Gallery of images

Examples and definitions of human impact on forestry landscapes

International Institute for Applied Systems Analysis

Human Impact on Forests Campaign, 2019

Human Impact on Temperate Forests

Content

OUR TASK: Identify tree age and level of human impact on forest

Full Definitions

1 Forest with very low human impact - forest not affected by human

- **"not disturbed"** - natural forest without any disturbances within the blue box and in the distance of **500 m** (5 blue boxes) in any direction from the blue box.
- **"with human impact nearby" -** forest in the blue box is not disturbed, but there are roads situated nearby (**within 500 m in any directions from the blue box**), mainly protected forest areas belong to this class (check Bing images with labels)
- **"abandoned crops/pasture" -** blue box area used to be cropland or pasture. Nowadays it is left abandoned for more than 5 years and there are sings of natural afforestation. There might be active cropland/pasture in surroundings.
- **"degraded or disturbed"** - no human activities in the blue box or nearby. The forest is disturbed due to wildfire, windthrow, flooding or insect/diseases outbreaks.

2 Forest with signs of clear-cut, selective logging and forest replanting - managed forest with signs of logging or clear cuts in the blue box or nearby

- **"naturally regrow forest (incl. selective logging)"** - forest is managed (signs of clear cut and logging in the blue box or in surroundings), but no planting.
- **"replanted forest"** - forest is managed and has planting origin. Replanted forest differ from the plantations by longer rotation time (over 20 years) and consists of native species.
- **"regeneration type is not clear"** - forest is managed, but we are not sure if it is planted or naturally regenerated.

3 Plantations - short rotation timber plantations (20 years max) or fruit trees

- **"woody plantations"** - short rotation (20 years max) timber plantations typically consists of non-native species: eucalyptus or hybrid poplar
- **"fruit trees (olives, apples, nuts, cocoa, etc.)"**
- **"oil palm (or other palms)" -** palms have very distinguishable crown shape.
- **"not sure if tree crops or woody plantations" -** in case we cannot distinguish between timber and fruit plantations

4 Other landscapes - trees in agriculture or urban environment

- **"Tree shelter belts, small forest patches" -** group of trees on cropland/pastures in lines or patches
- **"Agro-forestry/sparse trees on agriculture fields" -** individual trees on cropland or pasture, or mixed crops. There should be at least 4 large trees in the blue box
- **"Shifting cultivation"** - a form of agriculture, in which an area is cleared of vegetation and cultivated for a few years and then abandoned for a new area until its fertility has been naturally restored. Usually you can see pieces of land with all the stages of this process.
- **"trees in urban/built-up areas"** - buildings or infrastructure dominant the blue box or surroundings.

Characteristics of Temperate forests

(1) There are evergreen forest as well as deciduous with clear seasonality. See the example below:

(2) There are many replanted forests, in particular - China, Europe, and the USA

(3) Woody plantations (rotation time<20 years), they include mostly: eucalyptus, hybrid poplar, willow and pine. Mainly in Chile (South America), in South Africa, on the south of Australia, in Spain and Portugal, China and more.

(4) Majority of the forest is managed. Please check Bing images with labels to find out if this is a protected forest.

(5) Oil palms are rare. There are lots of fruit plantations that should not be classified as agroforestry – but as fruit trees.

These 4 themes represent different levels of human impact on forests:

1 Forest with very low human impact

Intact, primary forest. It is forest where biodiversity is not disturbed by human. There might be some paths or roads in the forest, but wild animals live there (almost) not bothered by people.

2 Forest with signs of clear-cut, selective logging and forest replanting

Human activities are visible. Parts of the forest have been cut, you can see selective logging. Because of clearcut or logging, the forest then can be naturally regrowing or replanted. Wild animals still live there and find food, but their natural habitat is disturbed.

3 Plantations

Plantations are forests with very high human impact. Natural forests have been cleared in order to plant trees under cultivation. The natural environment of animals is replaced.

4 Other landscapes

Other landscapes also represent very high level of human impact on forests. They can look like scattered trees on agriculture fields, houses built within the forest or trees in urban areas.

Step 1: Choose age of the tree

- Young
- Middle-aged
- Mature
- Mixed
- No trees

Step 2: Choose only ONE class from the 4 themes

1 Forest with very low human impact OR

- Not disturbed
- With human impact nearby (roads, deforestation,etc)
- Abandoned crops/pasture
- Degraded or disturbed (fire, wind, insects)

2 Forest with signs of clearcut, selective logging and forest replanting OR

- Naturally regrow forest (incl. selective logging)
- Replanted forest
- Regeneration type is not clear

3 Plantations OR

- Woody plantations
- Fruit trees (olives, apples, nuts, cocoa, etc.)
- Oil palm (or other palms)
- Not sure if tree crops or woody plantations

4 Other landscapes

- Tree shelter belts, small forest patches
- Agro-forestry or sparse trees on crop/pasture field
- Shifting cultivation
- Trees in urban/built-up areas

- None of the above

Tree age

Visual estimate of the size of trees in comparison with surroundings

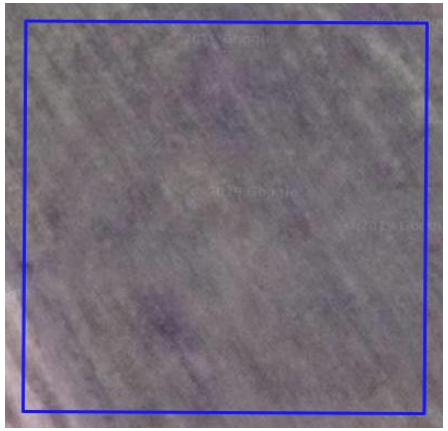
Young

Middle-aged

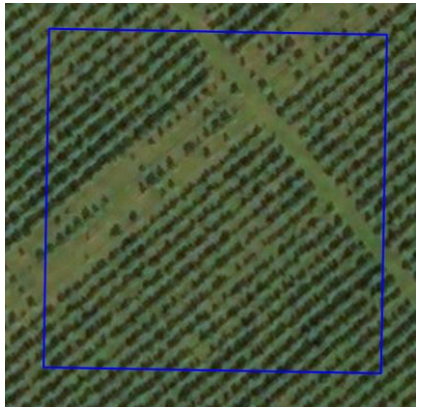
Mature

Mixed

No trees



Young

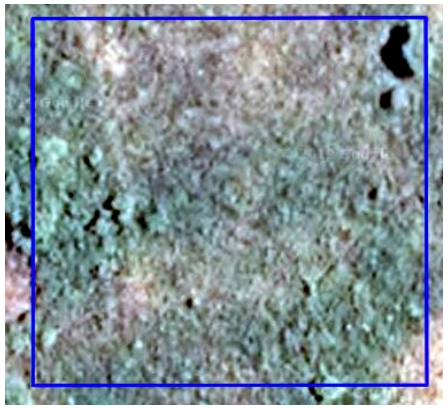


Middle-aged

Mature

Mixed

No trees



We use mixed tree age when we see minimum 20% area with different tree age inside the blue box.

1. Forest with very low human impact

We observe mature not disturbed forest on the hills and agriculture fields in the valley (away from the blue box, but still closer than 500 m). This is forest with human impact nearby.

Forest with very low human impact

- Not disturbed
- With human impact nearby (roads, deforestation,etc)
- Abandoned crops/pasture
- Degraded or disturbed (fire, wind, insects)

1. Forest with very low human impact

Not disturbed

On this example you can see mature forest in Russia, which is not disturbed. There are no signs of human interference or non-human disturbance neither in the blue box, nor in the surroundings (in 500 m. distance to all directions). We use the most recent available image to prove our decision.

1. Forest with very low human impact

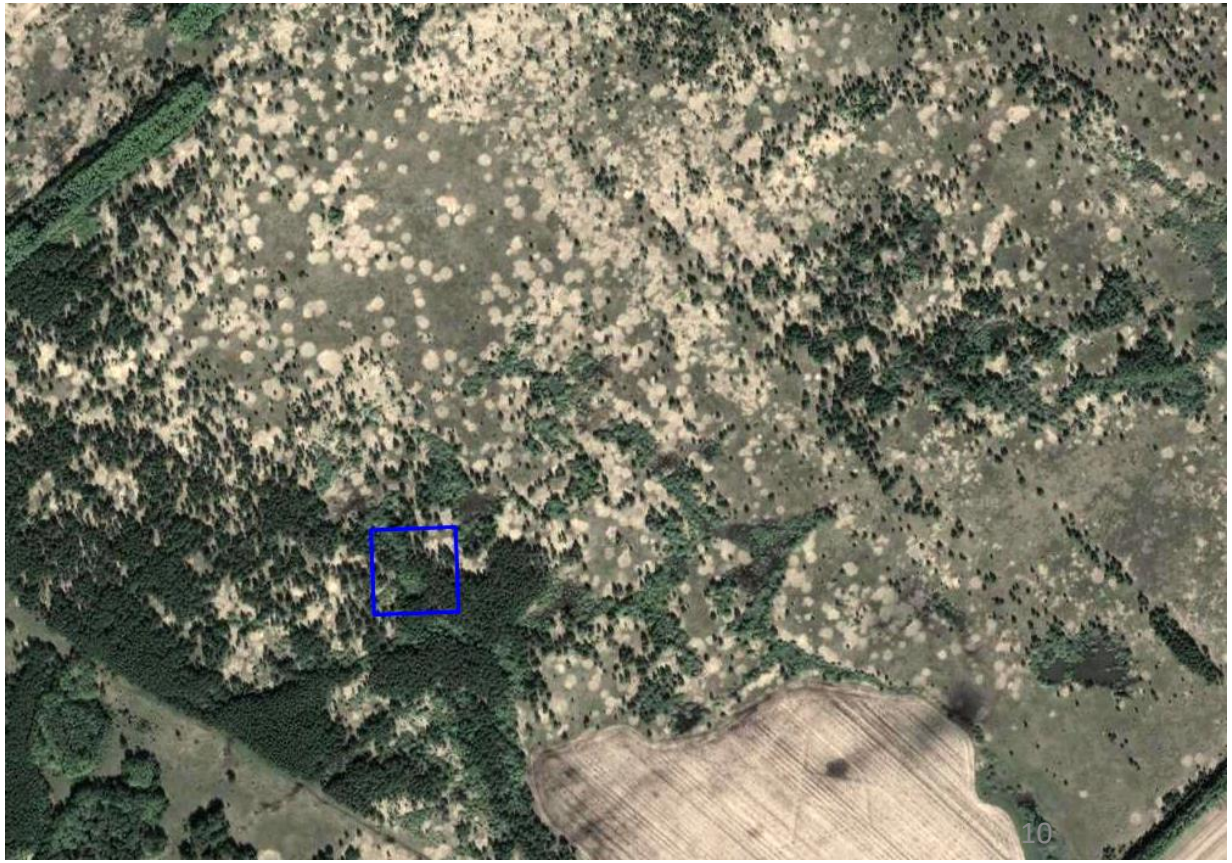
With human impact nearby

Here you see mature forest in Australia. There is a road upper the blue box, but the box itself is not disturbed and there are no signs of tree harvest within 500 m in all directions from it. Very low human impact nearby may refer to roads outside the blue box without tree cut or planting.

1. Forest with very low human impact

Abandoned crops/pasture

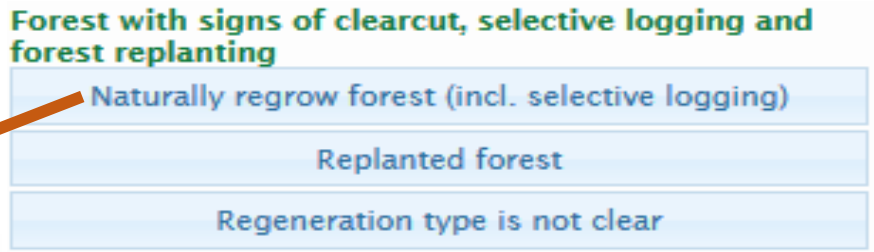
Below you see examples of abandoned cropland in Russia. One can recognize the shape of agriculture fields with natural afforestation on them.



2. Forest with signs of clear-cut, selective logging and forest replanting

Naturally regrow forest

This is an example of naturally regrow forest in British Columbia, Canada. Tree age is mixed because the forest was cut and now we see that it is regrowing. We see also forest roads, which people use to transport the trees.



The class “Replanted forest” is **very usual** landscape for temperate forests.
The class “Regeneration type is not clear” means that it is visually unclear if forest is naturally regrow or replanted, we don’t have enough information to decide. Both classes are very likely in temperate forests.

Forest with human impact nearby (roads, deforestation etc.)
is very different from
Naturally regrow forest (incl. selective logging)

Forest with very low human impact

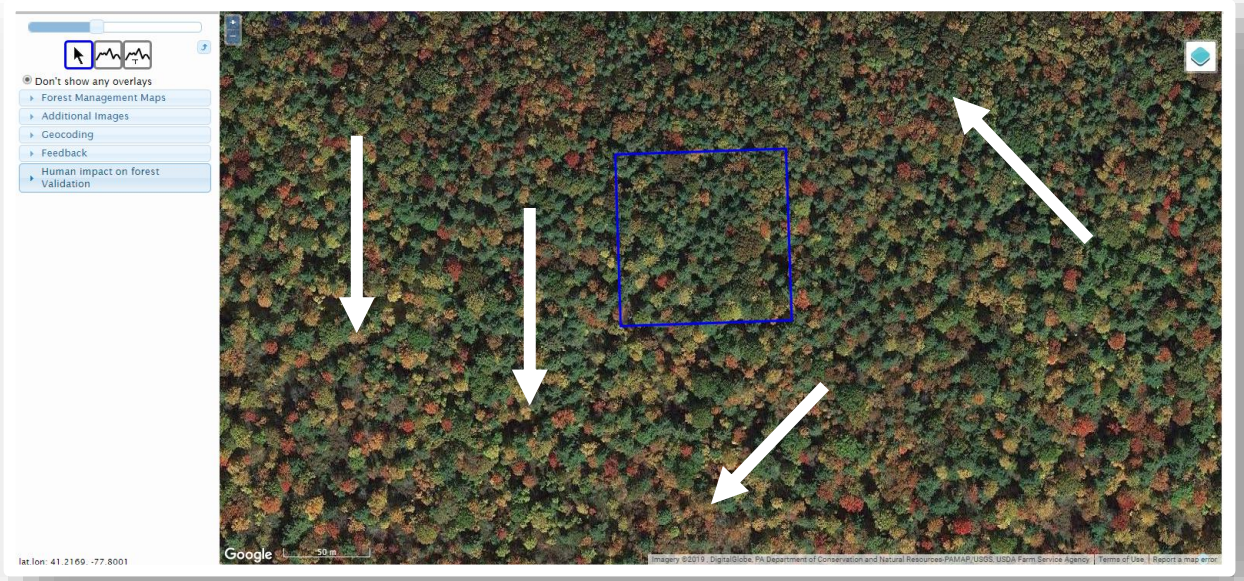
- Not disturbed
- With human impact nearby (roads, deforestation,etc)
- Abandoned crops/pasture
- Degraded or disturbed (fire, wind, insects)

≠

Forest with signs of clearcut, selective logging and forest replanting

- Naturally regrow forest (incl. selective logging)
- Replanted forest
- Regeneration type is not clear

This is primary forest, mature tree age, with very low human impact nearby. The white arrows show small forest roads. Choose this class when you observe signs of human activities within 500m. in all directions from the blue box, but **no** human activities in the blue box. The forest must be primary, not cut, not replanted.



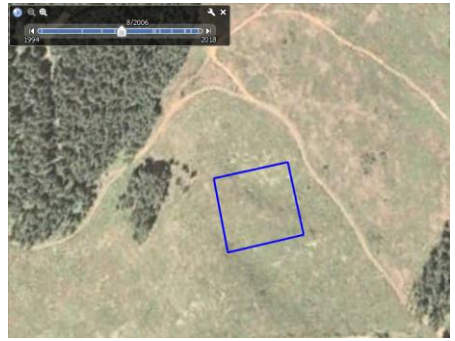
Here forest was cut. Inside the blue box, new trees are growing but there are few mature trees, so we identify their age as mixed. This is naturally regrow forest. Very often there are cropland or urban areas close to forests of this class.

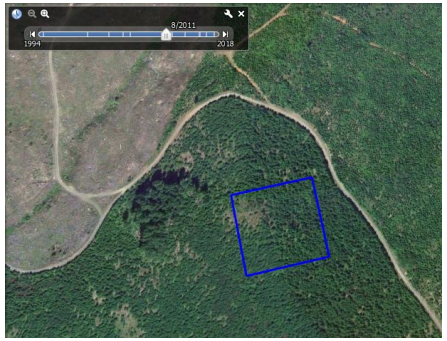
2. Forest with signs of clear-cut, selective logging and forest replanting

Replanted forest

We define replanted forest as every forest, which has longer rotation time than 20 years! Typically it consists of native species (i.e. oak, pine trees, spruce), which need more time to get mature.

On the image below you see replanted forest in California, USA. On the right side you see images from Google Earth, which show that the forest was planted around 2006 and 2018 it looks like middle-aged forest.





2. Forest with signs of clear-cut, selective logging and forest replanting

Replanted forest

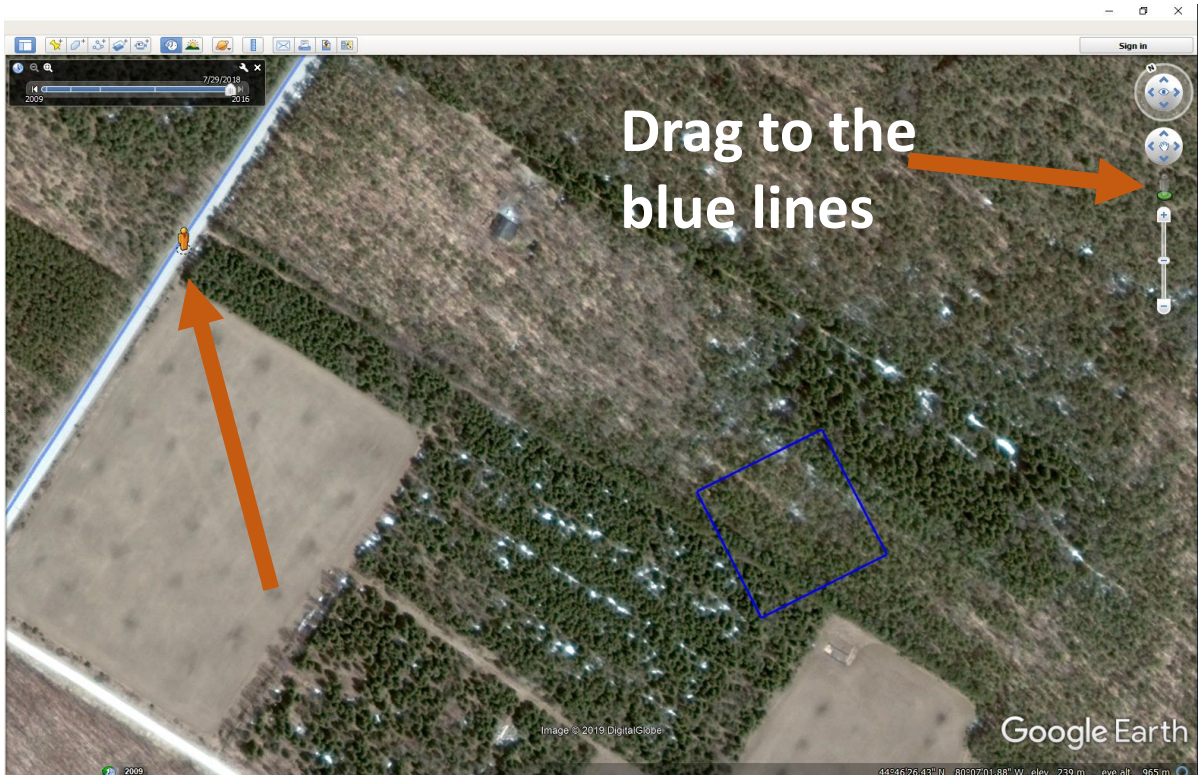
This is replanted forest in Louisiana, USA. We see thinning here, removing smaller, weaker and poorer quality trees with the purpose of increasing growth of the remaining trees. Thinnig might be done several times during the rotation period of trees, it is a sign that the forest has been replanted.

2. Forest with signs of clear-cut, selective logging and forest replanting

Replanted forest TIPS for validation

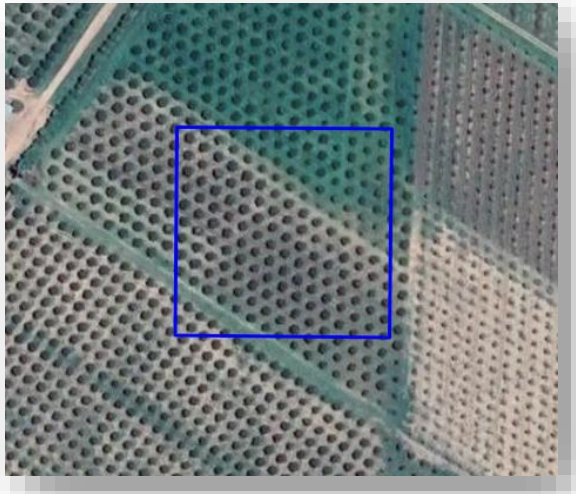
Always use Geo-Wiki zoom button to see where you are located

Use Google Earth *history view* to see if the forest was planted, when it was planted and also to track changes; use Street view to have a look at trees, see below:

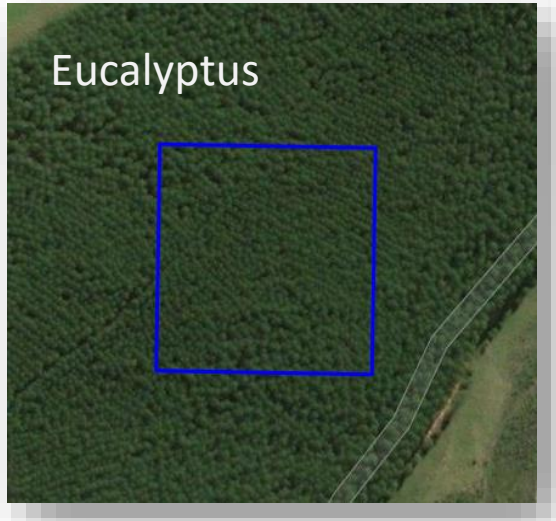


3. Plantations

Fruit trees



Woody plantation



Oil palms
not usual for temperate zone

Not sure if tree crops or woody plantation

Fruit Tree Plantation

Example for mature, fruit tree plantation. The trees are not very dense planted, that is why we know that they are fruit trees, but not woody plantations. Shelter belt along the road covers a small portion of the blue box and therefore not accounted.

Fruit Tree Plantation

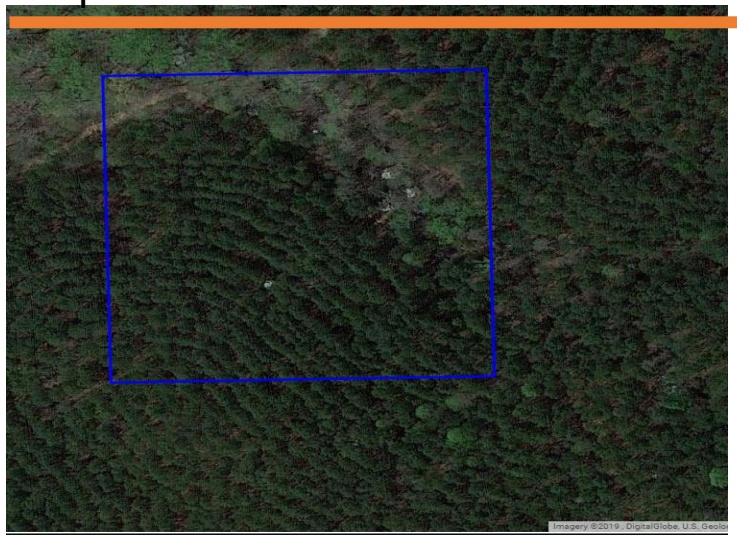
Fruit tree plantations in Ukraine. They are surrounded by tree shelter belts very often.

Fruit Trees & Replanted Forest

Fruit Trees

Fruit trees are not very dense planted. They are not so big trees, reach usually up to 2-3 meters height. Also they are often separated through tree shelter belts. Fruit trees are also not planted on vast areas.

Replanted Forest



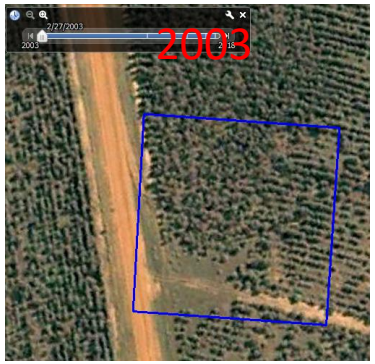
Replanted types of trees are usually bigger, when they reach matureness they are huge, have big crowns and are very tall. They are planted denser. If the forest is thinned (like the second image), we can look at the Google Earth history view to track changes.

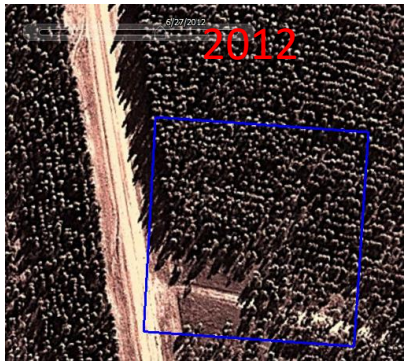
Woody Plantations (eucalyptus)

This is an example for <u>woody plantation</u> - <u>young</u> eucalyptus trees in Swaziland, Africa.

Important:
In temperate zone, you can see eucalyptus plantations mainly in Chile (South America), in South Africa, on the south of Australia, in Spain and Portugal, China and more.

Below are 4 images from Google Earth for the same location to show the short rotation time, in which eucalyptus trees are cut, replanted and cut again.





Google Earth Time Series
2003 – young
2012 – mature
2014 – cleaned
2017 – young,
next generation

Woody Plantations (eucalyptus)

Here we see eucalyptus plantations in Chile, South America. Forest with short rotation time (max.20 years)

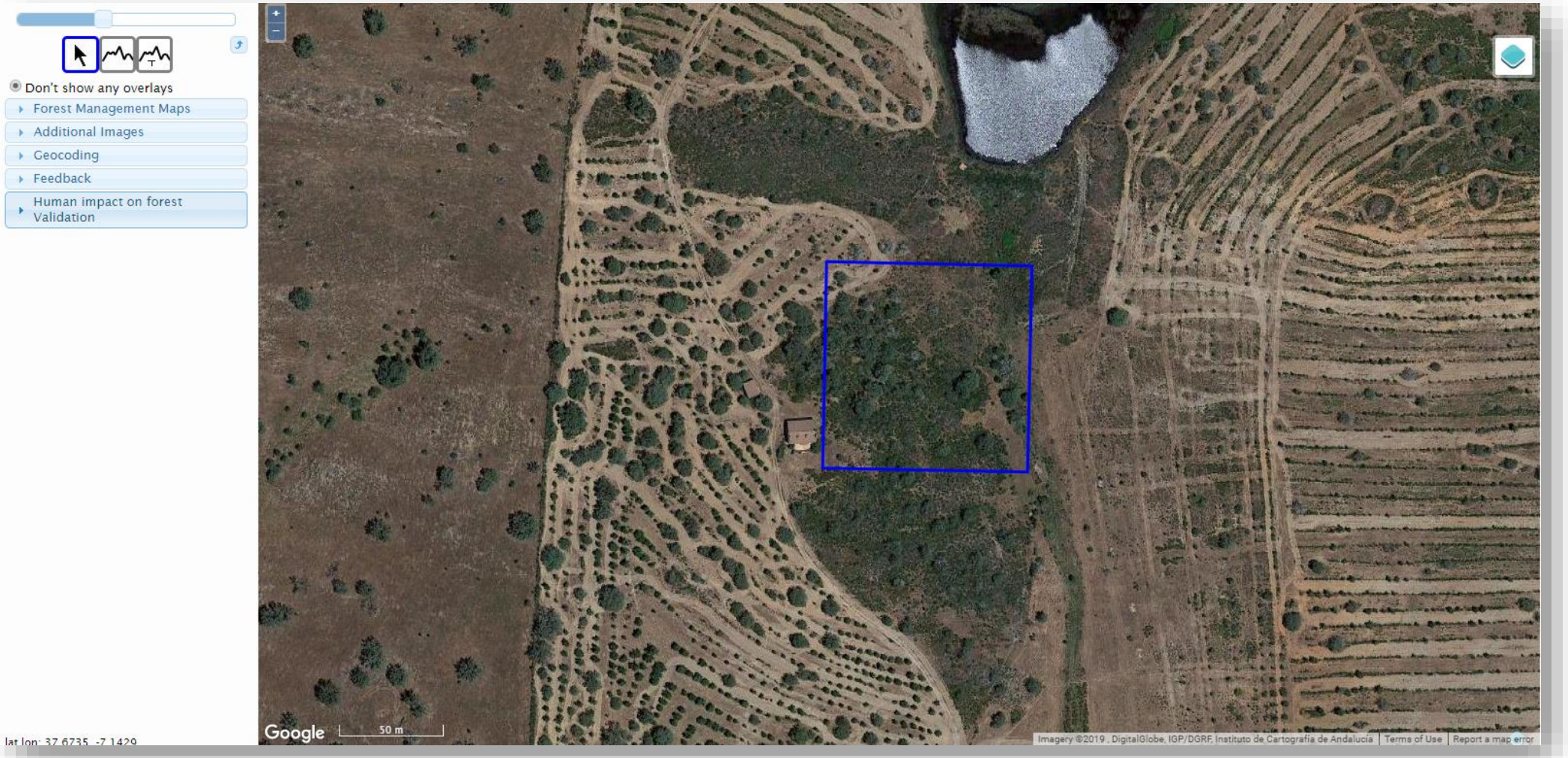
4. Other landscapes

Tree shelter belts, small forest patches

Below you see tree shelter belts with mature tree age in Ukraine.
Tree shelter belts are corridors of trees less than 20 meters wide. However tree shelter belts in South America make exception, here corridors can be up to 50 meters wide, or more.

Tree shelter belts, small forest patches

This is an example for small forest patches in Portugal.



Agro-forestry/sparse trees on agriculture fields

This is an example of sparse trees on agricultural fields in Australia, mature tree age. We chose the clas when we visually can tell that around 5% (more than 4 trees with big crowns) of the blue box is covered by trees.

Landscapes with less than 5% tree cover we consider as no forest -“none of the above”.

Shifting cultivation

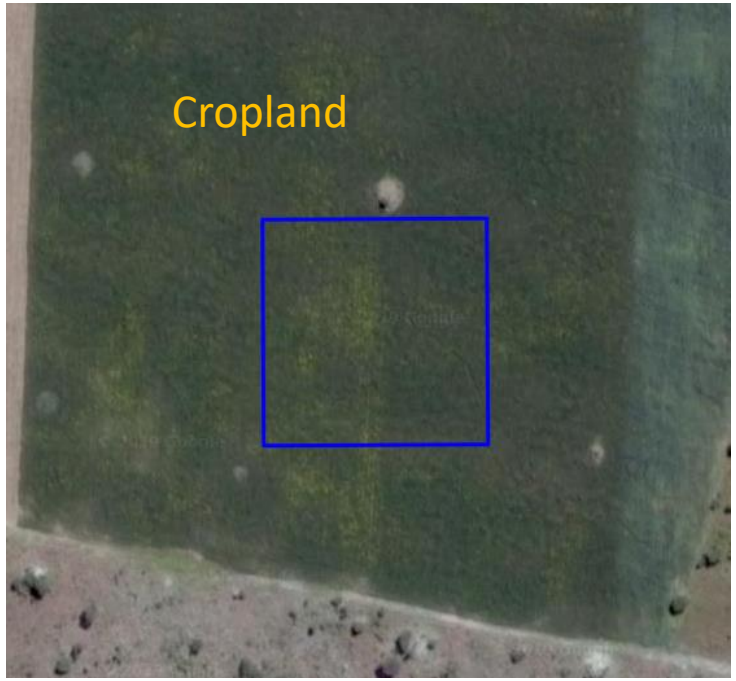
Shifting cultivation - local people recut forest, use the clean area for agricultural activities for a while and then abandon it. We can trace all the changes of land use in the surroundings.

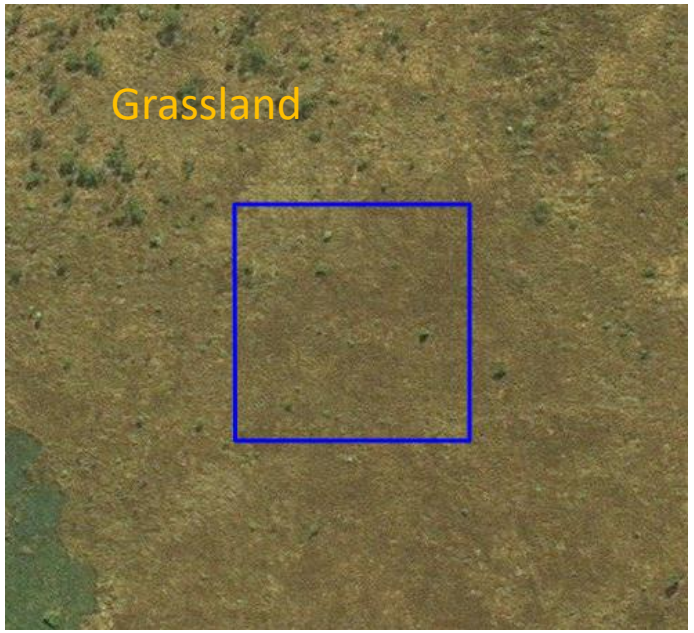
Trees in urban/built-up areas

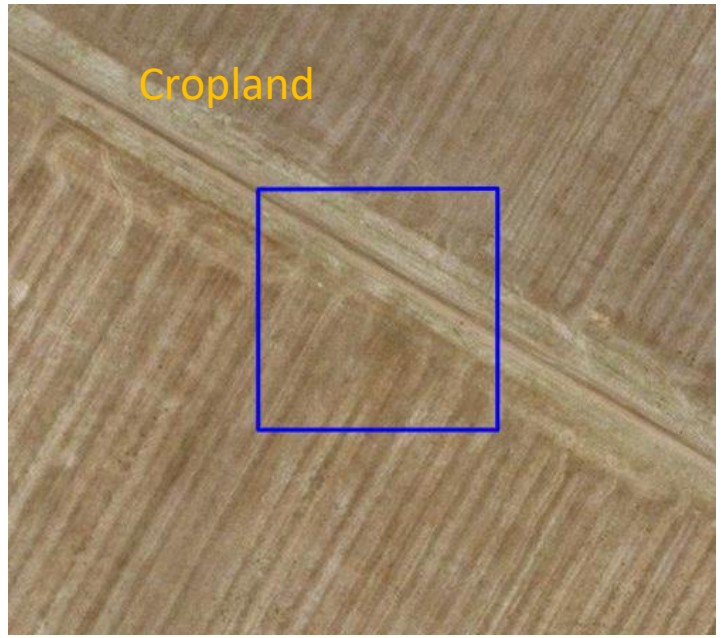
Example for mature trees in urban/built-up areas in Jamaica.

Example for mature trees in urban/built-up areas in Sri Lanka

None from the above

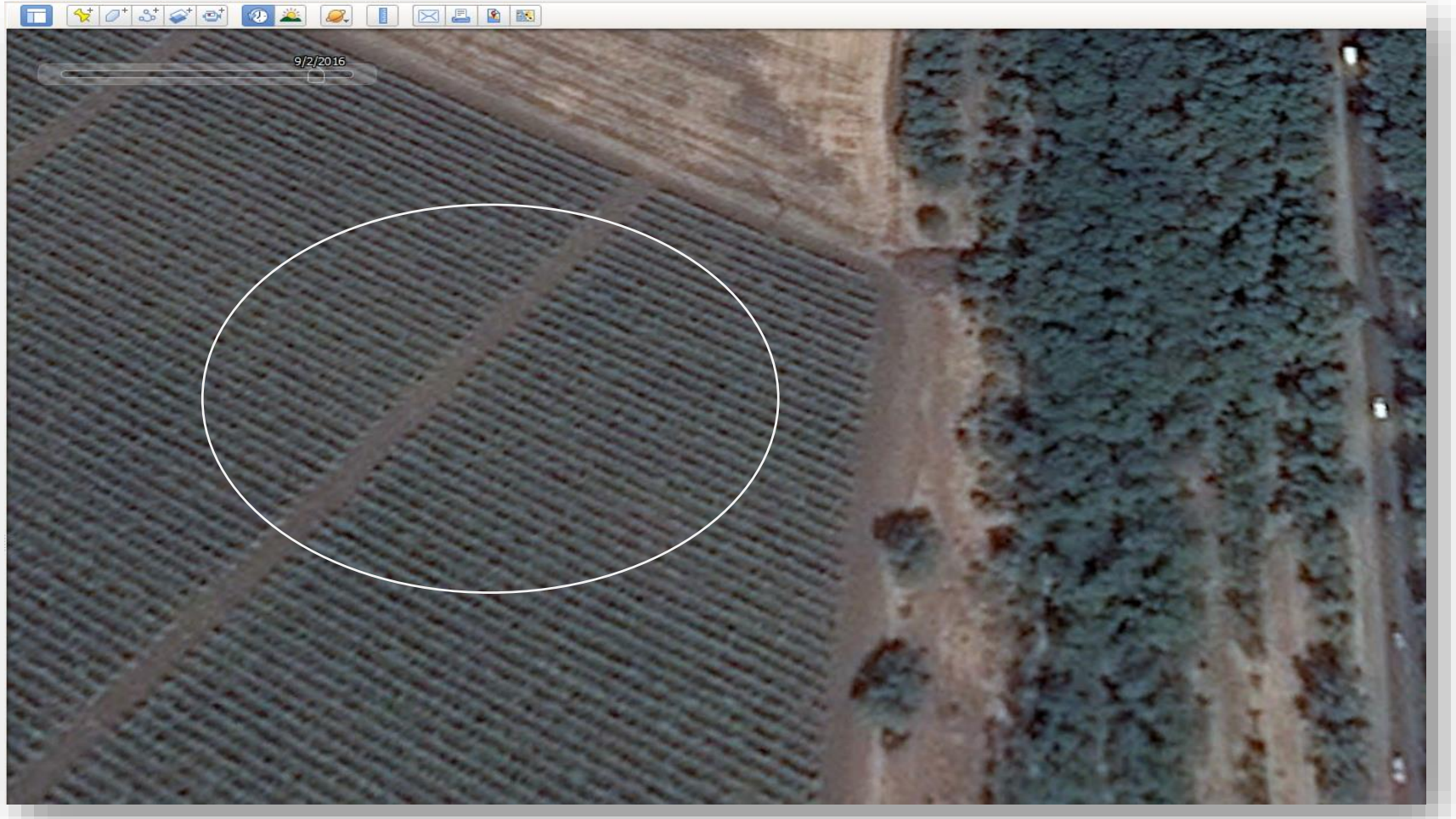






Vineyards are not forests!

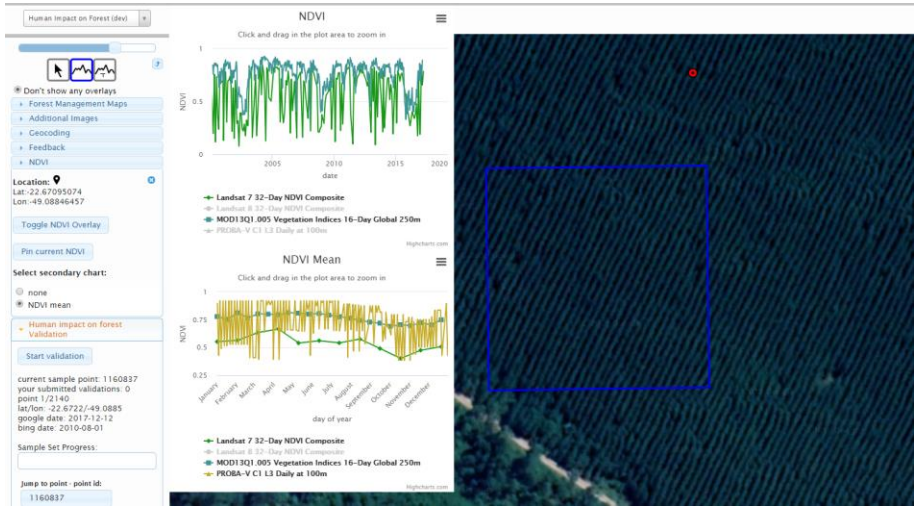
Correct classification – None of the above



NDVI tool (Normalized Difference Vegetation Index)

In certain cases you can also use the NDVI tool, an index of greenness showing dynamics of vegetation for a certain location. Below is an example of eucalyptus plantations in Africa. Here NDVI indicates the short rotation time of the plantation, less than 10 years (see e.g. 1, 2). The lower values show that the trees were cut in 2002, then eucalyptus trees were replanted, grew mature and in 2009 were cut again and replanted. In 2016 they were already mature - cut again, and replanted - rotation. Historical imageries from Google Earth (see e.g. 3) confirm the same observation.

1



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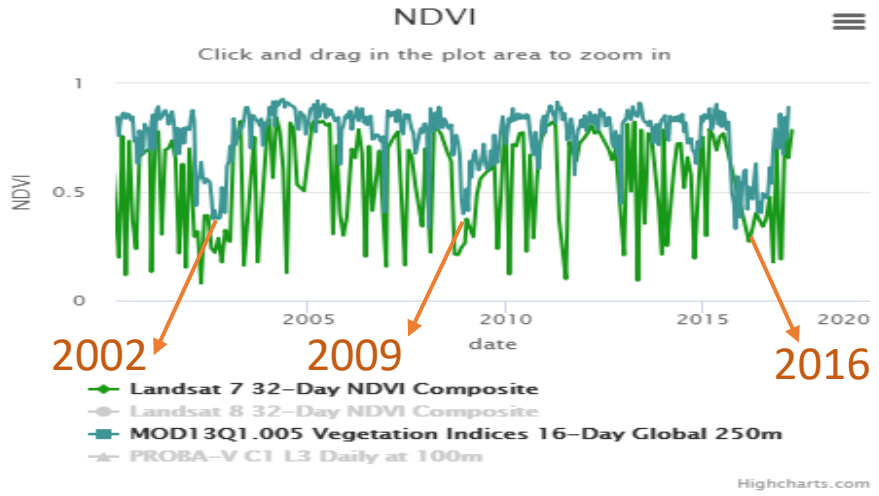

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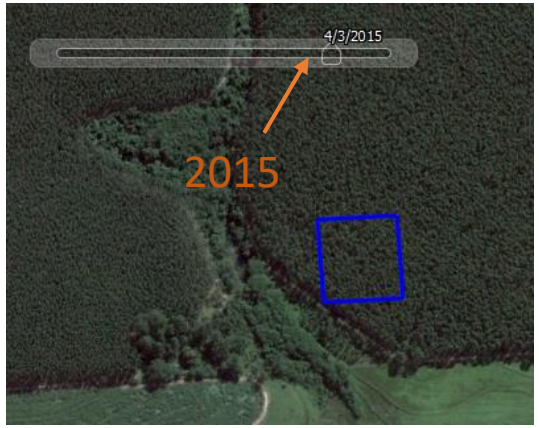
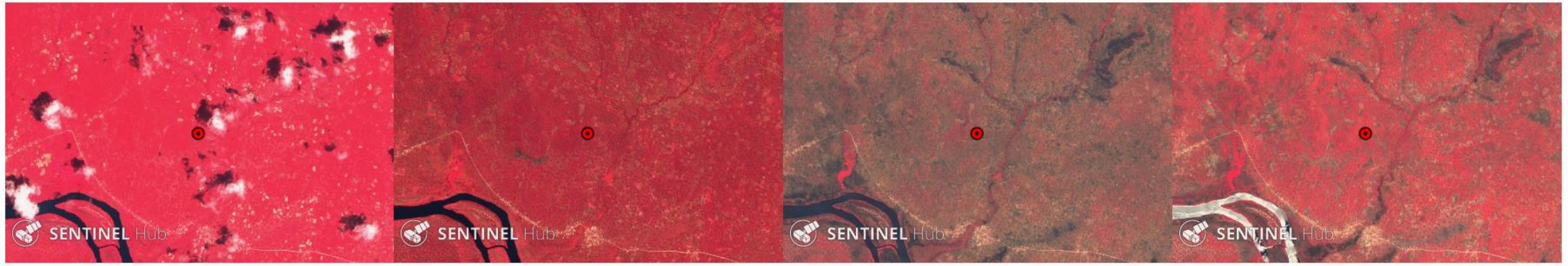


Time Series Sentinel Hub

Another tool which may be useful in certain cases as well, is Sentinel Time Series derived form Sentinel Hub. Below you can see images from 2016 and 2017 during the different seasons in Zambia, Africa. The intensive red color shows that there are mostly green trees or vegetation. There are no major changes in the landscape during 2016 as you can see. In 2017 we observe that forest was cut and big irrigation system was built. We can identify the gradual development of the irrigation system, where people probably pump out water from the river in order to irrigate crops.
In general we use Sentinel Hub to track changes in landscapes.

2016



2017