EO4IM

Harnessing Earth Observations to Support Indigenous-led Land Management

Presenters: Karyn Tabor & David Hunt

Updated Jan 17, 2019

What is EO4IM?

The EO4IM project is funded by NASA Applied Sciences A.50 GEO Work Programme under the AmeriGEOSS initiative

Aims to

1) Strengthen the technical capacities of indigenous peoples' organizations in the Americas for improved sustainable land management.

2) Involve new stakeholder groups with AmeriGEOSS

- Indigenous Groups
- Conservation NGOs

About GEO & AmeriGEOSS

- Group on Earth Observations -
  - Intergovernmental organization working to improve the availability, accessibility and use of Earth observations for the benefit of society.

- AmeriGEOSS -
  - Framework to promote collaboration and coordination among the GEO members in the American continent.

  - Aims to increase the regional capacity for data infrastructure and use of Earth Observations data, tools and data platforms for decisions related to sustainable development in 4 societal benefit areas (far right).

What are Earth Observations?

- Gathered information about the physical, chemical, and biological systems of Earth.
- Earth Observation Systems collect information from a variety of sources: satellites, ground sensors, ocean buoys, mobile phones and others to monitor changes on Earth.

EO4IM Activities

Combining Remote Sensing and Social Science

- Needs assessment: Use social science methods to understand how a selection of indigenous groups currently approaches sustainable land management decisions
- Capacity Building: Based on the results of the needs assessment, design targeted training materials and conduct webinars and on-site trainings to improve land management utilizing EO data, products, and tools

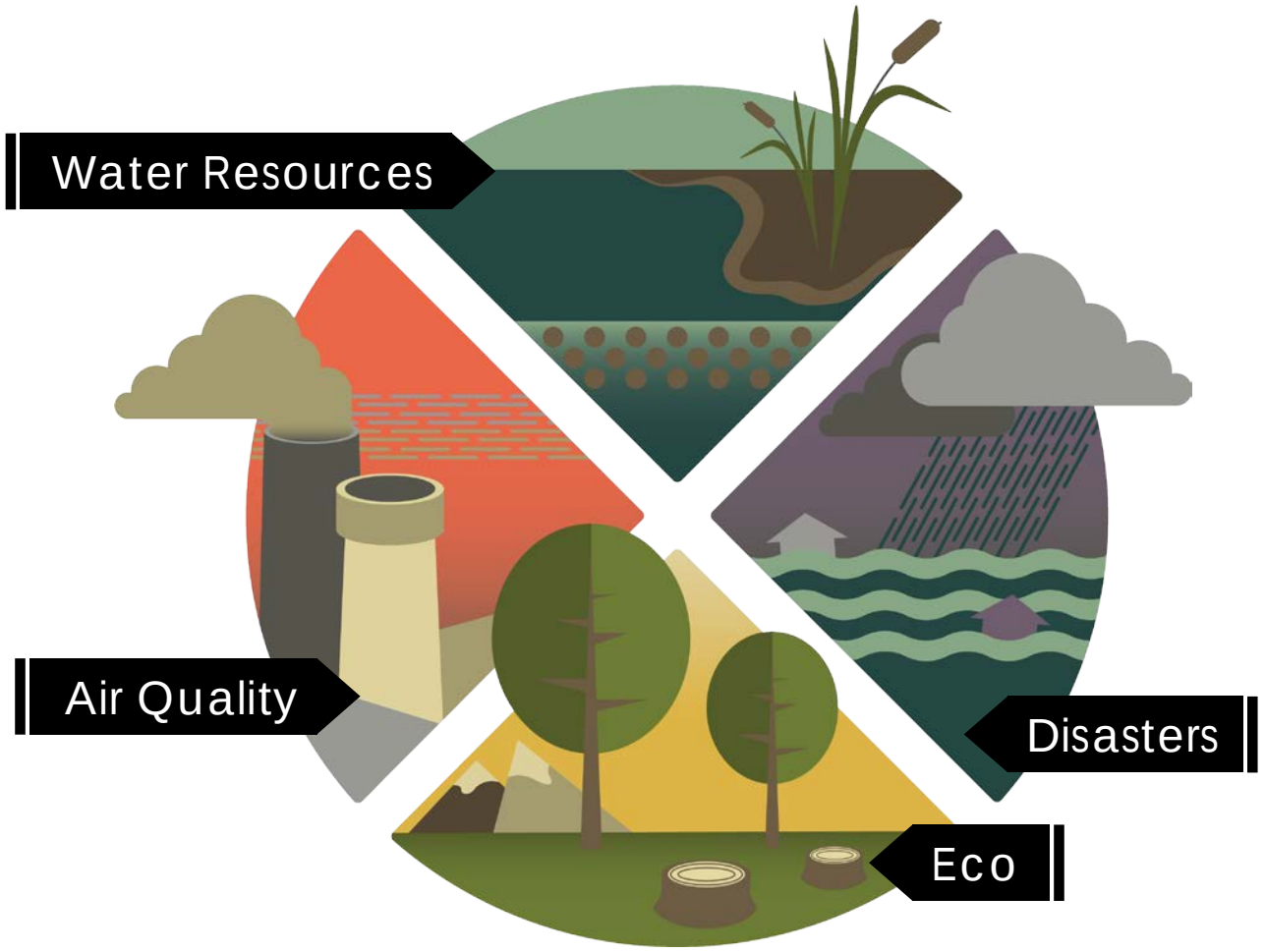
About ARSET

NASA's Applied Remote Sensing Training Program (ARSET)

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

- Empowering the global community through remote sensing training
- Part of NASA's Applied Sciences Capacity Building Program
- 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

Topics for Trainings Include:



ARSET Training Formats

Online

- Typically offered through the internet
- 2-5 weeks long
- 1-2 hours a week
- Available at all levels
- Live & recorded
- Free
- Materials available in English & Spanish

In-Person

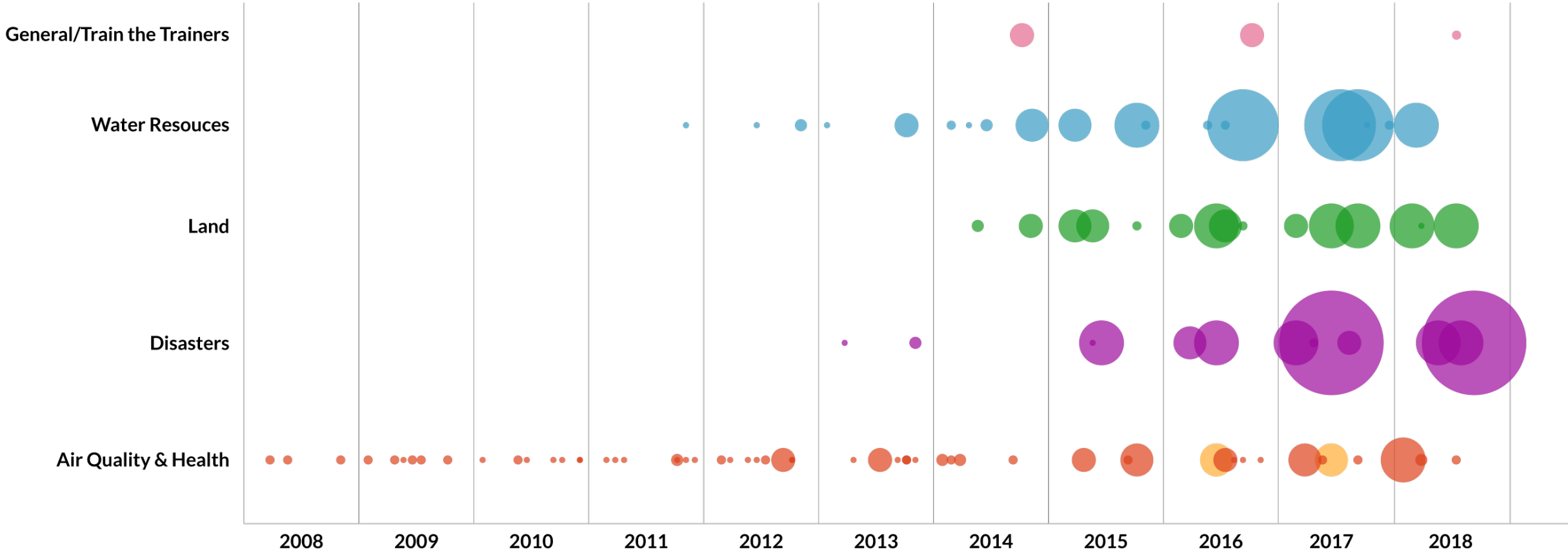
- Hosted with a partner
- Typically in a computer lab
- 2-7 days long
- Focus on locally-relevant case studies
- Certain topics can be presented in Spanish

Train the Trainers

- Online or in-person
- Designed for individuals and organizations looking to develop their own applied remote sensing trainings

ARSET Trainings

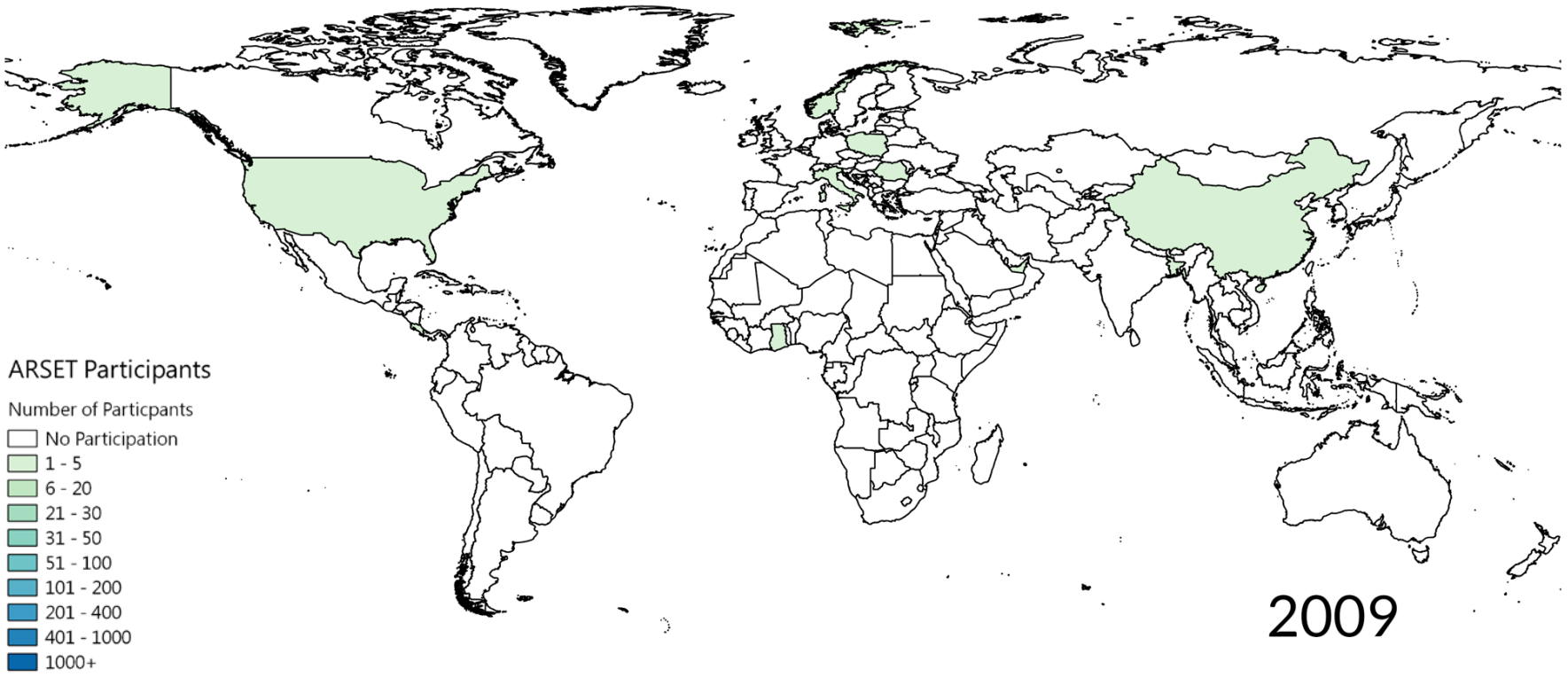
110+ trainings 18,000+ participants 160 countries 4,000+ organizations



* size of bubble corresponds to number of attendees

ARSET Trainings

ARSET Global Participants (2009, 2012-2017)



110+ trainings

18,000+ participants

160 countries

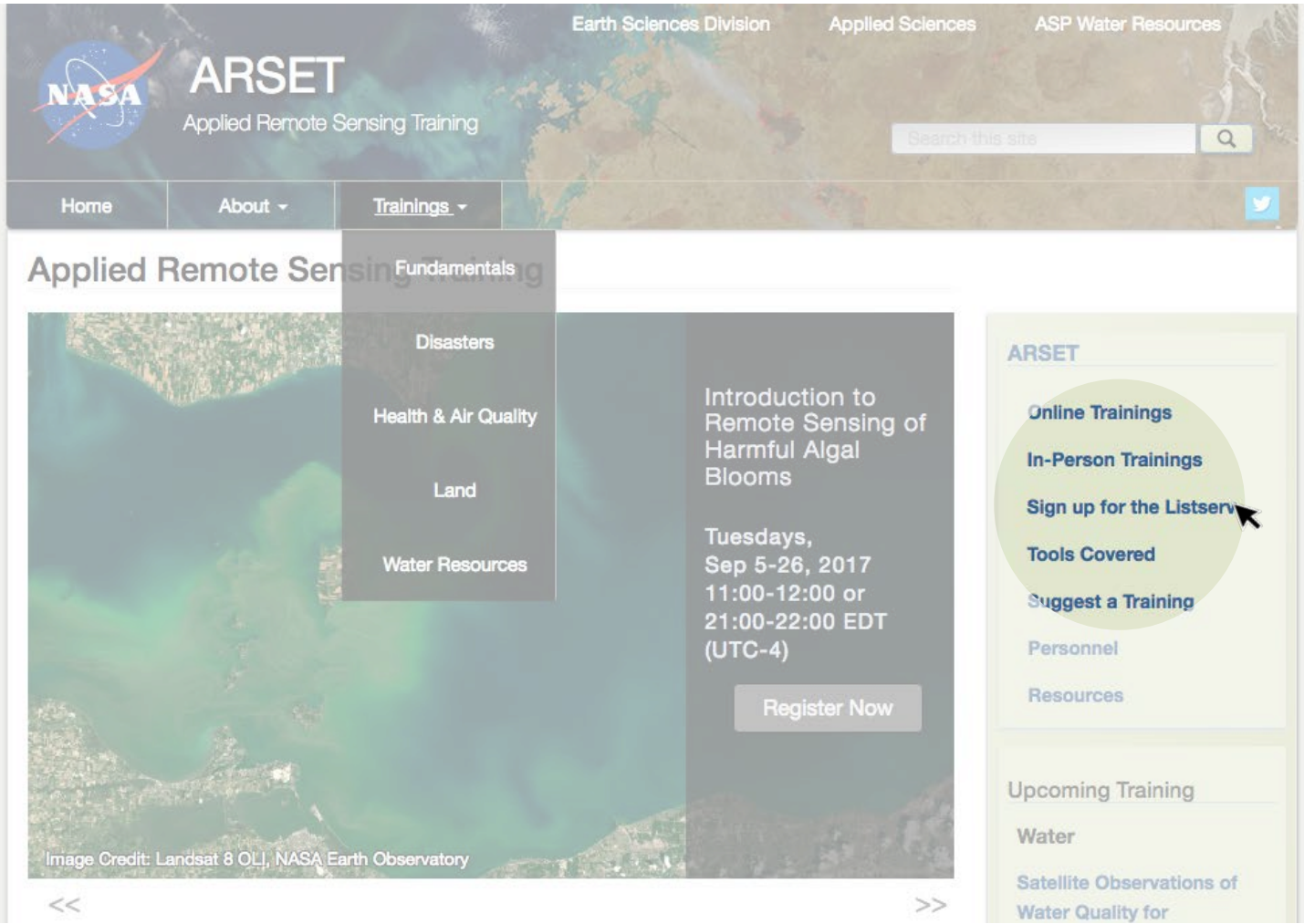
4,000+ organizations

1) Learn More About ARSET

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

2) Sign up for the ARSET Listserv

https://lists.nasa.gov/mailman/listinfo/arset



EO4IM Webinar Aims to:

- Provide an overview of remote sensing concepts, satellite sensors, and image interpretation relevant to sustainable land management

- Highlight the range of remote sensing applications available to inform sustainable land management decisions

- Enhance participants' knowledge with practical, implementable techniques and tools to help improve land management decisions

EO4IM Webinar Series Course Format

- Webinar divided into three sessions
  - Session 1: Introduction to Maps – February 5th (90 minutes)
  - Session 2: Introduction to Remote Sensing – February 12th (60 minutes)
  - Session 3: Applications for Sustainable Land Management Decisions: Early Warning and Alert Systems – February 19th (60 minutes)
- Each session has both an English and Spanish presentation
  - Session A in English at 10:00 – 11:30
  - Session B in Spanish at 15:00 – 16:30

EO4IM Webinar Series certificate

- Attend all three sessions
- Complete and return two homework assignments
- Assignment #1 due prior to session #2
- Assignment #2 due prior to session #3

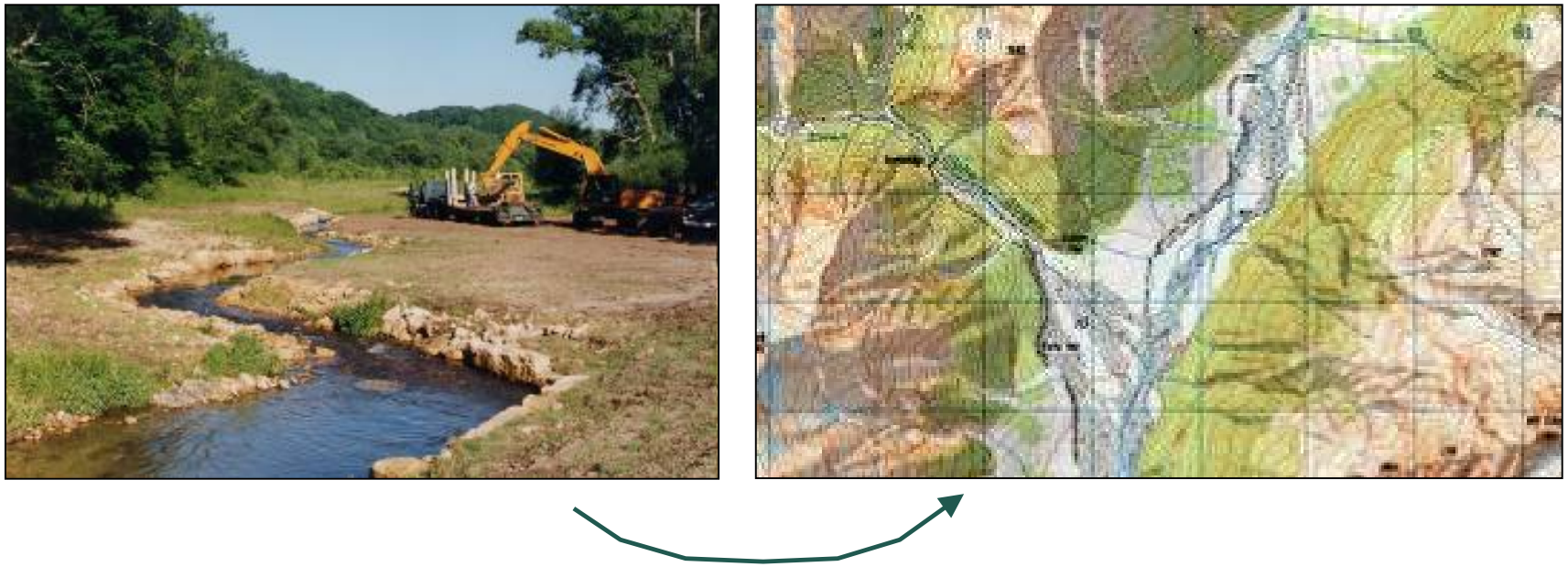
Session # 1:

- Overview of Mapping and GPS technologies
- Case studies of Participatory Mapping and Participatory GIS for mapping traditional ecological knowledge and cultural heritage

Introduction to Maps

What is a Map?

- A graphical representation of reality

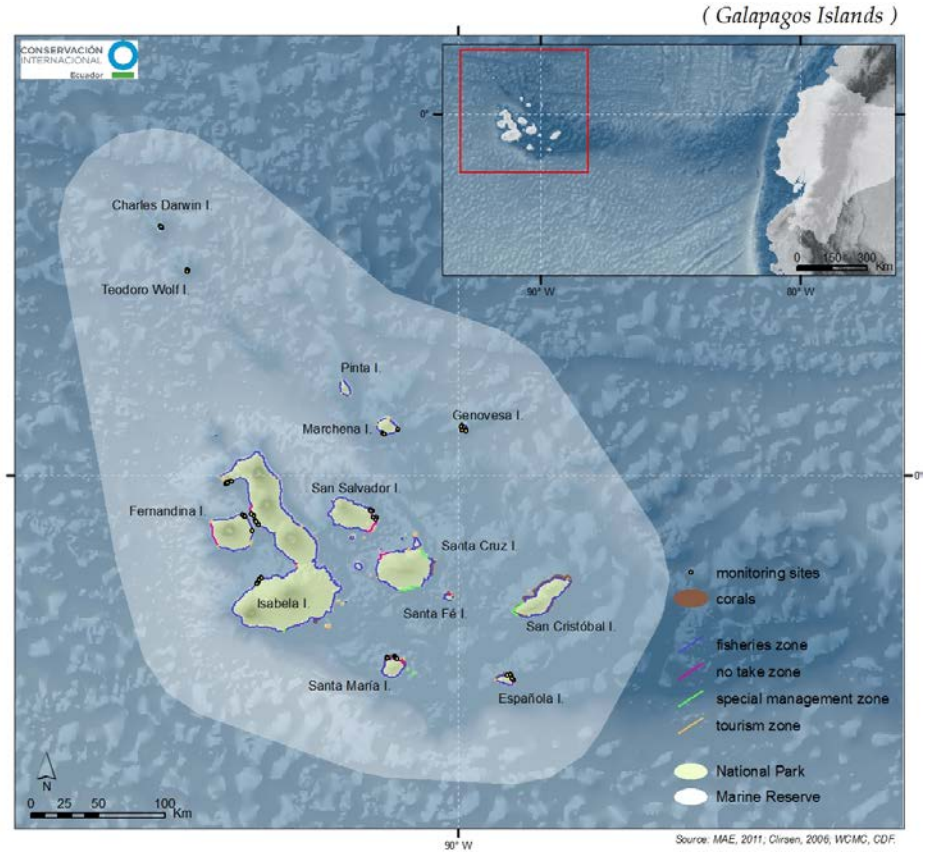


What Is a Map?

- They also represent reality, but they are not maps

What Is a Map?

- It represents reality — What is there?
  - Position — Where is it?
  - Size — How big is it?
  - Distances — How far away is it?
  - … — …

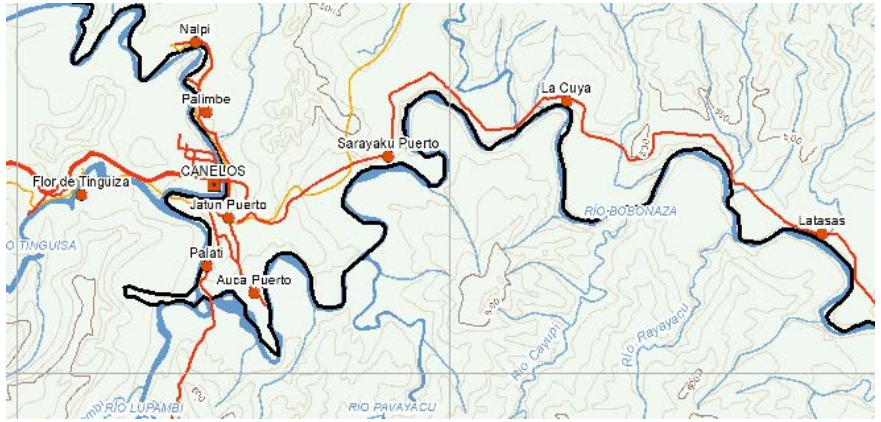


What Do Maps Show Us?

Graphical elements are used

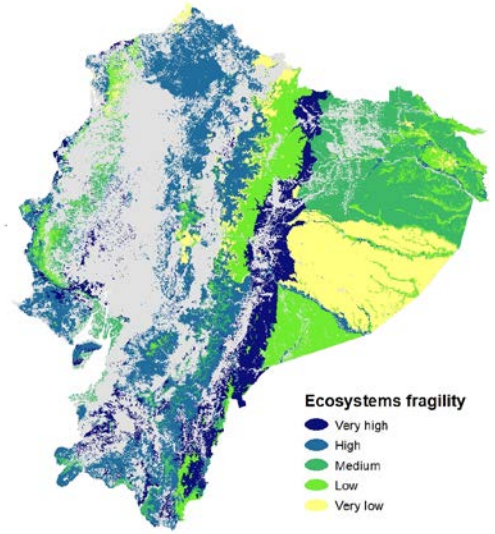
- Features of the land
  - rivers
  - roads
  - towns
  - altitude
  - …

BASEMAPS



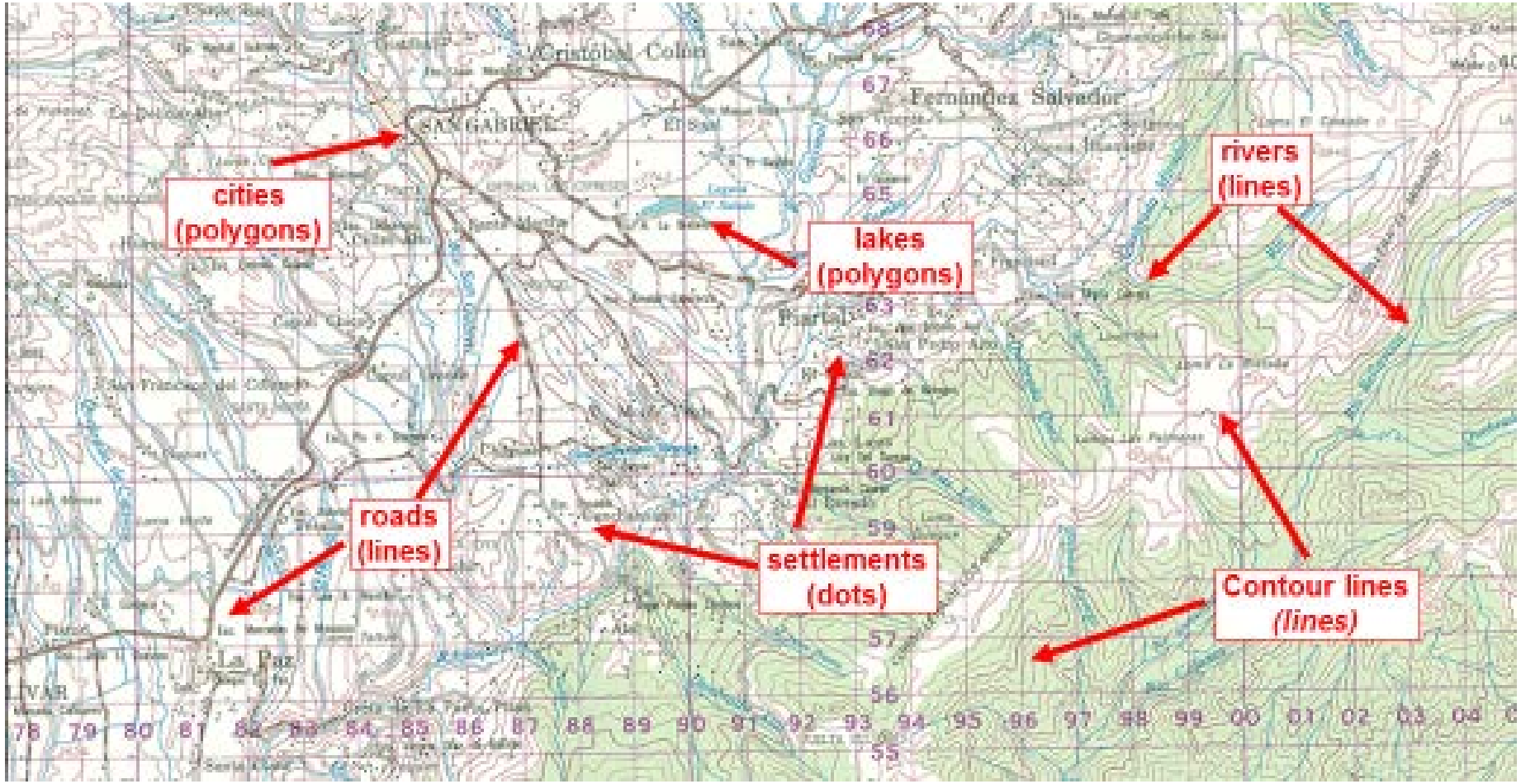
- Particular themes
  - Vegetation cover
  - Type of soil
  - Climate
  - Political division
  - …

THEMATIC MAPS



What Do Maps Show Us?

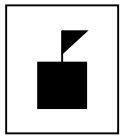
A symbolic simplification of reality (graphics)



What Do Maps Show Us?

A symbolic simplification of reality (colors)

BLACK: Man-made elements



Schools

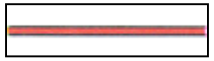
GREEN: Vegetation

Shrubland

BLUE: Bodies of water

Rivers

RED: Populated areas, main roads



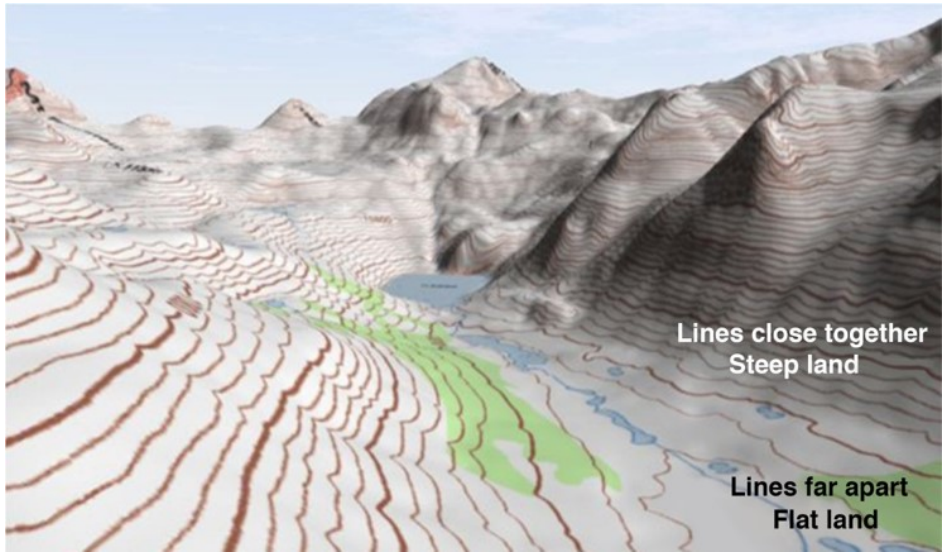
Paved road

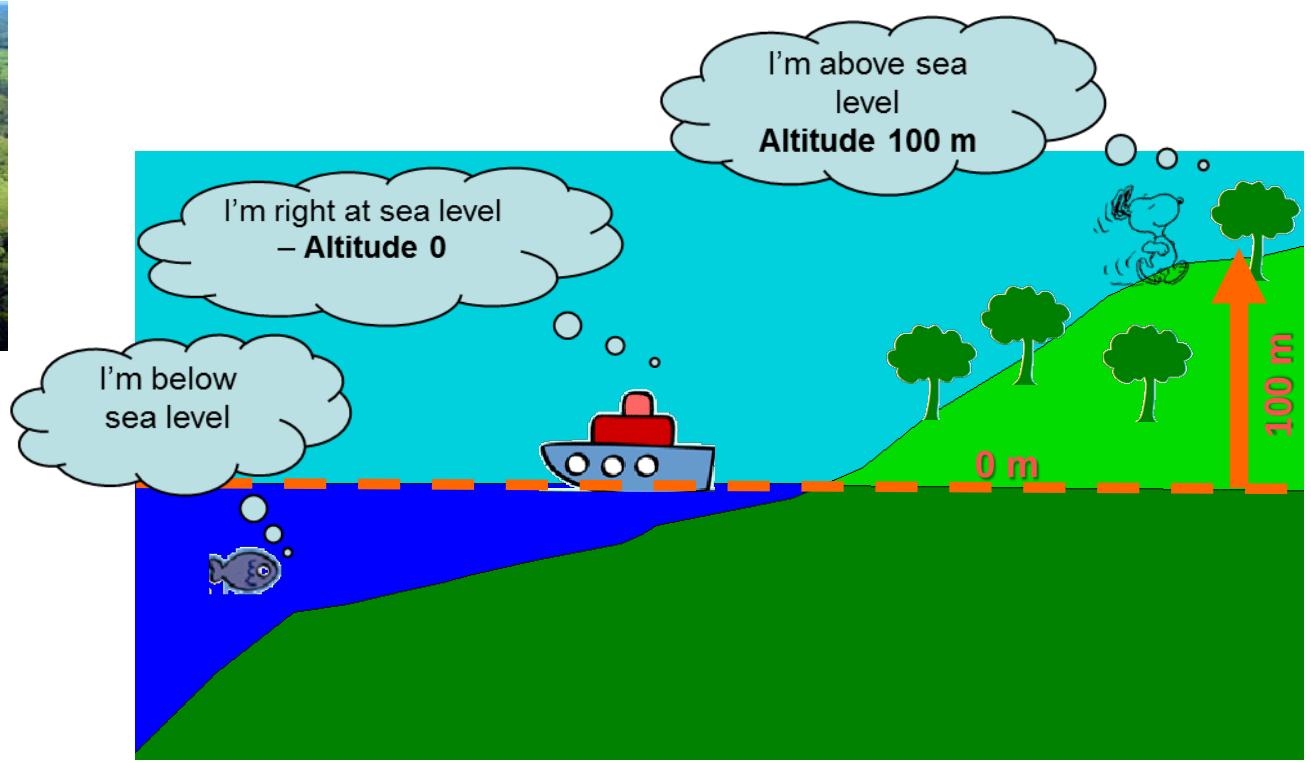
BROWN: Elements representing altitude

Contour lines

What Do Maps Show Us?

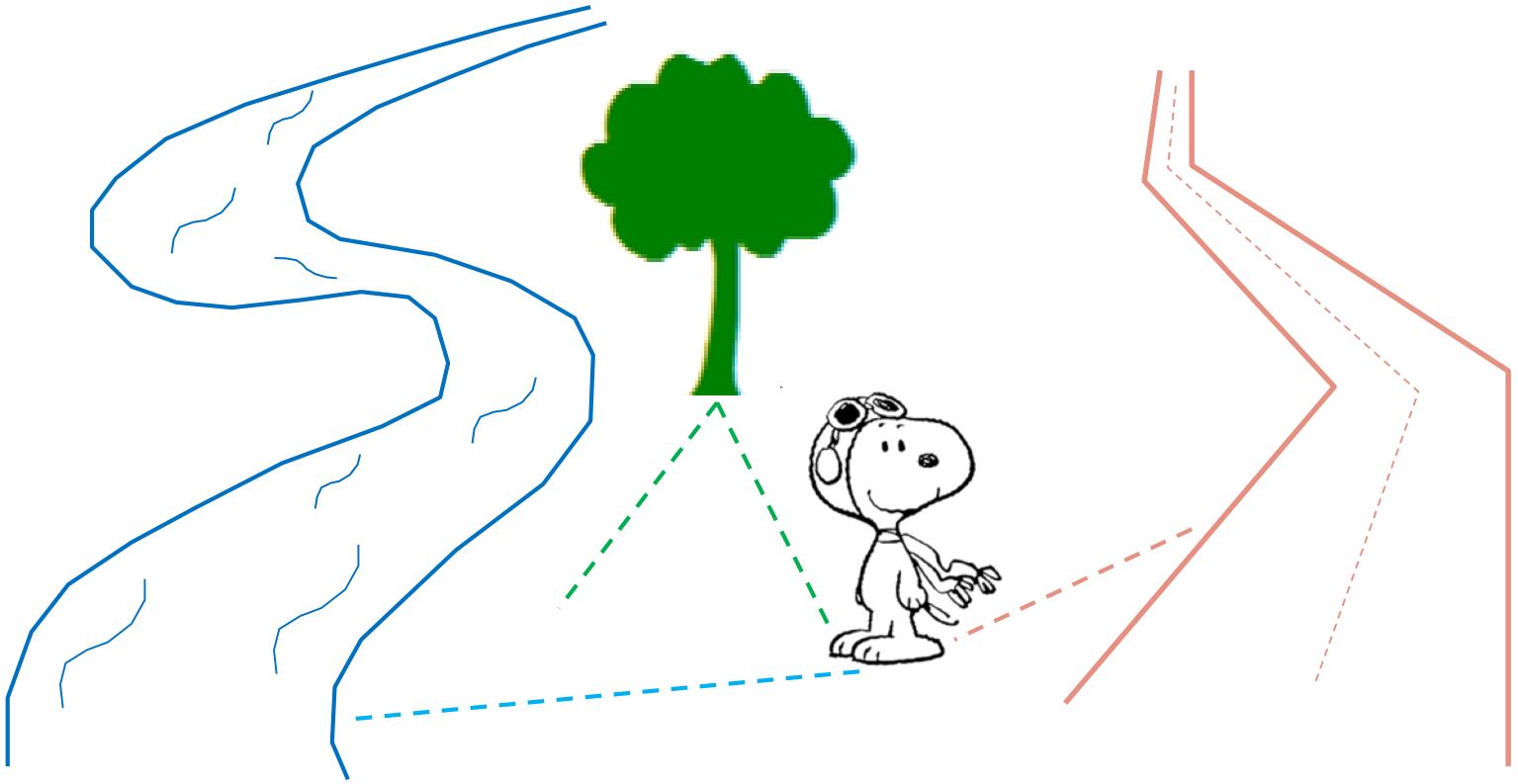
A symbolic simplification of reality (relief)





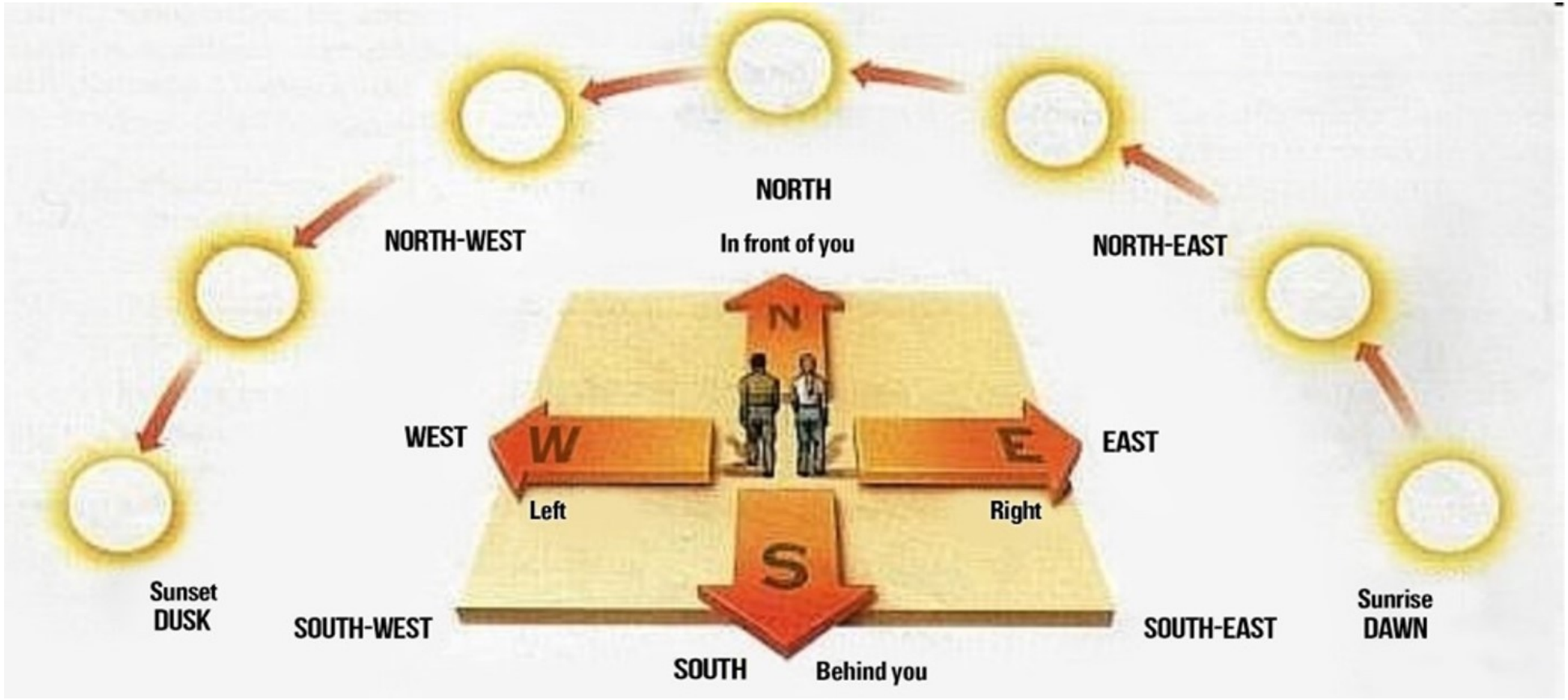
Where Are These Objects?

Reference



Where Are These Objects?

Direction

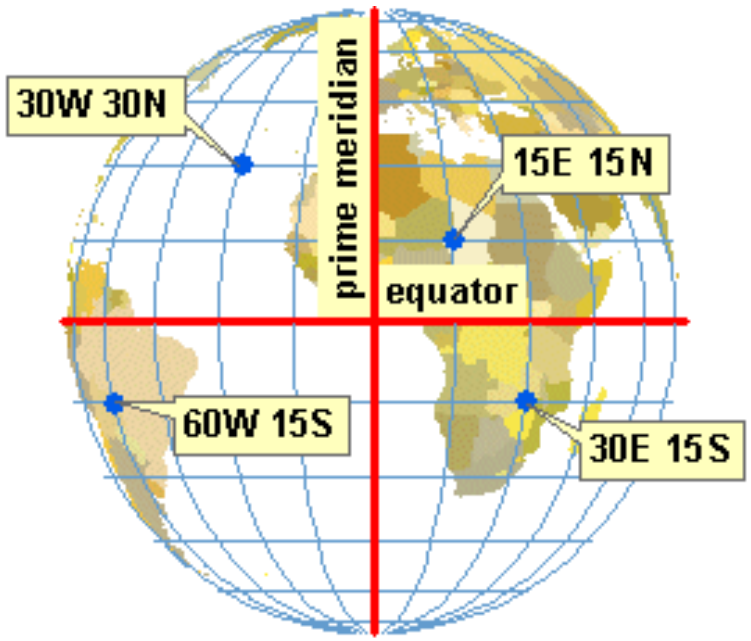


Introduction to Coordinate Systems

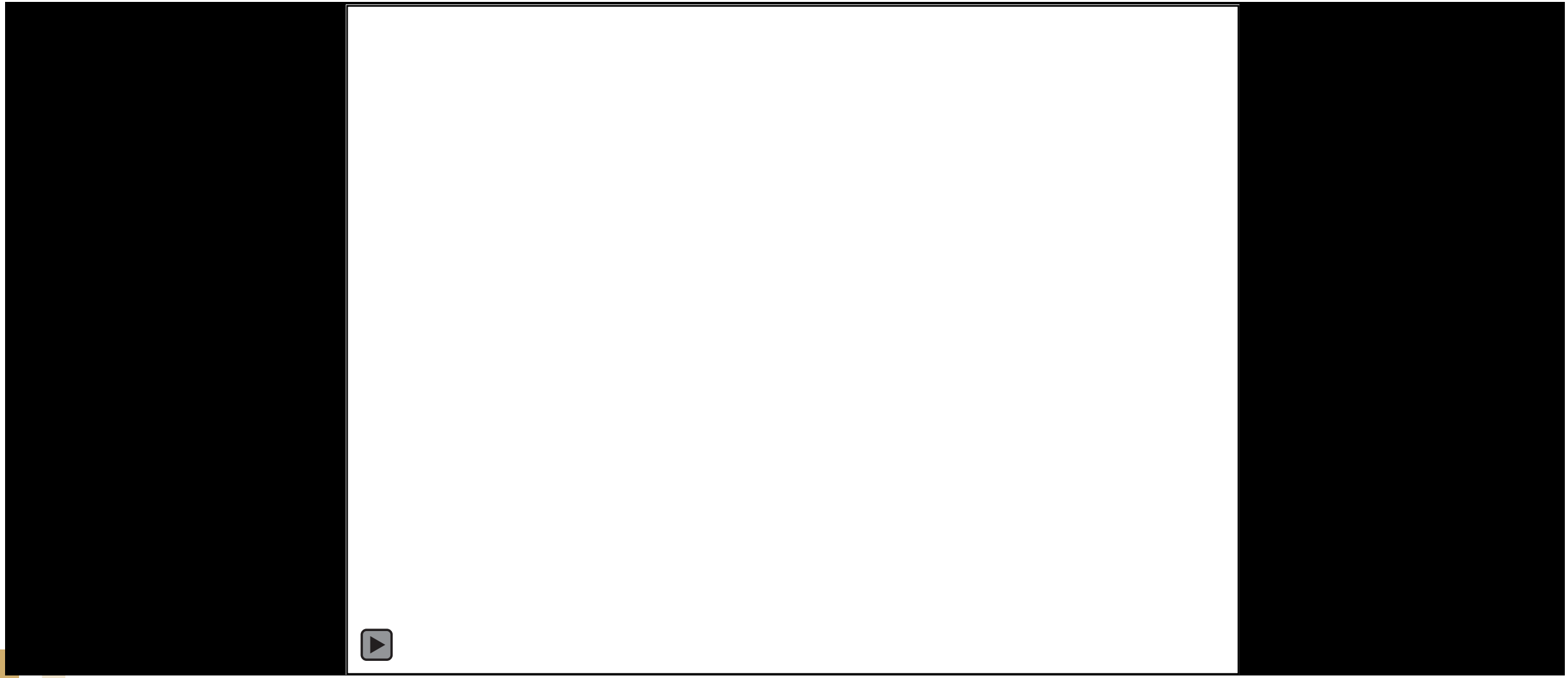
How to know where we are?

Geographic Coordinates

- We generate a global grid of vertical and horizontal lines. Each point in the Earth's surface is uniquely defined by a pair of values which we call "X-Y coordinates" or "latitude and longitude".



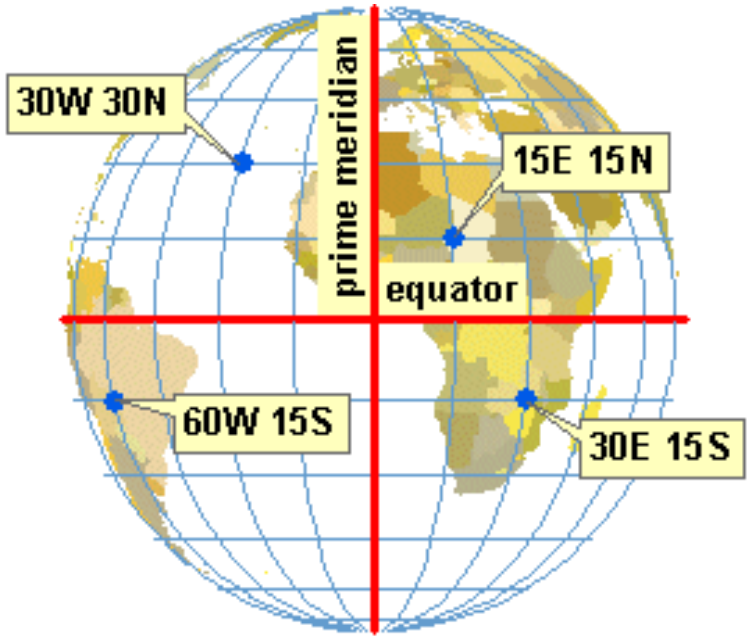
Coordinate Systems

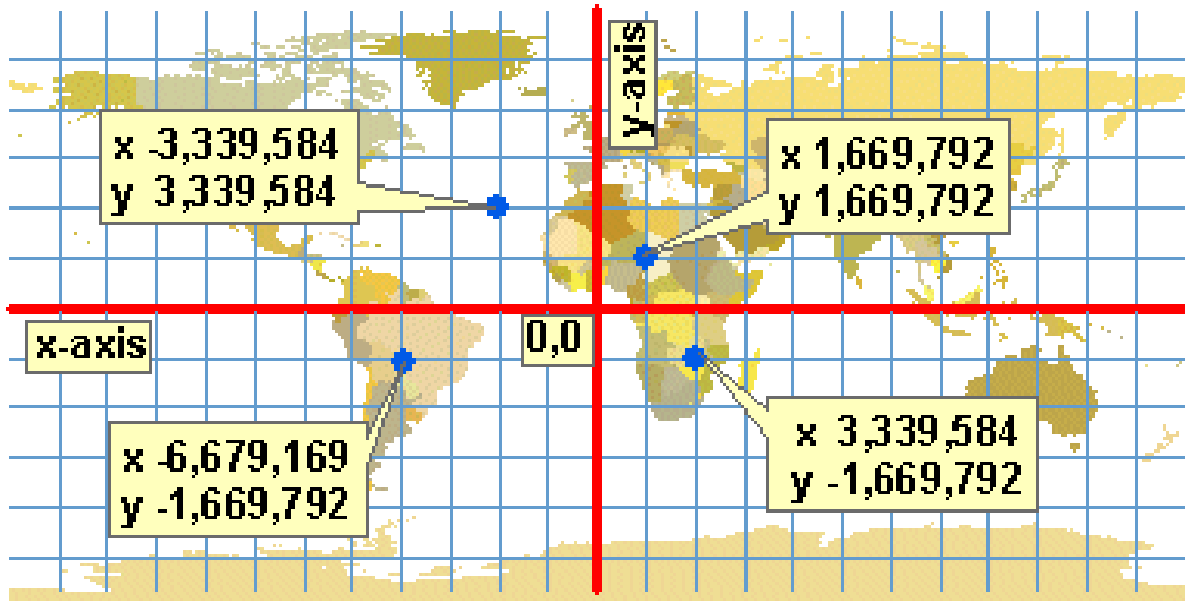


How to know where we are?

Projected Coordinates

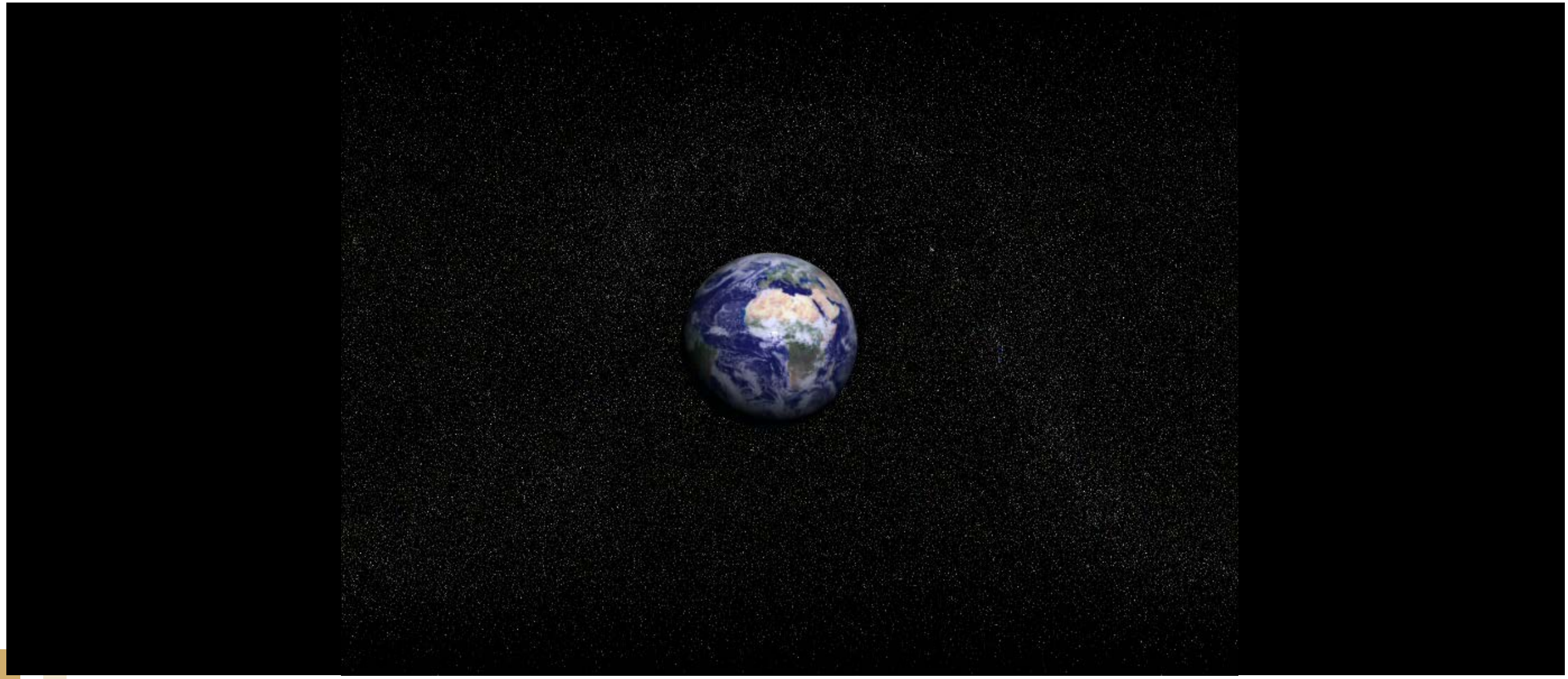
- We generate a global grid of vertical and horizontal lines. Each point in the Earth's surface is uniquely defined by a pair of values which we call "X-Y coordinates" or "latitude and longitude".



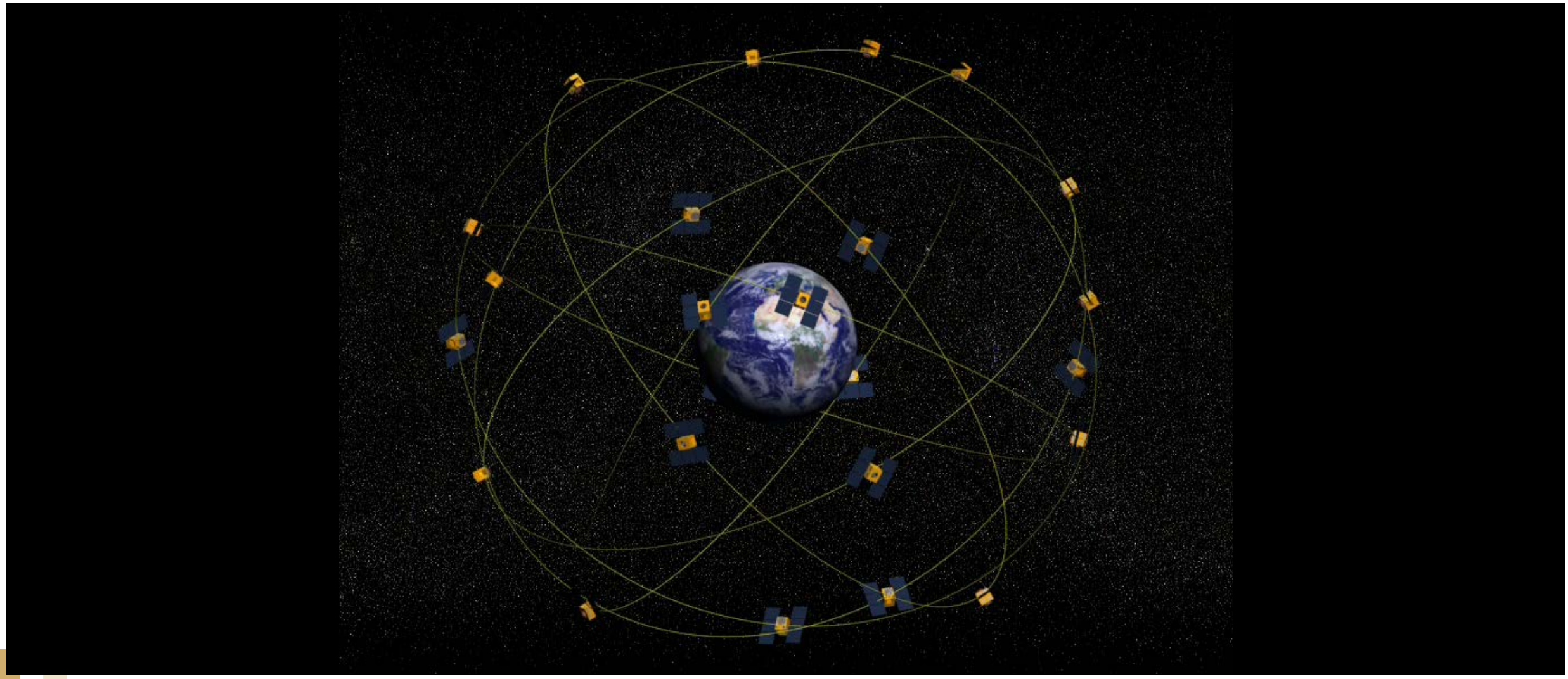


Introduction to Global Positioning System (GPS)

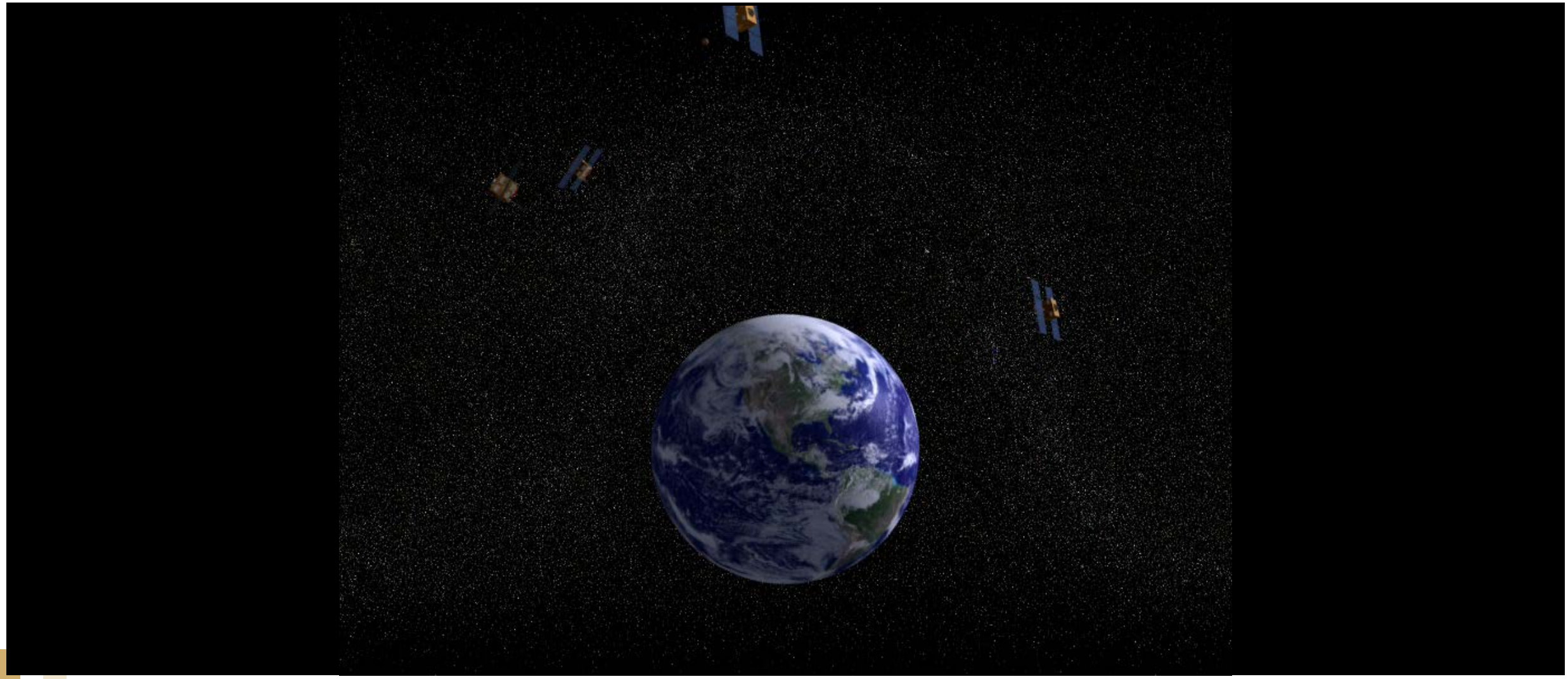
GPS



GPS

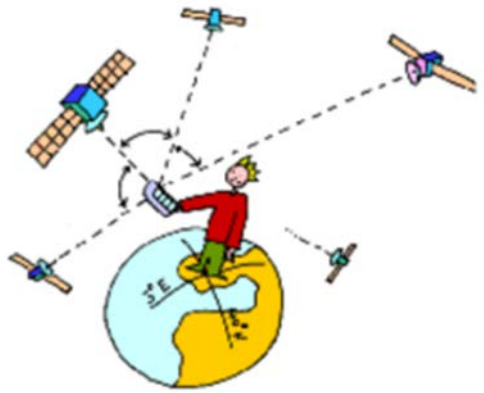


GPS

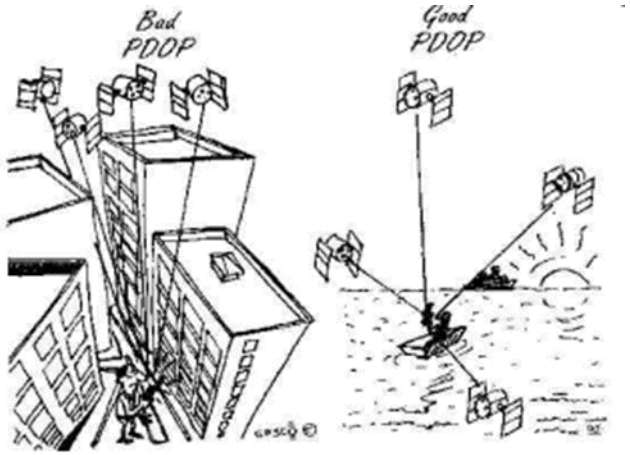


GPS

- Global coverage
- Operational 24 hours a day
- High precision
- Horizontal and vertical

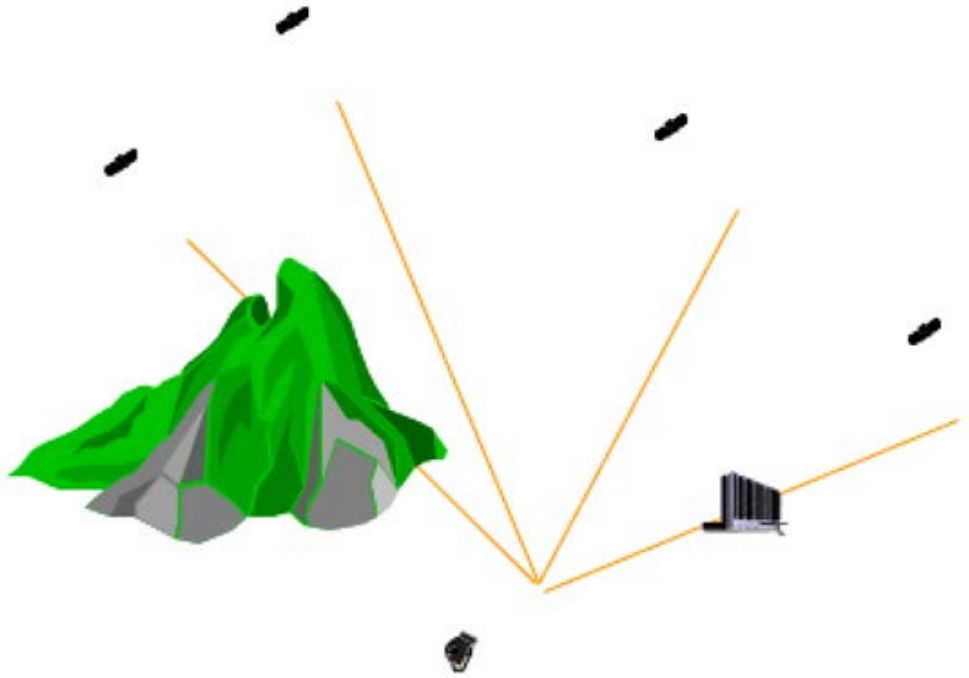


- Atmospheric errors
- Satellite geometry
- Signal reflection
- Canopy density



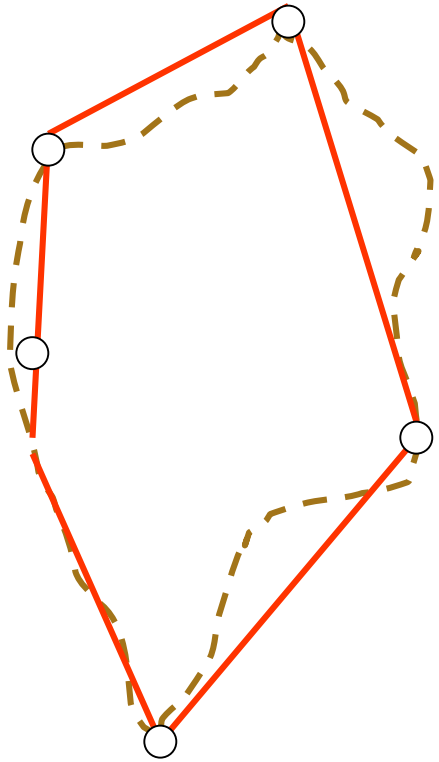
GPS

- A GPS signal cannot pass through metal or dense materials, or even just a few millimeters of water
- The signal is able to pass through glass, plastic, and light roofing materials
- The receiver needs an almost unobstructed view of the satellites



GPS

- The GPS stores three types of data
  - WAYPOINTS
  - TRACKS
  - ROUTES

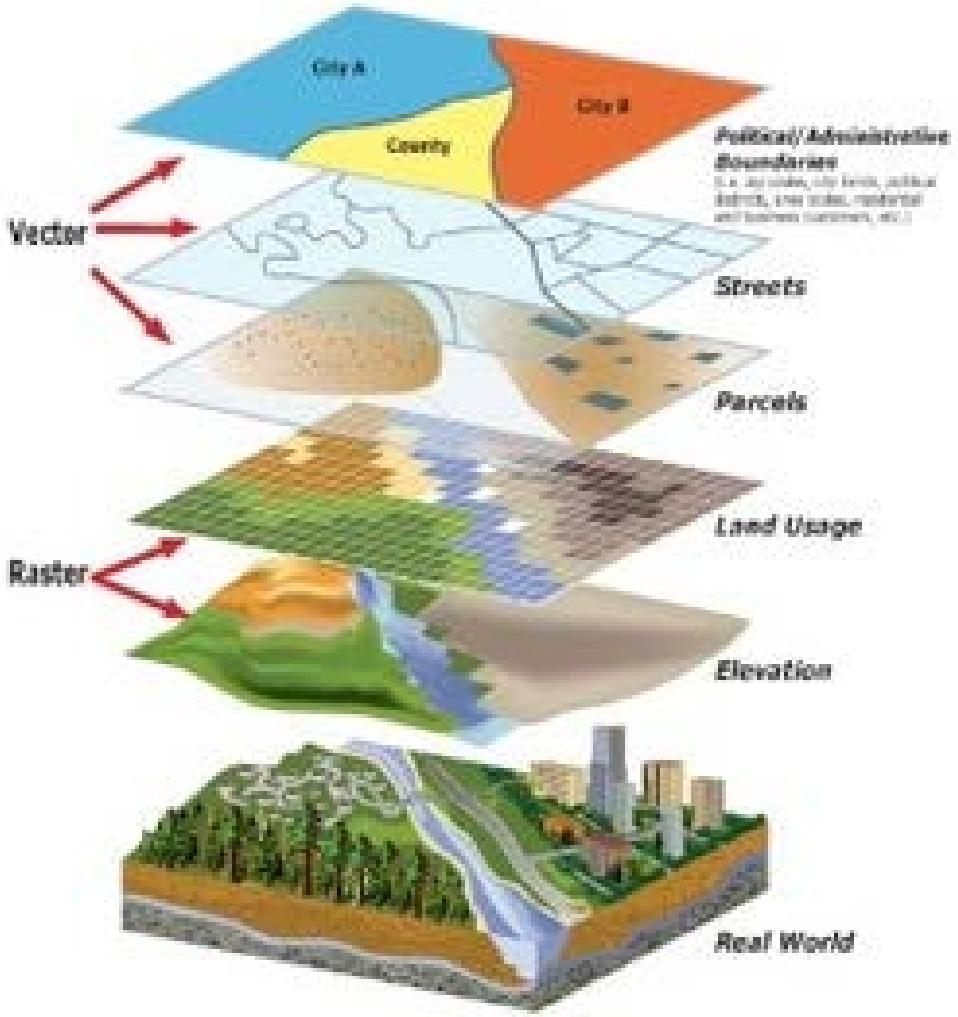


Note: The GPS provides secondary information – speed, direction, estimated time of arrival, sunrise/sunset, area calculations

What is GIS?

Geographic Information Systems (GIS)

- GIS is a framework for managing, analyzing, and displaying spatial data.
- GIS can map and analyze relationships of objects through space and time
- Capable of capturing a variety of information including photos, videos, and recorded stories.



Participatory Mapping and Participatory GIS

Definitions

- **Participatory Mapping or Community-based Mapping**
  - techniques combine mapping tools with participatory methods to represent local knowledge and perspectives

- **Participatory GIS (PGIS)**
  - Participatory approach to spatial planning, communications, and managing spatial information
  - Aims to increase diversity of viewpoints in spatial planning and bridge the gaps between different knowledge systems

Applications: map territories, record cultural heritage, biodiversity monitoring with traditional ecological knowledge TEK

Example: Participatory Mapping in the Native Community of Alto Mayo San Martín Region, Peru

Native Community of Alto Mayo

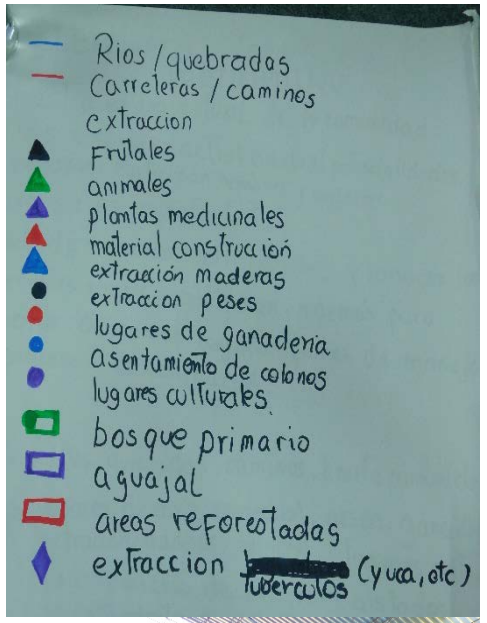
- One of 14 Awajún communities in the Alto Mayo area, in the San Martín region, Peru
- Population: 414 people, 89 families
- Area of the community: 10 855 ha

- **Main problems**
  - Renting land to migrants
  - Loss of forest coverage (almost 50% of forest lost)
  - Change in land use from forest to agricultural land (coffee, rice, cacao)

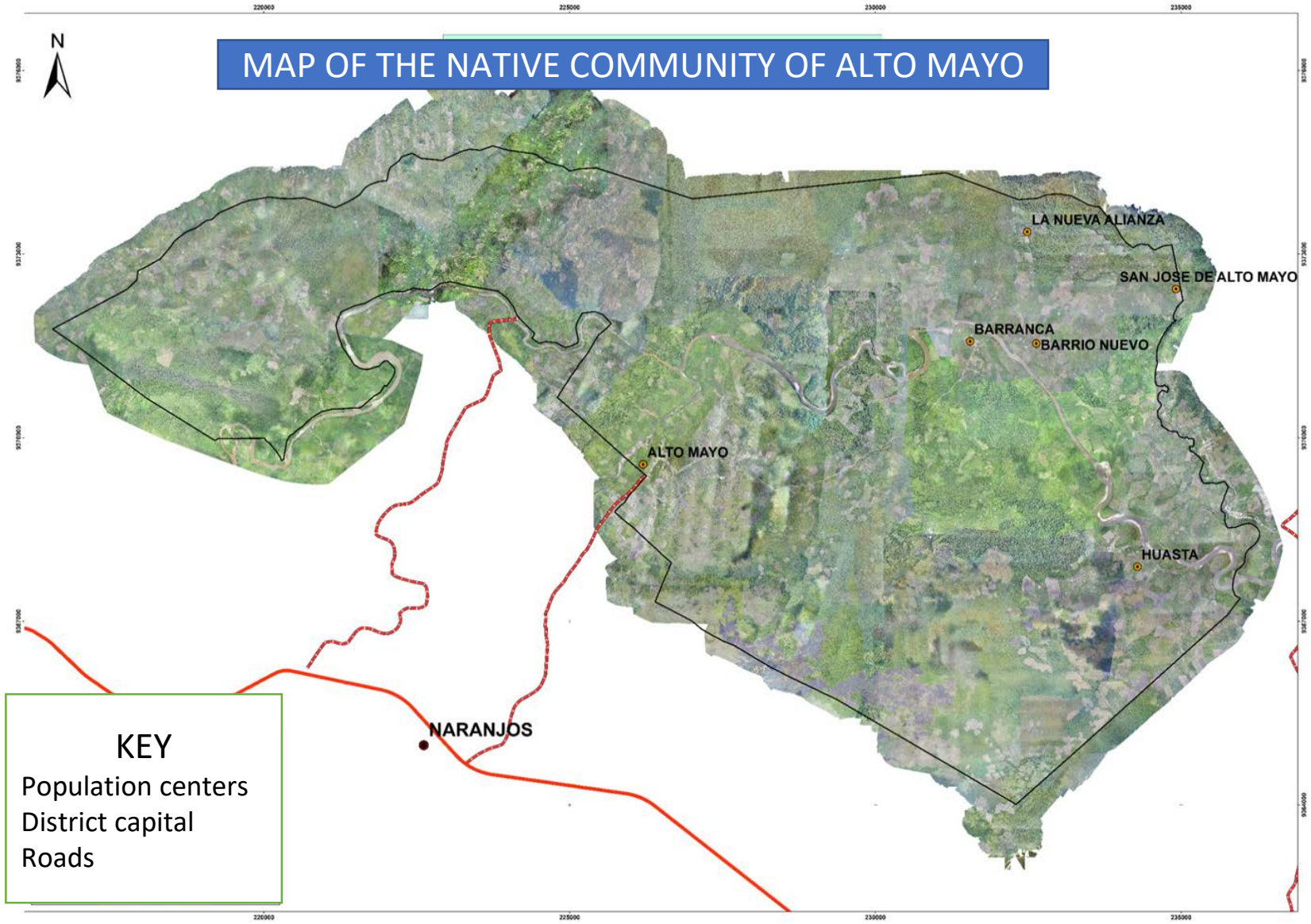
- **Participatory mapping**
  - Promotes interest in learning about the land
  - Access to tools such as a map and images
  - Contributes to the proper use of natural resources

Mapping in the Native Community of Alto Mayo

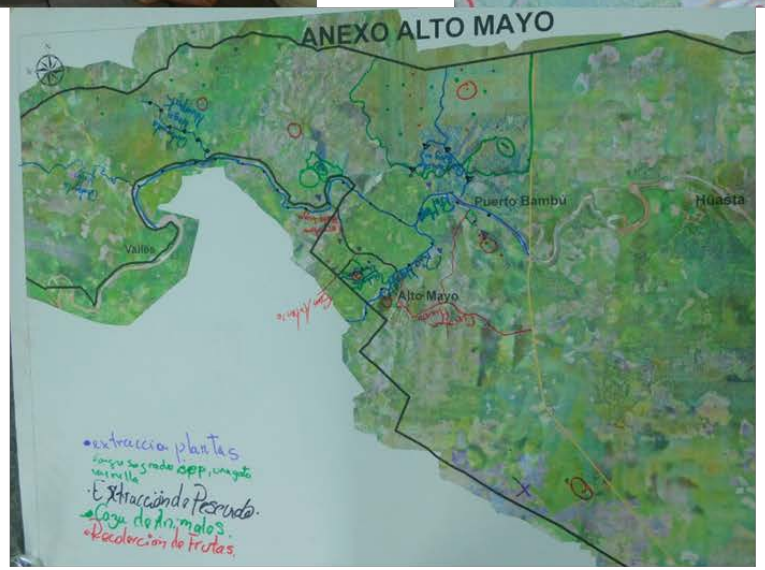
- Participatory
- Adults and children: 41 people
- 4 *anexos* [small settlements] within the community
- A survey was conducted: use of resources within the community
- Use of drones for imagery



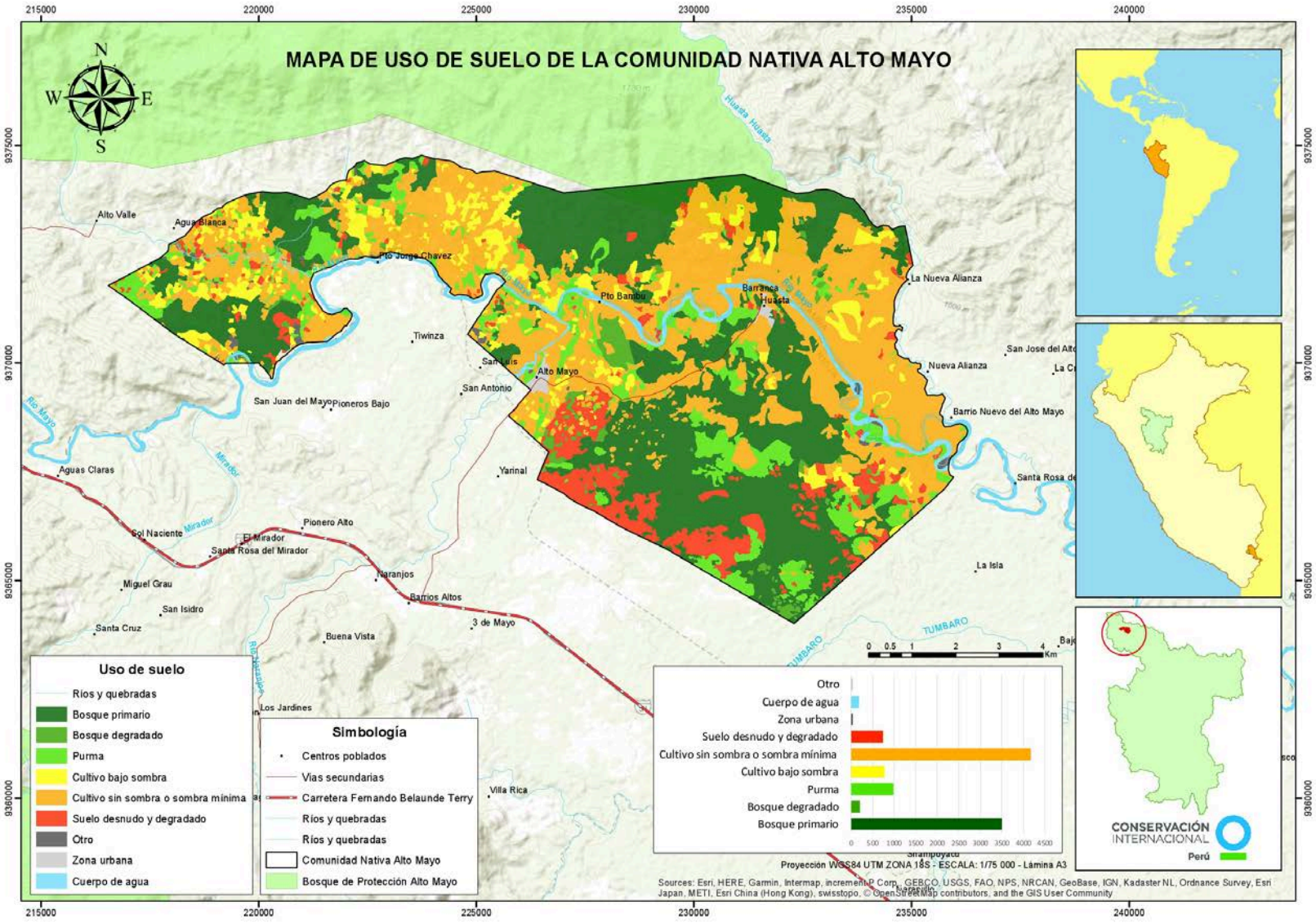
Mapping Using Drones



Participatory Mapping



Land Use Map


MAPA DE USO DE SUELO DE LA COMUNIDAD NATIVA ALTO MAYO
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Agua Blanca
Pto Jorge Chavez
Pto Bambu
Barranca Huasta
La Nueva Alianza
Tiwinza
San Luis
Alto Mayo
San Antonio
Nueva Alianza
San Juan del Mayo
Pioneros Bajo
Barrio Nuevo del Alto Mayo
Aguas Claras
Yarinal
Sol Naciente
El Mirador
Santa Rosa del Mirador
Pionero Alto
Naranjos
La Isla
Miguel Grau
Barrios Altos
San Isidro
3 de Mayo
Santa Cruz
Buena Vista
Los Jardines
Villa Rica
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Bosque degradado
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Cultivo bajo sombra
Cultivo sin sombra o sombra mínima
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Vias secundarias
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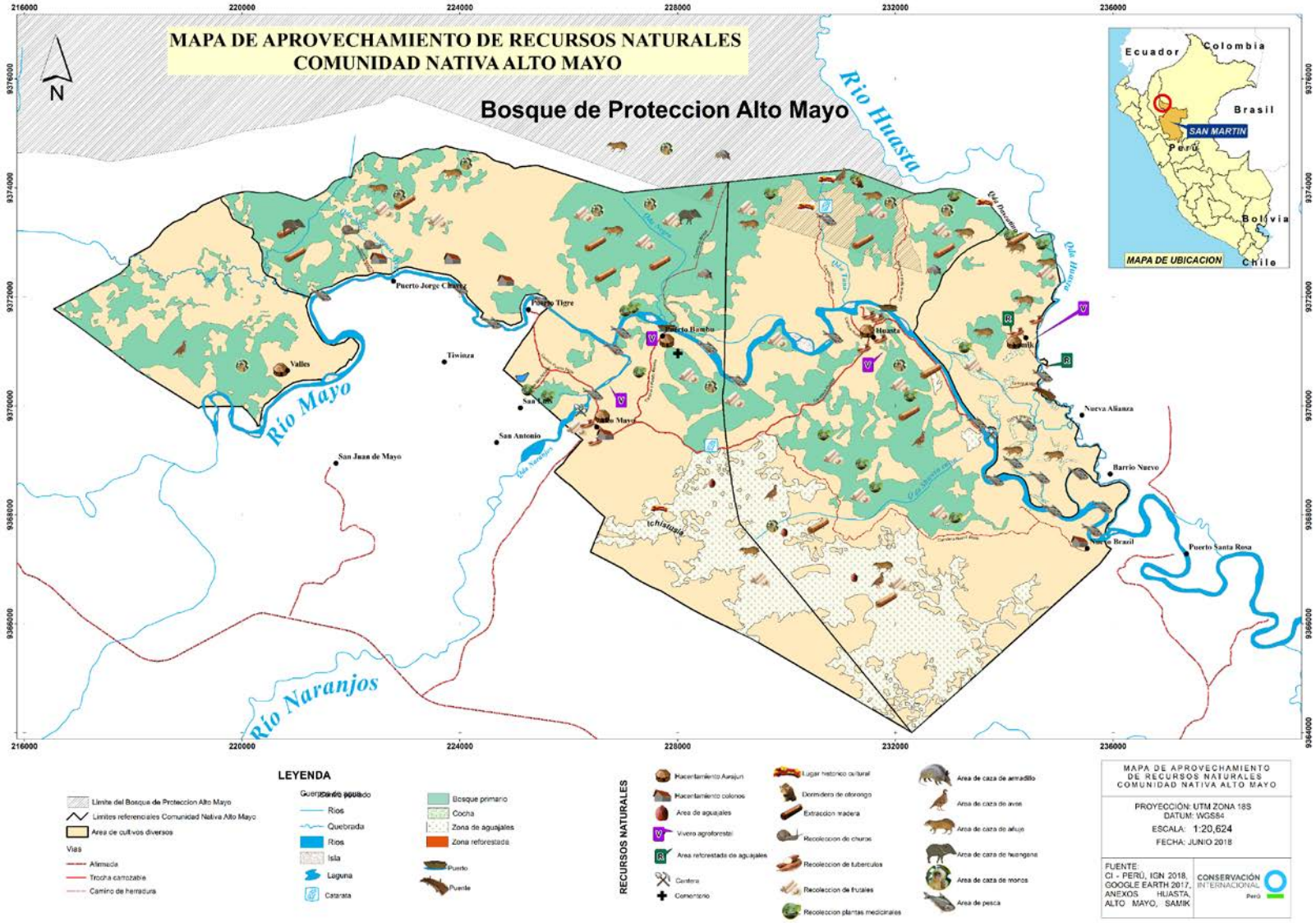
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

This Map is the Product of Participatory Mapping



Participatory Mapping

- Promotes knowledge of the whole territory
- Contributes to land zoning processes for improved land management
- Serves as an input for the implementation of life plans
- Baseline for a monitoring and patrol system for communal land

PGIS
Case Study: Maijuna Kichwa Regional Conservation Area

The Maijuna

- Maijuna are one of Peru's most vulnerable ethic groups numbering fewer than 500 people

- The Maijuna people, living across four communities, have been granted legal title to a small portion of their ancestral territory

- Maijuna people remain connected to the land despite lack of recognized rights to their original territory

The Maijuna

Problem

- Decisions of land tenure and land use are often made by government actors and are informed by spatial information
- Indigenous territories are often inadequately mapped because historically, government actors favored Western scientific knowledge over indigenous knowledge and social practices
- Culturally and biologically important ecosystems are not fully represented in spatial planning processes

Consequences for Maijuna

- Logging and poaching threaten land which remains outside of their direct legal control
- Loss of cultural heritage
- In 2008, the Peruvian government planned to construct a 130-km road and development corridor directly through their ancestral territory

PGIS Solution

- Improve mapping and environmental management of indigenous territories
- Capture diverse ecological and cultural knowledge required for spatial planning
- Inform land tenure and land use to design that preserve culturally and biologically important ecosystems.

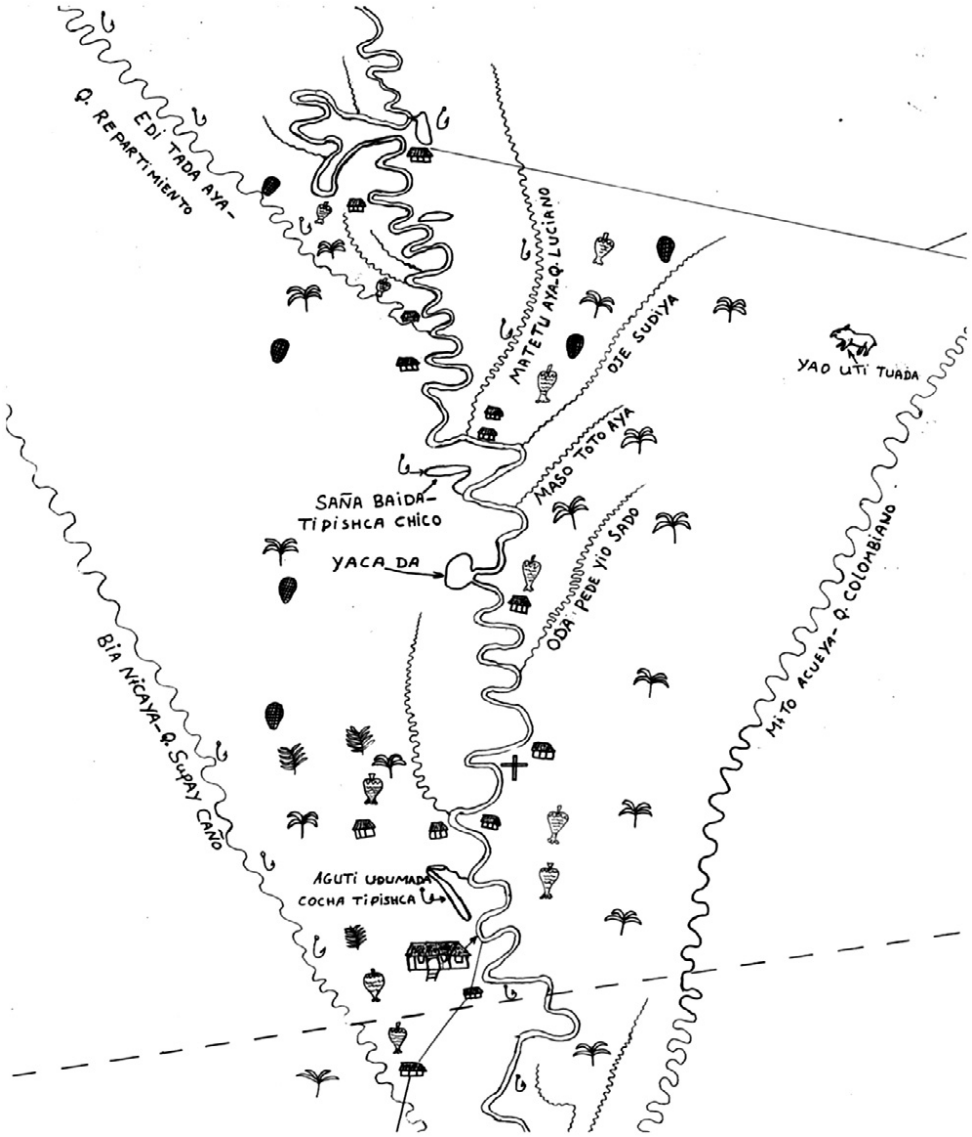
Maijuna Take Action

- Created an indigenous federation, the Federación de Comunidades Nativas Maijuna (FECONAMAI), to attempt to gain better control over their ancestral lands and to preserve their environmental and cultural heritage

- Invited PGIS researchers to document the important historical connection that the Maijuna have with the land around them and map their territory

Participatory Mapping

- Over 5 years 2004-9, conducted 4 participatory mapping sessions and PGIS field work
- First drew by hand map of river system
- Then drew mapped social, historical, and biological sites that they wanted to map.
- Result - Mapped 900 sites of biological and/or cultural importance to the Maijuna across 4 communities mapped

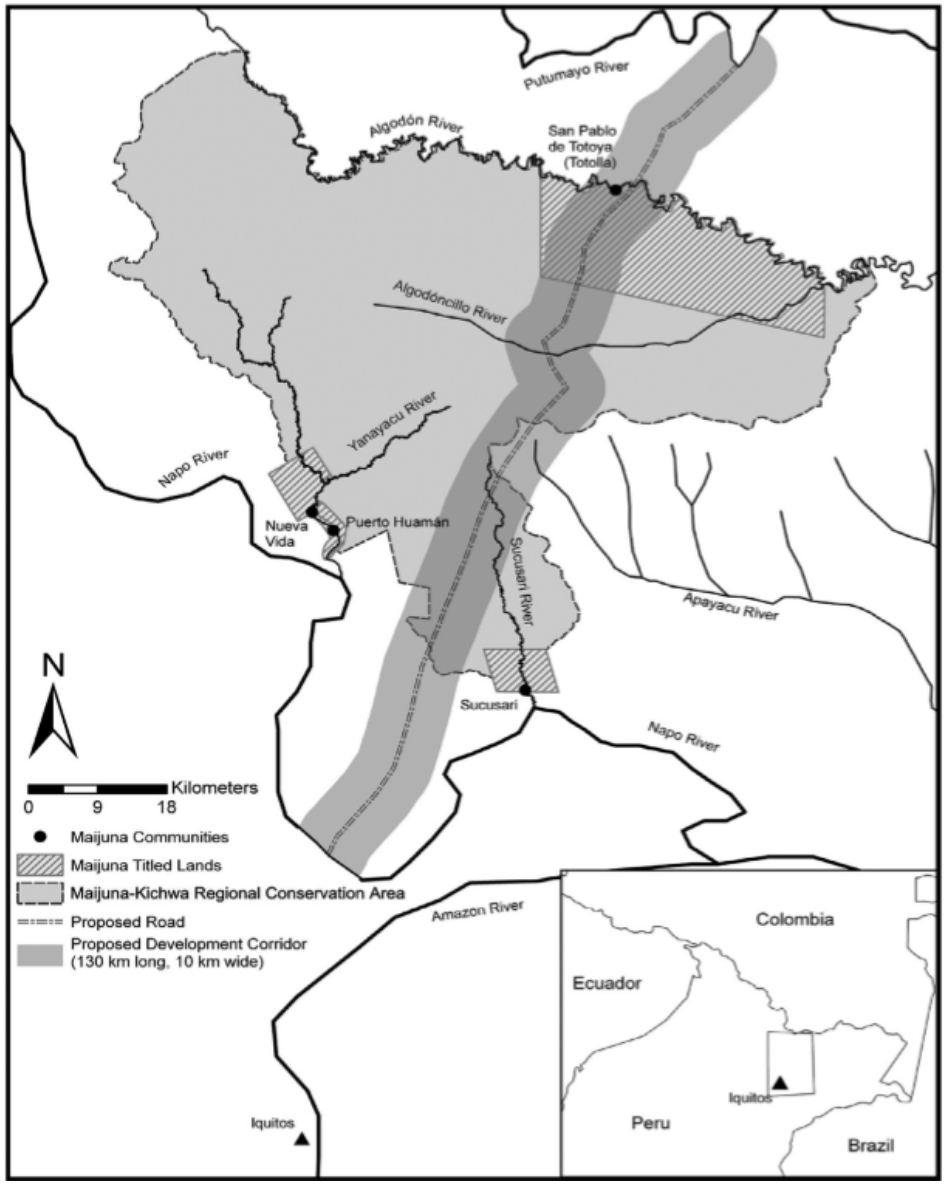


Participatory GIS

- A team of researchers and community volunteers visited the hand-drawn points on the paper maps.
- Used handheld GPS units to collect the geospatial coordinates of each site
- Used digital cameras to take photographs of the site
- Catalogued traditional ecological knowledge (TEK) essential for biologists and conservationists working in the area.
- An additional biological inventory which revealed that the area contained a previously unclassified and unreported habitat with new, rare, and specialized species.

Outcomes

- The mapped cultural and biological information helped inform the design of a new conservation area connecting the 4 Maijuna communities.
- On June 17, 2015, the government of Peru approved the establishment of the 391,039 hectare Área de Conservación Regional Maijuna Kichwa (ACR; Maijuna Kichwa Regional Conservation Area)
- The ACR prevented the road development on the Maijuna's ancestral land
- The ACR also protects their ancestral land from the increasing pressures from loggers and poachers



Conclusion

- Governments need the spatial data to inform policies
- PGIS can be an effective tool to record cultural and traditional ecological knowledge
- PGIS can help increase indigenous representation in policy decisions

MONGABAY
NEWS & INSPIRATION FROM NATURE'S FRONTLINE

RAINFORESTS OCEANS ANIMALS & ENVIRONMENT FOR KIDS DONATE WILDTECH MORE

To search, type and hit enter.

New reserve in Peru will protect nearly a million acres of pristine forest

by Morgan Erickson-Davis on 26 June 2015

Forest near Iquitos, close to where the new reserve is. Photo by Morgan Erickson-Davis.

A tract of Peruvian rainforest bigger than California's Yosemite National Park is officially more protected, with formal declaration of the Maijuna-Kichwa Regional Conservation Area (RCA) made last week in Lima. Those involved with the reserve's formation hope it will safeguard the area's biodiversity as well as the ancestral homeland and way of life of local indigenous communities.

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https://news.mongabay.com/2015/06/new-reserve-in-peru-will-protect-nearly-a-million-acres-of-pristine-forest/

Spatial Planning Case Study:
Canelos Kichwa Community, Ecuador
Life Plan Update

The Kichwa Community of Canelos

- The territory of the Kichwa community of Canelos is located in the Ecuadorian Amazon, specifically in the province of Pastaza.

- It covers a surface area of over 18,000 ha and is home to more than 1,700 inhabitants.

- Despite being an ancestral indigenous community, it experiences high urban influence due to its proximity to the town, and faces problems associated with:
  - Cultural loss (ancestral practices and language)
  - Poverty
  - Deforestation
  - Loss of biodiversity
  - Inefficient production practices

- A process has begun to update their life plan (territory management plan), including a strong local engagement component with support from TNC, CI and the Moore Foundation

Local Engagement

- Expanded diagnosis workshops

- 12-person delegation to make up the local technical team:
  - Socioeconomic promoters
  - Park rangers
  - Natural resource managers

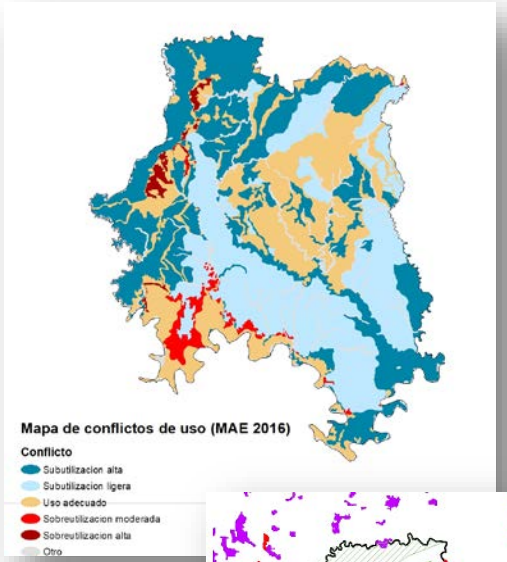
- They were trained in:
  - GPS use
  - Mapping
  - Data collection (surveys)
  - Control and surveillance

Land-use Planning

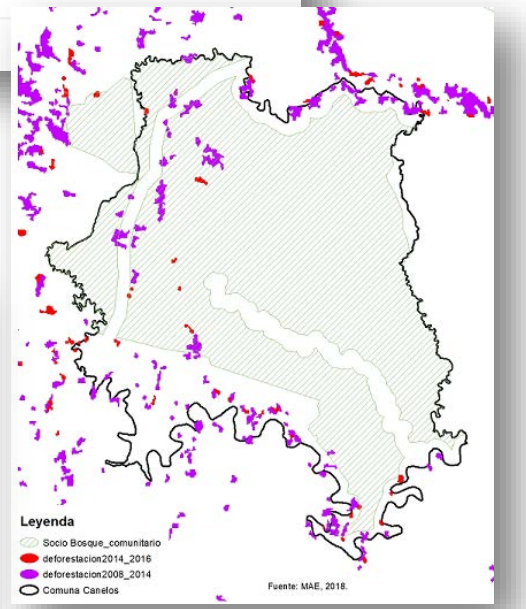
- Over 87% of the territory is covered by native forest.

- It is necessary to:
  - Establish specific land zoning
  - Define regulations for use and coexistence

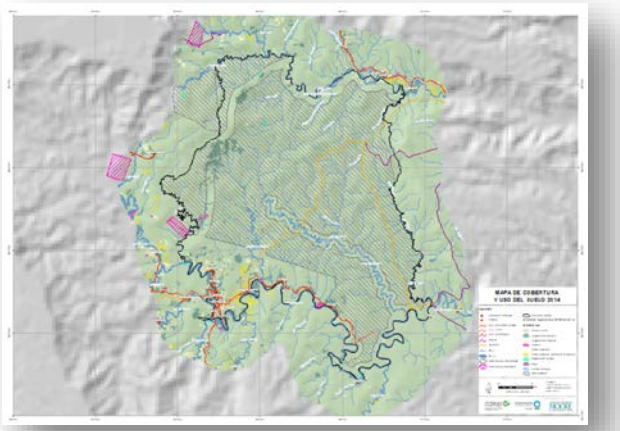
- Some information considered in the territory analysis:
  - Vegetation cover and land use.
  - Dynamics of land-use change.
  - Land-use conflicts (current use vs. potential or optimal use).



Land-use conflicts



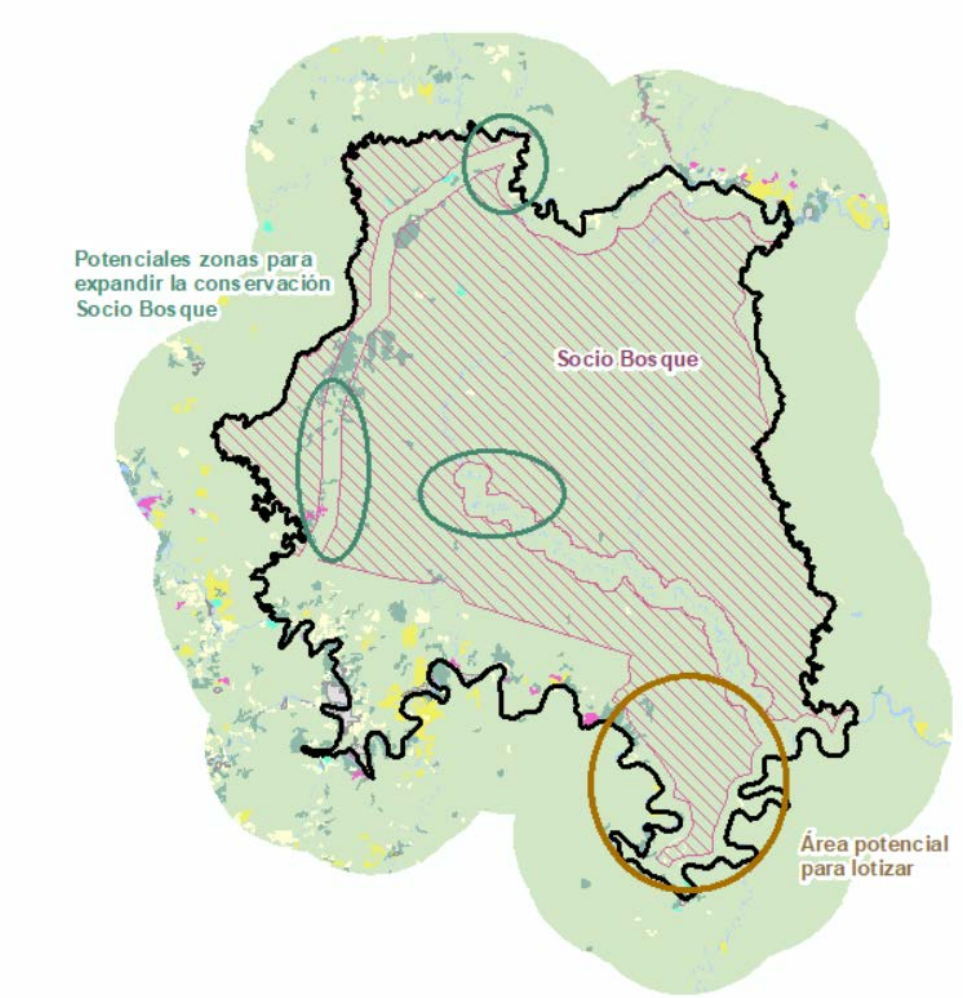
Deforestation patterns



Vegetation cover and land use

Population Growth vs. Conservation

- The community of Canelos has a Socio Bosque conservation agreement for 71% of its territory (13,000 ha).
- Inhabitants need 600 ha to divide into lots and develop productive activities.
- The local technical team is surveying the conditions of certain sites to redefine uses.
- Then it will be necessary to draw up a report and negotiate with Socio Bosque to amend the agreement.
- This process requires strengthened local capacities in:
  - Using technological tools
  - Mapping and spatial analysis concepts
  - Producing reports.
  - Negotiating skills with authorities



Demonstration:
Mapping Cultural Heritage with Google Earth

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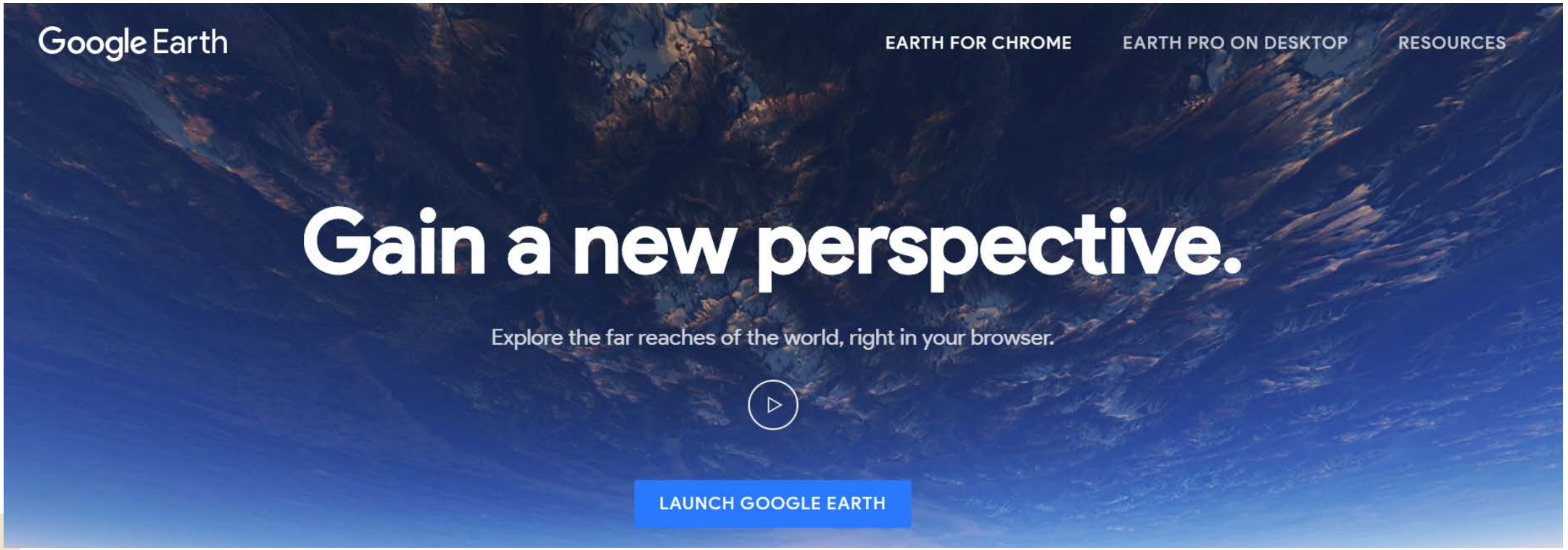
Google Earth

- Install CHROME web browser
- Launch Google Earth https://earth.google.com/web/



Surui Cultural Map

- My places
- Enable KML import in Settings
- Import KML File:
  - https://mw1.google.com/mw-earth-vectordb/blog/nl_surui_en.kml
  - https://earth.google.com/gallery/kmz/surui_tour.kmz

Summary of Session #1

- Maps
- GPS
- Participatory Mapping
- PGIS
- Applications for mapping
- Mapping in Google Earth

Homework #1

- You can complete one of two homework assignments by next week's session for participation credit
- The assignment helps participants become familiar with Google online mapping services
- First option uses Google Earth Pro
  - This must be downloaded and installed
  - Google Earth Pro has many useful features but is more complex to use
- The second option uses Google My Maps
  - This can be done directly on your web browser
  - My Maps is less complicated to use
- This assignment can be found in the handout section and the materials webpage
- All of the instructions for completing this assignment can be found in the homework document
- Please complete this homework by the beginning of next week’s webinar session

Session 2: Overview of Remote Sensing for Land Management

Preview of Next Session

- Overview of remote sensing concepts
- History of remote sensing
- Current remote sensing technologies for land management