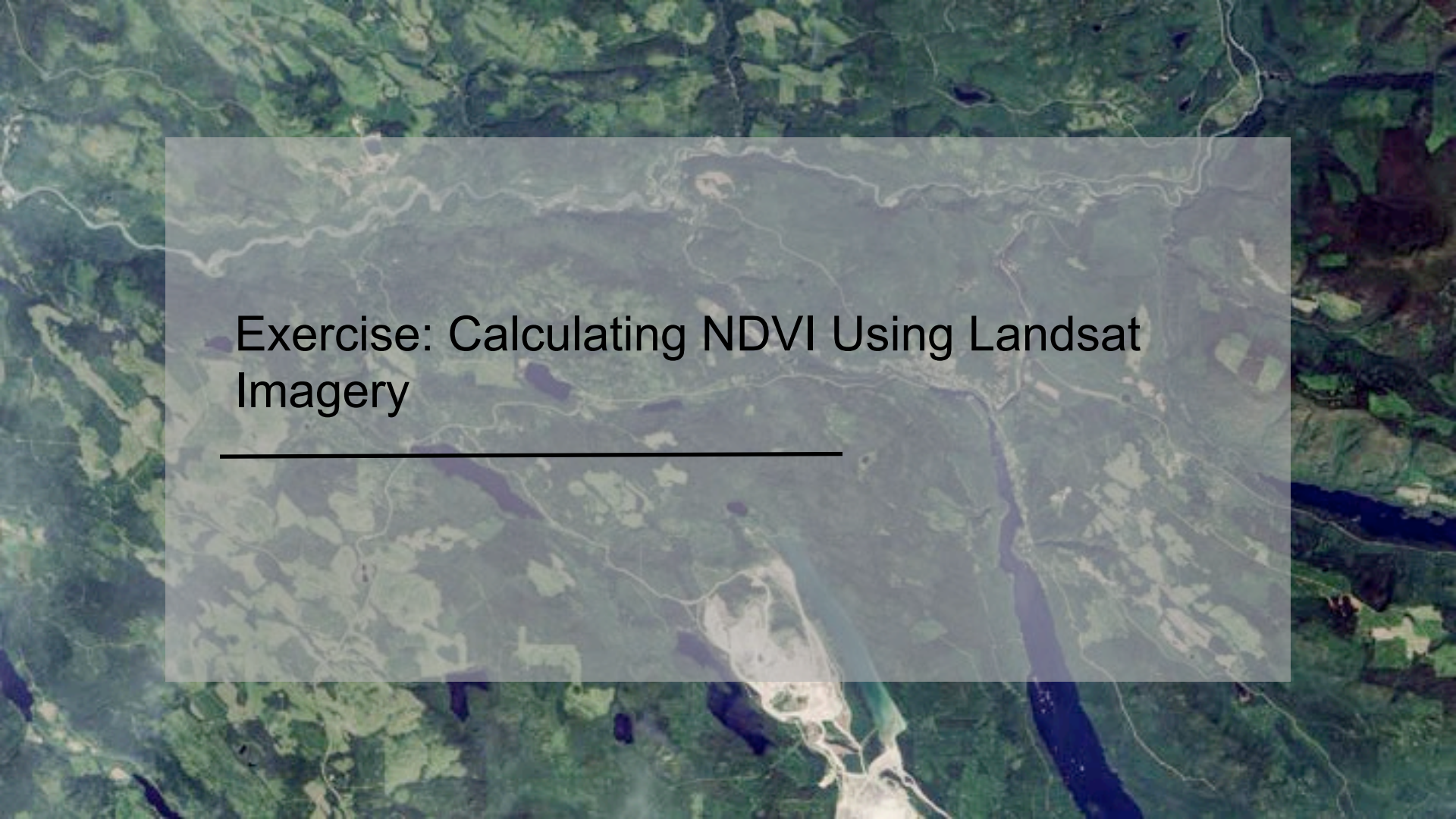


## Landsat Global Archive Consolidation (USGS)



## Global Land Survey

- Not a data portal, but a global collection of cloud free Landsat images from 1975-2008.
- Time series include (GLS 1975, GLS 1990, GLS 2000, GLS 2005, GLS 2010)
- Acquire GLS datasets through Earth Explorer, GloVis, and GLCF

The background is a satellite image of a landscape. It shows a dense green forest covering most of the area. A river or stream flows through the landscape, appearing as a dark blue line. There are some lighter green patches, possibly indicating different types of vegetation or cleared areas. A semi-transparent grey rectangular box is overlaid on the center of the image, containing the title text.

## Exercise: Calculating NDVI Using Landsat Imagery

---



# Contacts

- ARSET Land Management and Wildfire Contacts
  - Cynthia Schmidt: [Cynthia.L.Schmidt@nasa.gov](mailto:Cynthia.L.Schmidt@nasa.gov)
  - Amber McCullum: [AmberJean.Mccullum@nasa.gov](mailto:AmberJean.Mccullum@nasa.gov)
- General ARSET Inquiries
  - Ana Prados: [aprados@umbc.edu](mailto:aprados@umbc.edu)
- ARSET Website:
  - <http://arset.gsfc.nasa.gov/>





## ARSET

Applied Remote Sensing Training

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

---

# Thank You

---

**Next Week:**

***MODIS NDVI Time Series***