



Space for Ecosystems

Nature valued from space

Presenter: Dr. Eva Maria Haas, GeoVille

Location: ACES 2014, Washington D.C.

Date: 11.December 2014

www.space4ecosystems.com

A satellite image of Earth showing a large, irregularly shaped landmass highlighted in a vibrant red color. This red area covers most of the visible land, including North America, South America, and parts of Europe and Africa. The surrounding oceans are a deep blue, and white, swirling cloud patterns are visible over the water. The text "Exploring the potential of Earth Observation ..." is overlaid in white on the left side of the image.

Exploring the potential of
Earth Observation ...



... to support Ecosystem Service
Assessments and Valuation

The consortium

The explorers: A unique international project consortium combining

Earth Observation experts in
land and marine applications



Market Experts





Nature valued from space

AIM of  **esa** projects

G-ECO-MON: extend the use of EO based information for
multiple applications targeting ecosystem services

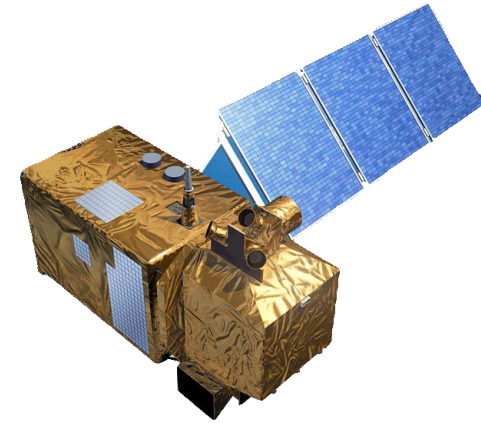
- Large scale user requirements assessment => market analysis
- 11 demonstration studies in land, coastal and marine ecosystems
- Provision of targeted EO products for various market segments and users

ECOSERVE: demonstrate the value of EO based information products for the emerging sector of
ecosystem services valuation

- 5 demonstration studies in land, coastal and marine ecosystems
- identify and map indicators for a suite of ecosystem services
- provide objective baselines for environmental monitoring systems

A satellite image showing a large river delta with multiple channels branching out into a body of water. The land is green, and the water is a light blue color.

Why Earth observation?



- Neither costly nor complex, easily accessible and available for large areas to support ecosystem service assessments
- Objective, independent, validated and unbiased mapping and monitoring of ecosystems



Carbon sequestration

Biomass for energy

Recreation

Wood for raw material

Game animals

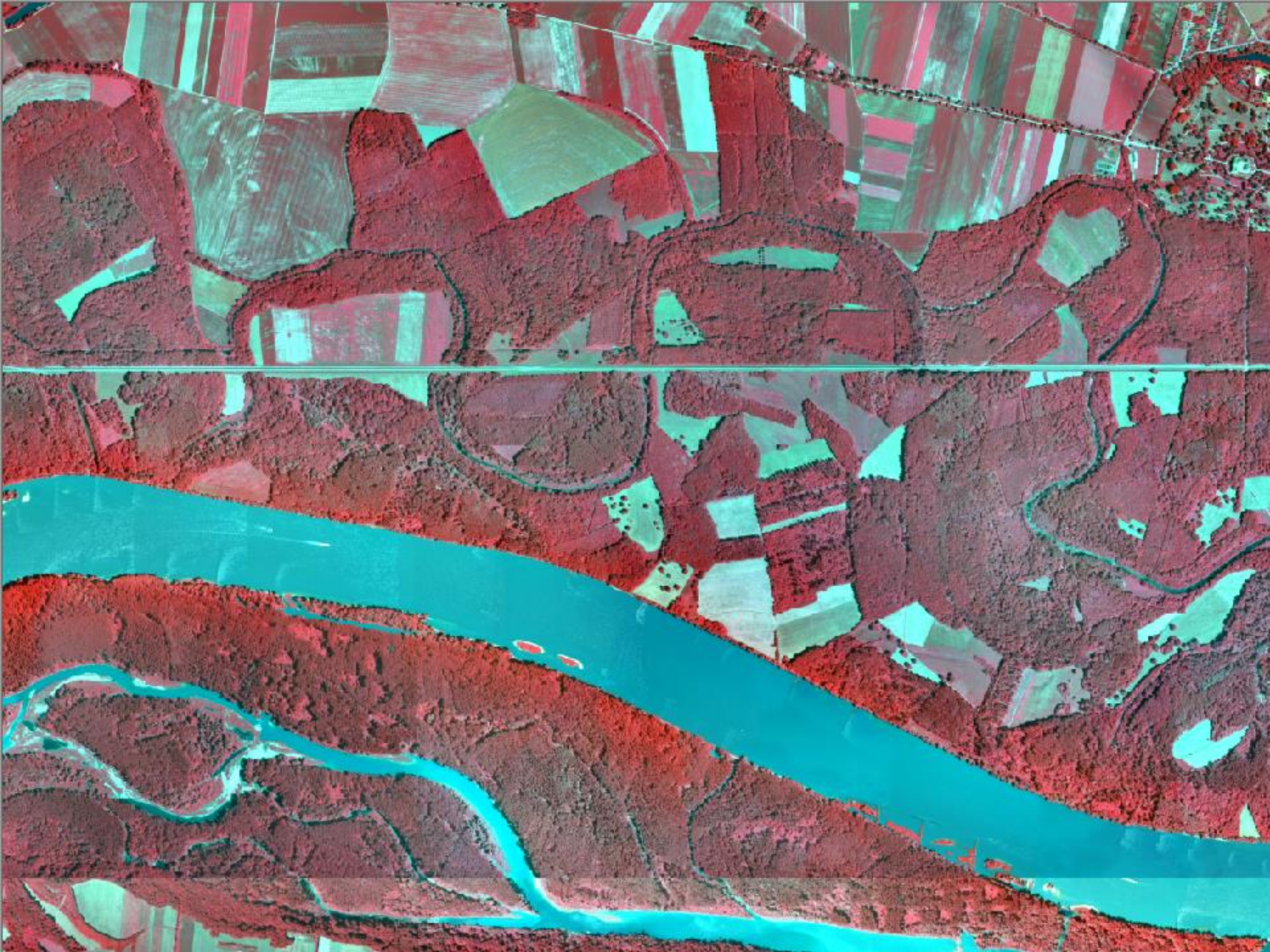
Clean water

Soil productivity

Mushrooms

Berries

Ecosystems like forests provide many benefits...
... but how can we measure them?



Surveys and Earth Observation are complementary tools to achieve large-scale ES assessments

Soil productivity

Biomass for energy

Carbon sequestration

Recreation

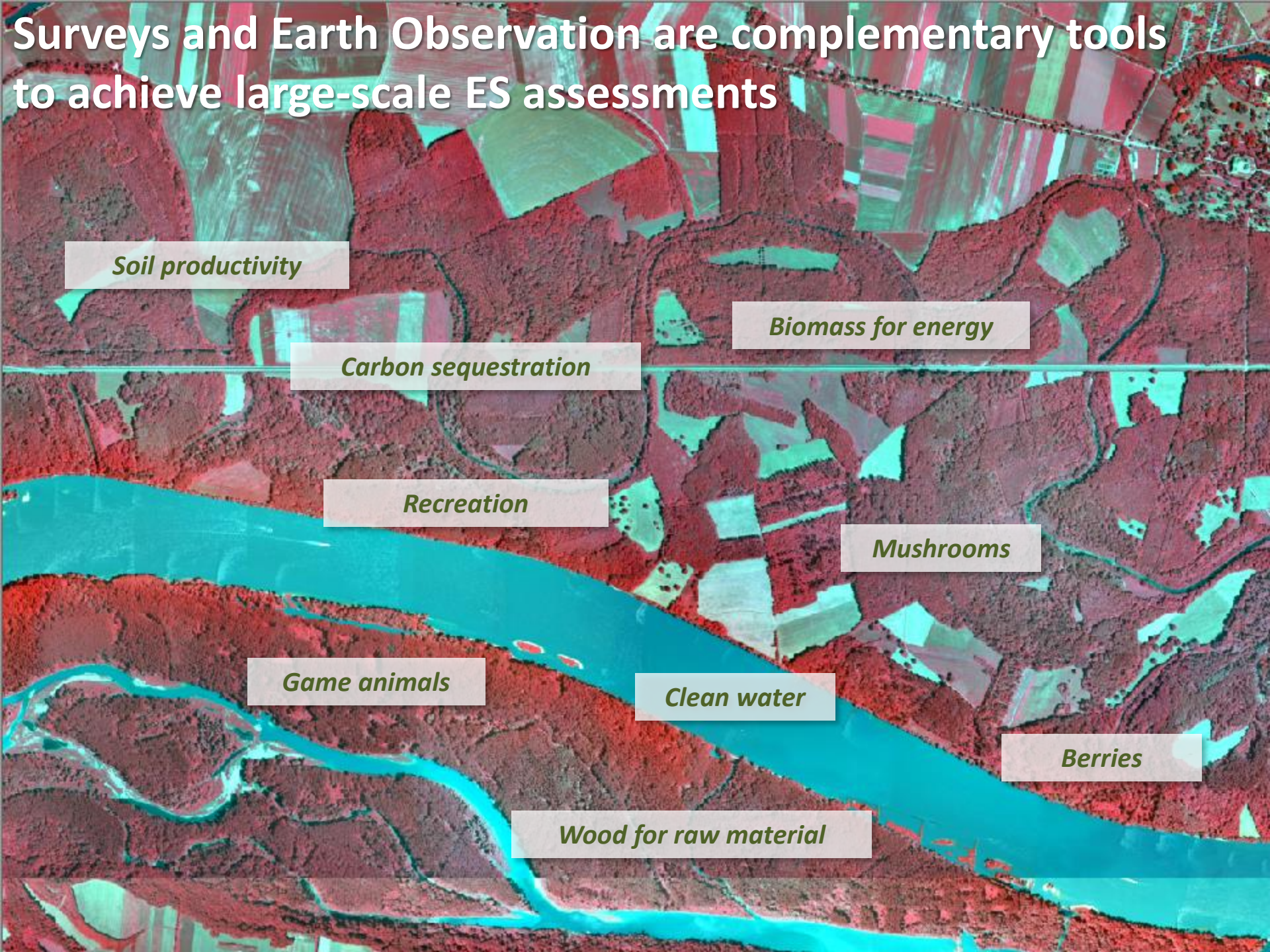
Mushrooms

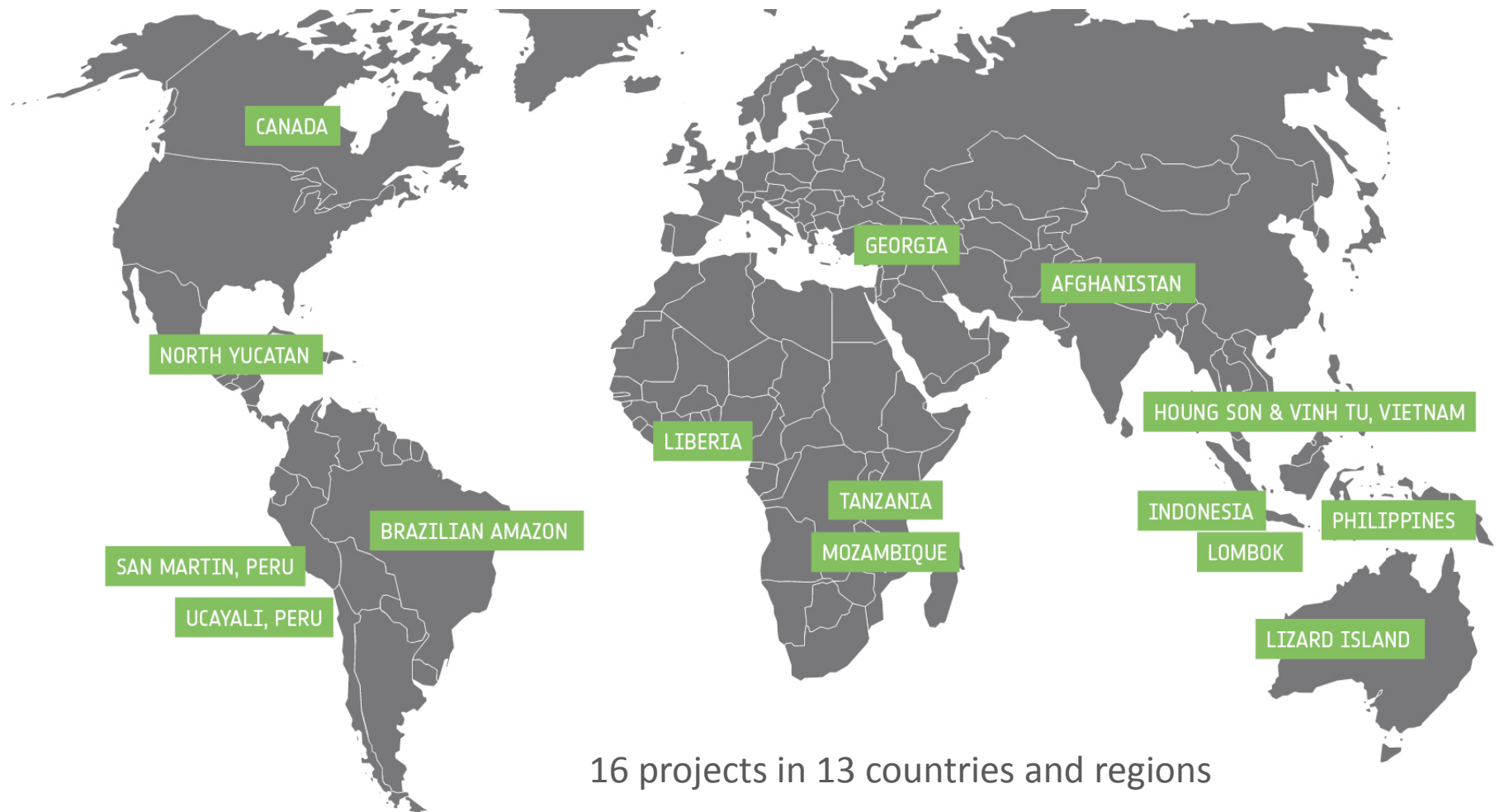
Game animals

Clean water

Berries

Wood for raw material







Our users (G-ECO-MON & ECOSERVE)



Winrock International




Quebec Centre for
Biodiversity Science



World Wide Fund of Nature -
Brazil



World Wide Fund of Nature -
Germany



British Petrol



EcoAgriculture Partners



Zoological Society of London



International Union for
Conservation of Nature



United Nations Environment
Programme



Institute of Marine Sciences
and Limnology




FSC / SNV / World Wide Fund
of Nature Indonesia



Queensland Parks & Wildlife
Service



G-ECO-MON & ECOSERVE examples



Conservation International

Ecosystem Values Assessment & Accounting (EVA)

San Martin, Peru

Natural Capital Accounting, Land Cover Change



Government of Philippines & World Bank

Philippines Wealth Accounting and Valuation of Ecosystems

Southern Palawan, Laguna Lake; Philippines

Natural Capital Accounting, SEEA



ECOSERVE Ucayali (Peru)

World Wide Fund of Nature in Germany and Peru

Ucayali, Peru

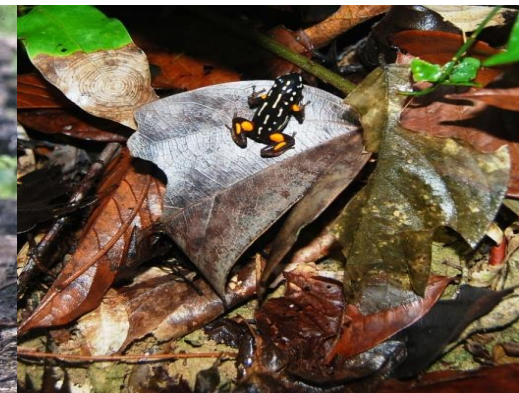
Timber, Climate Regulation



ECOSERVE – Ucayali, Peru

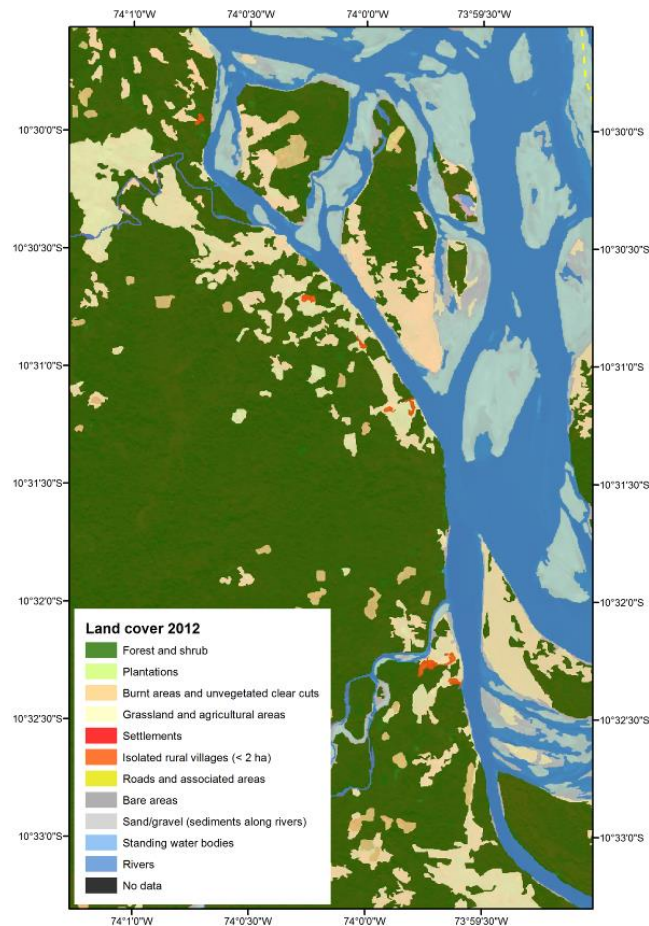
Assessing habitat quality and biodiversity

- Patterns in biodiversity are inherently spatial → they can be estimated by analysing LULC maps in conjunction with habitat threats and sensitivities.
- Habitat quality depends on a habitat's proximity to human land uses and the intensity of these land uses.

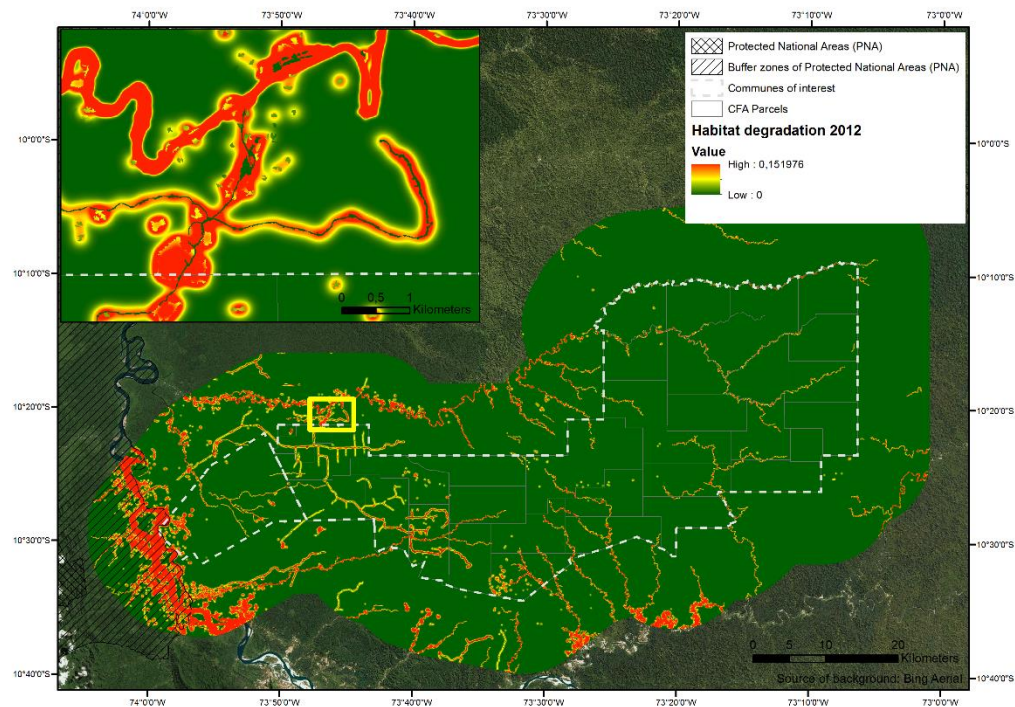




Land Cover 2012 (5 m)



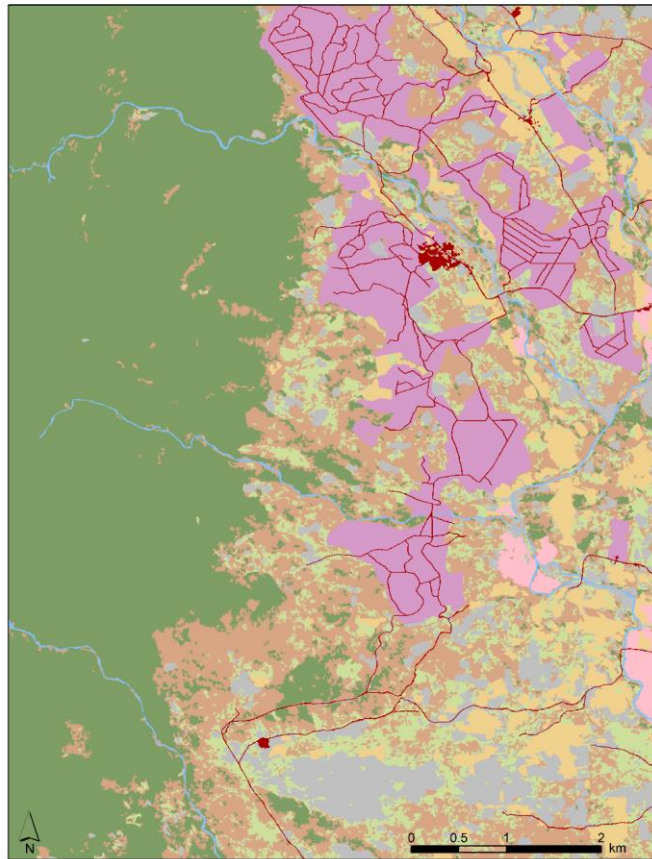
InVEST Habitat Quality



Example

- Biodiversity InVEST module (non-monetary metric)
- Characterises habitat quality and quantifies habitat degradation / loss

G-ECO-MON – Philippines

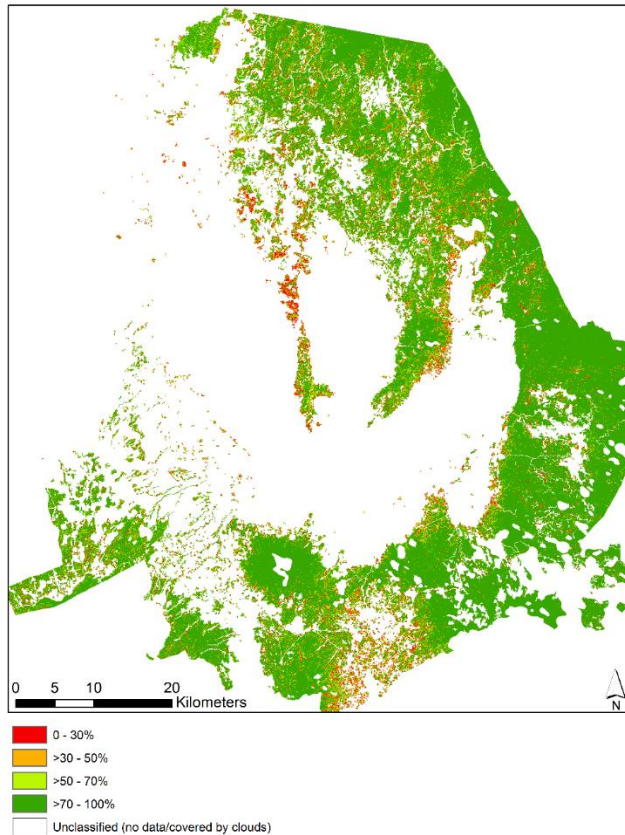


“The G-ECO-MON project has provided critical support to the development of ecosystem accounts under the Philippines Wealth Accounting and Valuation of Ecosystem Services (WAVES) project. The Earth Observation-based maps have filled information gaps needed to model key ecosystem services as well as validate and improve upon existing data.”

Stefanie Sieber, World Bank - WAVES

Southern Palawan: LULC for 2003 and 2010; 2,5 m

G-ECO-MON – Philippines



“The G-ECO-MON project has provided critical support to the development of ecosystem accounts under the Philippines Wealth Accounting and Valuation of Ecosystem Services (WAVES) project. The Earth Observation-based maps have filled information gaps needed to model key ecosystem services as well as validate and improve upon existing data.”

Stefanie Sieber, World Bank - WAVES

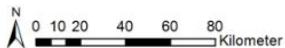
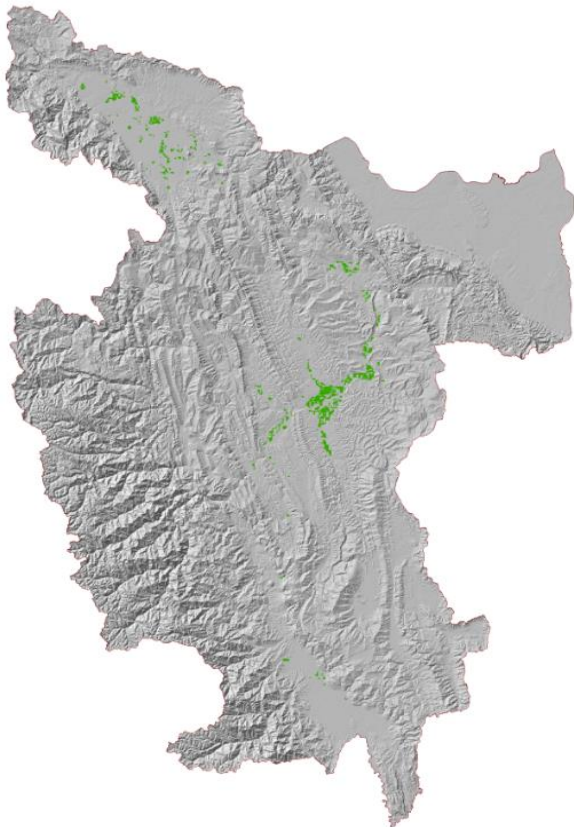
Laguna Lake watershed: LULC and tree cover density for 2010; 20m



G-ECO-MON – San Martin, Peru

2013

Cloud Appearance
Flooded Rice area
Frequency of clouds
High
Low : 0
Low



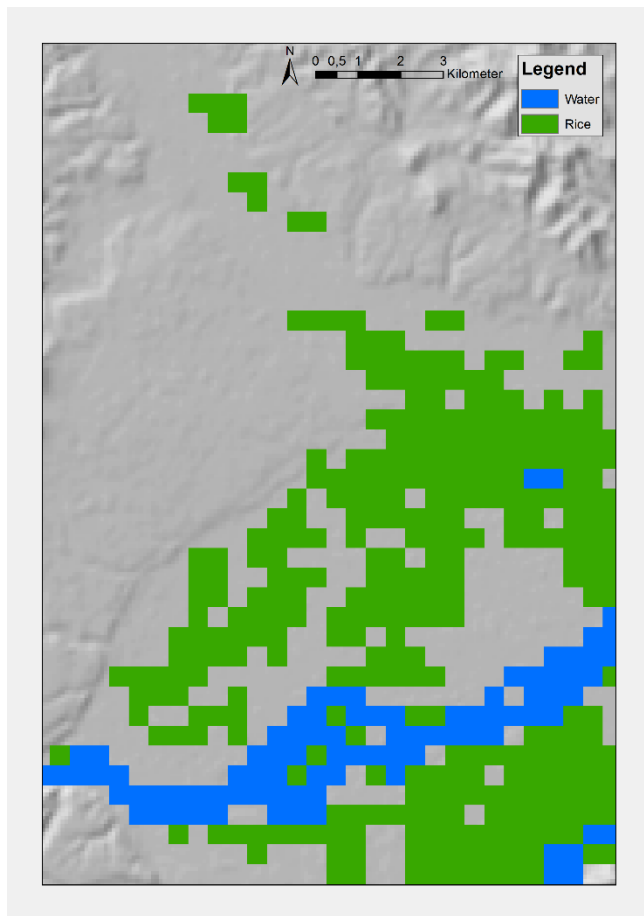
“The G-ECO-MON project and resulting Earth observation based products were a great asset to our efforts in ecosystem accounting. ”

Daniel Juhn, Conservation International

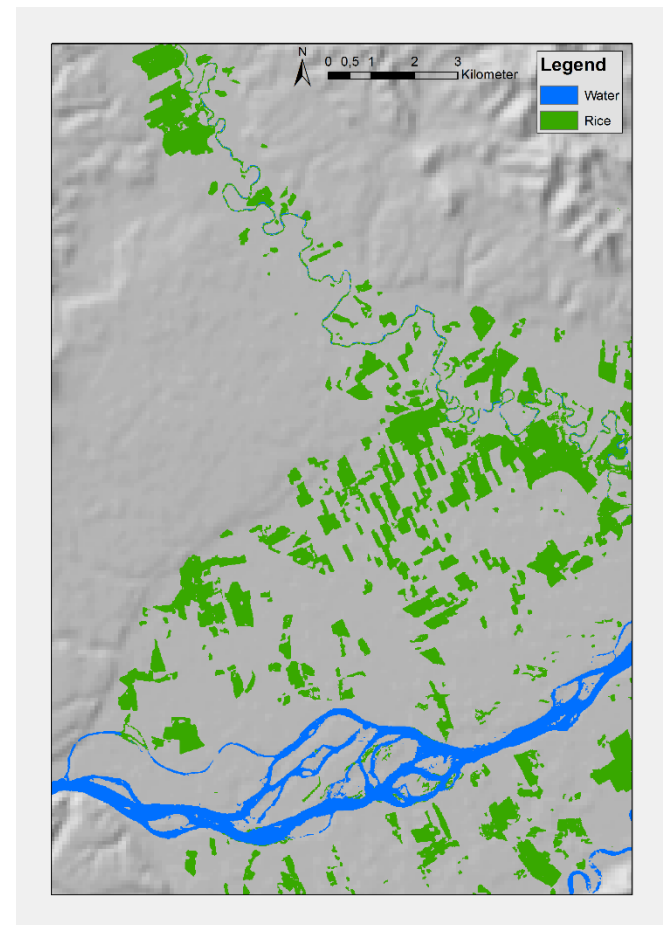


G-ECO-MON – San Martin, Peru

Towards free, high spatial resolution data....

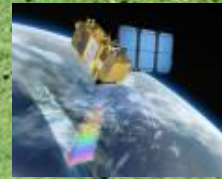


2013 MODIS (500 m)



2013 Landsat-8 (15 m)

The Sentinels



SENTINEL-1

- **Launch:** 3 April 2014 (1A) + 2016 (1B)
 - **Orbit:** Polar, Sun-synchronous at an altitude of 693 km
 - **Life:** Minimum of seven years
 - **Funding:** ESA Member States and the European Union
 - **Instrument:** C-band synthetic aperture radar (SAR) at 5.405 GHz;
 - Interferometric wide-swath mode at 250 km and 5×20 m resolution
 - Wave-mode images of 20×20 km and 5×5 m resolution (at 100 km intervals)
 - Strip map mode at 80 km swath and 5×5 m resolution
 - Extra wide-swath mode of 400 km and 20×40 m resolution
 - **Global coverage**
 - **Near-real time data access**
 - **All weather, day and night, cloud free imagery**
 - **Revisit time:** Six days from two-satellite constellation
 - **Main applications:** Monitoring sea ice, oil spills, marine winds & waves, land-use change, land deformation among others, and to respond to emergencies such as floods and earthquakes
- 
- A Sentinel-1 satellite is shown in orbit above the Earth's surface. The satellite is a long, rectangular structure with multiple solar panel arrays extending from its sides. It is positioned diagonally across the frame, with the Earth's horizon and clouds visible below. The background is the deep black of space.

SENTINEL-2

- **Launch:** Sentinel-2A in April 2015, Sentinel-2B in 2016
- **Orbit:** Polar, Sun-synchronous at altitude of 786 km
- **Life:** Planned for seven years (carries consumables for 12 years)
- **Funding:** ESA Member States and the European Union
- **Instrument:** Multispectral imager (MSI) covering 13 spectral bands with a swath width of 290 km and spatial resolutions of 10 m (4 visible and near-infrared bands), 20 m (6 red-edge/shortwave-infrared bands) and 60 m (3 atmospheric correction bands)
- **Global coverage**
- **Revisit time:** Five days from two-satellite constellation (at equator)
- **Main applications:** Monitoring agriculture, forests, land-use change, land-cover change; mapping biophysical variables such as leaf chlorophyll content, leaf water content, leaf area index; monitoring coastal and inland waters; risk mapping and disaster mapping



An aerial photograph of a river delta, likely the Amazon, showing a complex network of channels and islands. A semi-transparent grey rectangular box is centered horizontally across the middle of the image, containing the text 'THANK YOU FOR YOUR ATTENTION'.

THANK YOU FOR YOUR ATTENTION

www.space4ecosystems.com

haas@geoville.com