

# Direct-to-Digital with Google Earth

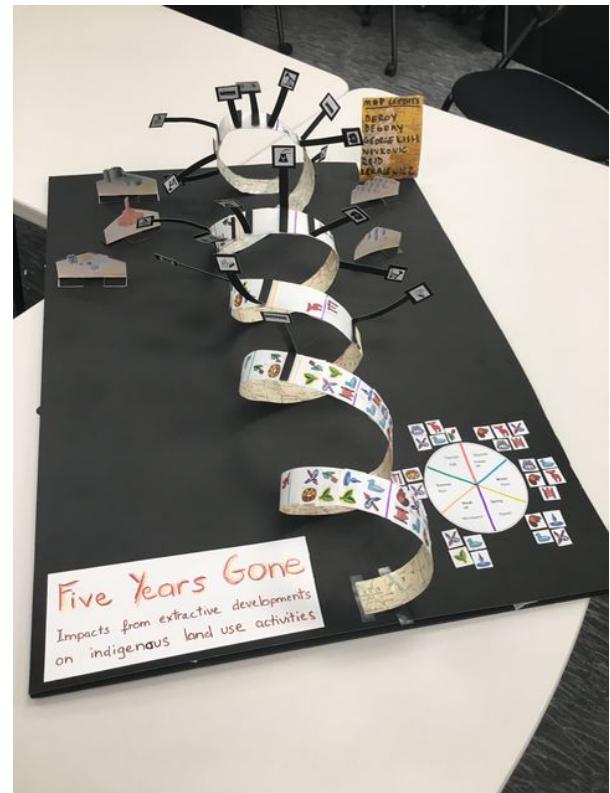
Google Geo for Good Summit  
September 17, 2019  
Steve DeRoy, Alta De Vos and Cynthia Annett



What do you think Participatory Mapping is?

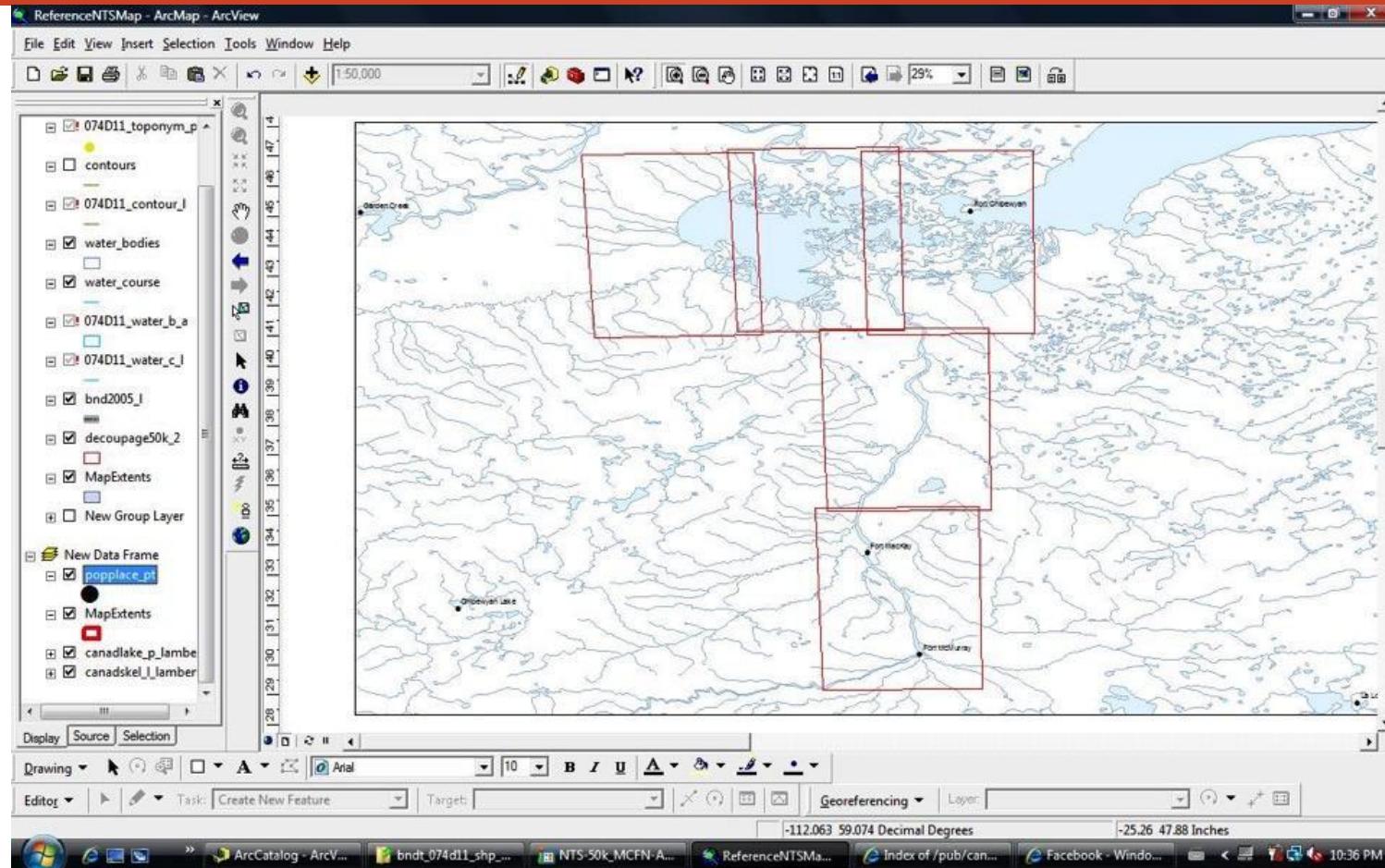
# Participatory Mapping - some ground rules

- Sometimes called “community-based mapping” or “citizen science” in which the community defines the approach and techniques to be used to collect, store and share information.
- Relies on the expert knowledge of the local community.
- Represents a culturally, socially and distinct understanding of place.
- The process of gathering data is driven by “what matters most” to the community.
- The output maps may not be in compliance with conventional cartographic conventions.
- An effective approach for community engagement, especially in decision-making processes.

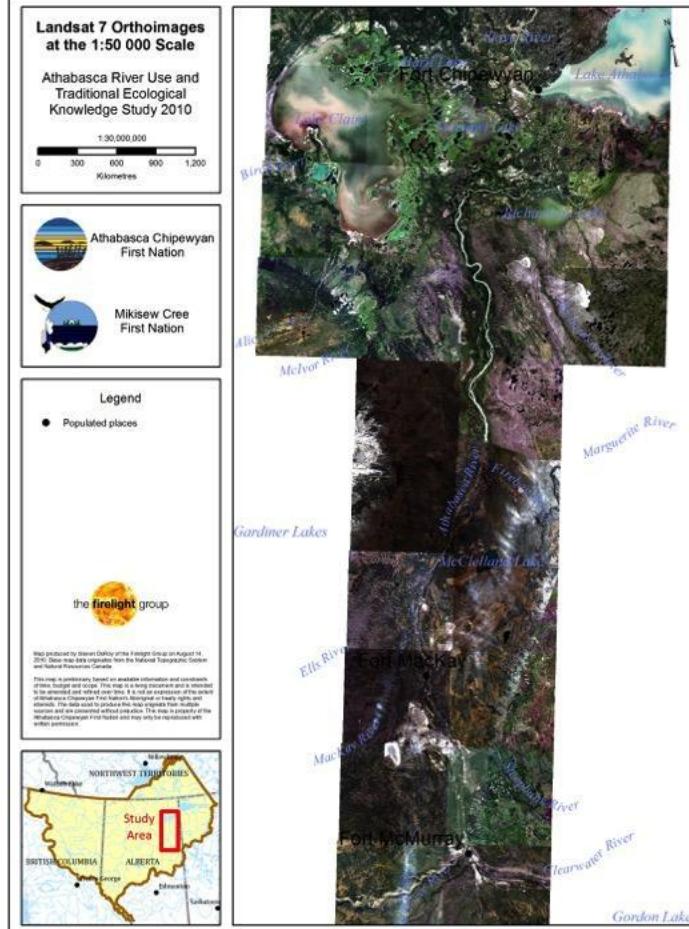


# Traditional Land Use & Occupancy Studies with Google Earth

# Traditional Paper Mapping



# Traditional Paper Mapping



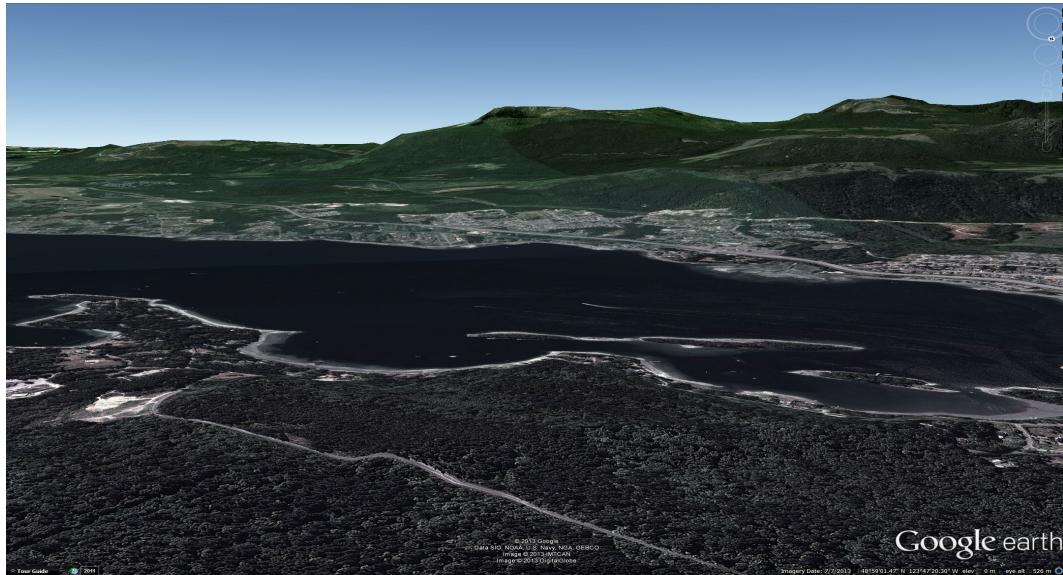
# Traditional Paper Mapping



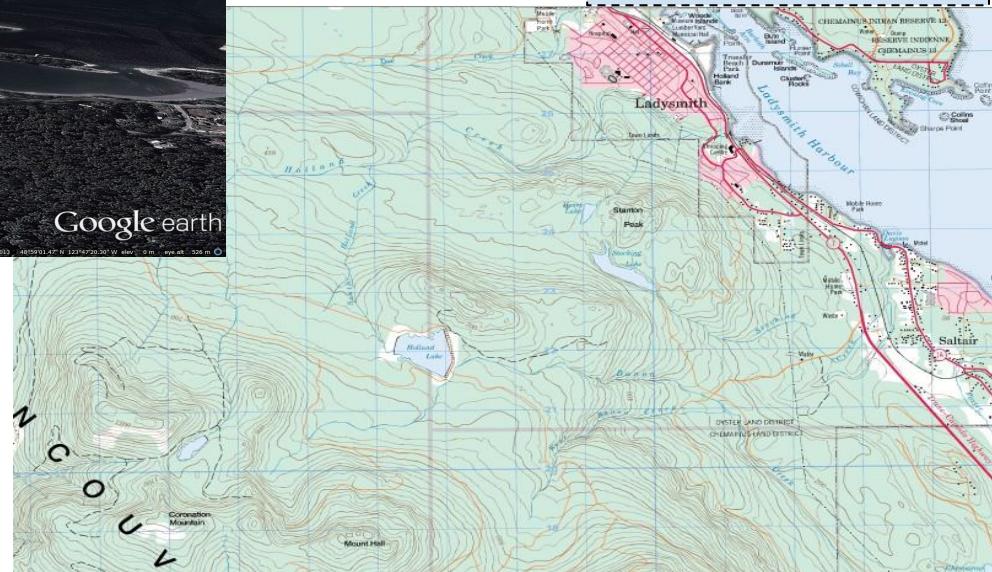
# Lots of maps!



# Using Google Earth



Google Earth imagery  
of **Thuq'min** and area



Topographic Map of  
**Thuq'min** and area

## Advantages

- Easy zooming & panning
- Hi-res imagery & terrain
- Cuts down on need for field trips w/GPS
- Eliminates digitization step

# Direct-to-Digital (D2D) Mapping

- Project Google Earth onto the wall
- Structured interviews with active land users
- Record audio, video and notes
- Save map data as KMZ files
- Convert to GIS format for analysis

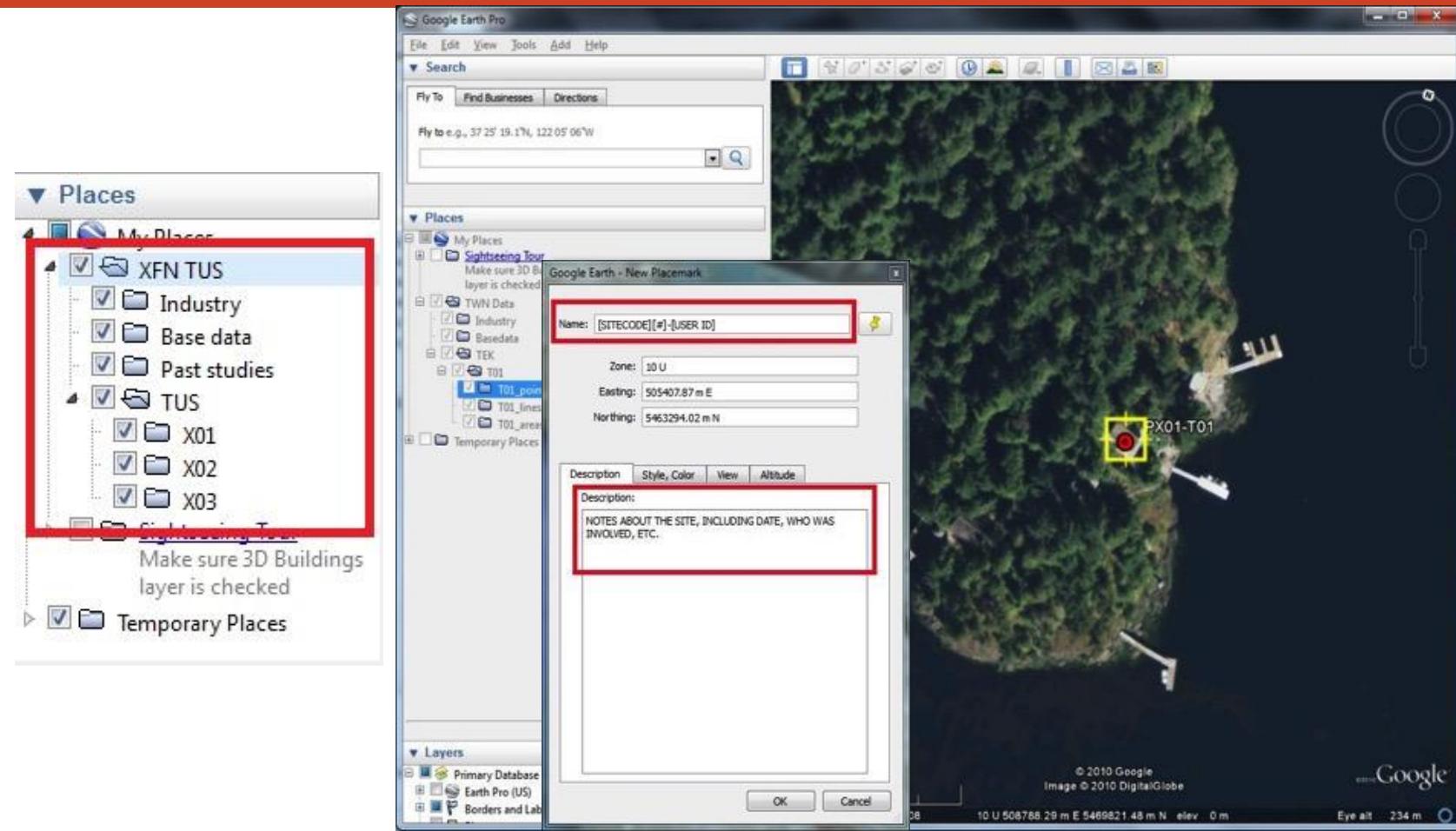


# Tools Needed

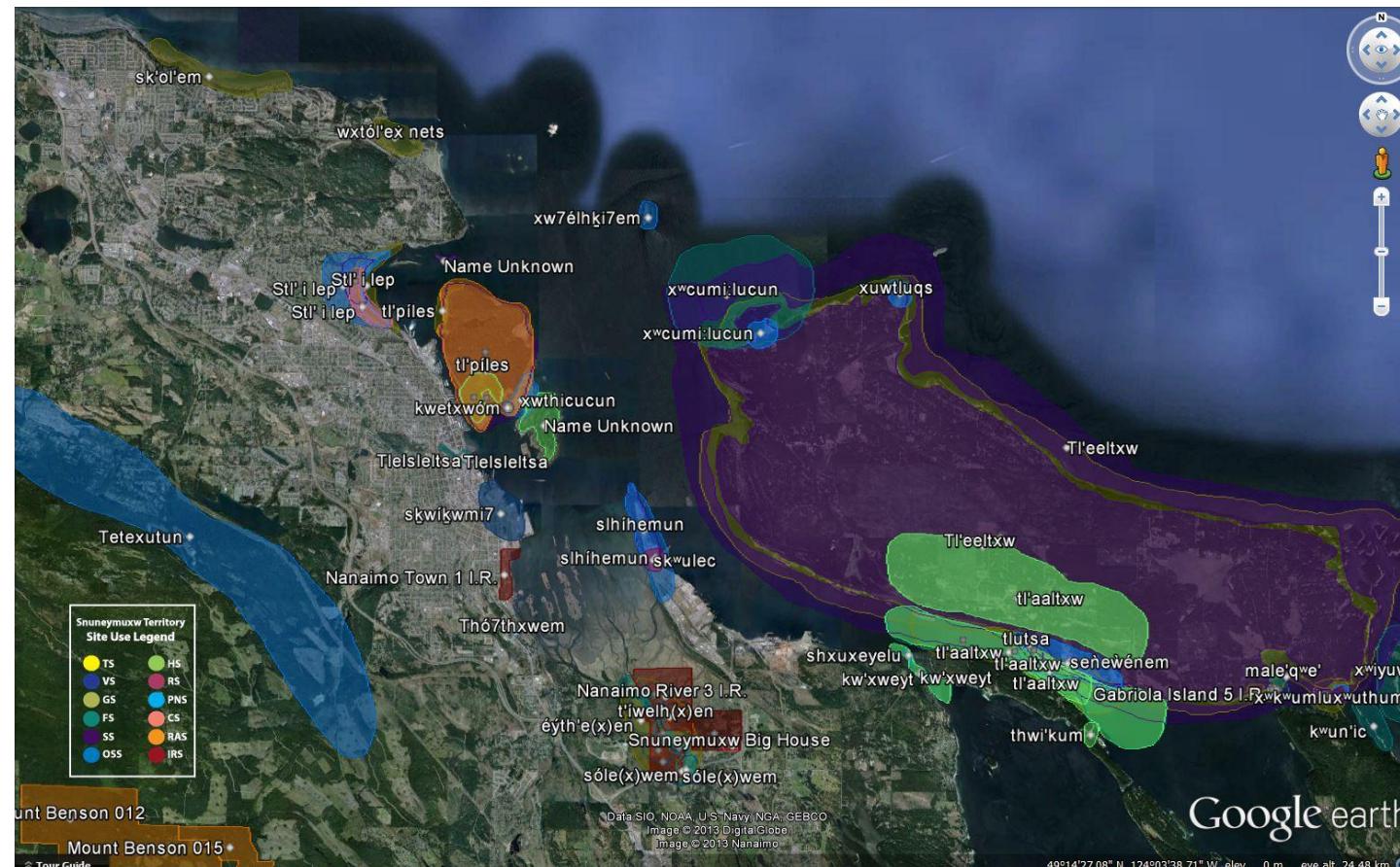
- Google Earth installed on a laptop with WIFI
  - Projector
  - Laser pointer
  - Interview guides
- Recording devices (zoom mics, video camera, tripod)
  - SD memory cards
  - Power adapters / batteries / USB hub



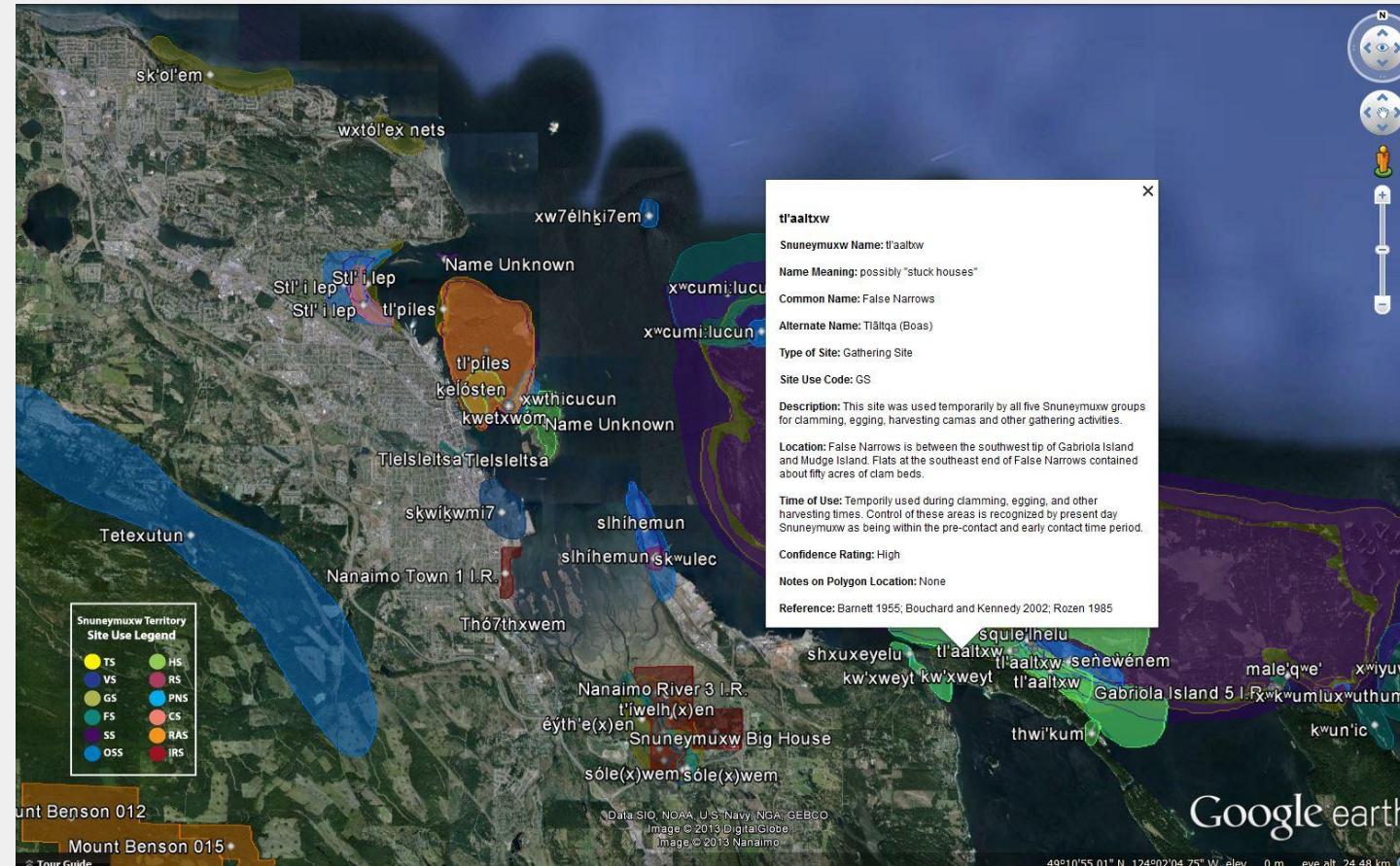
# Organizing the data in Google Earth



# Snuneymuxw Land Use and Occupancy



# Snuneymuxw Land Use and Occupancy



# Innu of Québec Significant Places

**20- Atatshi-uinipeku**

Official Name: Mealy Mountains

The green polygon represents what is now the Mealy Mountains National Park reserve, as recognized by Parks Canada. This area aims to protect the ecosystems and traditional ways of life which lay within its borders. The threatened herd of Mealy Mountain caribou live within this reserve, although they used to migrate to areas far surpassing the present day borders. This herd used to be an essential element to Innu subsistence in traditional society, but now is protected and is only hunted illegally.

(Kobalenko 2011:43)

Directions: [To here](#) - [From here](#)

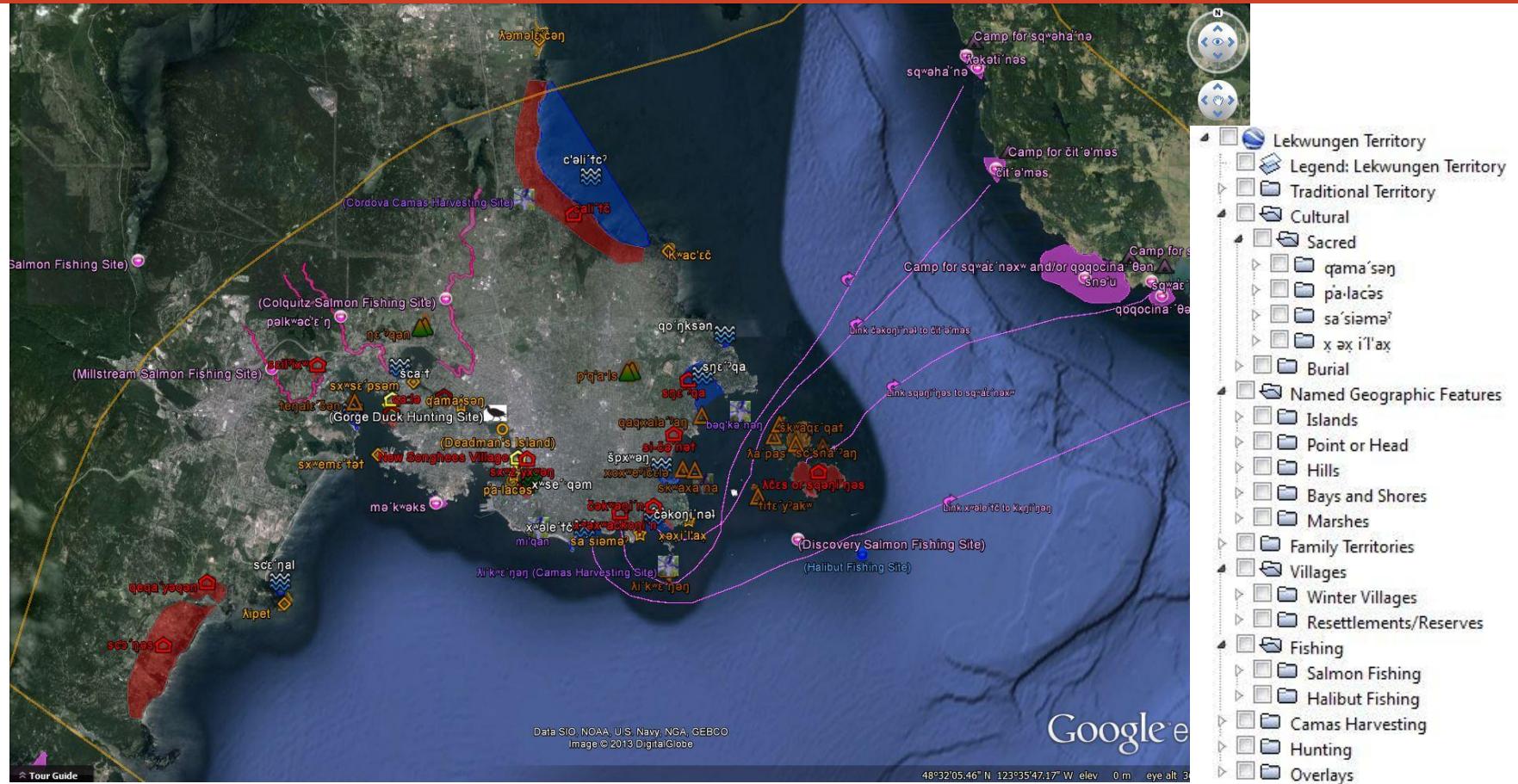
**LEGEND**

- HISTORICAL FORTS
- WINTER/FALL CAMPS
- SUMMER/SPRING CAMPS
- RESERVE LOCATIONS

UVic Anthropology Student Class Project by Alycia Gillham

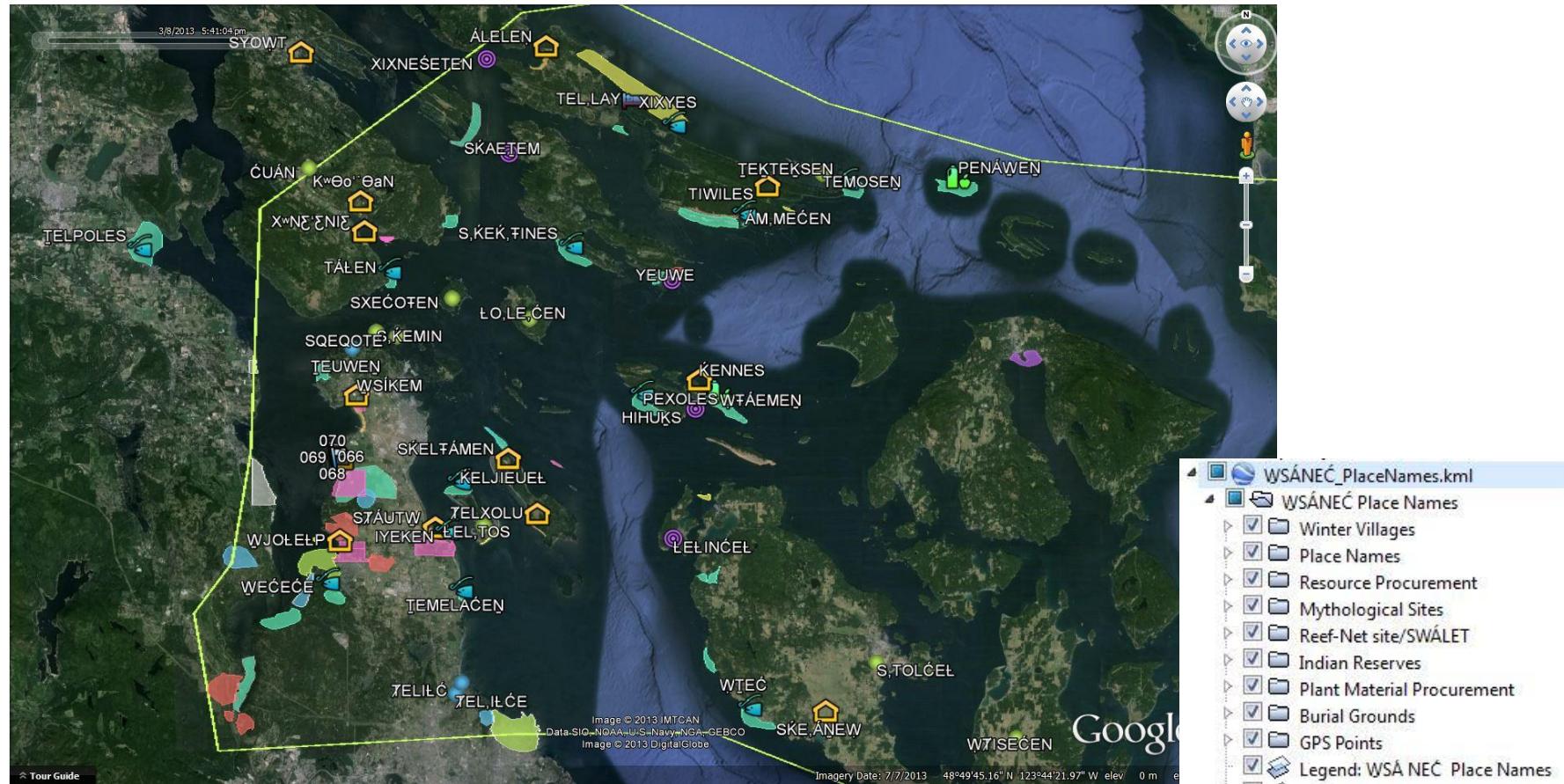
Imagery Date: 4/9/2013 53°09'44.35" N 59°14'18.49" W elev 0 m eye alt 303.14 km

# Lekwungen Territory Ethnographic Mapping project



UVic Anthropology Student Class Project by Paige Erickson-McGee

# Sencot'en Place Names by Dave Elliott, WSÁNEĆ territory



# Direct-to-Digital Mapping

‘Direct-to-Digital’ mapping in Google Earth provides an unparalleled opportunity to have detailed and engaged conversations about land-based cultural practices.

Interviews are guided by a detailed conversation about imagery shown in Google Earth, including from both the 2D and 3D perspectives.

Locations for placemarks, paths, and polygons are indicated by the knowledge-holder and digitized on the spot by the interview team.

Direct-to-Digital Interviews are video and audio-recorded for posterity and accuracy of later analysis. High quality audio-video can be used for many purposes (schools, public education).

A basic Direct-to-Digital set-up includes a laptop running Google Earth (with key imagery ‘cached’), a projector, a laser pointer, a high quality audio-recorder, and 2 video camera (one to record the screen, one for the interviewer).

It is always good to have topographic maps available in case of tech failure.

# Google Earth Basics for Direct-to-Digital

## What is Google Earth Pro?

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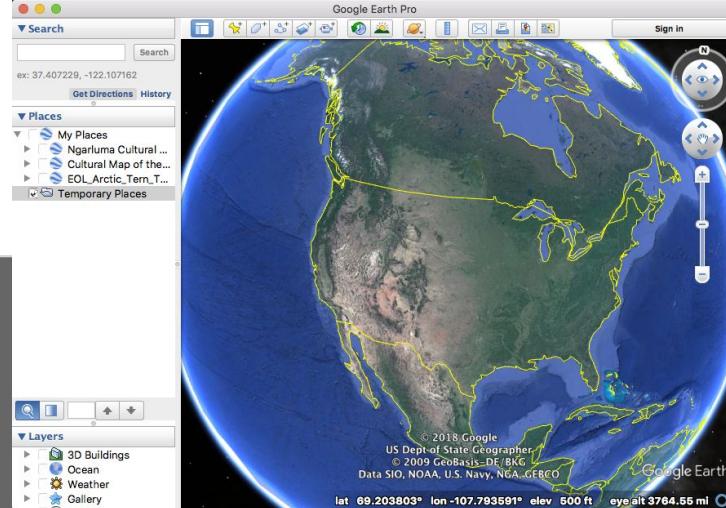
A virtual globe which pieces millions of images together and puts the world's geographic information at your fingertips.



## Google Earth Pro vs. Google Earth Web

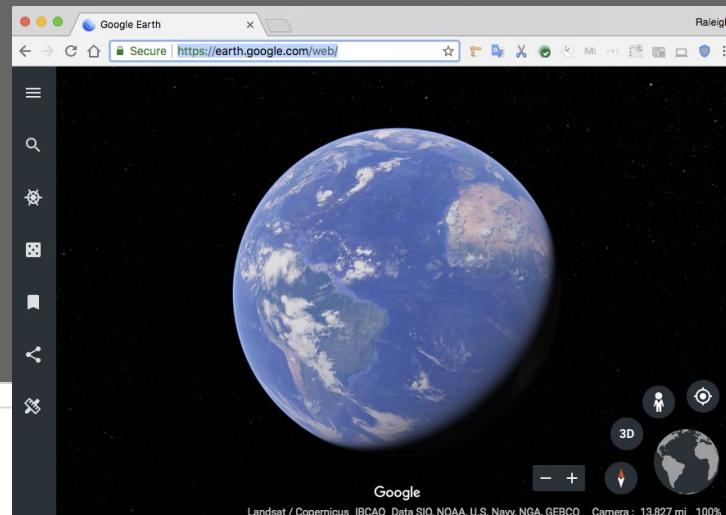
### Google Earth Pro

- Desktop app (download to computer)
- Create your own maps



### Google Earth Web

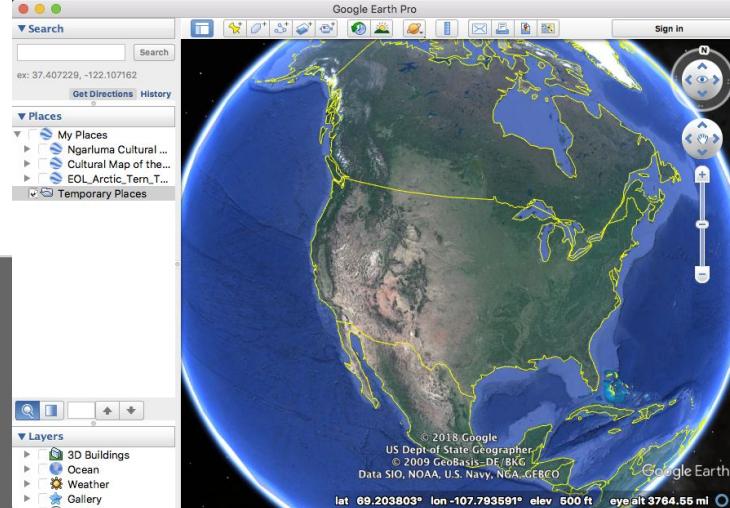
- Web app (go to [earth.google.com/web/](https://earth.google.com/web/))
- Currently no creation tools



## Google Earth Pro vs. Google My Maps

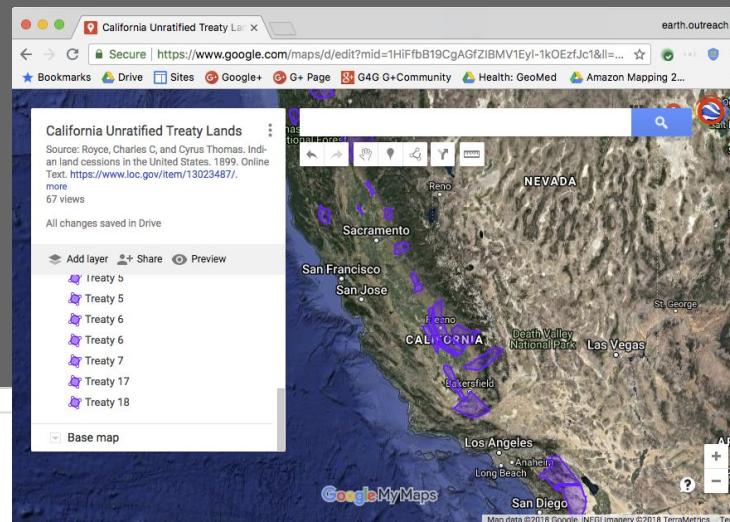
### Google Earth Pro

- 3D terrain & imagery
- Ability to tilt and rotate for a more realistic perspective
- Data saved onto your computer
- Some offline support



### Google My Maps

- 2D map (includes satellite view)
- Bird's eye view only
- No offline support



## Data privacy and ownership

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Review the Google Terms of Service.

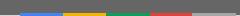
You retain ownership of your content.

Your Google Earth Pro content is stored locally on your device as a KML file.

If you keep Google Earth data on your laptop for data security be aware that:

- You will lose your file if your computer crashes and you did not back it up
- A KML that you share can easily be shared with others and you may lose control
- If you email KML files your email will be on a server and may not be more secure than a private (password protected) file in Google Drive or My Maps

If you want to keep your files secure offline, back them up on an external hard drive and control who has access to it (you can encrypt the hard drive if security is important)



## Tools that handle KML files

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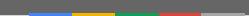
### Inside the Google ecosystem

- Google Earth Pro
- My Maps
- Fusion Tables
- Earth Engine
- Tour Builder
- Earth Web



### Outside the Google ecosystem

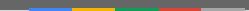
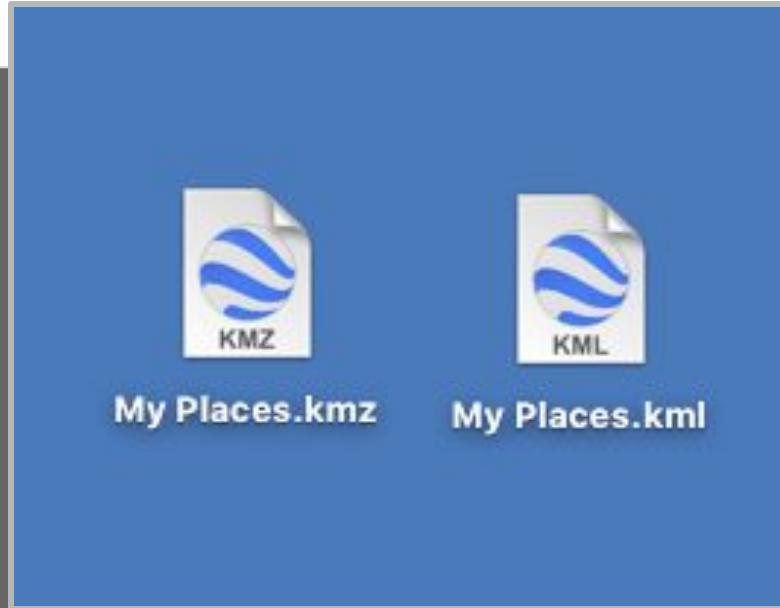
- ArcGIS
- Mapbox
- QGIS
- Text Editor (Text Mate, etc.)
- KML to CSV convertor



## Sharing KMZ Files

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KMZ vs KML?

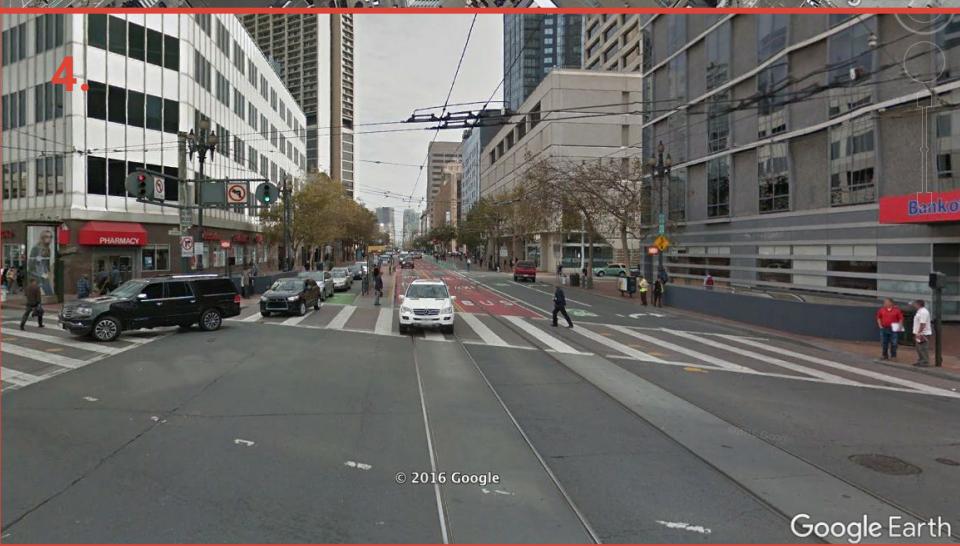
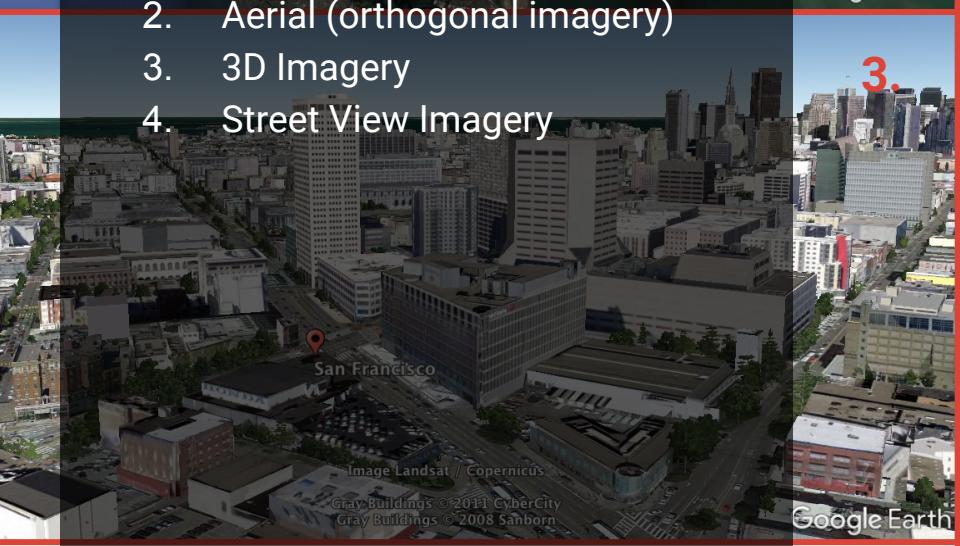


## Imagery in Google Earth

# Imagery of San Francisco in Google Earth

(San Francisco, California, United States)

- 1. Satellite Imagery
- 2. Aerial (orthogonal imagery)
- 3. 3D Imagery
- 4. Street View Imagery



## Imagery in Google Earth

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Frequency of Imagery depends  
on population and demand.

Imagery tiles from different satellites in Google Earth.

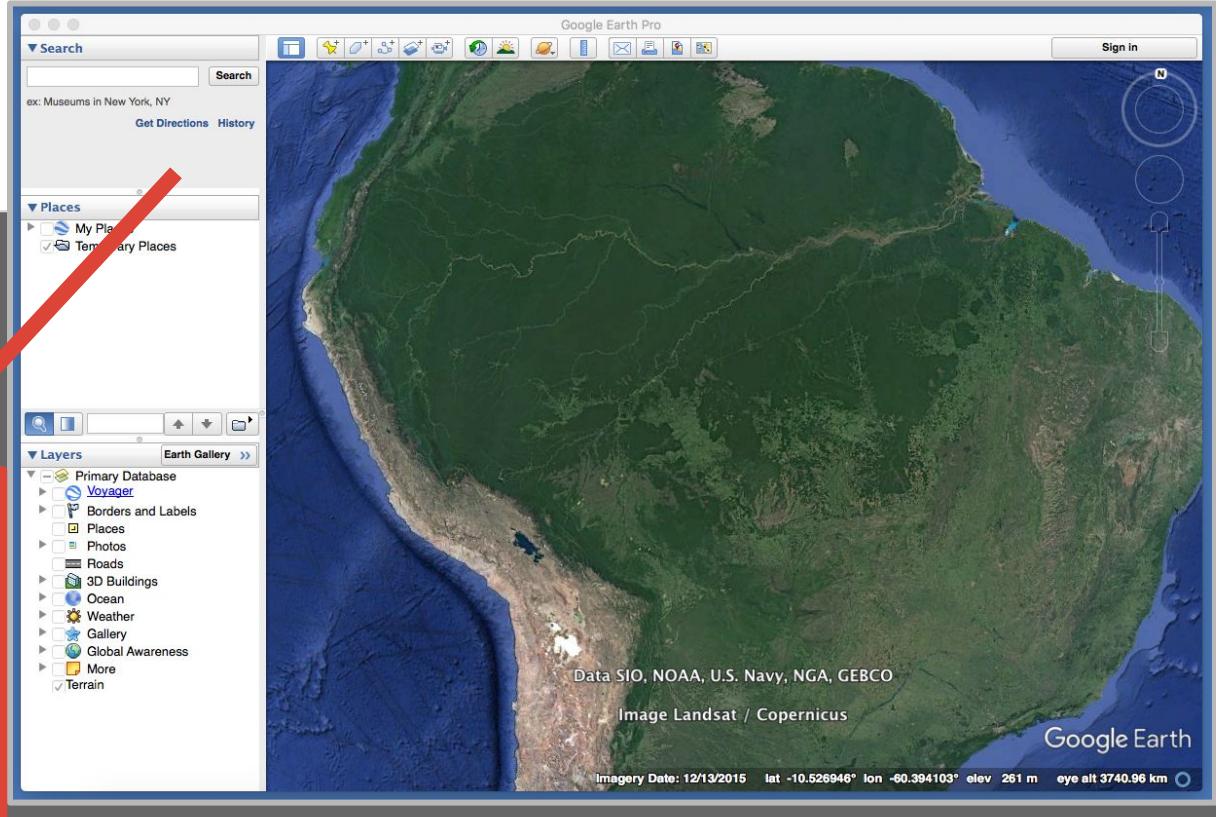
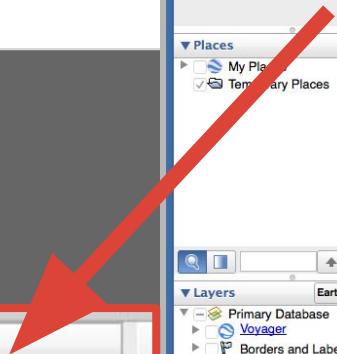
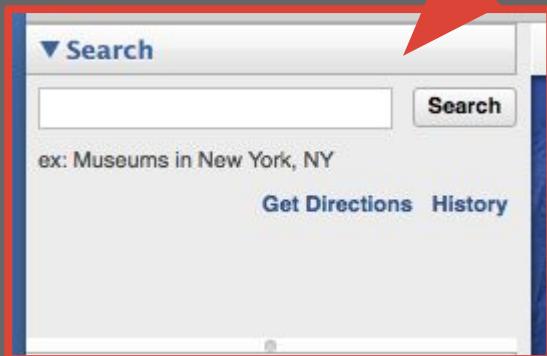
## Panels in Google Earth

## Panels in Google Earth



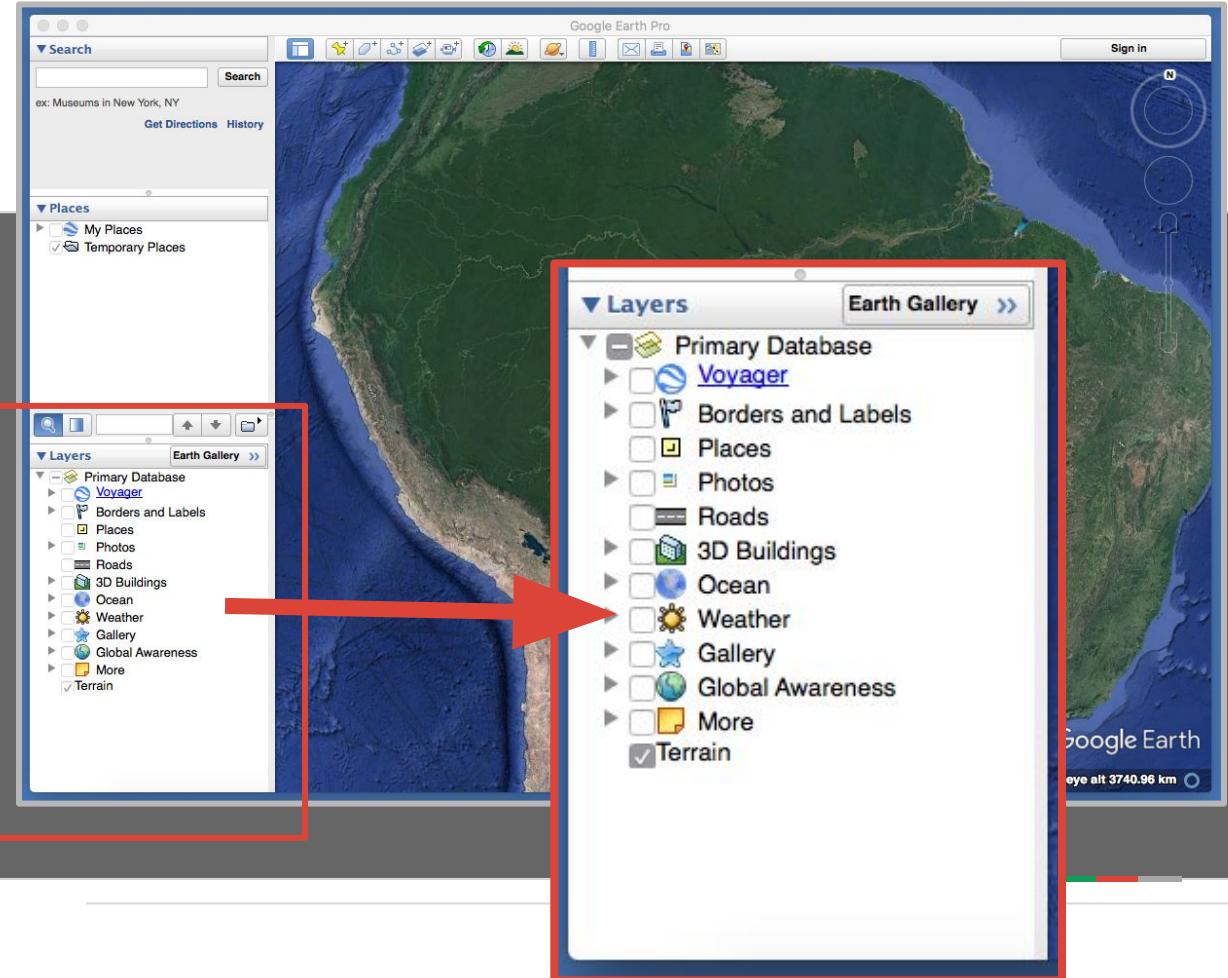
## Panels in Google Earth

### The Search Panel



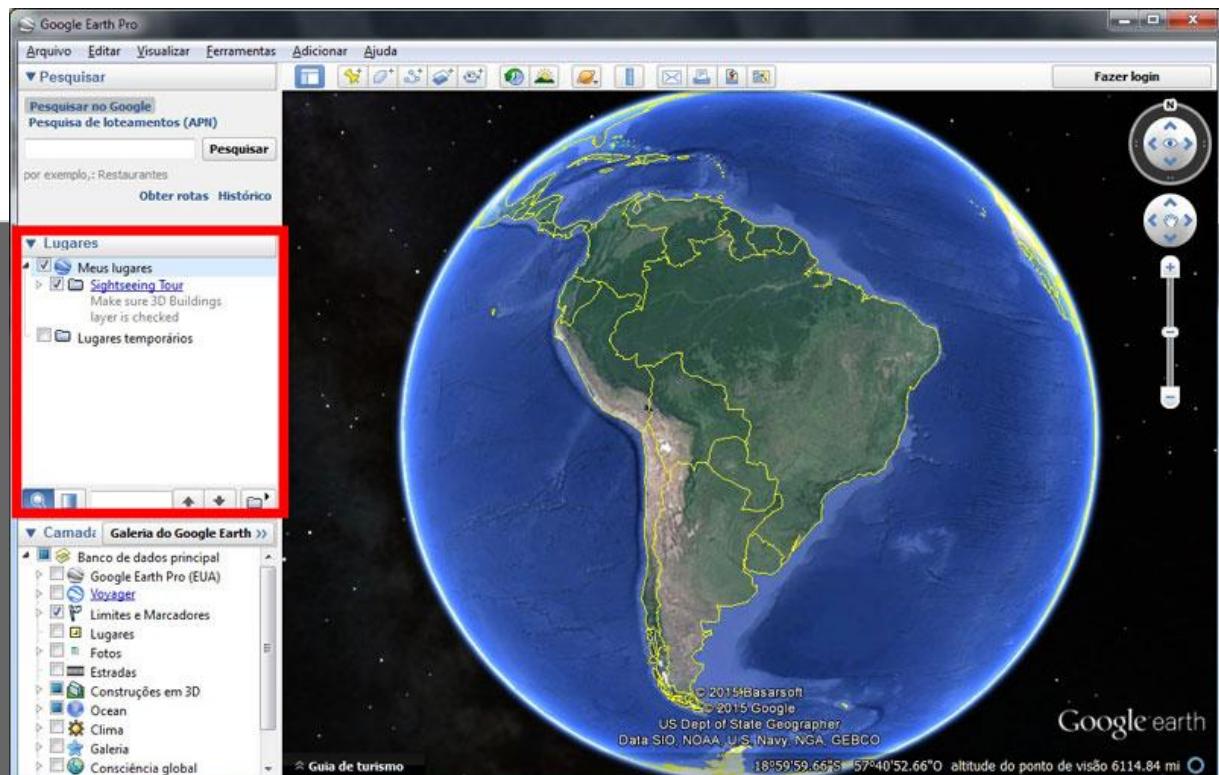
## Panels in Google Earth

The Layers Panel:  
Google Data and  
curated content from  
partners who Google  
works with.



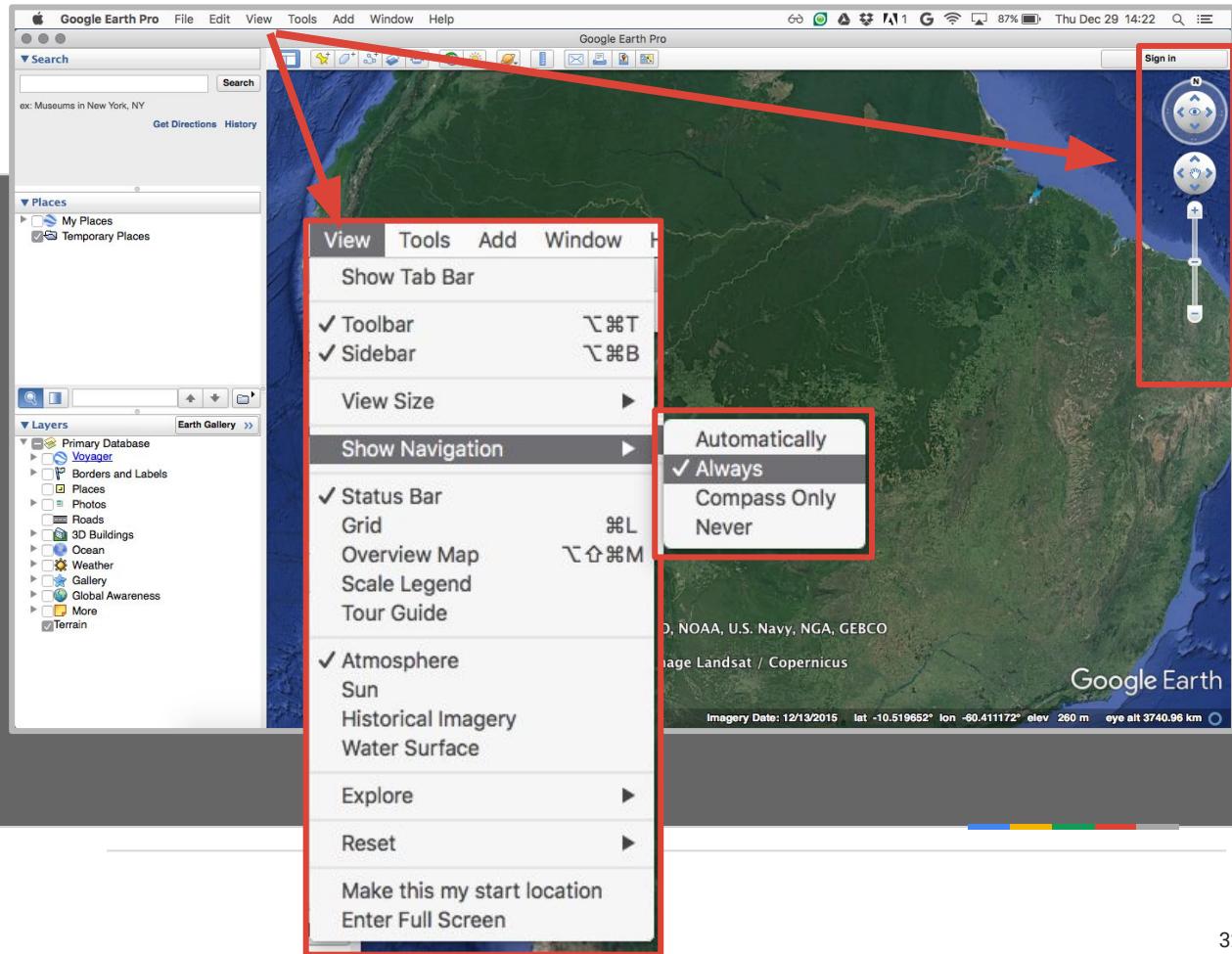
## Panels in Google Earth

The Places Panel:  
organize and save your  
places



## Navigation in Google Earth

Navigation options within the application



## Navigation in Google Earth

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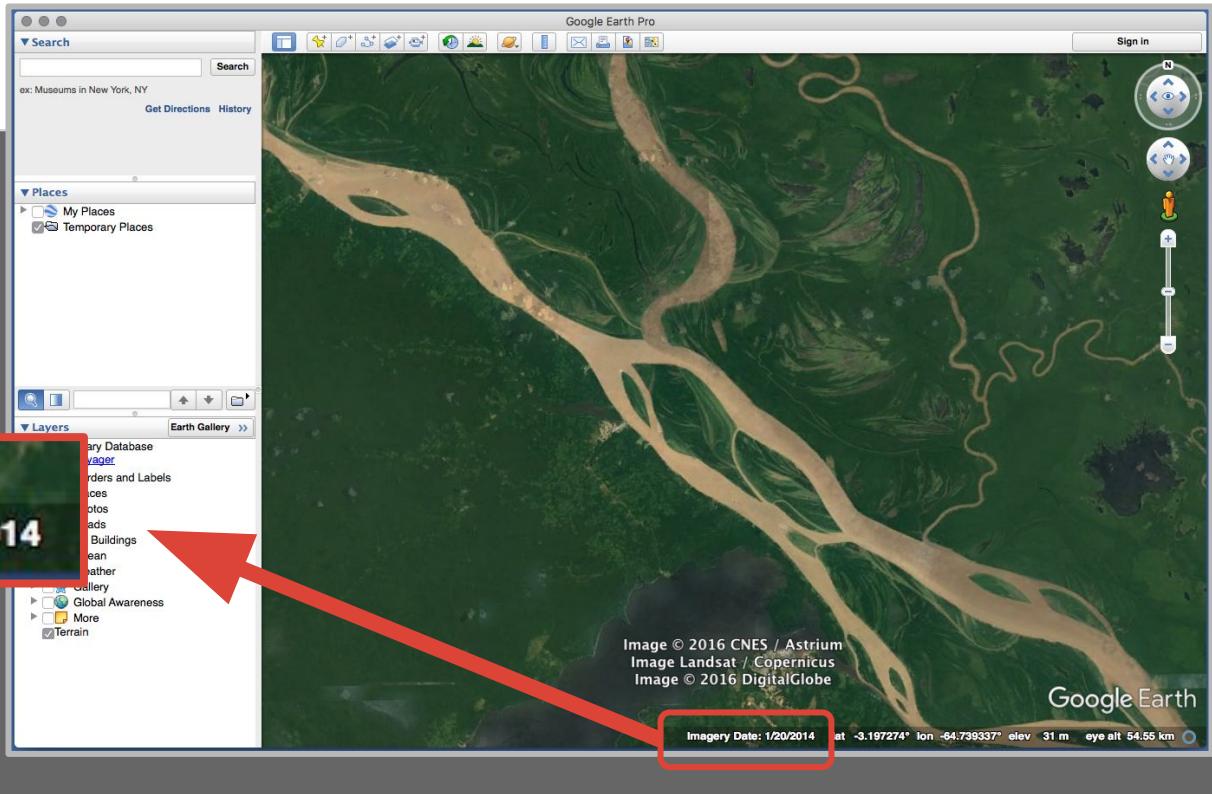
Other forms of navigation:

1. Keyboard
2. Touchpad
3. Mouse



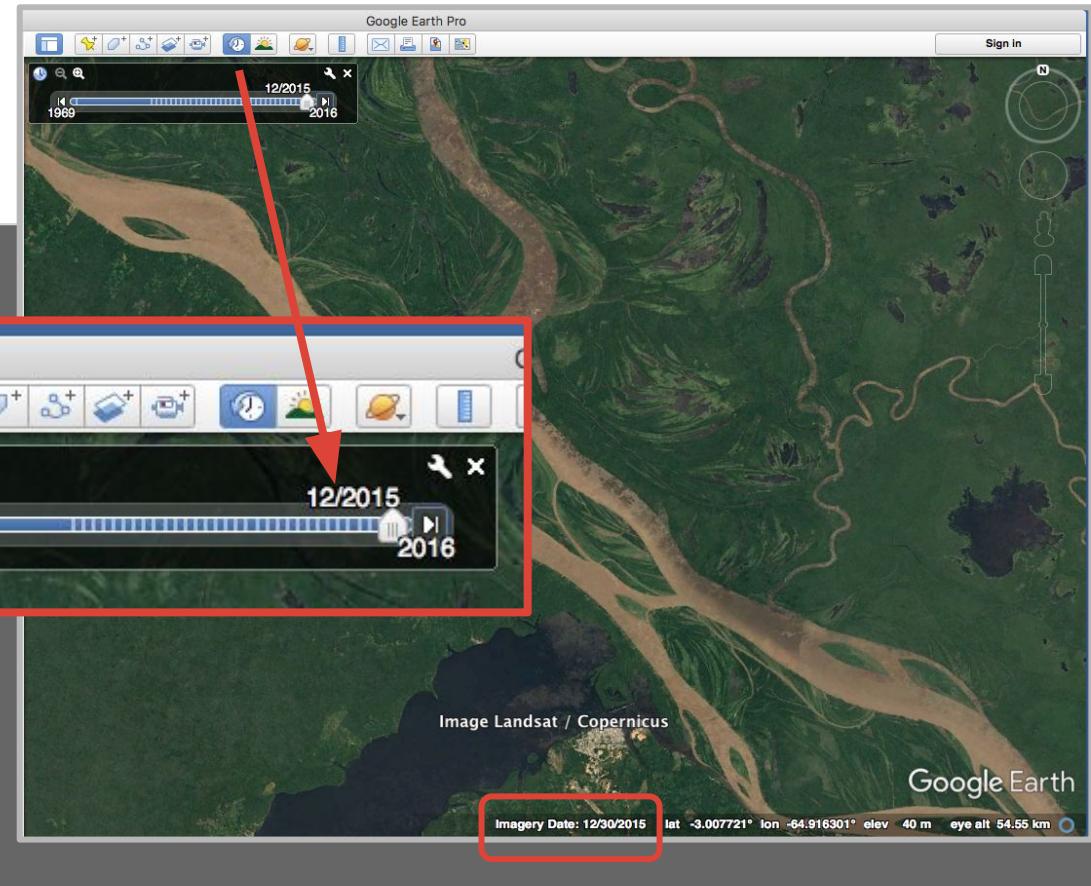
## Exploring Imagery in Google Earth

Finding the Date of  
an Image



## Exploring Imagery in Google Earth

Viewing historical imagery



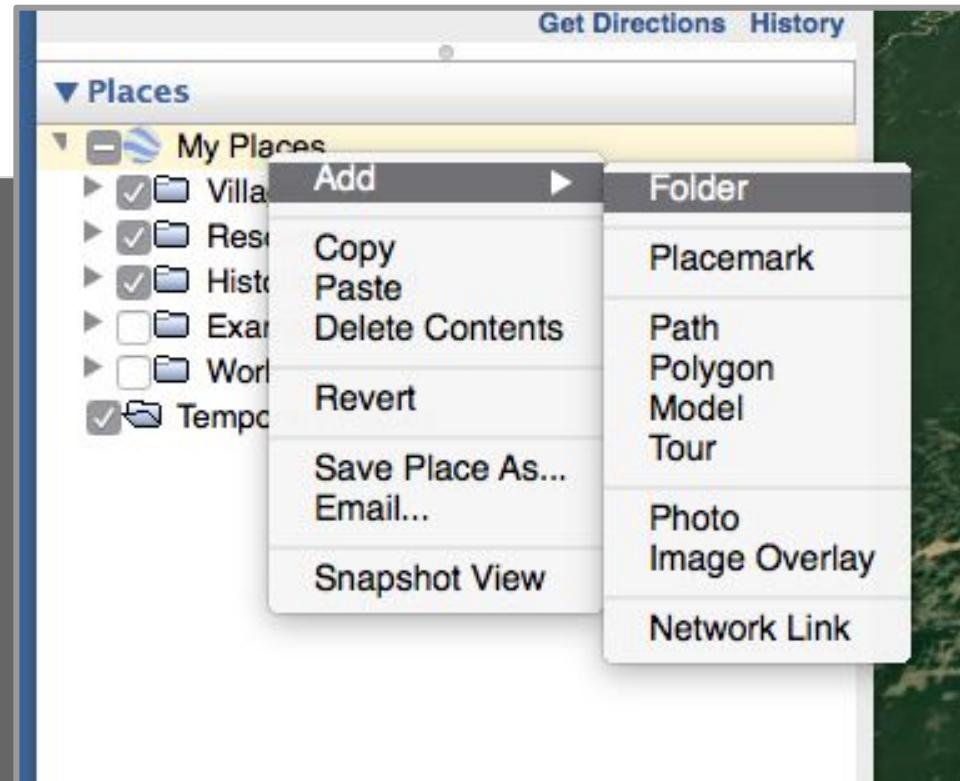
## Organizing the Map into Folders

Click on the folder you want to draw in.

For example, right-click on “My Places” to Add>New Folder.

Name your folder.

Move things to folders if you want them somewhere else!



## Organizing the Map into Folders

Keeping your folders organized with appropriate categories.

The screenshot shows the Google Earth 'Places' panel with three open KML files:

- WSÁNEĆ Place Names.kml**: Contains a main folder 'WSÁNEĆ Place Names' with sub-folders: Winter Villages, Place Names, Resource Procurement, Mythological Sites, Reef-Net site/SWÁLET, Indian Reserves, Plant Material Procurement, Burial Grounds, GPS Points, and a legend entry 'Legend: WSÁNEĆ Place Names'.
- Snuneymuxw Land Use and Occupancy Study.kmz**: Contains a main folder 'Snuneymuxw Land Use and Occupancy Study' with a sub-folder 'Introduction and References'. A note states: "Snuneymuxw First Nation is a Halkomelem speaking group on southeast Vancouver Island." It also contains a 'Site Use Legend' and a 'Territory Sites' folder with sub-folders: Village Sites, Gathering Sites, Fishing Sites, Spiritual Sites, Origin Story Sites, Hunting Sites, Route Site, Place Name Sites, Ceremonial Site, Reconciliation Agreement Sites, and Indian Reserve Sites.
- Lekwungen Territory.kmz**: Contains a main folder 'Lekwungen Territory' with a 'Legend: Lekwungen Territory' entry. It includes sections for 'Traditional Territory', 'Cultural', 'Sacred' (with entries qama'səŋ, p'ałacəs, sa'siema, x əx i'l'ax), 'Burial', 'Named Geographic Features', 'Islands', 'Point or Head', 'Hills', 'Bays and Shores', 'Marshes', 'Family Territories', 'Villages' (with sub-folders Winter Villages, Resettlements/Reserves), 'Fishing' (with sub-folders Salmon Fishing, Halibut Fishing, Camas Harvesting, Hunting), and 'Overlays'.

## Placemarks: Identifying Specific Sites

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Points on the map:  
Placemarks



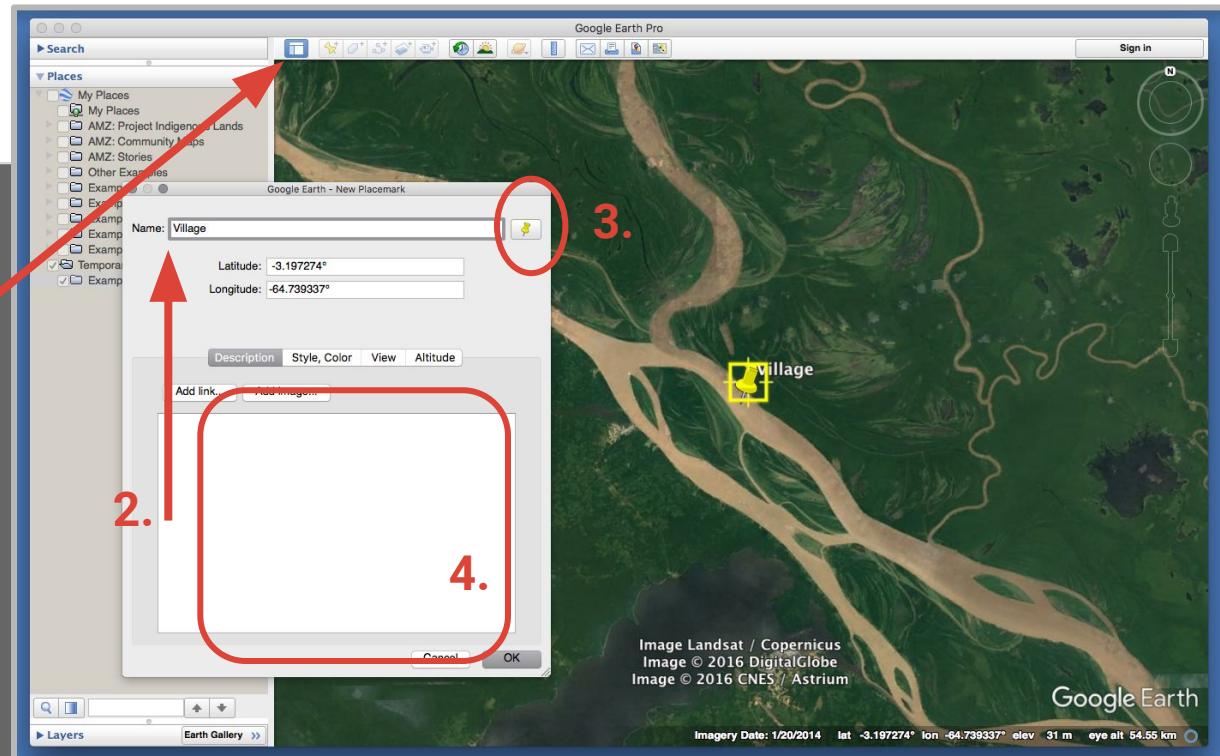
## Placemarks: Identifying Specific Sites

1. Add Placemark

2. Name it

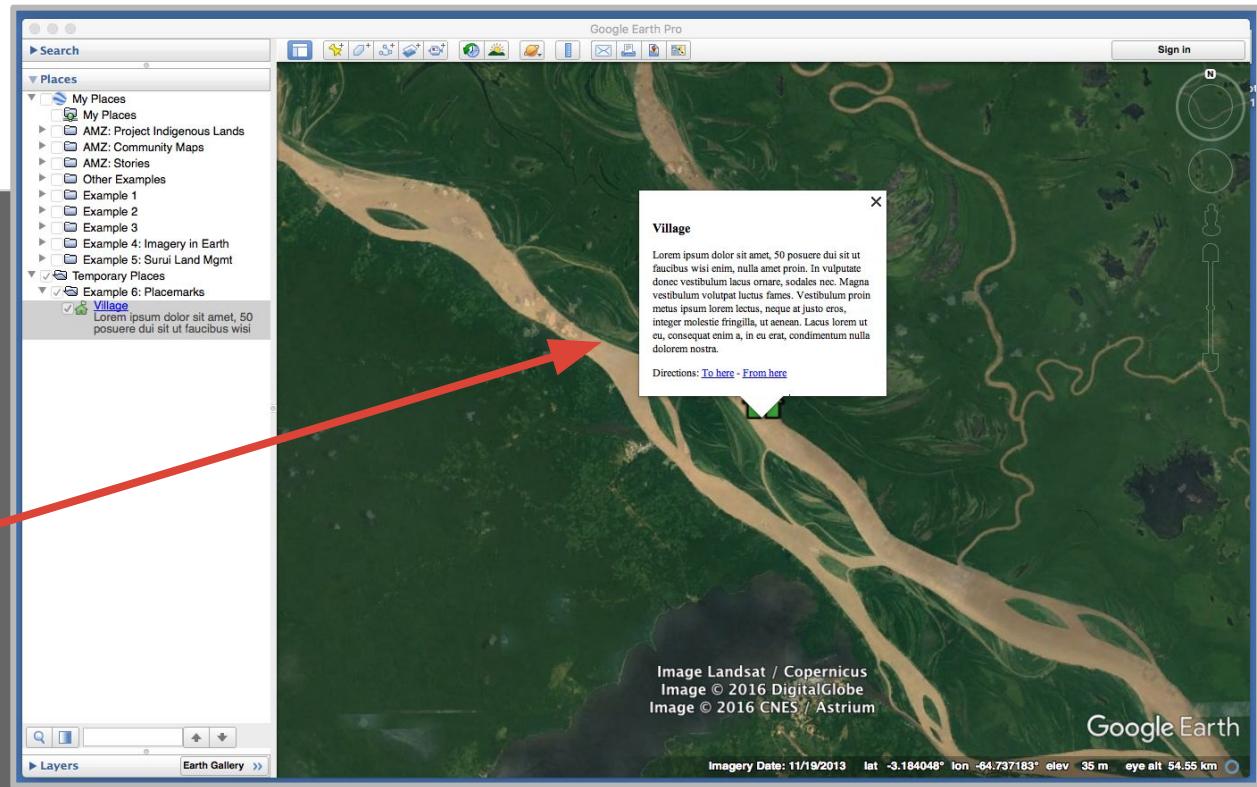
3. Change the icon

4. Add description



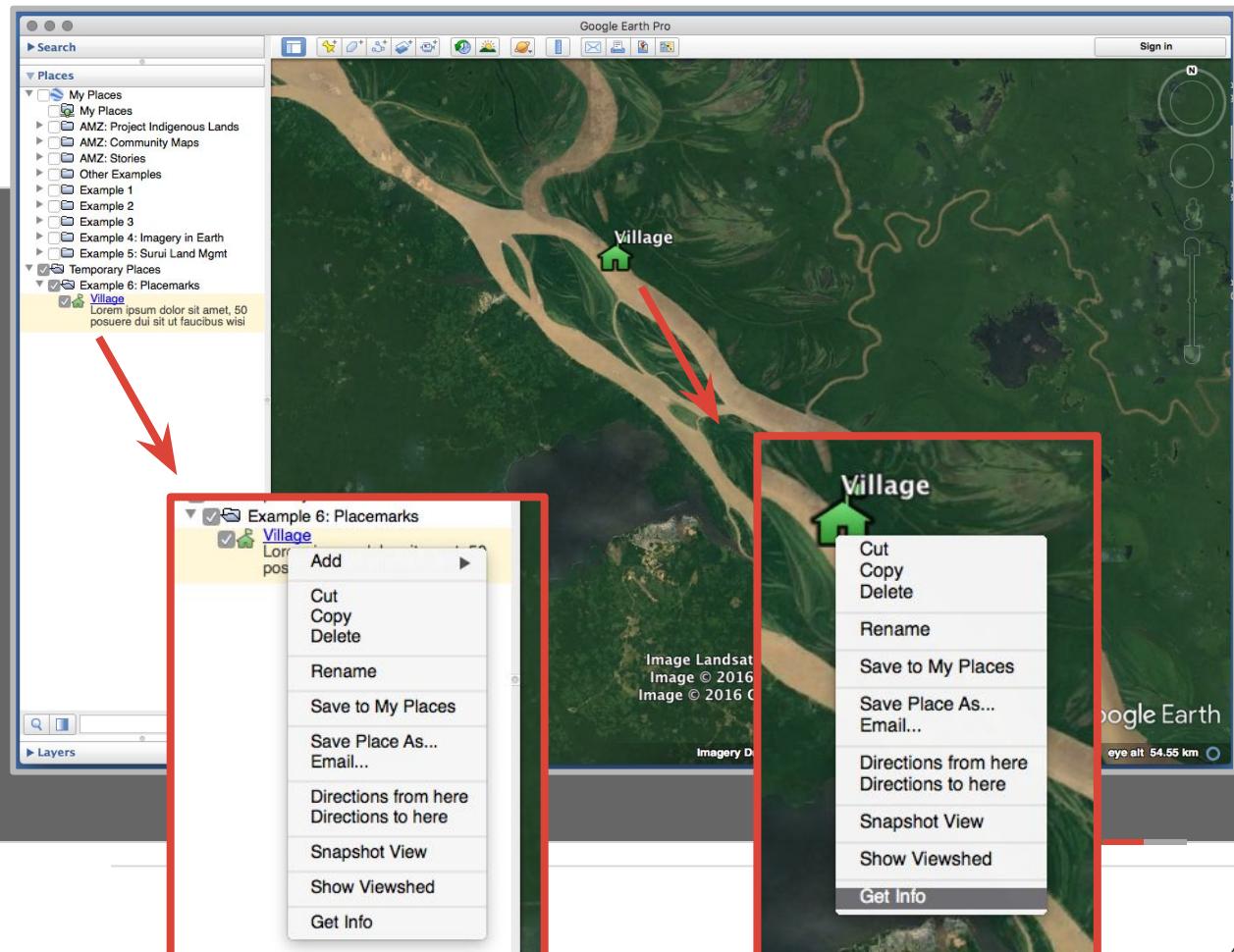
## Placemarks: Identifying Specific Sites

Your placemark



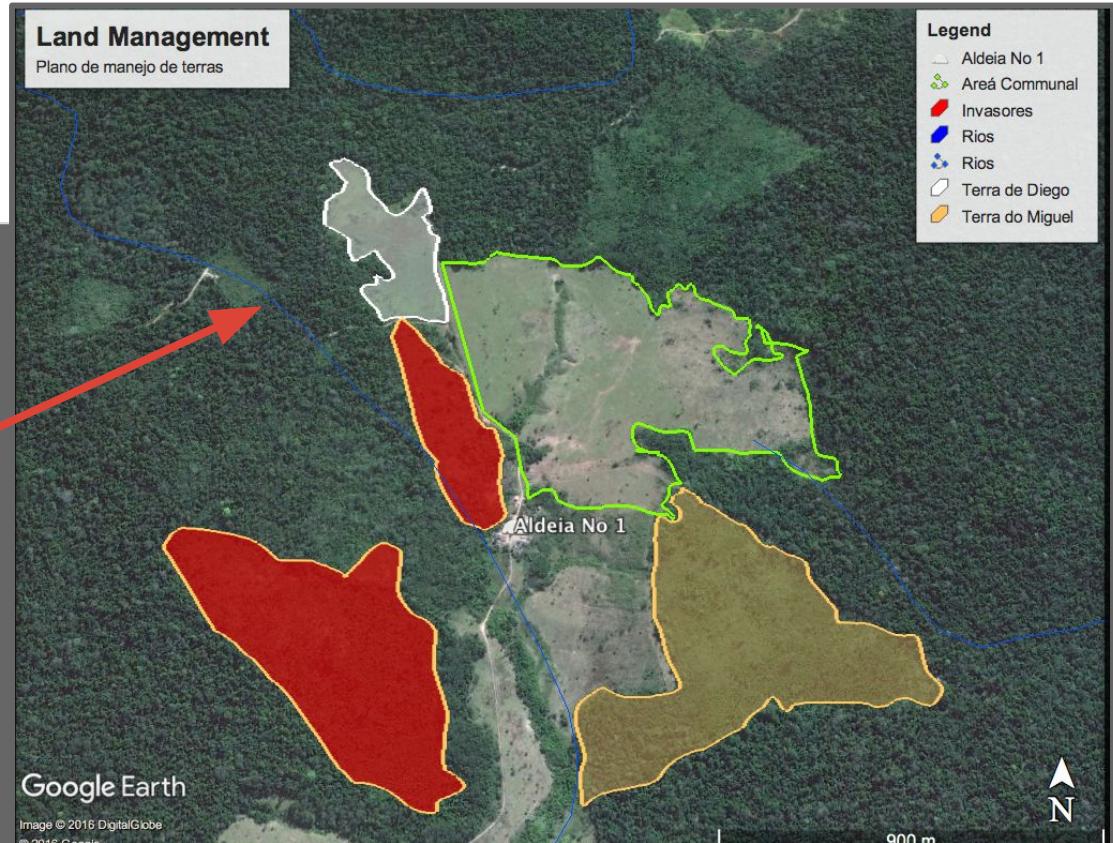
## Placemarks: Identifying Specific Sites

Move or  
Change a Placemark.



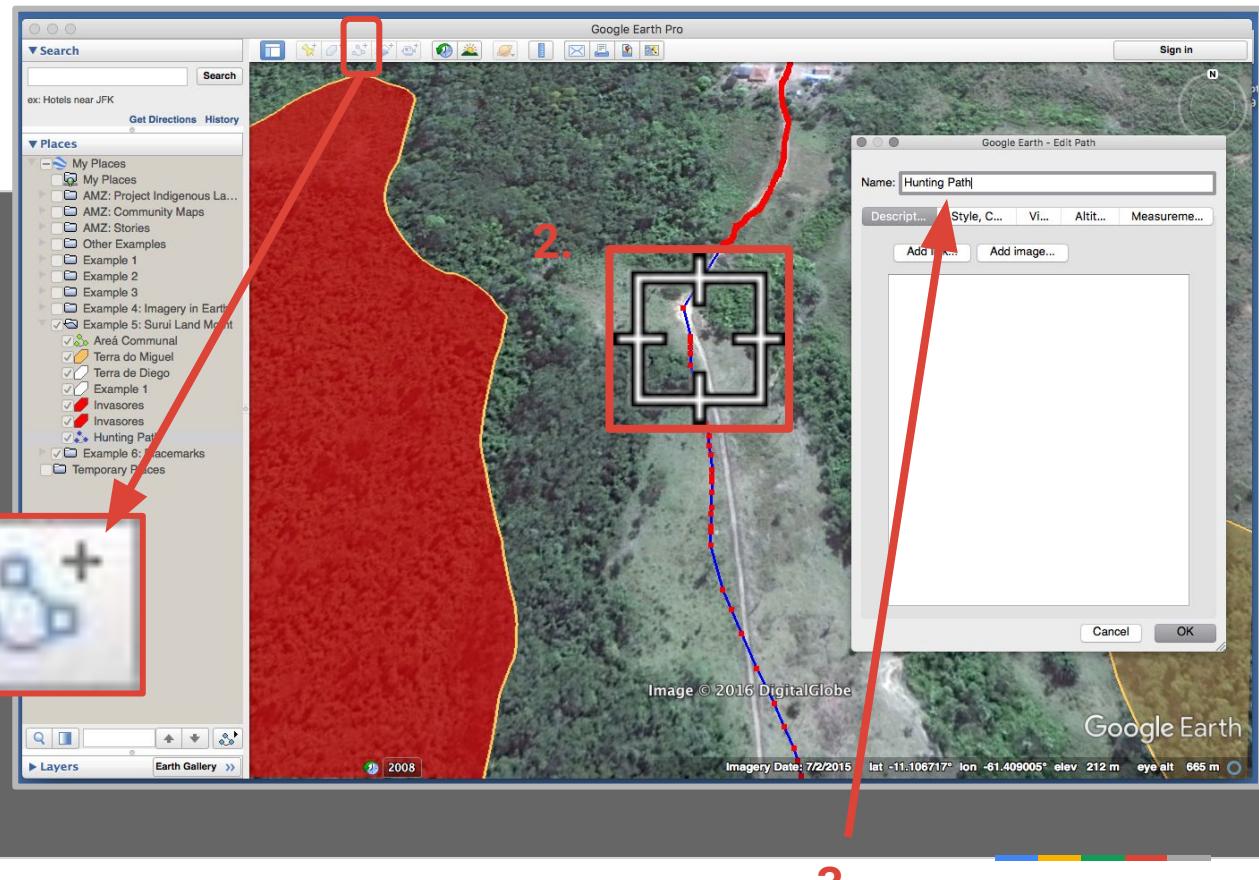
Paths: Identifying Roads & Boundaries

Paths: Identifying Roads, Trails  
or Boundaries



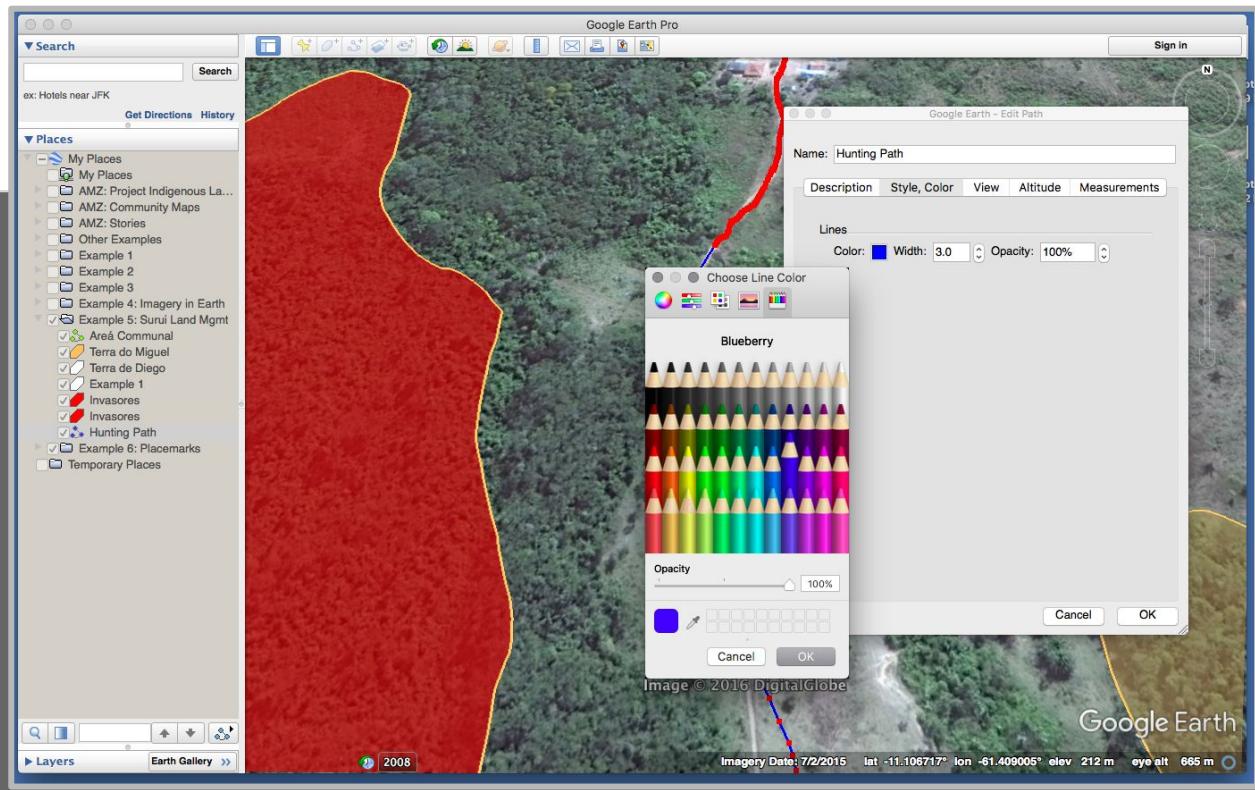
## Paths: Identifying Roads & Boundaries

1. Add a New Path
2. Draw or trace your path
3. Name your path

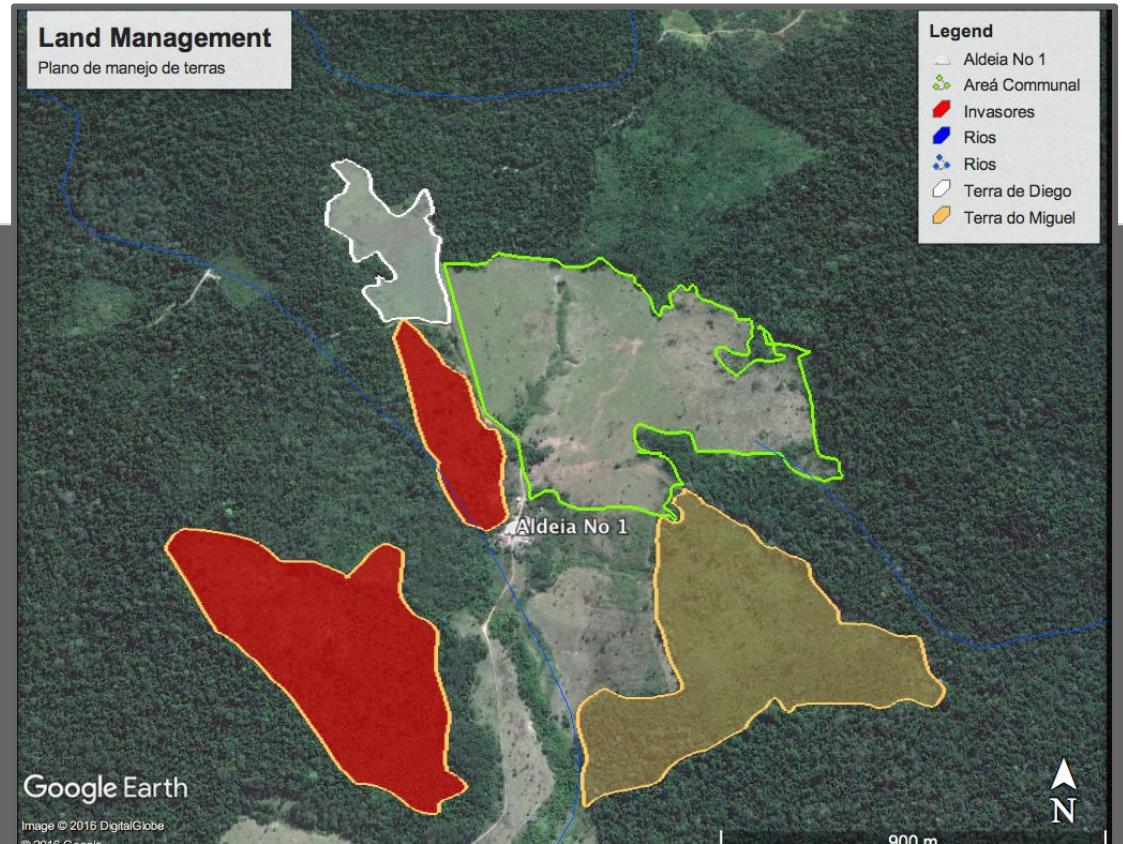


## Paths: Identifying Roads & Boundaries

Adjust styling options.

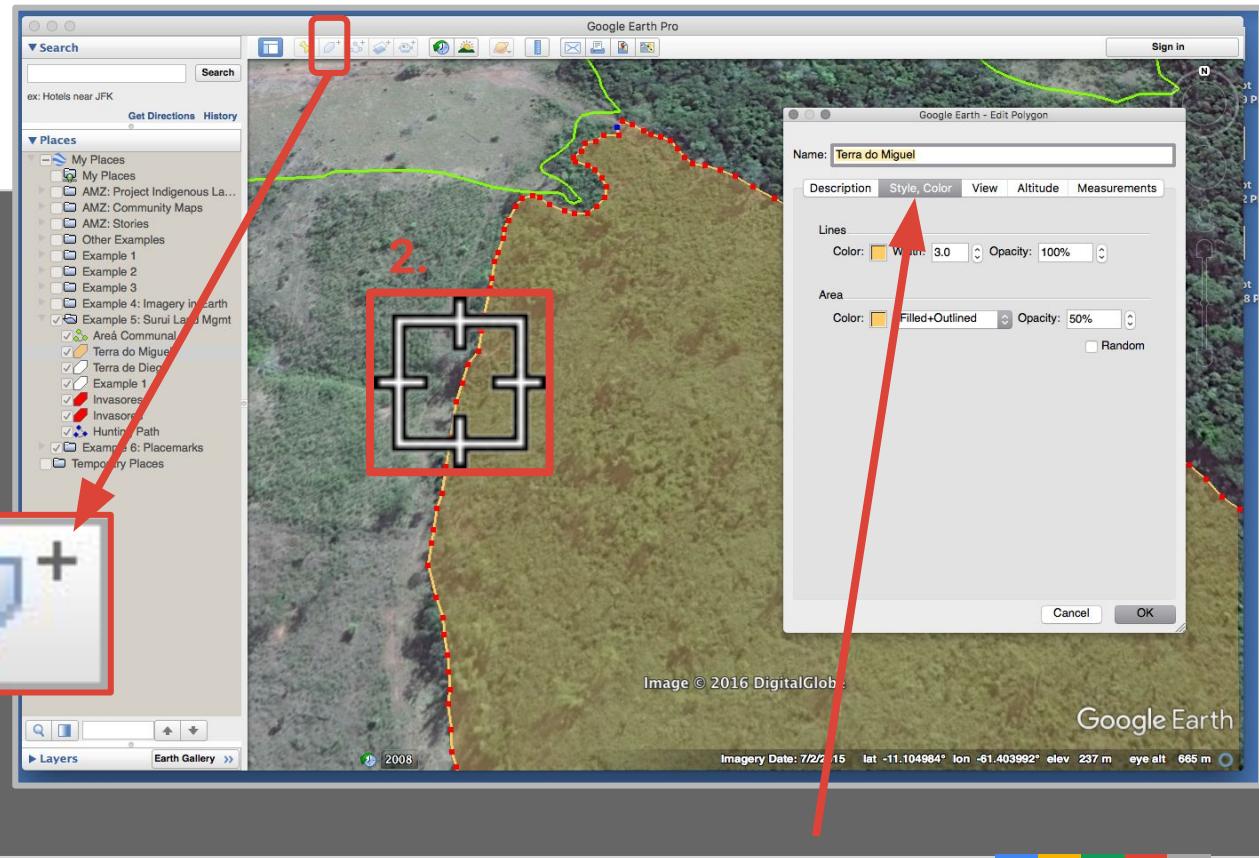


Polygons: Identifying Areas or Parcels



## Polygons: Identifying Areas or Parcels

### Adding a Polygon

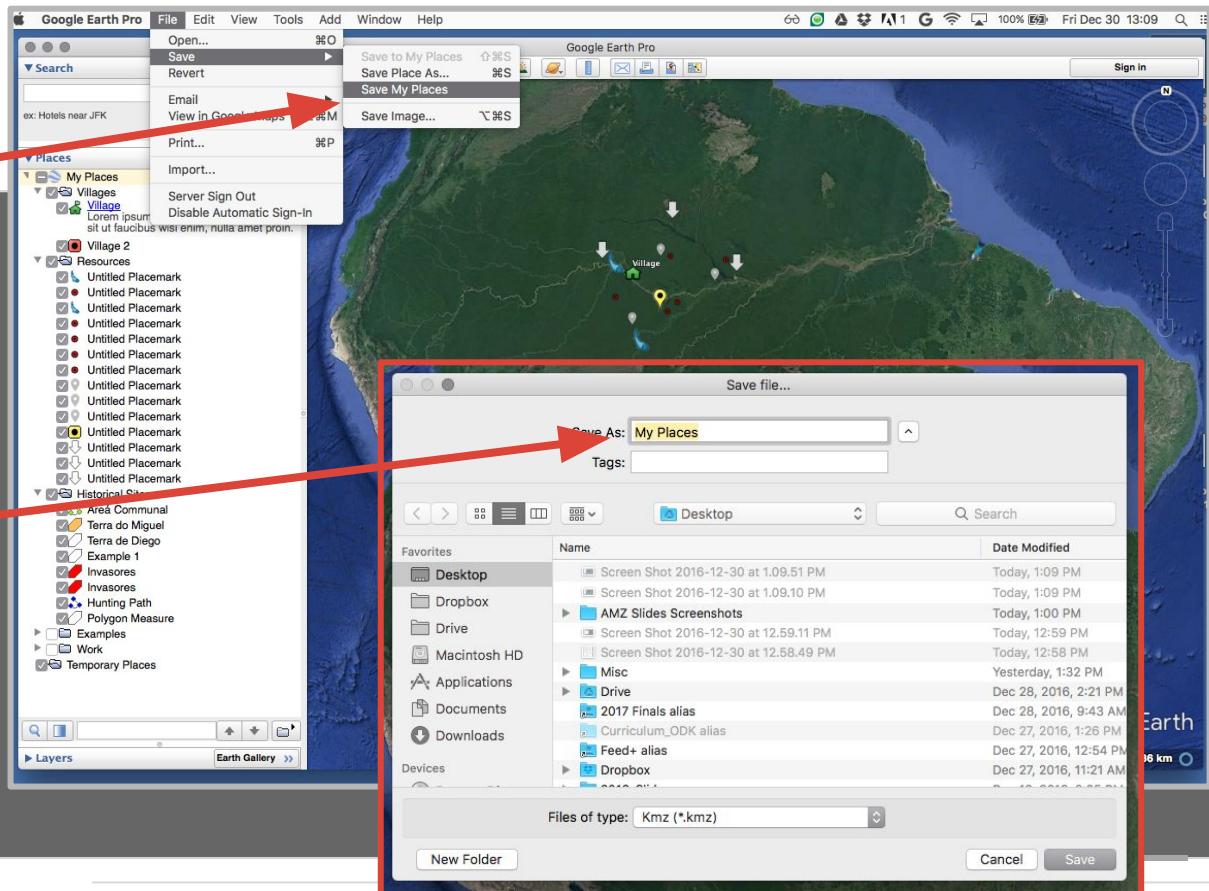


## Saving & Protecting Your Work

How to save  
in Google Earth:

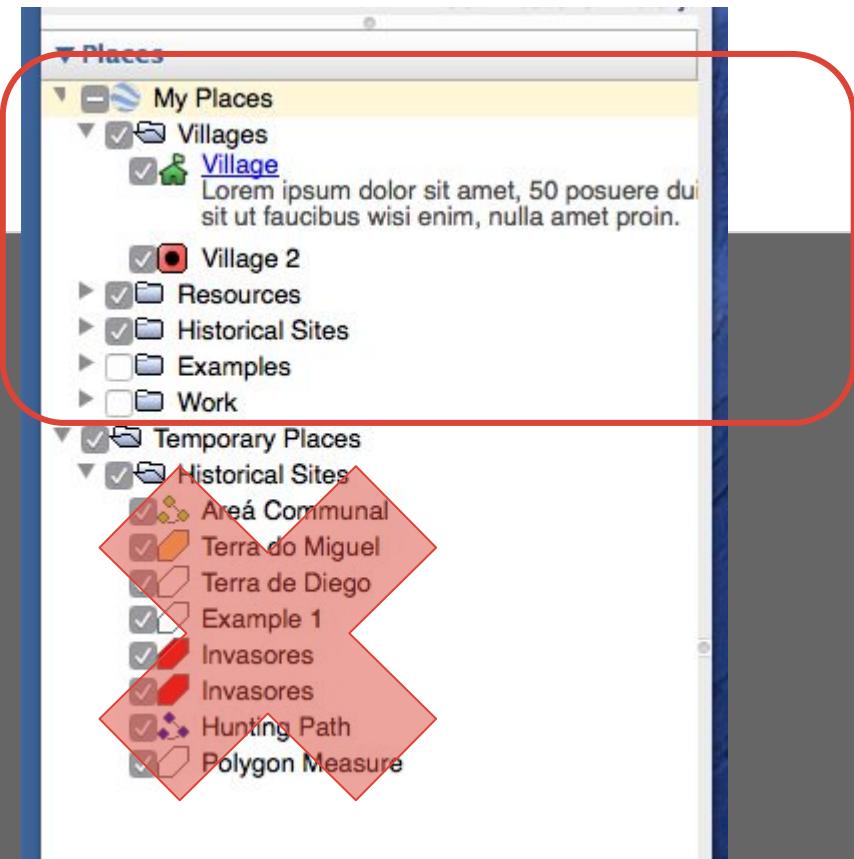
File > Save > Save My  
Places

Name your files, locate  
them on your hard drive



## Saving & Protecting Your Work

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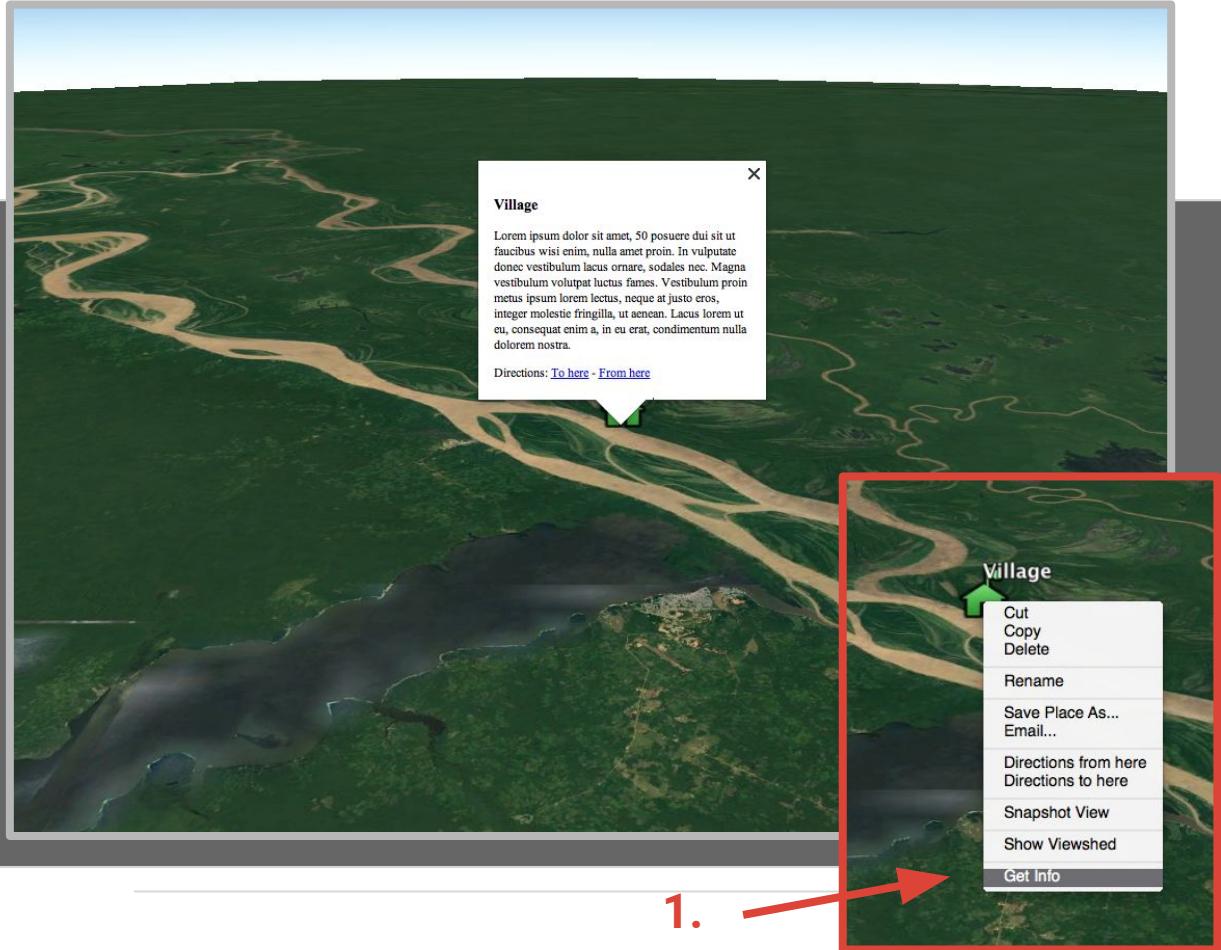


## Best Practices for Saving Your Work

- Store your project in the My Places, not Temporary Places.
- Save your project often
- At the end of each work day, save your project

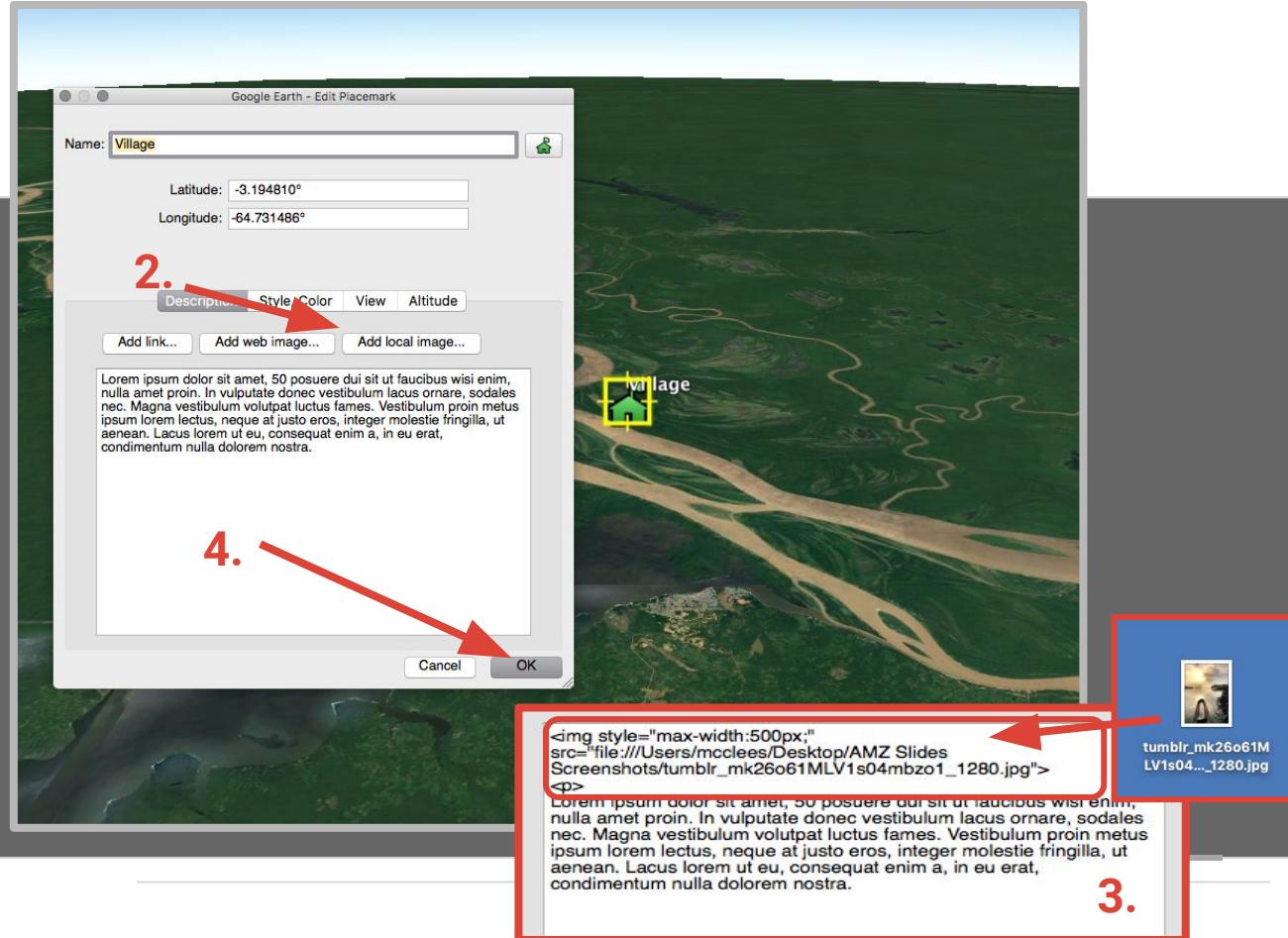
## Adding Photos to Maps

Add an image that  
is on your  
personal hard  
drive.



## Adding Photos to Maps

Add an image that  
is on your  
personal hard  
drive.



## Adding Photos to Maps

Your map has an image!

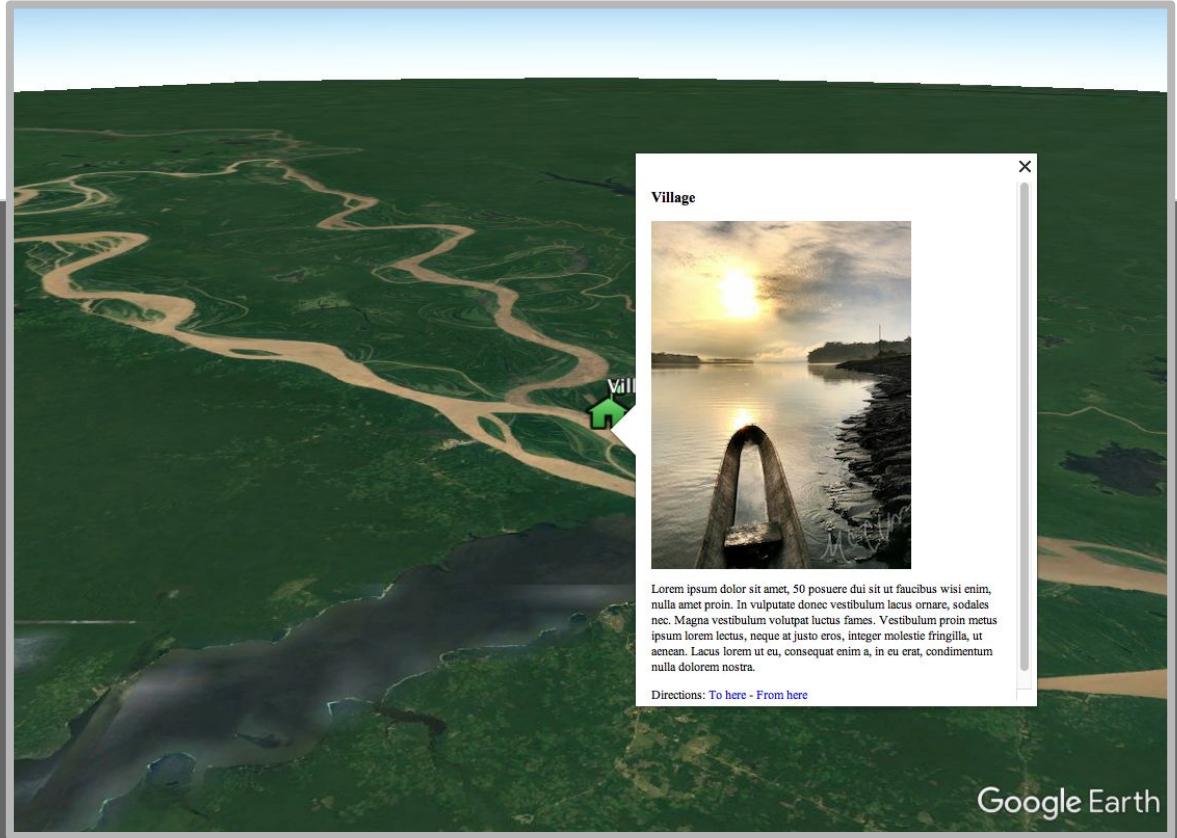


Image Source: Copyright by McClees Stephens, 2013, mcclees-amazonia.tumblr.com.

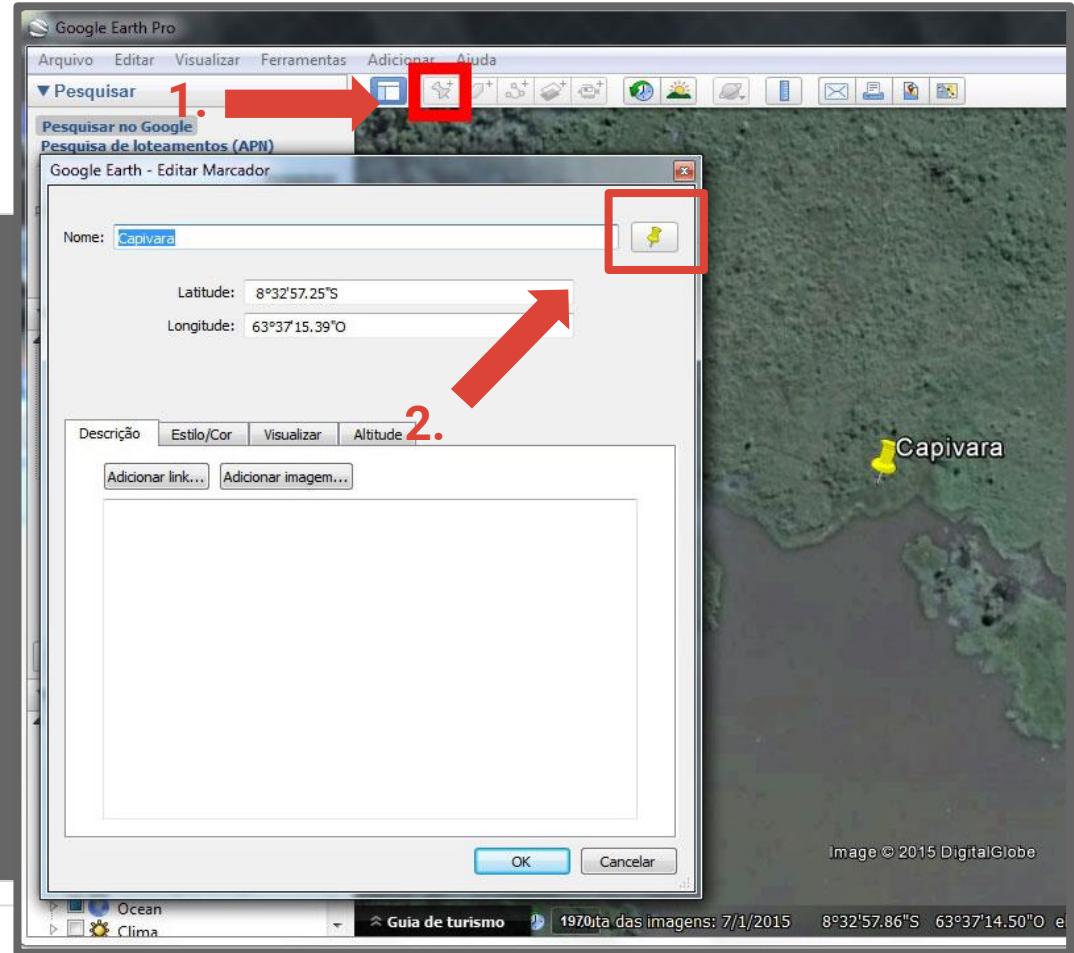
## Creating Custom Icons for Placemarks

Adding a new site:

Add a placemark and title.

*Title = Site type.*

Refer to your legend for all your site types.

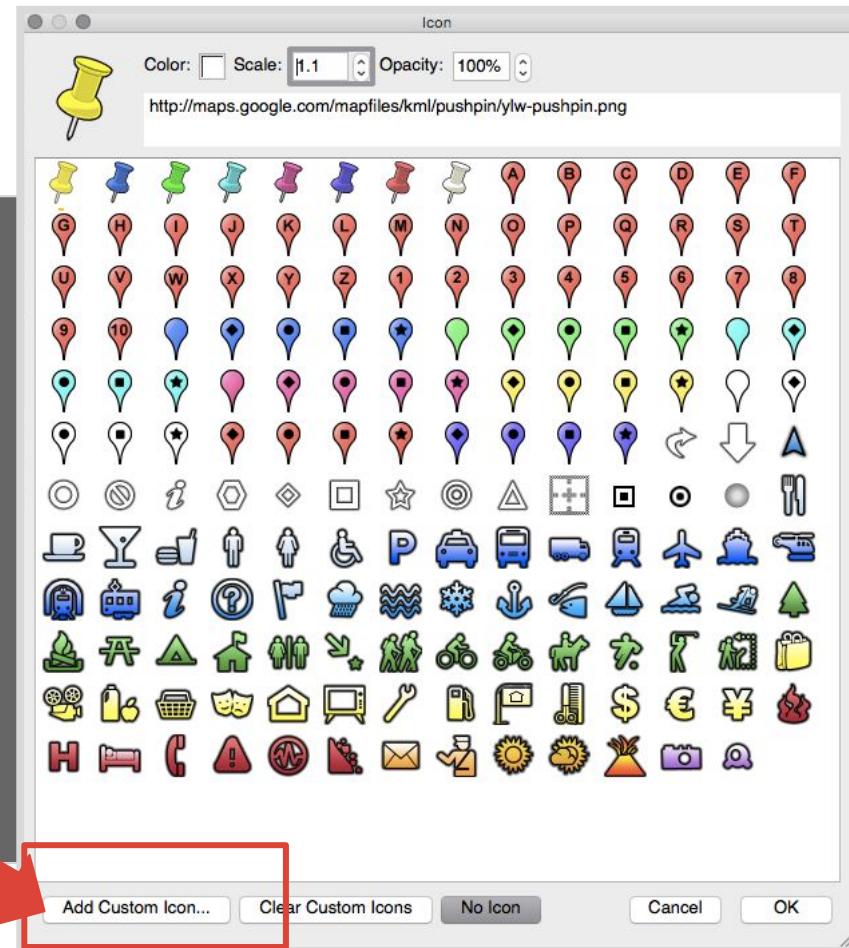


## Creating Custom Icons for Placemarks

Changing Icons.

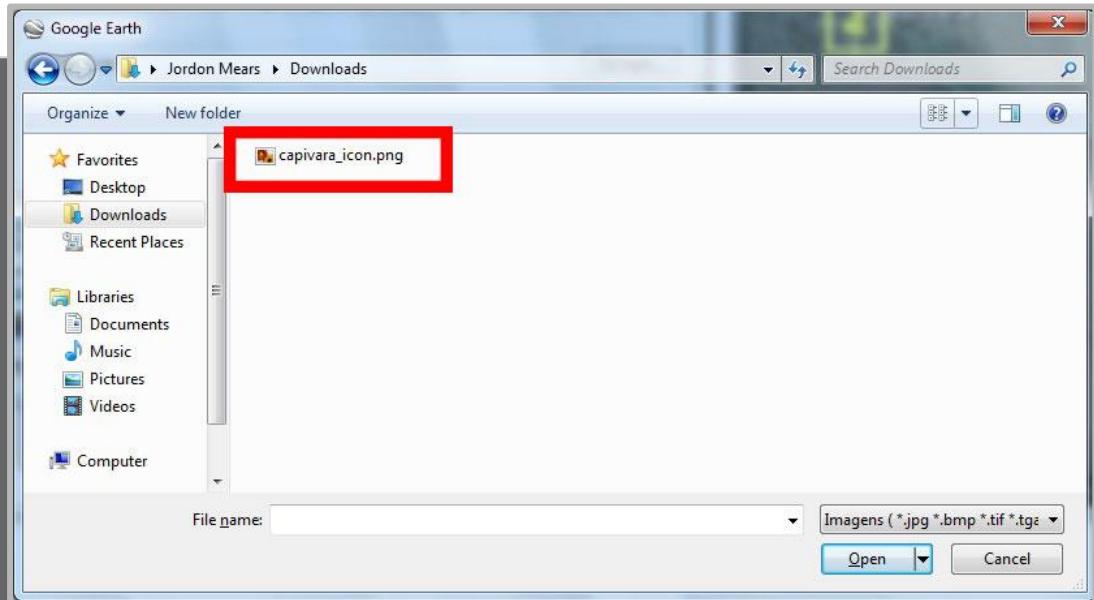
Here you can select any of the already existing icons available in Google Earth.

You can also Add a Custom Icon.



## Creating Custom Icons for Placemarks

Change the icon to the appropriate icon for the site type.



## Creating Custom Icons for Placemarks

Custom-made Icons.

The University of Victoria in Canada created custom icons for Indigenous communities in Canada.

They are online and designed to be easy to import into Google Earth.



University  
of Victoria

Anthropology

Ethnographic Mapping Lab

## Creating Custom Icons for Placemarks

Accessing these Icons.

Go to the URL provided in the materials or at the bottom of this slide.

The screenshot shows a web browser window titled "Google Earth Icons - Univers" with the URL "goo.gl/8Q4KAt". The page displays a set of 12 icons representing various activities, resources, and site types. Below the icons is a descriptive text from the Ethnographic Mapping Lab. A "Resources" section provides a grid of icons for three categories: Medium Land Mammal, Large Land Mammal, and Reindeer / Caribou, each in six color variations: Icon, Blue, Green, Purple, Red, and Yellow.

The Ethnographic Mapping Lab has developed a set of icons for mapping Indigenous land/marine use with Google's mapping tools (ie: Google Earth, Google MyMaps) or other applications that accept custom icons.

These icons were designed by graphic artist James Gray to represent a range of activities, resources and site types commonly associated with Indigenous mapping projects. The icon design is consistent with the overall style of the icon libraries in Google Earth and Google MyMaps, and are intended to be sufficiently generic for use by a broad range of communities and cultural contexts. Icons are 64x64 Portable Network Graphic (.png) files with transparent backgrounds.

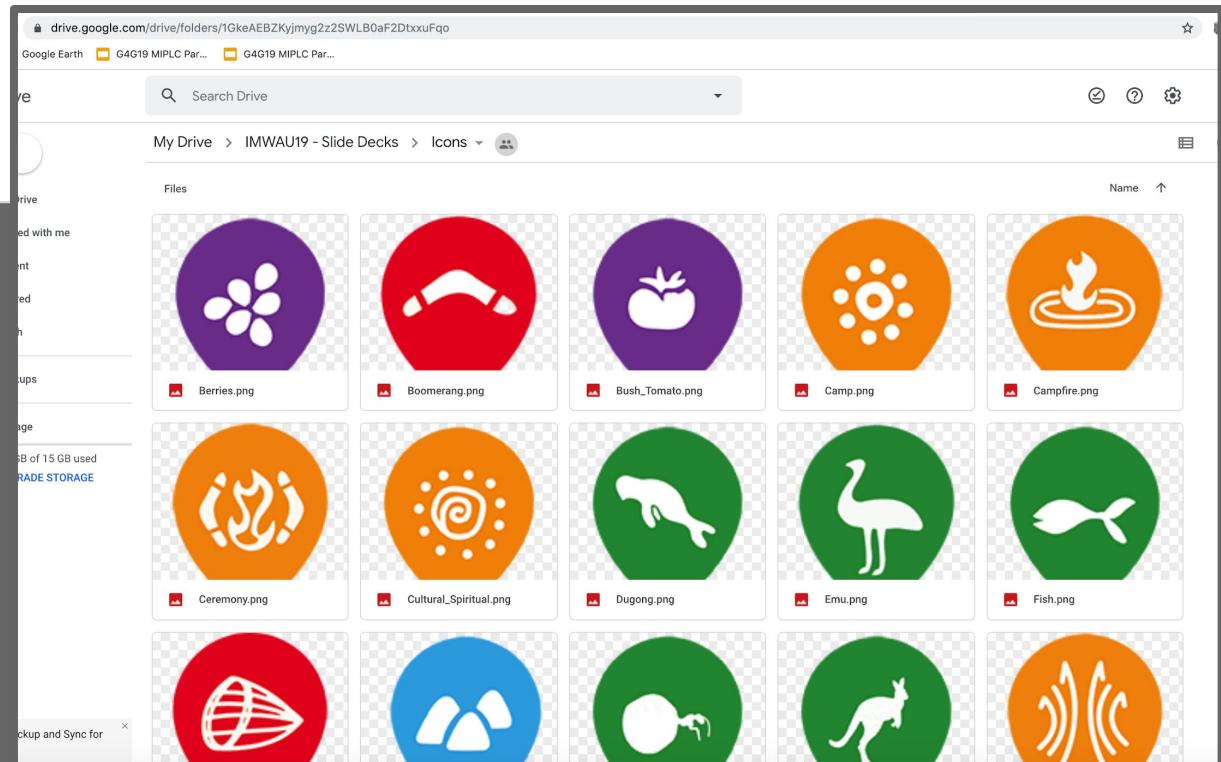
You may link directly to the URL for each icon you wish to use, or download the sets of icons in the colour schemes developed, including full colour, blue, green, purple, red and yellow.

Name	Icon	Blue	Green	Purple	Red	Yellow
Medium Land Mammal						
Large Land Mammal						
Reindeer / Caribou						

## Creating Custom Icons for Placemarks

Accessing these icons.

Go to the URL provided in the materials or at the bottom of this slide.



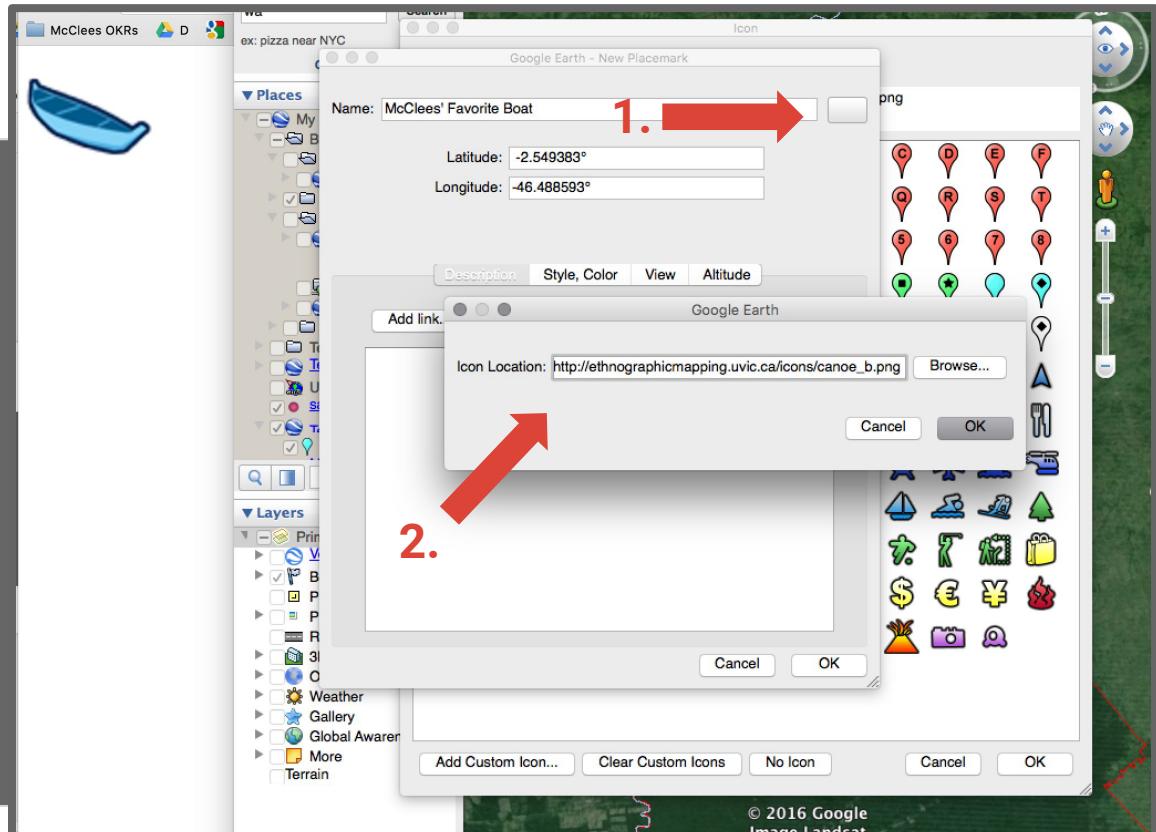
## Creating Custom Icons for Placemarks

1. Search around the web page to find an icon that you'd like to use in a map.
2. Find an icon you'd like and click on it.
3. Click on the URL address at the top and “copy” it.



## Creating Custom Icons for Placemarks

1. Go back to Google Earth. Create an placemark and click on the icon box.
2. Here you can see the boat from the University of Victoria's Ethnographic Mapping Lab Icon Set.



## Creating Custom Icons for Placemarks

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Here you can see the boat from the University of Victoria's Ethnographic Mapping Lab Icon Set.

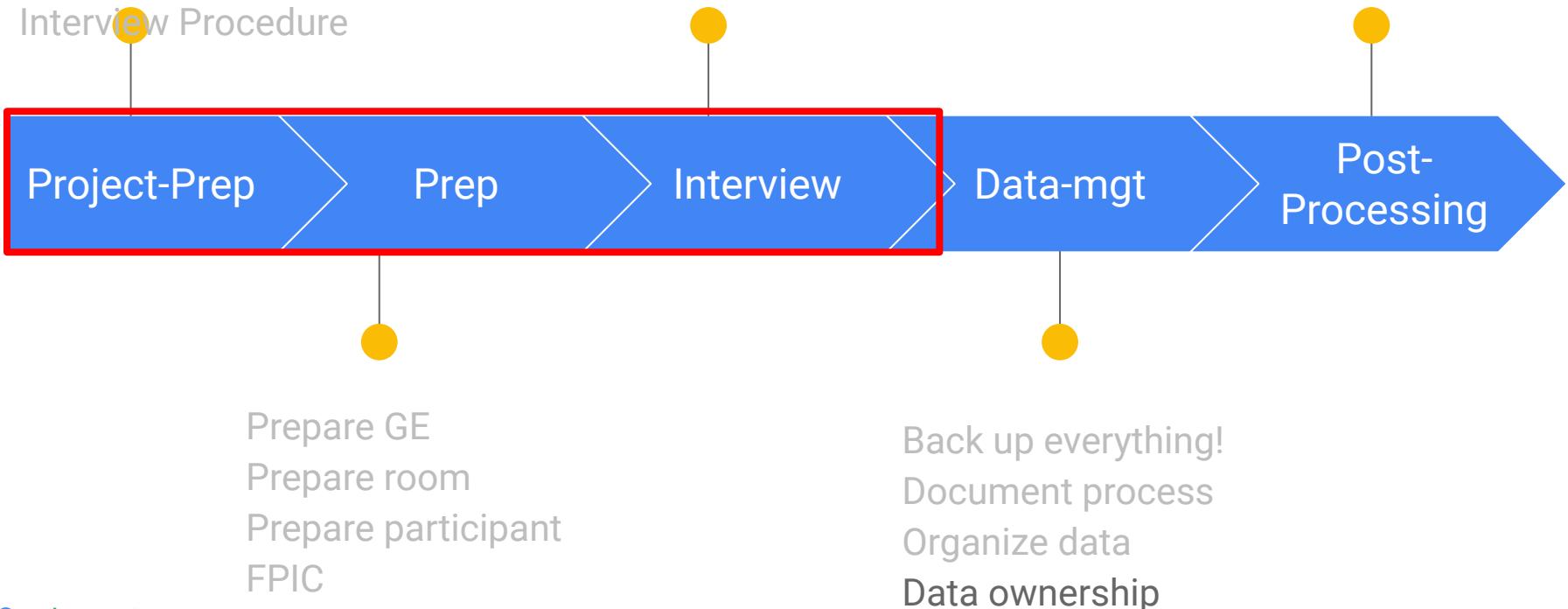


# Best Practices for Direct to Digital Mapping

Determine:  
Project  
Study Area  
Mapping Codes  
Interview Procedure

Follow interview guide  
1 Lead & 1 Mapper  
Document process

Import data into ArcGIS  
Make and share maps  
and visualisations  
Transcribe & code



## The Importance of High Quality Data Collection

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- High-quality data collection and management standards to organize your data, keep it safe, and make it easy to retrieve when you need it.
- Data can be used for other purposes: reviewing referrals; informing consultation and accommodation with the Crown; land use planning and other decision-making
- Defensible



# Project Preparation

1. Define project goals
2. Establish mapping style and method
3. Define area of interest (territory wide or project-specific?)
4. Define interview questions & methodology
5. Generate master list of mapping “codes”

## BIRD KILL SITES

DU = Duck

EA = Eagle

FL = Falcon

GE = Goose

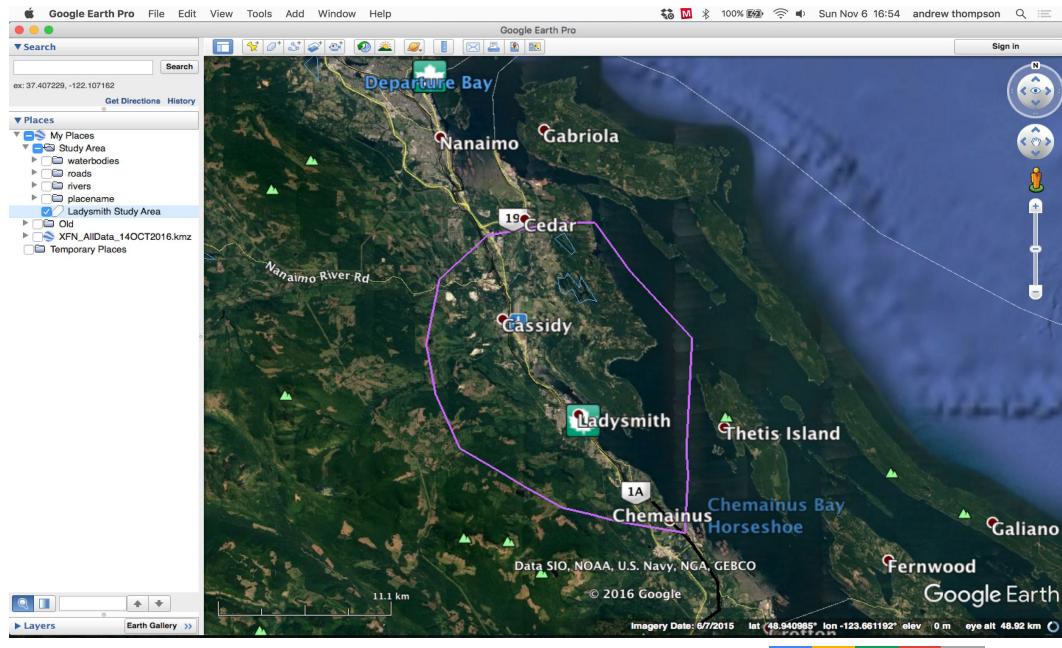
GR = Grouse / Chicken

HA = Hawk

OB = Other Bird

OW = Owl

SW = Swan



## Project Preparation - Metadata Spreadsheet

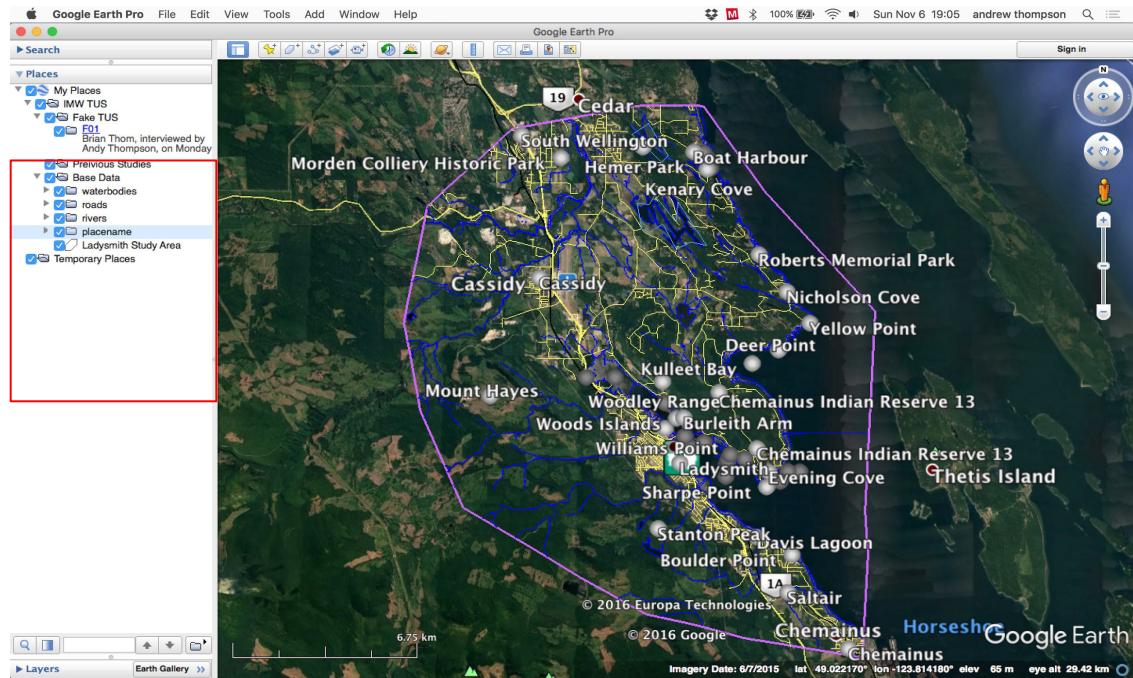
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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	PIN	Name	InterviewID	Project	Consent	Trapline	Interviewer	Mapper	OtherResearcher	InterviewDate	StartTime	Location	Audio1	Audio2	Audio3	VideoTracks	NotesLocation	NewSitesMapped
2	X01	Name1	XFN:1	XFN101	Yes	Yes	Jordan Tam	Guy Polden		YYYY-MM-DD	24hr		hh:mm:ss	hh:mm:ss	hh:mm:ss			
3	#N/A																	
4	#N/A																	
5	#N/A																	
6	#N/A																	
7	#N/A																	
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13	#N/A																	
14	#N/A																	
15	#N/A																	
16	#N/A																	



# Preparing for a Direct-to-Digital Interview?

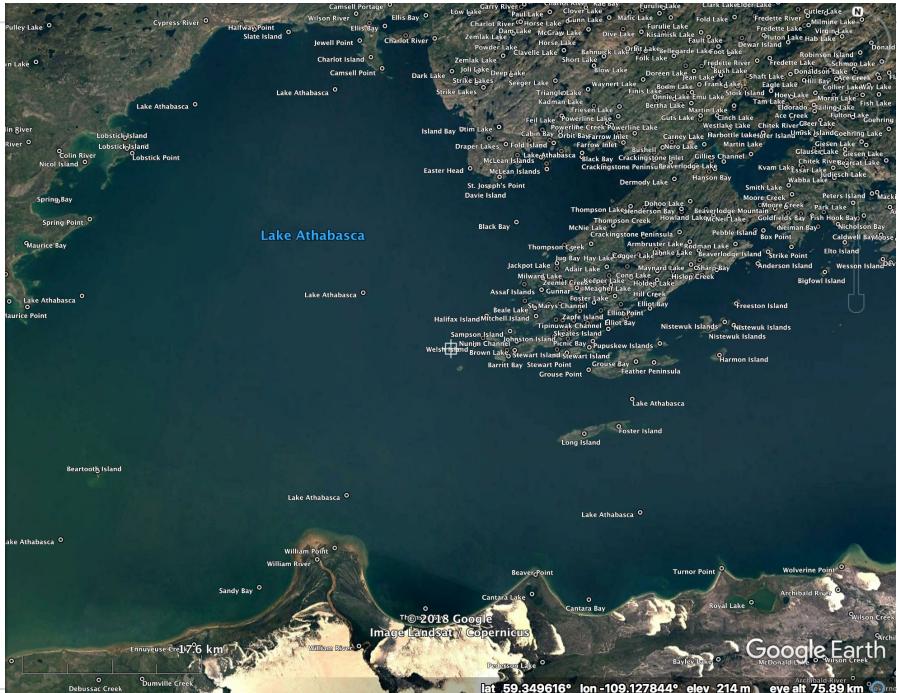
1. Prepare Google Earth
2. Prepare room
3. Explain process to participant
4. Ensure participant has given consent before proceeding



# Prepare Google Earth

## Preparing Google Earth Pro:

- Set up your folder structure (covered in Mashing up Datasets session)
  - Load in base data such as placenames, forestry roads, creeks and rivers (covered in Mashing up Datasets session)
  - Cache google earth imagery (notes on this below)
  - Overlay data from previous studies - Check if participant has been interviewed before – if so, turn on that TUS data.
  - Familiarize yourself with the study area, places of interest and areas and sites the participant may have mapped previously



# Google Earth Outreach

## Setting up the room for a Direct-to-Digital Interview

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Before starting your interviews, give yourself about 15-20 minutes to ensure that you have the following equipment and materials ready, tested, and set up:

- Interview guide – have at least 2 copies available for each individual interviewee
  - Consent form – have at least 2 copies available for each individual interviewee
  - Laptop/computer with a mouse connected –Google Earth software should be installed
  - Projector – displayed on a clear wall, preferably on a white wall
  - Digital video camera – aim the video to fit the projected screen on the wall
  - Tripod – for the digital video camera
  - SD memory cards – backup memory for digital video camera and audio recorder
  - Digital audio recorder or built-in audio recorder on your computer
  - External microphone – position or point the microphone close to the interviewee
  - Laser pointer (red dot) – the interviewee will use this to point to features projected on the wall
  - Pad of paper and pens/pencils
  - Extension cord and surge protector power bars
  - Batteries – AA, AAA, 9V, etc. for backup, depending on your equipment
  - Gifts for the participants
  - Physical layout of the room - room should be dark and quiet, with a wall that can be projected on to, and a door that can be closed for confidentiality
- 

## Setting up the Interview

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Checklist to make sure everything is ready for the interview

Equipment Setup	
Setting	Blinds drawn in room
	Comfortable chair for participant
	Background noise eliminated e.g. fans turned off/moved away
	"Do not disturb" sign on the door
On the table	Laser pointers x 2
	Interview guide (printed x2)
	Consent form (filled out with participant's PIN) <span style="border: 2px solid red; padding: 2px;"> </span>
	Master mapcodes spreadsheet
	Project notebook and pens
	Project description and supplementary information
	Tobacco (or customary gift)
	Snacks (avoid noisy snacks e.g. chips, granola bars)
	Water or coffee/tea
	Copy of interview schedule
Projector	Projector set up away from audio recorders
	Projector image is straight and focussed
Audio	SD card formatted or has space for at least 4hrs recording
	Fresh batteries in audio recorders
	Audio test recording done (recording level @80-90)
	Audio recorders on tripods or raised off table
Video	64GB SD/mini-SD card in camera
	Video test recording completed
	Video camera power connected and on tripod
	Video camera frames entire projection image and is focused
Computer	Mouse connected
	Computer power cord connected
	Metadata Spreadsheet Open
	Master Mapcodes spreadsheet open

# Setting Up the Room

What is wrong with this setup?



## Overview of the Interview

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1. 1 Lead to ask questions, 1 Mapper to document in google earth - room for a note taker
2. Use questions on the interview guide, but don't be afraid to deviate
3. Ensure the participant is comfortable at all times - check temperature of the room, take breaks, have coffee water and snacks nearby



## Start the interview

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When ready, press record on the video and audio recorders (If you don't have audio recorders, you can use the built in audio recording software on your pc or mac, or phone)

Introductions

Primary interviewer – name and role

Second interviewer (mapper) – name and role



## In the Interview

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- The interview will take about 2 to 3 hours to complete (break about halfway through)
- The primary interviewer or interviewee can stop the interview at any time
- There are three main sections or types of questions:
  - First: background and experience in project area
  - Second: specific places or resources, especially within 5km of the project area. Includes: camps, trails, hunting and fishing areas, berry or plant collection areas, important habitat, cultural or spiritual places, and other places you consider important
  - Third: How might the Project (if relevant) impact these values?

## Reminders for during the interview

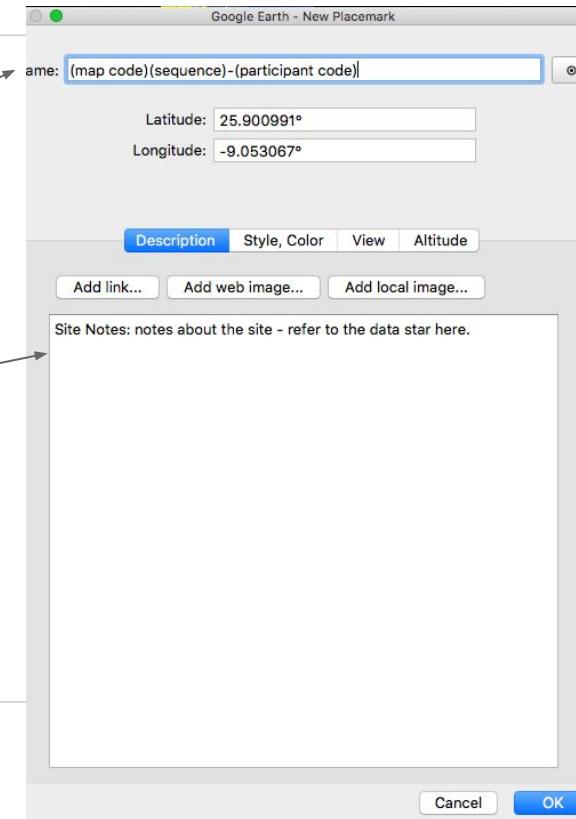
- Keep a list of place names
  - Spell out all proper names, including those of individuals
  - Ask relevant questions to get more detailed information about knowledge and use
  - Note when there are important quotes and record time code or mapped site
-

## What to record in mapped features

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Site ID: **(map  
code)(sequence)-(participant code)**

Site Notes: notes about the site -  
refer to your data star



## What to record in mapped features

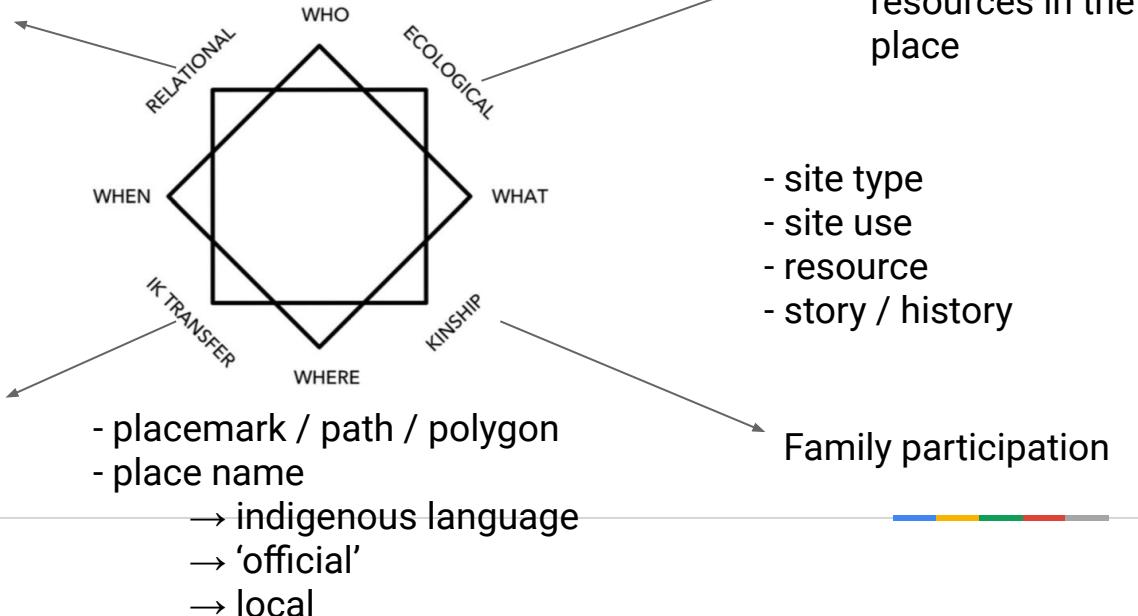
---

How this site relates  
to use in other  
locations nearby

- specific time (season, year, date range)
- general time (decade, quarter century, etc)
- frequency

Teaching and  
knowledge transfer  
necessary

- tribal name / language group
- person(s) who did the activity
  - gender, age etc
- reference to documentation
  - interview, bibliographic, etc

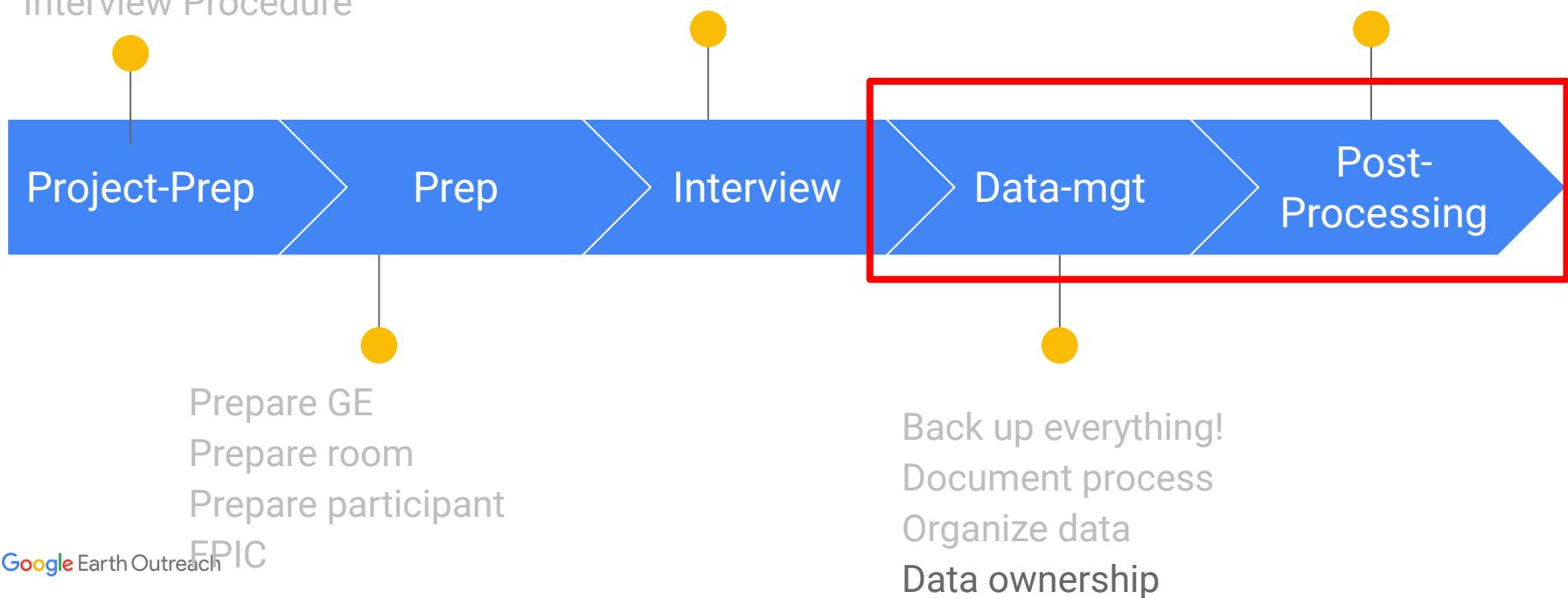


# What's Next?

Determine:  
Project  
Study Area  
Mapping Codes  
Interview Procedure

Follow interview guide  
1 Lead & 1 Mapper  
Document process

Import data into ArcGIS  
Make and share maps  
and visualisations  
Transcribe & code



## Managing Information

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1. Before each interview
  - a. Signed consent form
2. During each interview
  - a. Take good notes (spell out people's names, keep a list of place names)
  - b. Save your work in Google Earth by clicking "Save My Places"
3. After each interview
4. Name each file "PIN\_NAME\_DATE" e.g. F01\_JohnSmith\_05DEC2017
  - a. 3 KMZ files (individual; TUS and All data)
  - b. 2 audio files (primary and backup)
  - c. 1 video file
  - d. Filled out metadata spreadsheet



## Managing Information

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- There are three places all project files should be stored:
  - one on your laptop
  - one on a portable hard drive, and
  - one that would be uploaded to the server
- Final backup and storage solutions should follow the 3-2-1 rule:
  - 3 total copies of your data, 2 of which are local but on different mediums (read: devices), and at least 1 copy offsite.



Best Practices for the Field

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Technical Tips for the Field...

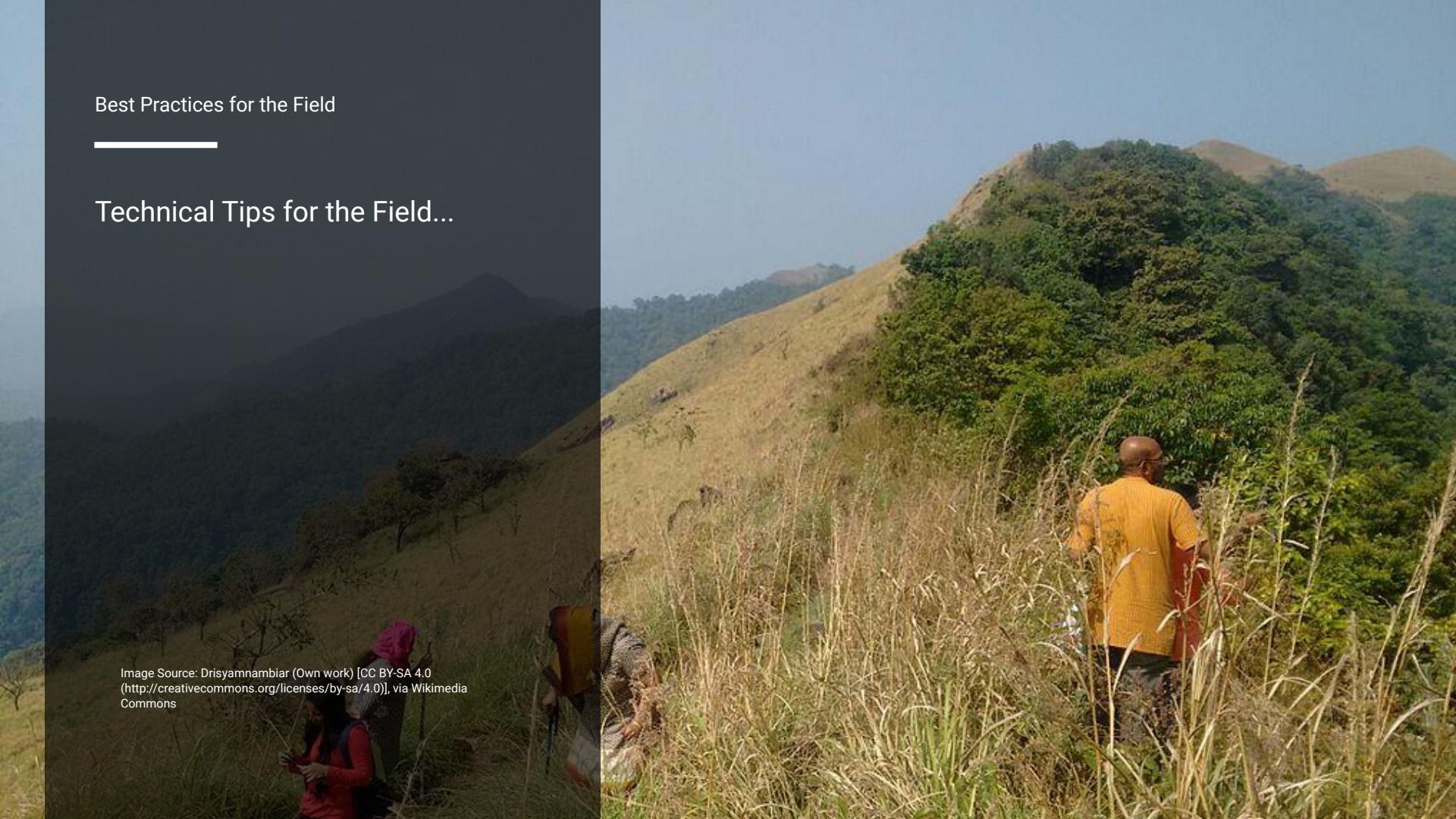


Image Source: Drisyamnambiar (Own work) [CC BY-SA 4.0  
(<http://creativecommons.org/licenses/by-sa/4.0>]), via Wikimedia Commons

### Considerations:

- Where will you be mapping in Google Earth?
- Do you plan to interview people in one village about their use of the surrounding lands?
- Are you considering a proposed development project (a mine, air field or farm) and you want to understand how people use the land where the project will be built?

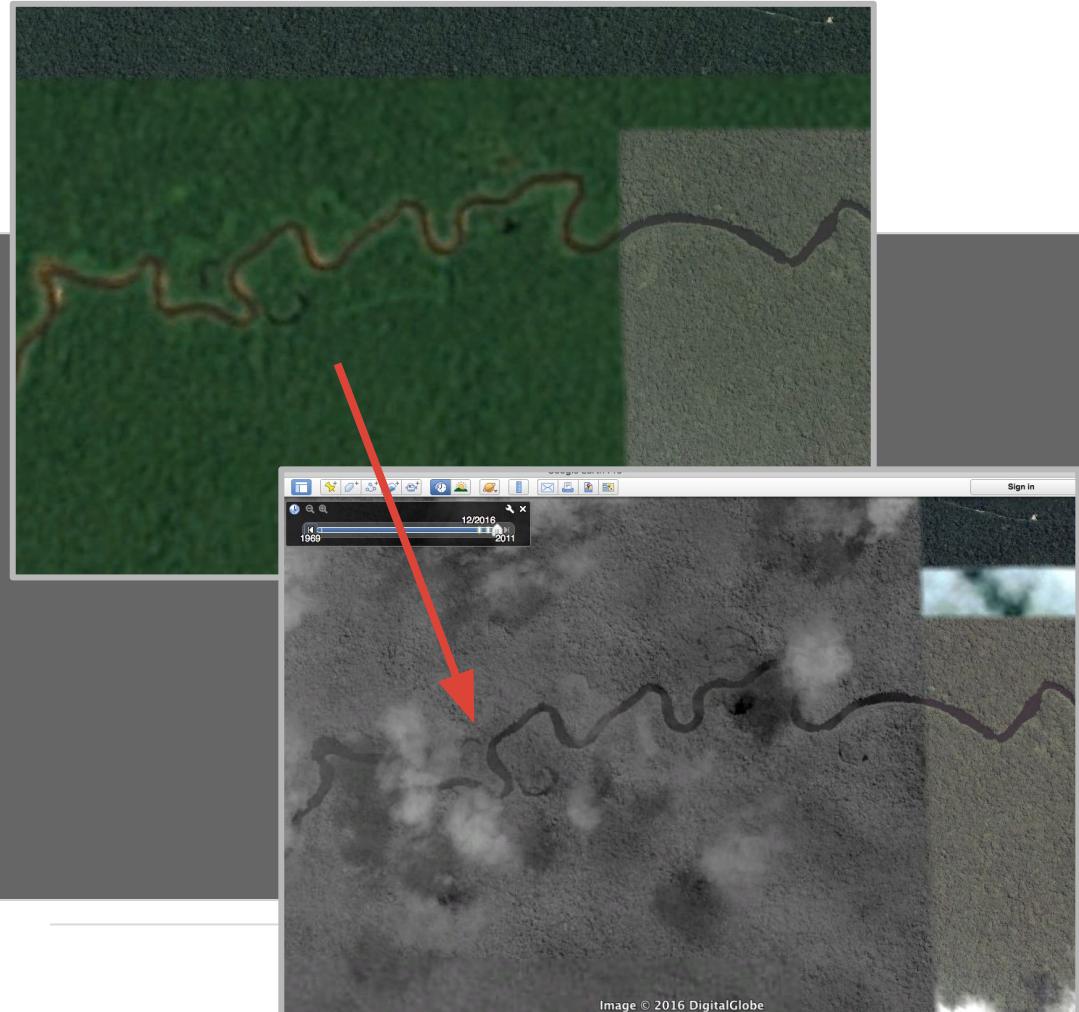


## Best Practices for the Field

---

### Imagery Considerations:

- What is the imagery in the area like?
- Can you use the imagery in Google Earth?
- Is there historic imagery?



## Best Practices for the Field

Other helpful data to collect before going to the field:

- Boundaries, rivers, or other data?
- Past work?
- Industry development data?
- GPS tracks or waypoints?

The screenshot shows a Google search results page for the query "usgs kml maps". The search bar contains the query, and the results page displays several links related to USGS data. One link leads to Google Earth/KML Files from the USGS Earthquake Hazards Program, which includes links to digital geologic maps of US states and historical topographic maps. Another link leads to Google Earth KML feeds for rivers in Southeast Asia. A third link leads to USGS Historical Topographic Maps. The results page also shows a snippet of a file browser window on the right, displaying a folder containing a shapefile named "rivers\_in\_seasia\_shapefile" with four files: Rivers\_in\_Southeast\_Asia.dbf, Rivers\_in\_Southeast\_Asia.prj, Rivers\_in\_Southeast\_Asia.shp, and Rivers\_in\_Southeast\_Asia.shx.

usgs kml maps

All Maps News Images Shopping More Settings Tools

About 542,000 results (0.46 seconds)

**Google Earth/KML Files - USGS Earthquake Hazards Program**  
https://earthquake.usgs.gov/learn/kml.php ▾  
Dec 7, 2016 - Maps of ground motion and shaking intensity for significant earthquakes. Google Earth KML files are in the Downloads area for each individual ...

**Geologic maps of US states - USGS Mineral Resources On-Line ...**  
https://mrdata.usgs.gov/geology/state/ ▾  
Digital geologic maps of the US states with consistent lithology, age, database structure, and format. ... USGS-SGMC.kml KML suitable for use in Google Earth.  
California geologic map data · Virginia geologic map data · Washington · Arizona

**USGS Historical Topographic Maps | topoView**  
https://ngmdb.usgs.gov/topoview/ ▾  
Explore, interact, and download historical topographic maps. The KMZ format is a compressed archive of vector and raster data.

**Google Earth™ KML feeds**  
https://earthquake.usgs.gov/learn/kml.php ▾  
The KML feeds offer a variety of data layers. You will need to download the feeds and import them into Google Earth.

Favorites

- Desktop
- Dropbox
- Drive
- All My Files
- Macintosh HD
- Applications
- Documents
- Downloads

Devices

- Remote Disc

Shared

- All...

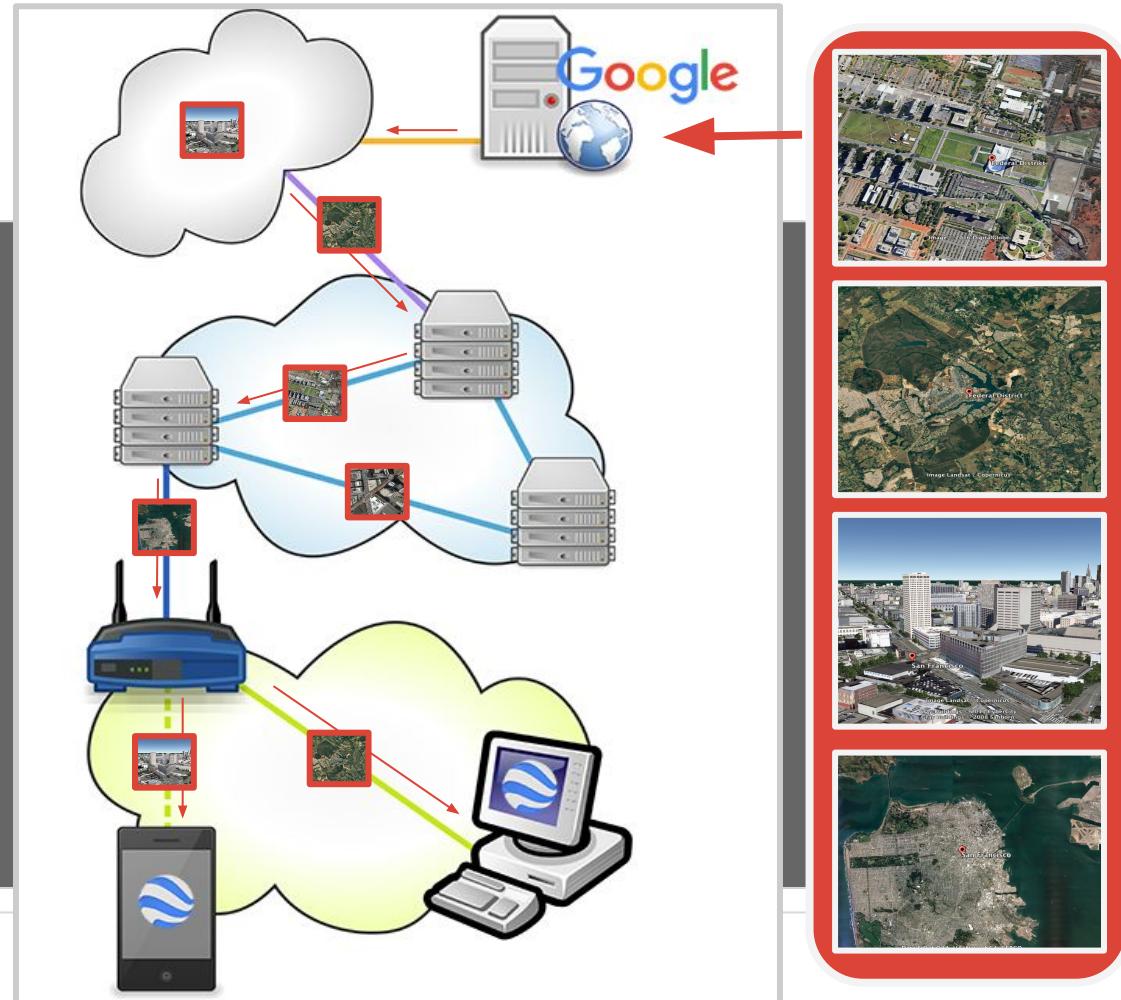
Tags

Name	Date Modified	Size	Kind
Rivers_in_Southeast_Asia.dbf	Sep 24, 2008, 11:18 PM	8.6 MB	Document
Rivers_in_Southeast_Asia.prj	Sep 24, 2008, 9:27 PM	145 bytes	Document
Rivers_in_Southeast_Asia.shp	Sep 24, 2008, 9:27 PM	3.2 MB	Document
Rivers_in_Southeast_Asia.shx	Sep 24, 2008, 9:27 PM	83 KB	Document

## Caching

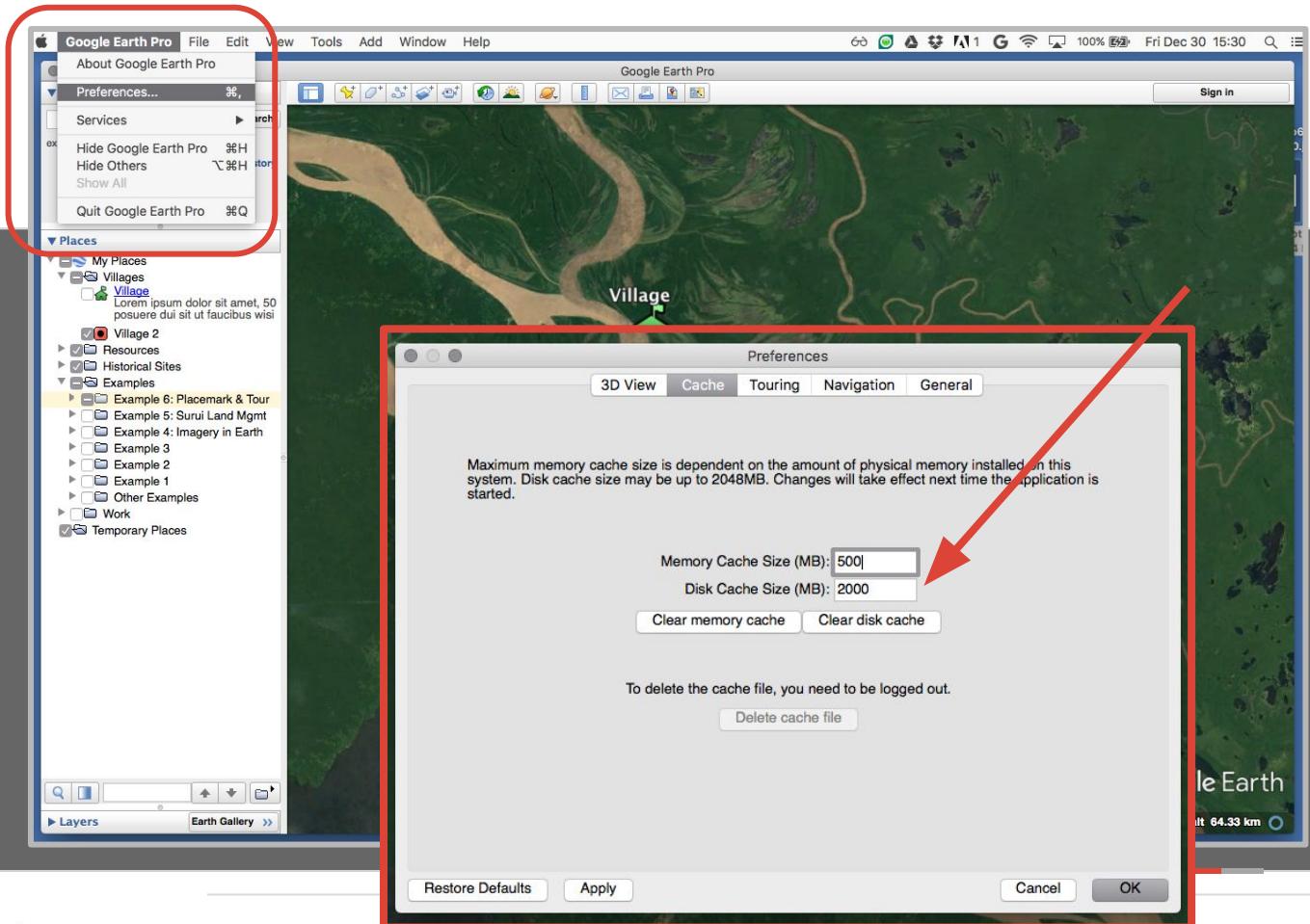
Your computer only stores a small amount of images.

Image Source: Internet access diagram, by Ferran (Own work) [CC BY-SA 4.0] (<http://creativecommons.org/licenses/by-sa/4.0/>), via Wikimedia Commons. Adapted for this use.



## Caching

The 2,000 MB storage limit in Google Earth.



## Caching

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Caching Google Earth imagery is useful when working with:

- Low-bandwidth internet
- No internet

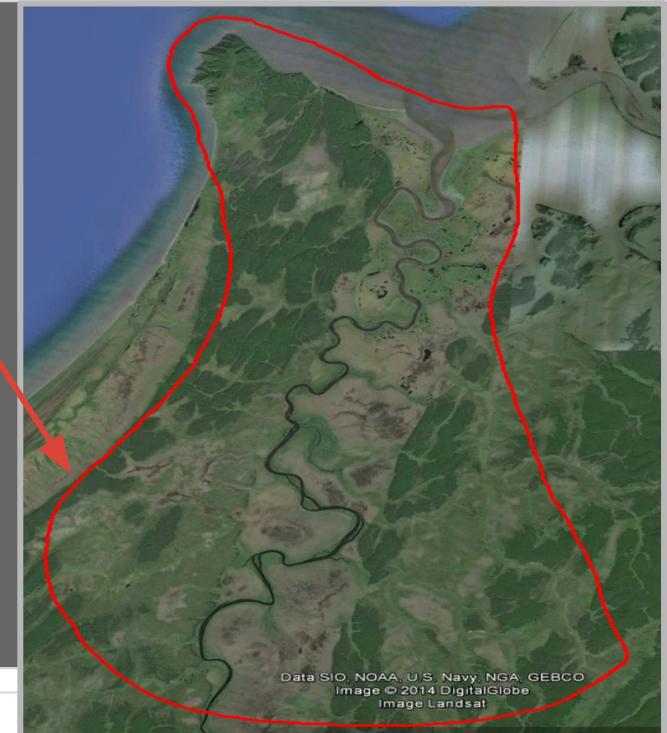
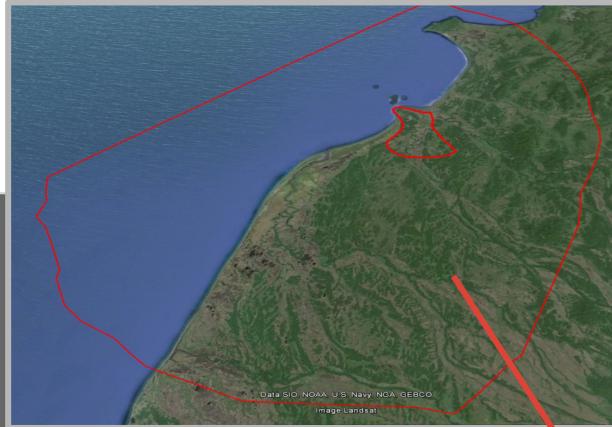
(Requires good initial internet connection)



## Caching

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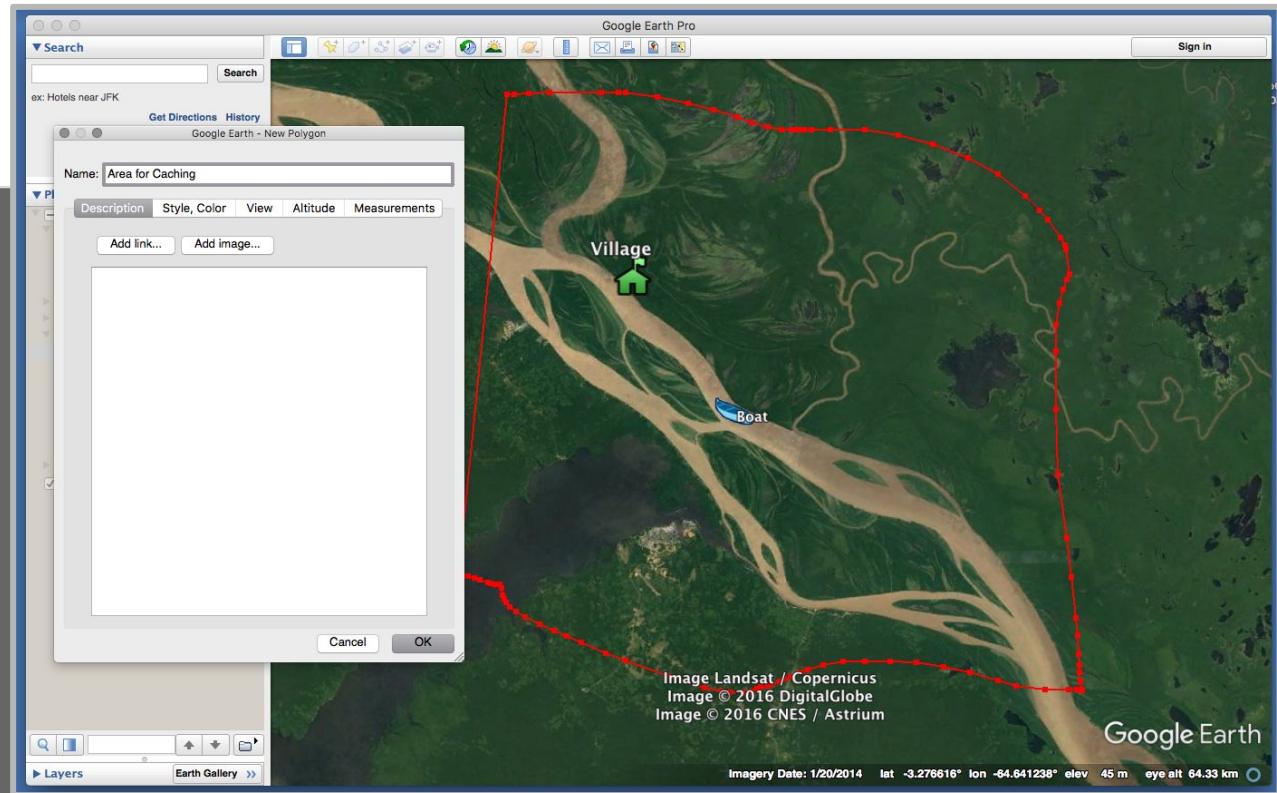
Choosing your  
area size and detail



## Caching

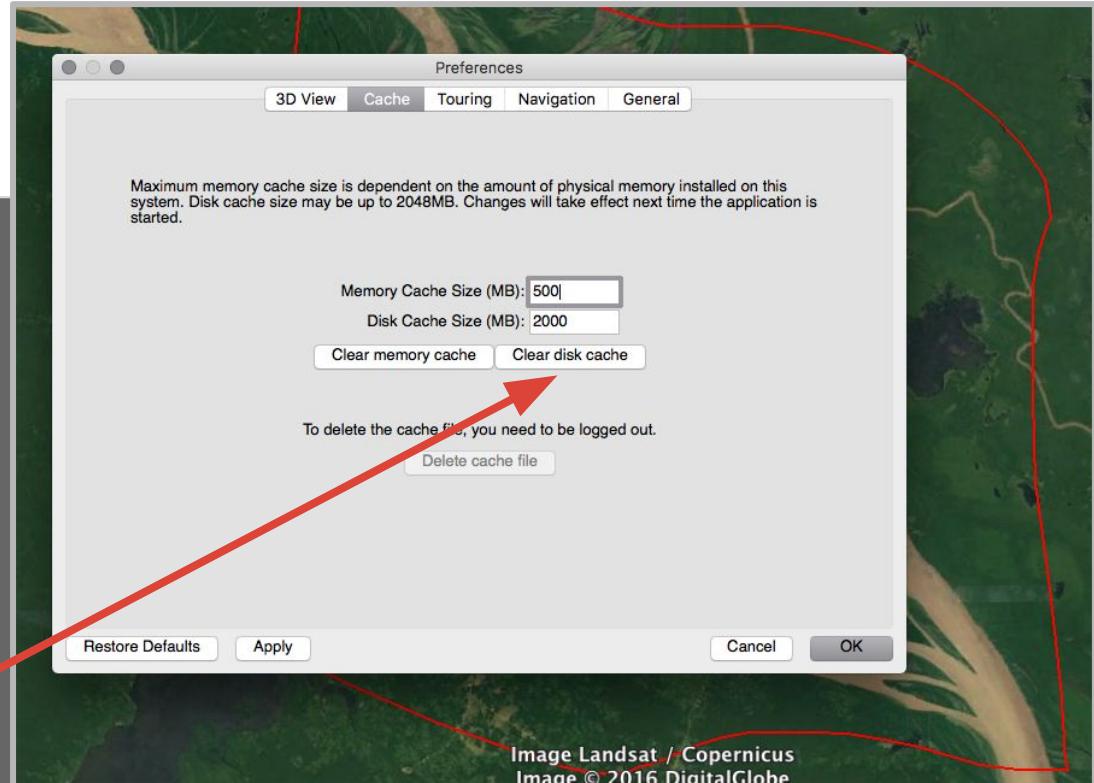
### How to cache imagery:

1. Draw a polygon around what you want to cache to guide yourself.



## Caching

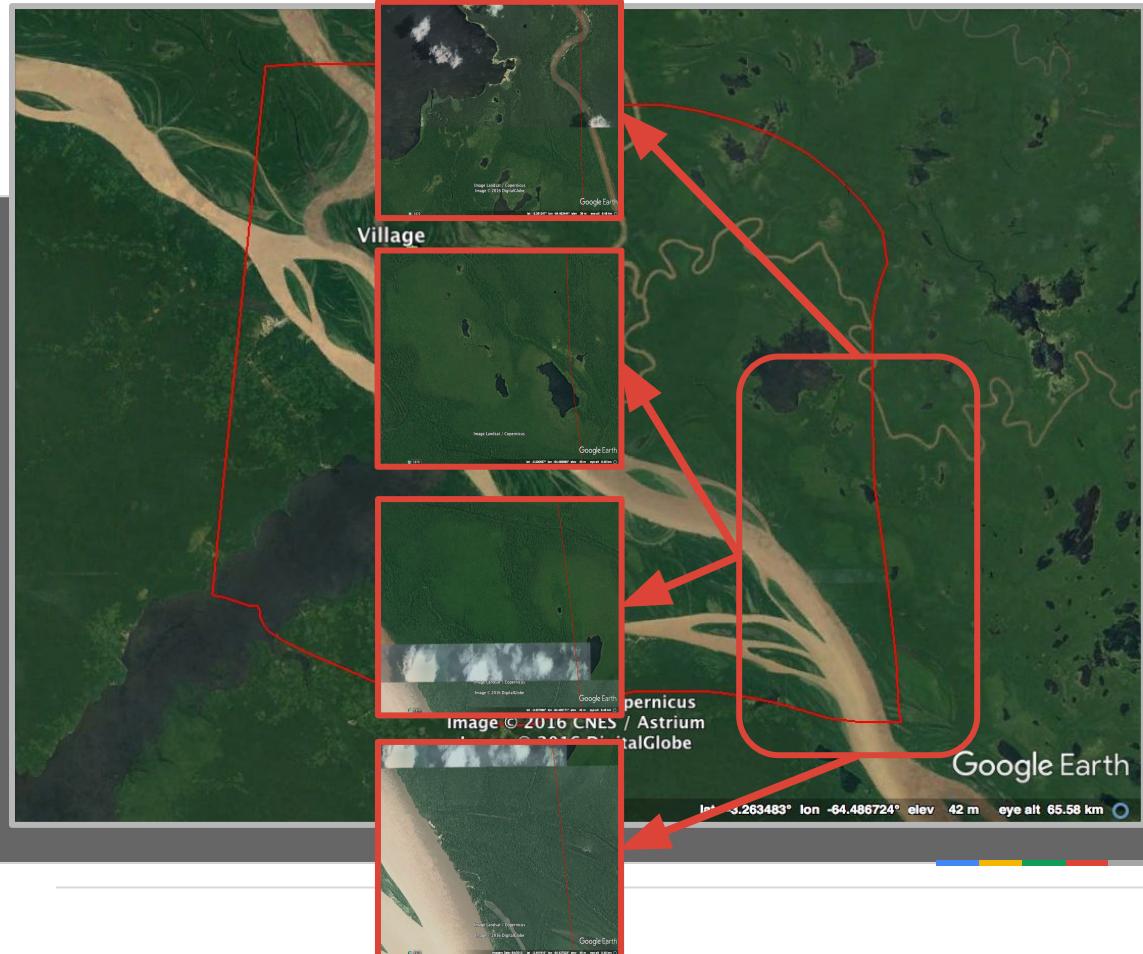
2. Clear the cache  
(Google Earth >  
Preferences >  
Cache > Clear  
disk cache)



## Caching

3. Fly around the area of interest, letting imagery load and cache

\*Do this for the entire area.



## Caching

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4. Disconnect from Internet and see if your imagery shows up still!

\*If it doesn't, it won't load like this.



The background is a dark space view from the Moon's surface, showing the Earth rising over the horizon. The Earth is a bright blue and white sphere against the black void.

Thank you!

Questions?