

# Naturetrade: creating a marketplace for ecosystem services



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# Oxford Long-Term Ecology Lab

Long-Term Ecology, Biodiversity Conservation, and Environmental Stewardship Technologies

<https://oxlel.zoo.ox.ac.uk>



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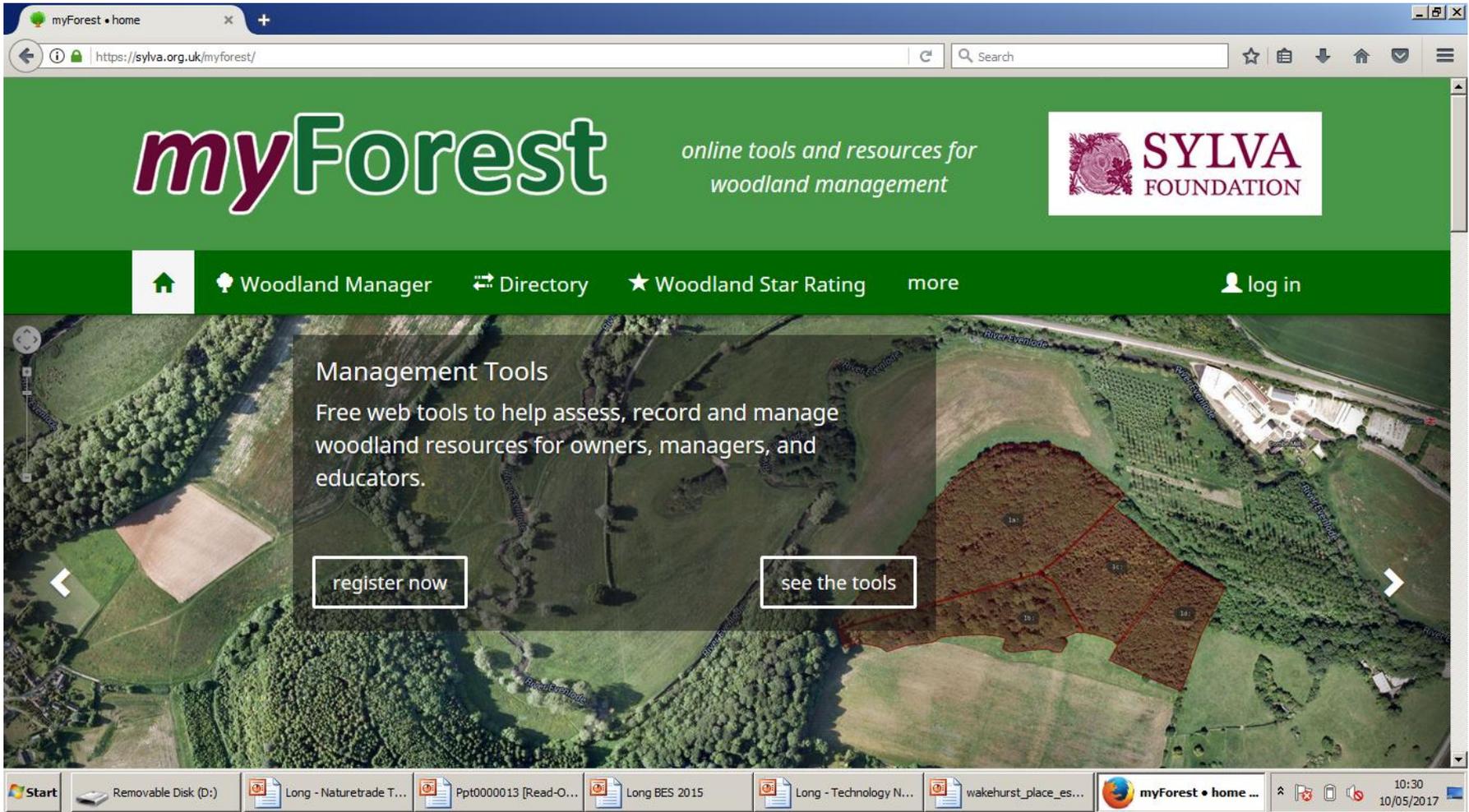
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Biodiversity Research**

**Global Research**  
From local field sites to global tools

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Start Removable Disk (...) Long - Naturetra... Ppt0000013 [Re... Long BES 2015 Long - Technolog... wakehurst\_place... Oxford Long-T... Untitled - Paint 10:31 10/05/2017



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https://sylva.org.uk/myforest/

# myForest

online tools and resources for woodland management

SYLVA FOUNDATION

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Management Tools

Free web tools to help assess, record and manage woodland resources for owners, managers, and educators.

register now see the tools

Start Removable Disk (D:) Long - Naturetrade T... Ppt0000013 [Read-O... Long BES 2015 Long - Technology N... wakehurst\_place\_es... myForest • home ... 10:30 10/05/2017



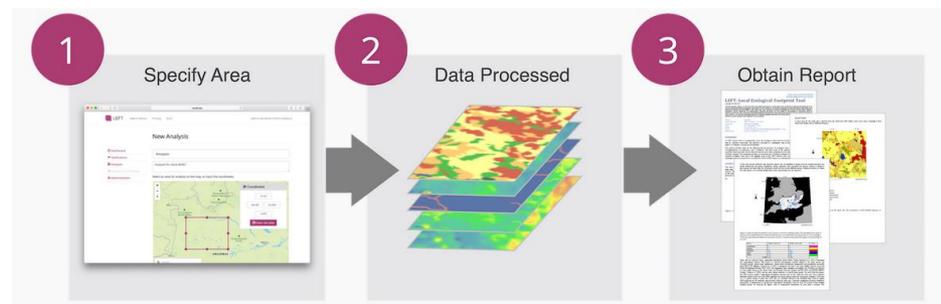
## Local Ecological Footprinting Tool

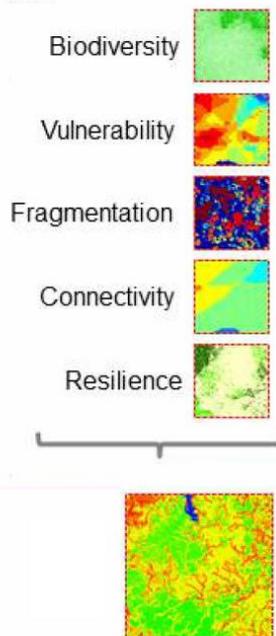
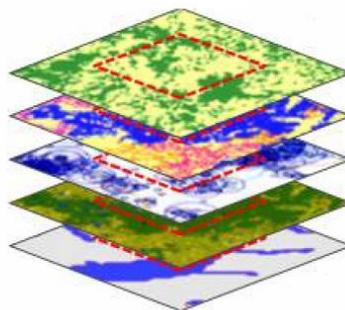
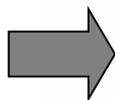
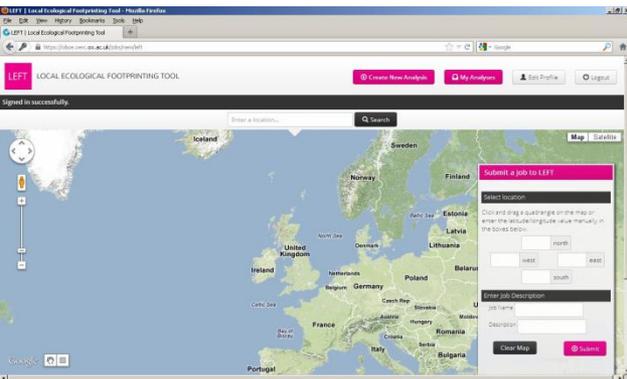
Online mapping tool for biodiversity risk assessments

[www.left.ox.ac.uk](http://www.left.ox.ac.uk)

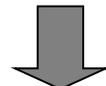


- Very easy to use
- Results are provided quickly
- Excellent science, globally consistent
- High spatial resolution

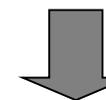




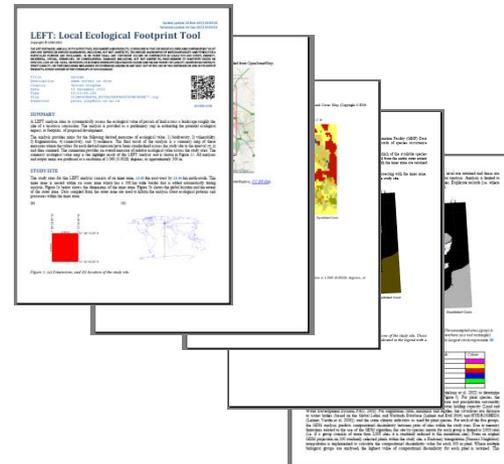
High quality, globally consistent 30m resolution stored data is retrieved for the area.



Data is automatically processed using standard, peer-reviewed algorithms to calculate some measures of ecological value



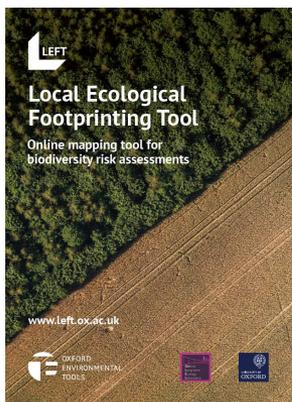
A pdf report is generated and emailed to the user



User specifies an area of interest anywhere in the world using the web interface

[www.left.ox.ac.uk](http://www.left.ox.ac.uk)

Willis et al (2012) Biol Cons



# Naturetrade: creating a marketplace for ecosystem services

## Aim

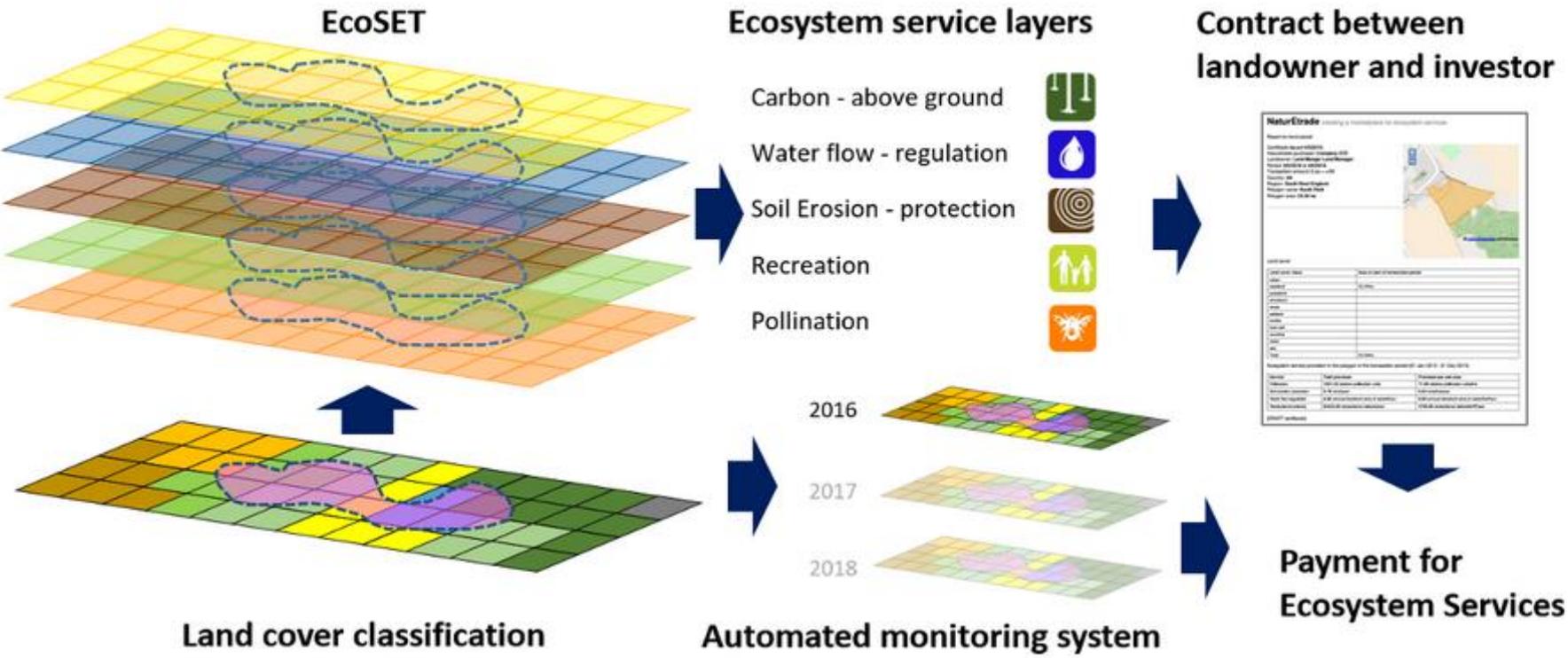
Prevent loss of biodiversity in Europe associated with land cover change

## How?

Demonstration project to create a scalable infrastructure to enable landowners to assess ecosystem services provided by their land and build a web-based trading platform to support payments for ecosystem services.



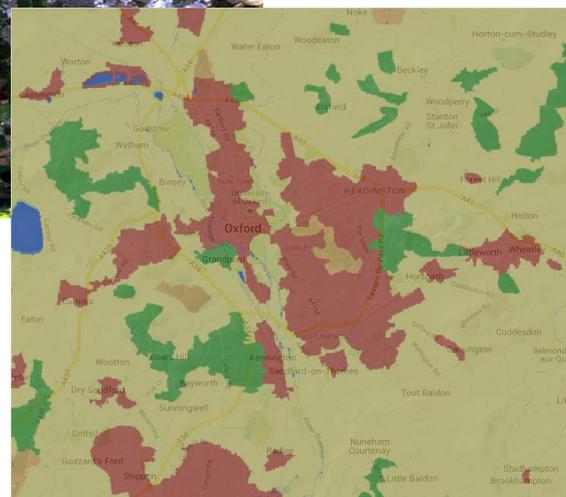
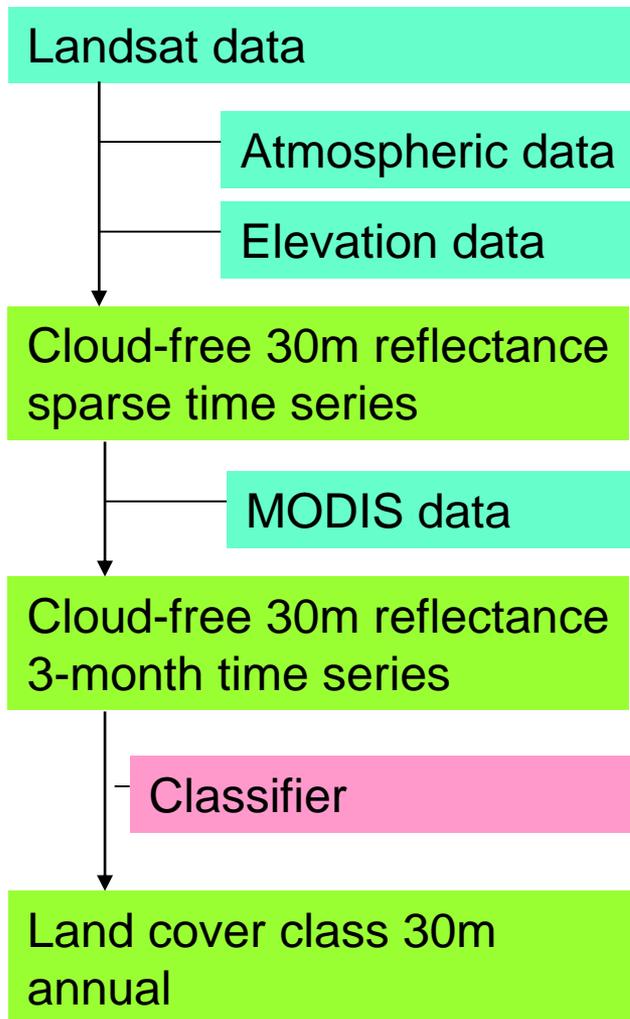
# Naturetrade: creating a marketplace for ecosystem services



# Natural Capital Tool

- land cover
- carbon in AGB
- water flow regulation
- pollination
- recreational amenity
- soil erosion protection

# Land cover



30m resolution

# Soil erosion protection

RUSLE model takes account of...

- Rainfall erosivity
- Soil erodibility
- Slope length
- Slope steepness
- Land cover



The service of soil erosion protection is defined as the amount of avoided soil erosion from a patch of land as a result of the land cover class (trees, crops, etc) compared to how much soil would be eroded at this location if the land cover were bare soil.

Units: tons averted soil erosion / hectare / year

# Pollination

Model takes account of...

- Land cover
- Crop dependence on pollination
- Pollinator geographic distributions
- Nesting habitats requirements of pollinators
- Foraging ranges of pollinators



The service of crop pollination is defined as the degree to which a patch of land provides nesting habitat for pollinators within foraging range of pollination dependent crops.

Units: relative pollination units

# Recreational amenity

Model takes account of...

- Visitor numbers to some places
- Flickr records
- Covariates: land cover, elevation, climate etc
- Human population density (GPW)

Service of recreational amenity is defined as the estimated number of people visiting

Units: visitors / km<sup>2</sup> /year



# Carbon in above-ground biomass

Model takes account of...

- FIA forest plot data (AGB)
- Satellite observations
  - GLAS waveforms
  - Reflective (spectral indices)
  - Structural (BRDF parameters, LAI)
  - Thermal (LST, ATI)
  - Microwave (Ku, C)



The service of carbon stored in above-ground biomass is simply the estimated number of tons of carbon / hectare stored in vegetation.

Units: tons carbon / hectare

# Water flow regulation

Distributed hydrological model takes account of...

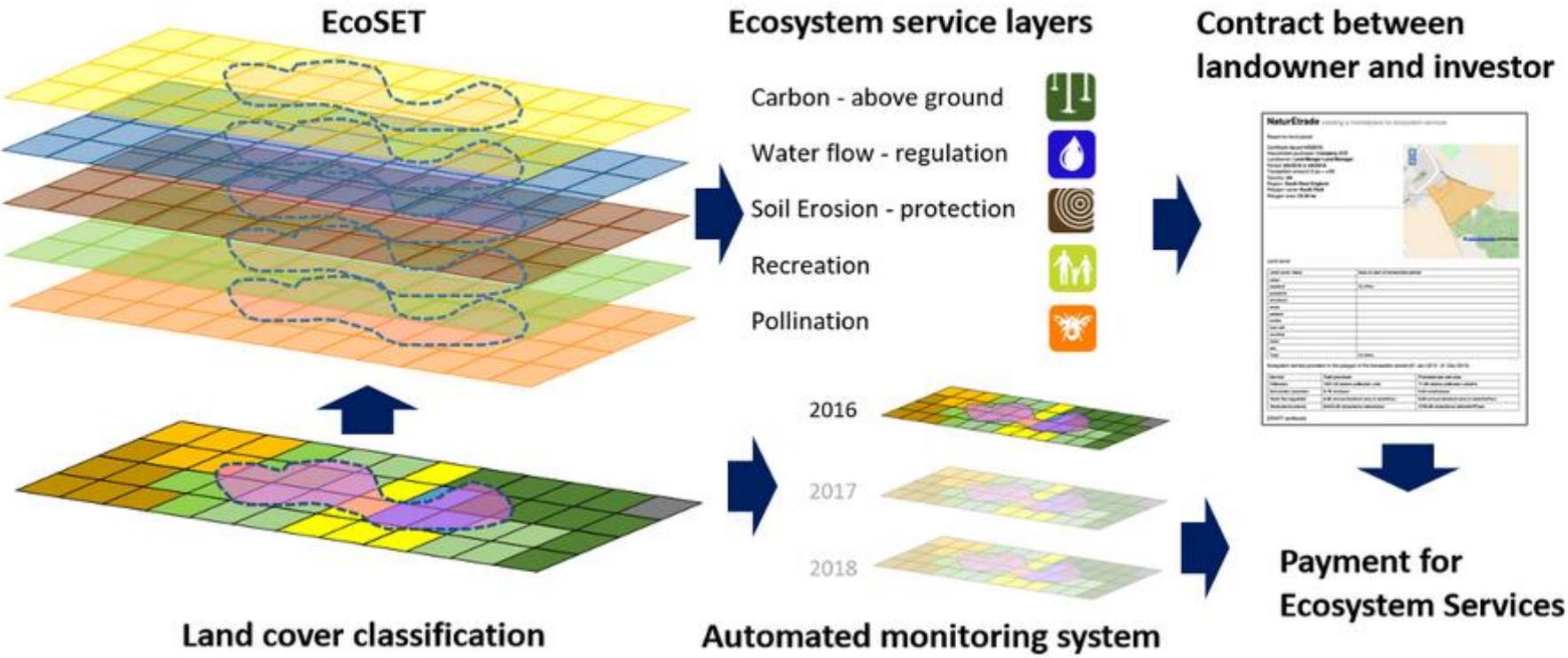
- Meteorological forcing data
- Land cover
- Topographic index
- Soil albedo
- Soil hydrological properties



The service of water flow regulation is defined as as the maximum amount of runoff from a patch of land with a particular land cover class which was averted because of the land cover. This is calculated by comparing to the amount of runoff which would be produced at this location if the land cover were bare soil.

Units: annual maximum tons water / hectare / hour of runoff averted

# Naturetrade: creating a marketplace for ecosystem services



NaturEtrade - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Peter Long - Outlook Web App x NaturEtrade x +

www.naturetrade.ox.ac.uk

Search

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## NaturEtrade creating a marketplace for ecosystem services

A LIFE+ project funded by the EU

NaturEtrade is web-based mapping tool that aims to, where possible, overcome market failures which have resulted in the degradation of natural capital and associated ecosystem services.

It is an easy-to-use ecosystem service evaluation tool and trading platform being developed for landowners to measure the ecosystem services provided by their lands. Beneficiaries of ecosystem services will be able to contract with landowners for the continued and enhanced provision of these services.

**EcoSET**

**Ecosystem service layers**

- Carbon - above ground
- Water flow - regulation
- Soil Erosion - protection
- Recreation
- Pollination

**Contract between landowner and investor**

2016

2017

2018

**Payment for**

## your groups

find property help + add group

Wakehurst Place delete

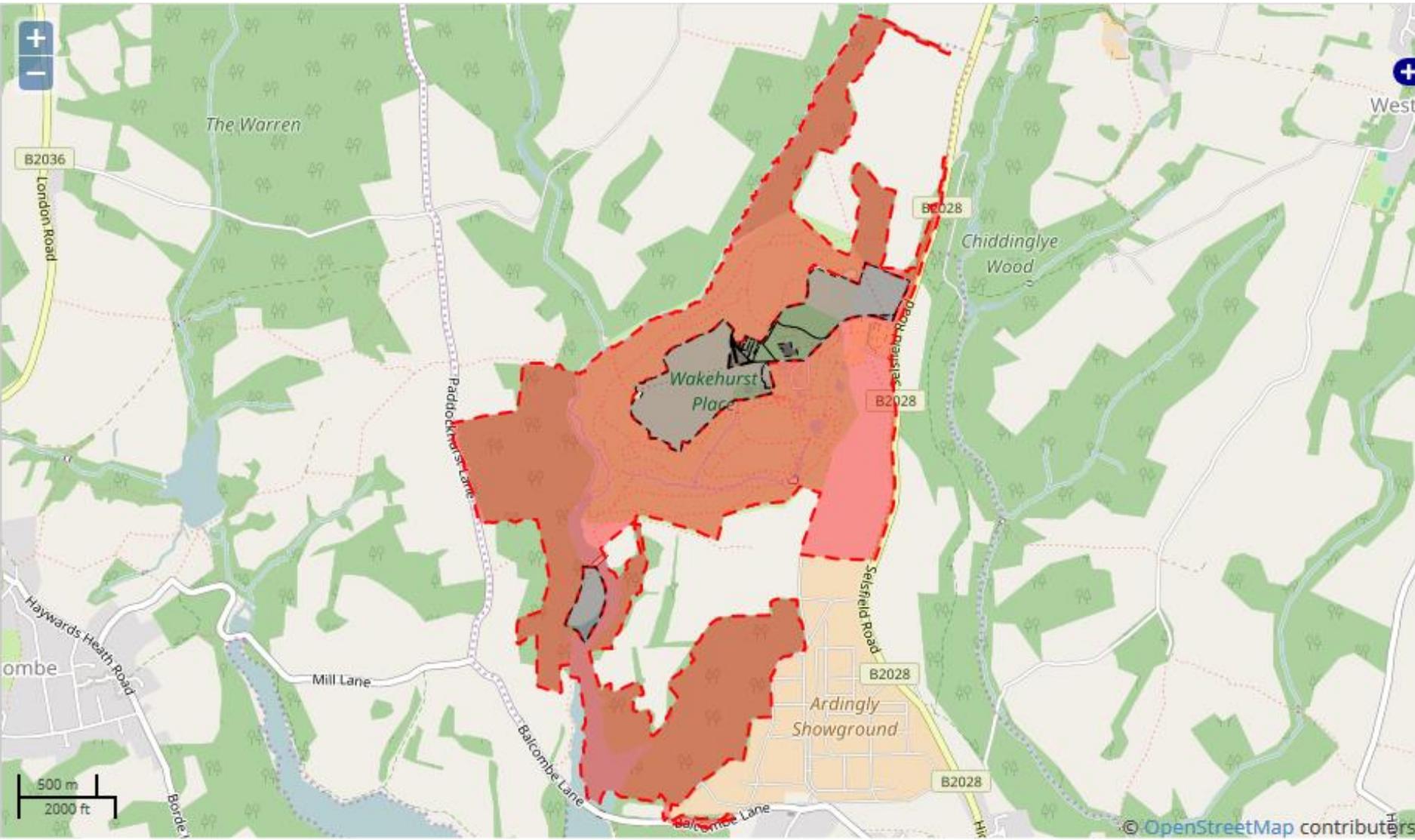
RBG Kew - Wakehurst Place PDF delete

+ add polygon

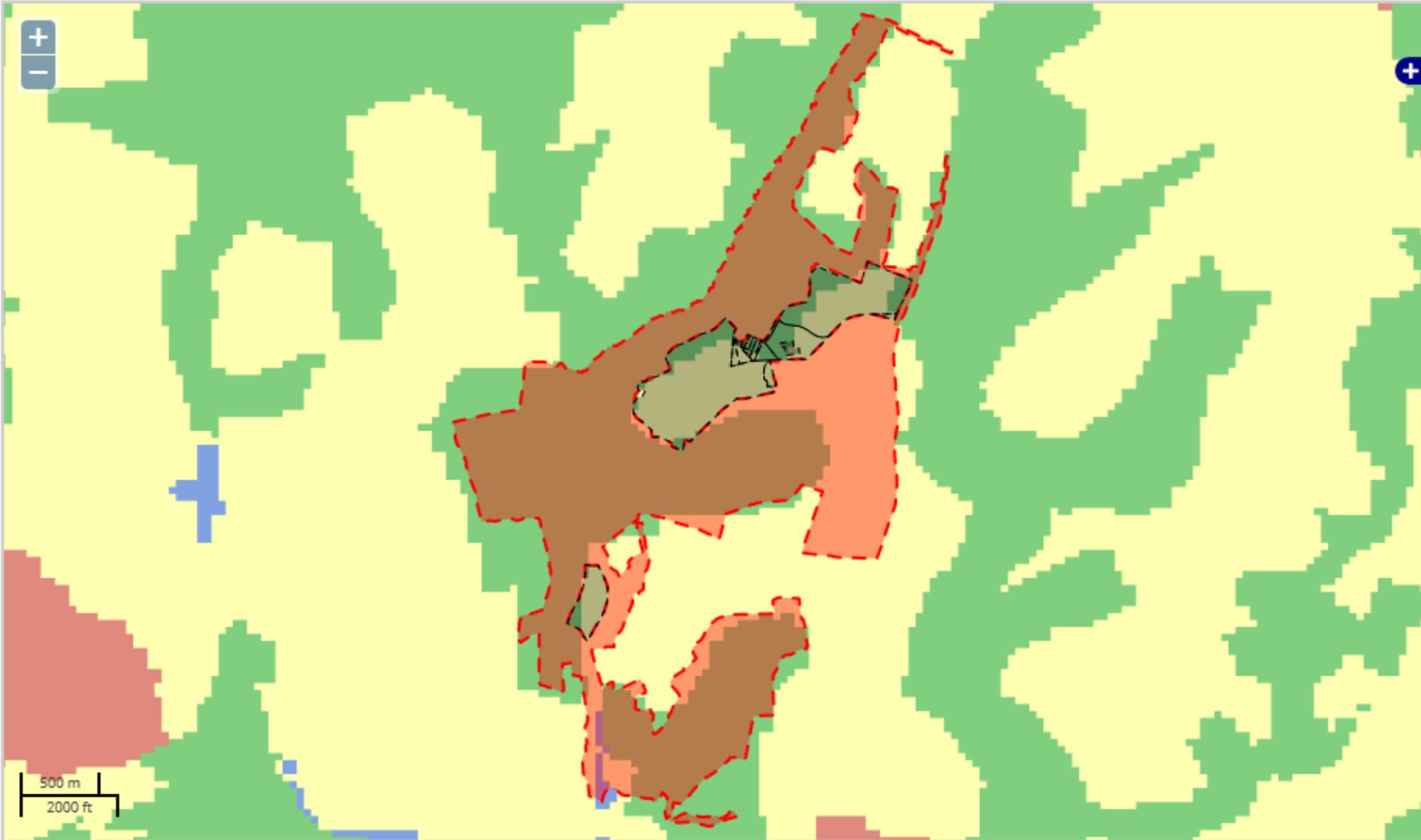


# RBG Kew – Wakehurst Place

Open Street Map, Land registry polygon 473.33 ha



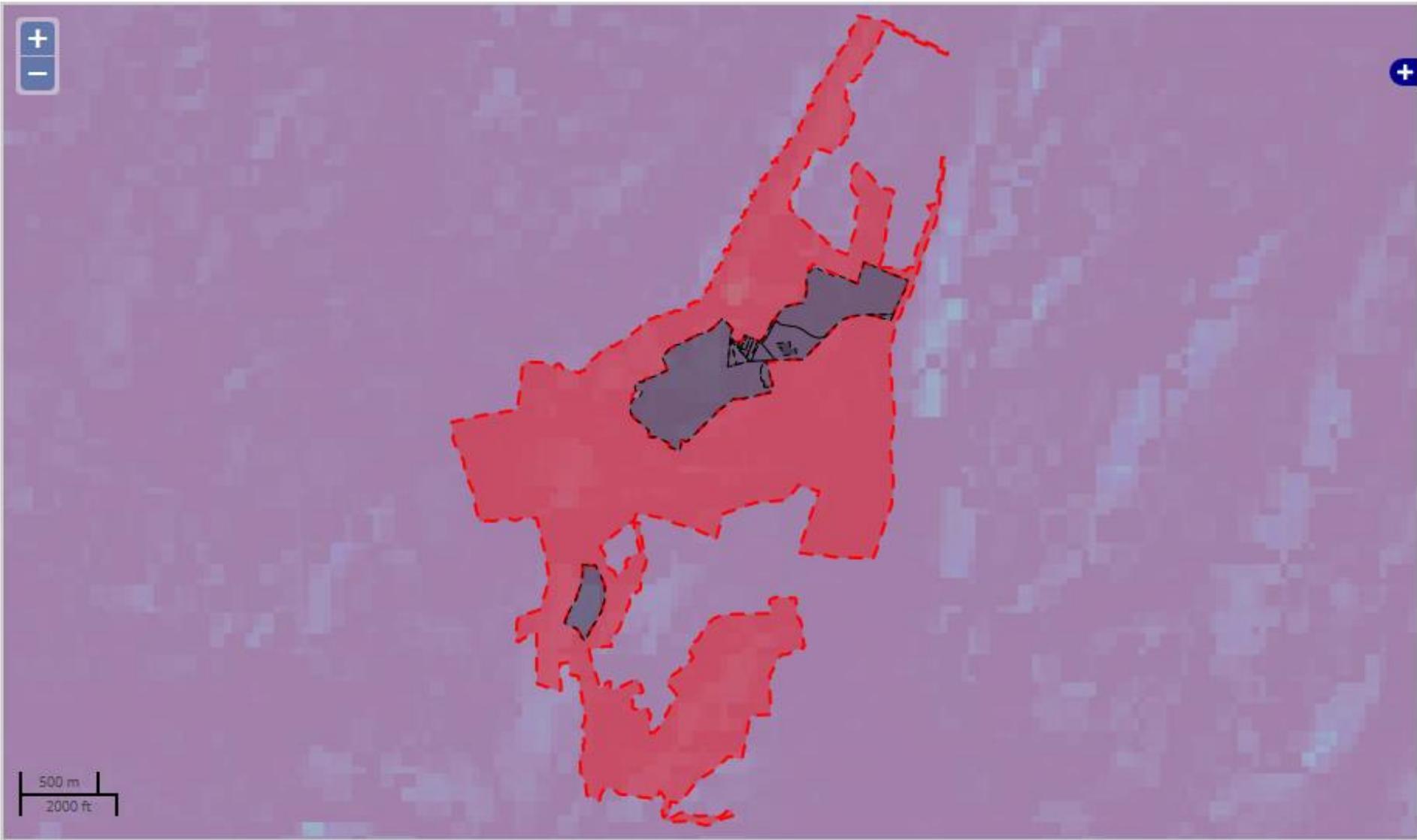
# Land cover



Red polygon contains:  
335.52 ha Forest  
124.12 ha Cropland  
13.69 ha Water

- Urban
- Forest
- Cropland
- Water

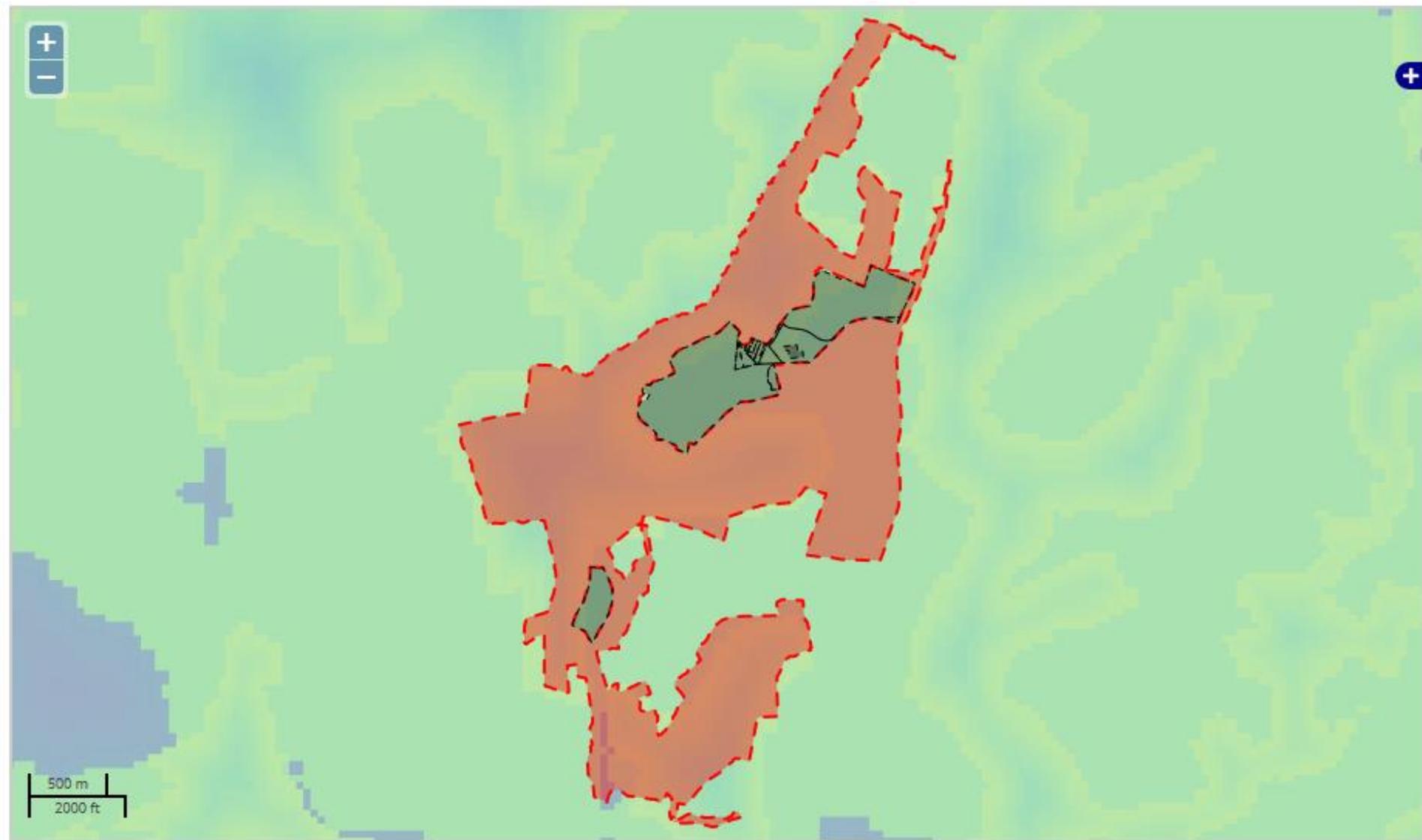
# Soil erosion protection



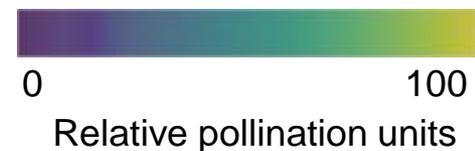
In the Red polygon...  
0.41 tons/ha/year of soil erosion is prevented because of the vegetation cover  
In total, 194 tons of soil/year is being retained by the vegetation



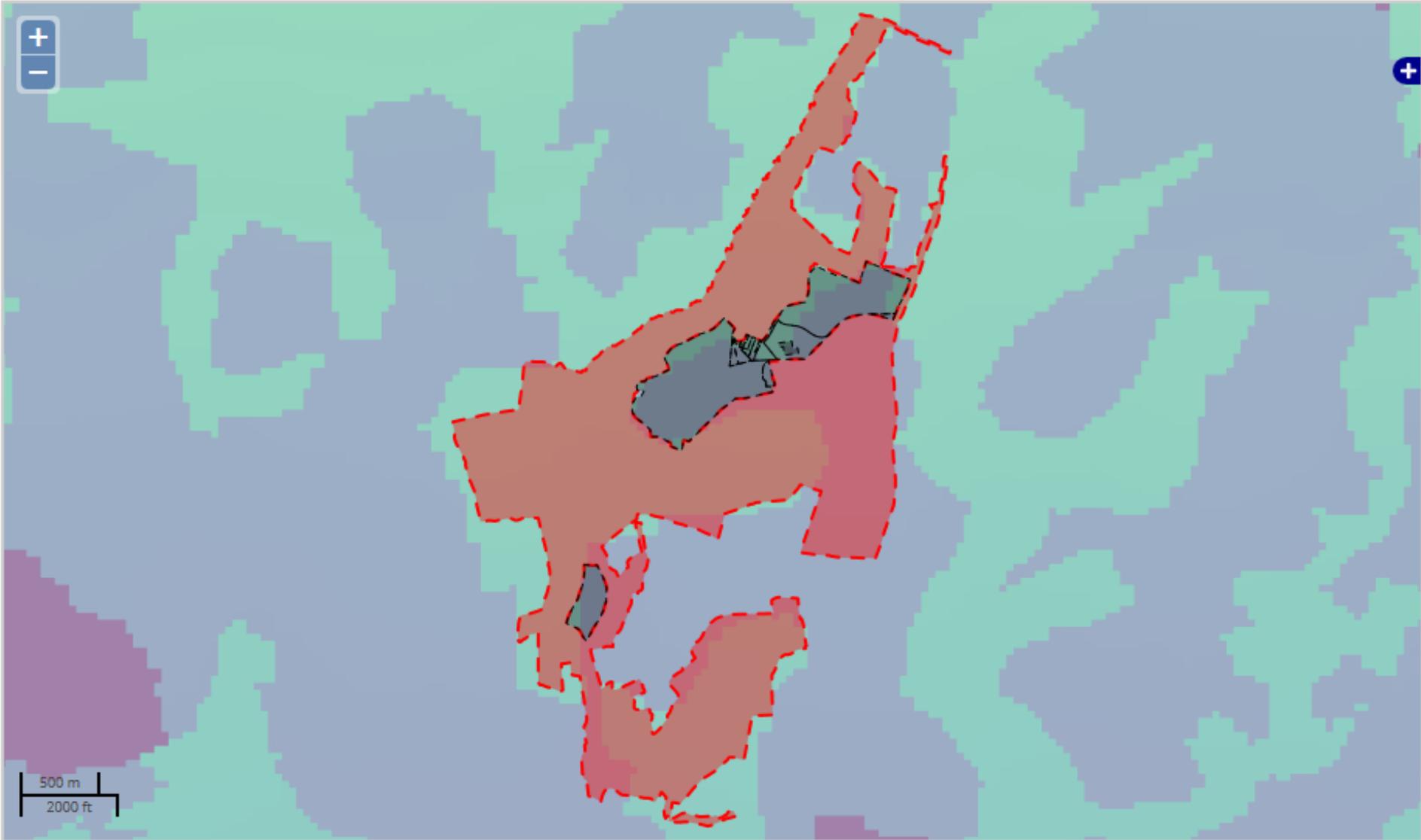
# Pollination



In the Red polygon...  
74.72 relative pollination units/ha is being provided because the vegetation provides  
nesting habitat for pollinators of nearby pollination dependent crops  
In total, 350367 relative pollination service units are being provided



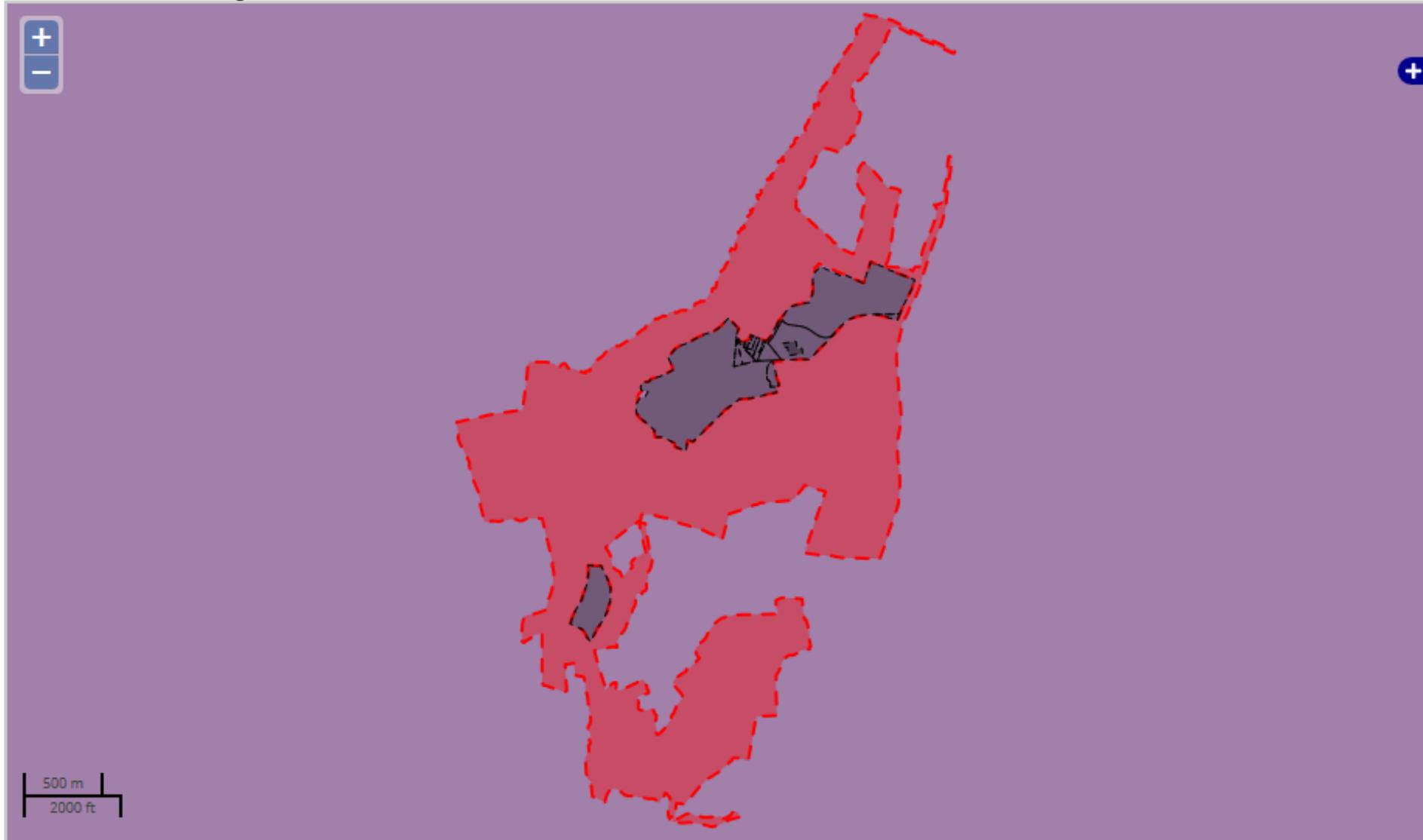
# Recreational amenity



In the Red polygon...  
Estimated 11248 recreational visitors / ha/ year



# Water flow regulation



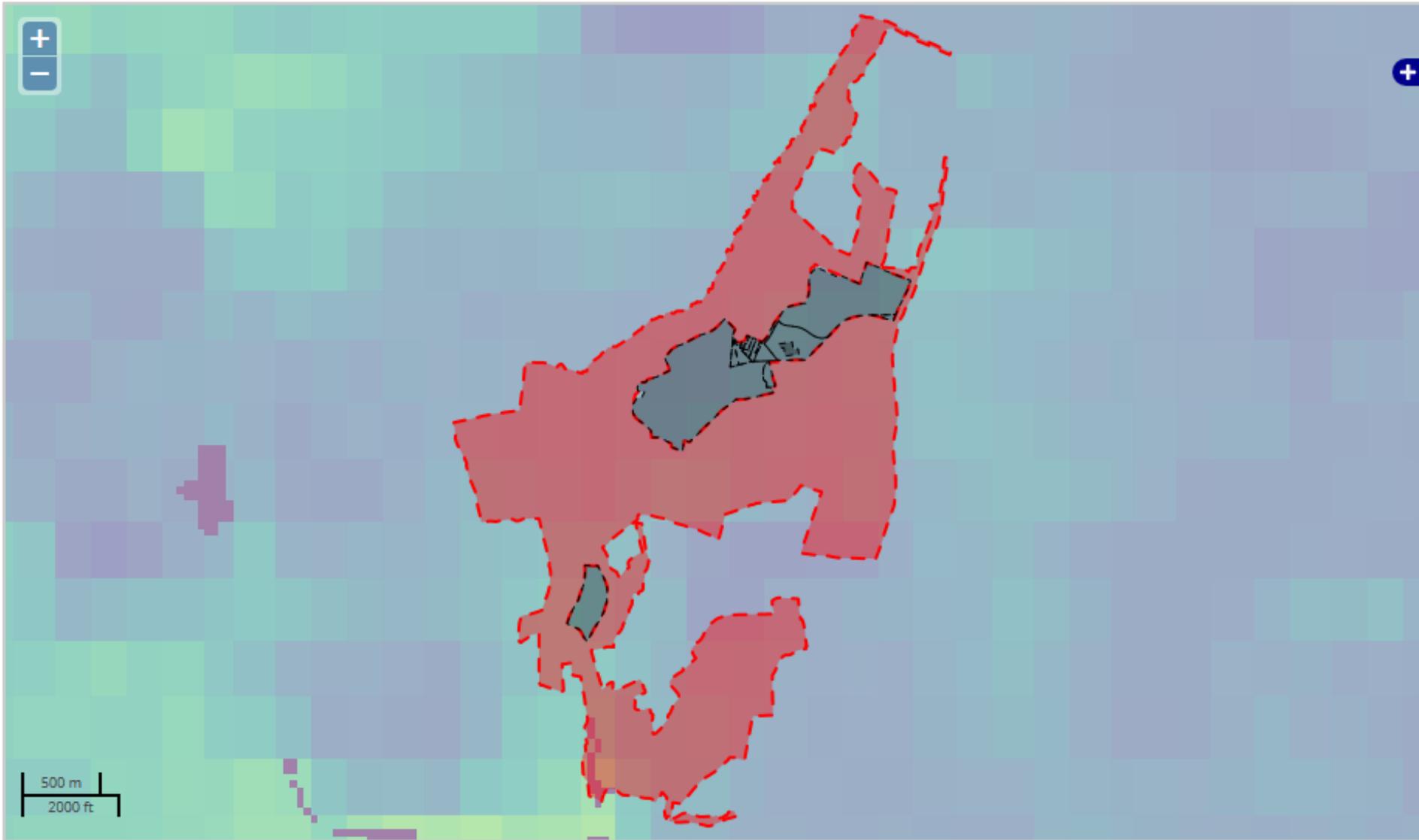
In the Red polygon...

According to our distributed hydrological model, the vegetation in this location does not contribute to reducing peak runoff



Annual maximum tons/ha/hour of averted runoff

# Carbon in AGB



In the Red polygon...  
105.56 tons/ha of carbon is stored in above-ground biomass  
In total, 49964 tons of carbon is stored in the vegetation

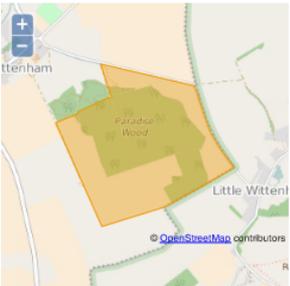


Tons carbon in above-ground-biomass

**NaturEtrade** creating a marketplace for ecosystem services

Maintenance of verified ecosystem service provision attributable to a NaturEtrade transaction

Certificate issued 21/3/2016  
 Naturetrade purchaser: **Company XYZ**  
 Landowner: **Alistair Yeomans**  
 Period: 21/3/2016 to 21/3/2019  
 Transaction amount: £500 pa x 3 = £1500  
 Country: **UK**  
 Region: **South West England**  
 Polygon name: **Compartment 1**  
 Polygon area: 173.76 ha



Lowland broadleaved woodland surrounded by wild flower meadow.

Land cover

Land cover class	Area at start of transaction period 01 Jan 2015	Area at end of transaction period 01 Jan 2016
Trees	10ha	10ha
Natural grassland	80ha	76ha
Scrub	10ha	12ha
Total	100ha	100ha

Land cover change observed by satellite during the transaction period was **compliant** with the goal of preventing loss of high biodiversity and ecosystem service land cover classes.

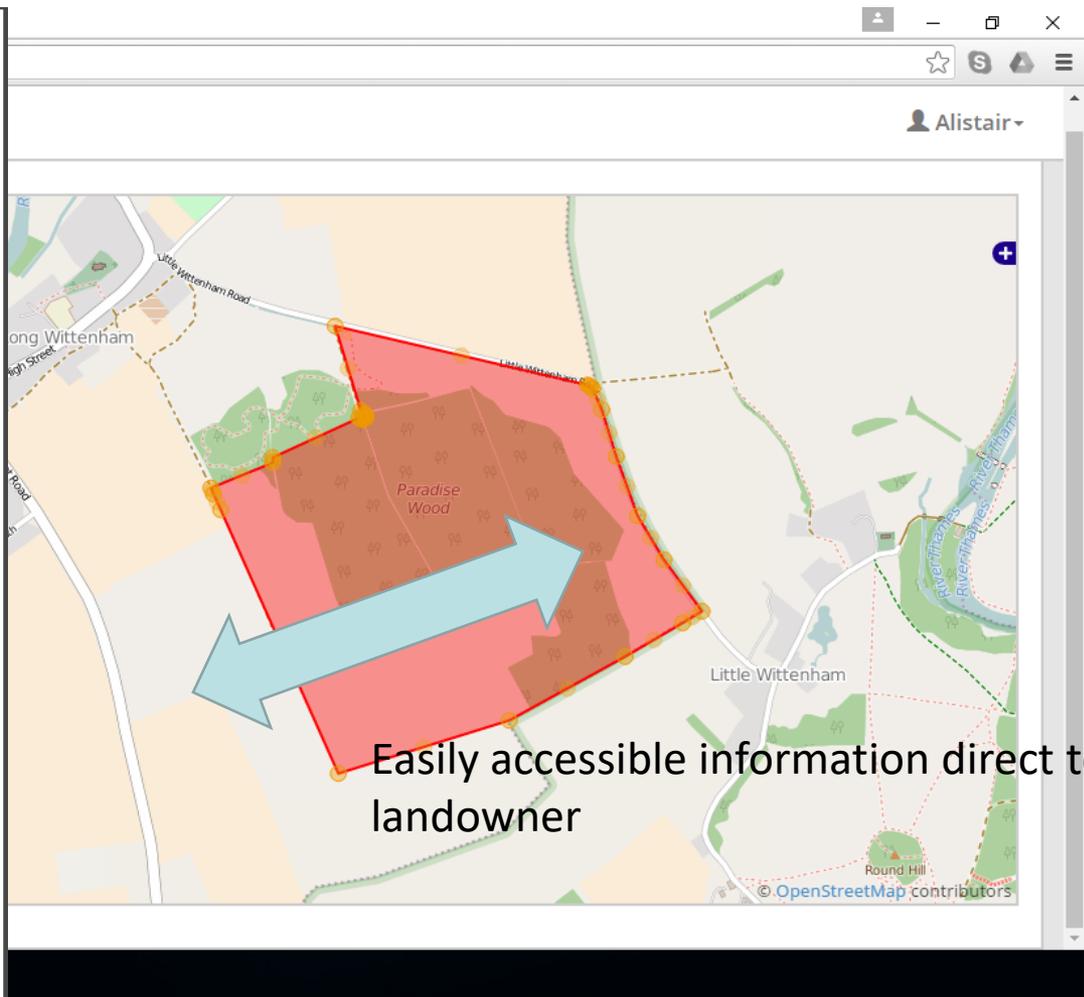
Ecosystem service provision in the polygon in the transaction period (01 Jan 2015 - 31 Dec 2015)

Service	Total provision	Provision per unit area
Carbon in AGB	(406) tons	(4.06) Tons/ha
Soil erosion protection	(20) tons	(0.2) Tons/ha
Water flow regulation	(6000) litres	(60) Litres/ha
Pollination	(4120) units	(41) Units/ha
Recreational amenity	(3012) units	(30) Units/ha

Adverted loss of Ecosystem service provision in the polygon in the year (2015) attributable to this transaction

Service	Total provision	Provision per unit area
Carbon in AGB	(5) tons	(0.05) Tons/ha
Soil erosion protection	(1) tons	(0.01) Tons/ha
Water flow regulation	(600) litres	(6) Litres/ha
Pollination	(52) units	(0.52) Units/ha
Recreational amenity	(35) units	(0.35) Units/ha

[DRAFT certificate]

Easily accessible information direct to landowner

N

about

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purchaser  
dashboard

help

view all

draw search area

IE8 polygon

A

B

fsdfsd

fdfd

clump 1

dsds

fsdfsd

noo poly

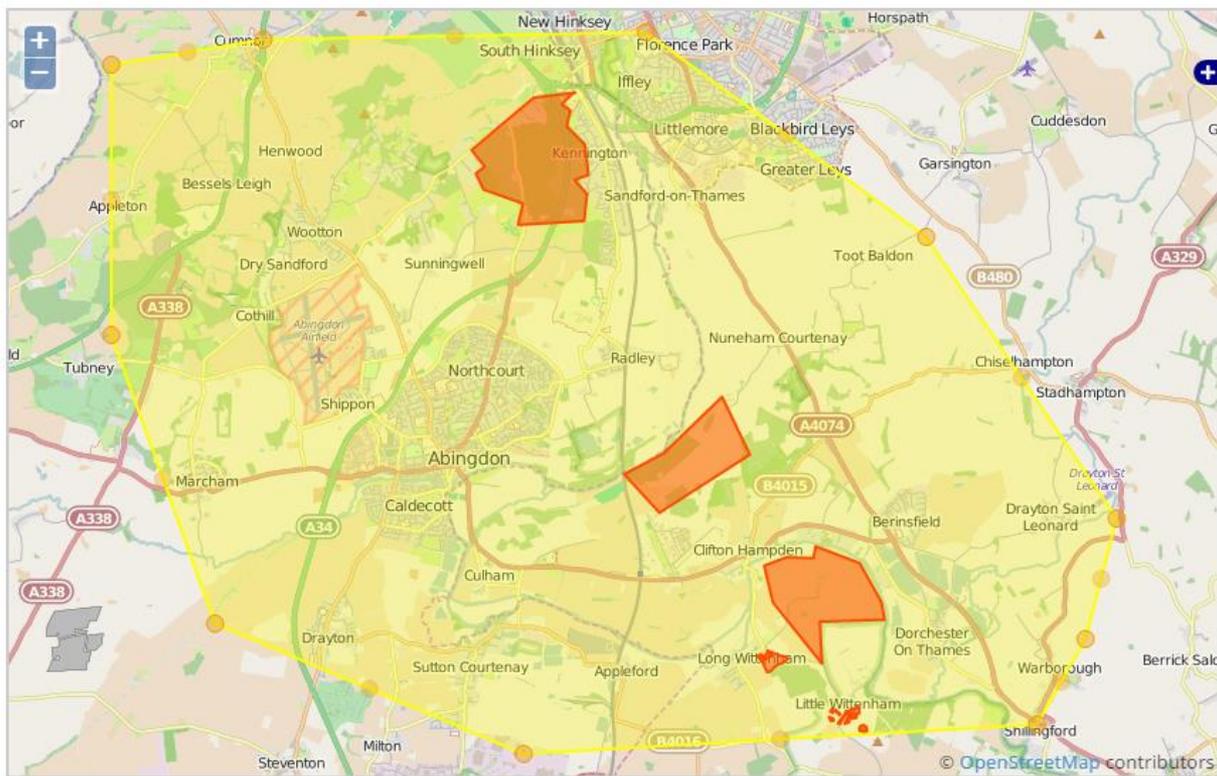
B1

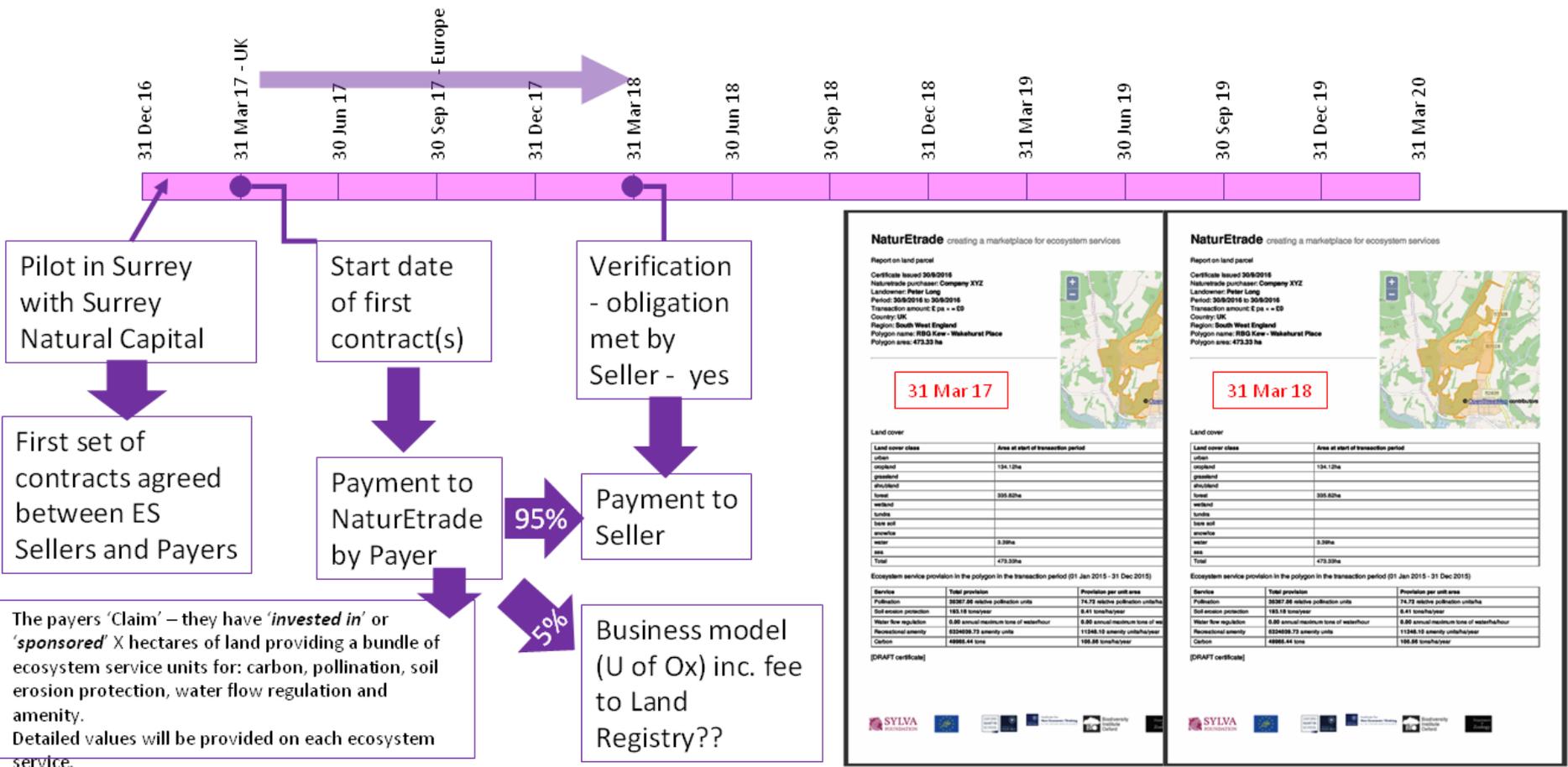
b3

wee wood

B2

C





**NaturEtrade** creating a marketplace for ecosystem services

Report on land parcel

Certificate issued: 30/9/2016  
NaturEtrade purchaser: Company XYZ  
Landowner: Peter Long  
Period: 30/9/2016 to 30/9/2016  
Transaction amount: £ ps + € SD  
Country: UK  
Region: South West England  
Polygon name: RB03 Kew - Winkhurst Place  
Polygon area: 473.33 ha

**31 Mar 17**

Land cover class	Area at start of transaction period
urban	
cropland	134.12ha
grassland	
shrubland	
forest	
wetland	335.82ha
tundra	
bare soil	
water	3.39ha
sea	
Total	473.33ha

Service	Total provision	Provision per unit area
Pollination	52027.26 metric pollination units	11.79 metric pollination units/ha
Soil erosion protection	193.18 tonnes/year	0.41 tonnes/ha/year
Water flow regulation	0.00 annual maximum tone of water/ha	0.00 annual maximum tone of water/ha
Recreational amenity	8224029.73 amenity units	11246.10 amenity units/ha/year
Carbon	49993.44 tone	106.00 tonnes/ha/year

(DRAFT certificate)

**NaturEtrade** creating a marketplace for ecosystem services

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(DRAFT certificate)

# Why do we think Naturetrade will work?

- Strong and clear **property rights** in the UK
- **Simple** contract = “maintain the land”
- Strong **enforcement** and **monitoring**
- Low **transaction costs** thanks to satellites
- **Additionality** = mitigate risk of destruction (incentives for uplift outside contract)
- **All the ingredients of a successful market!**

# Acknowledgements



Peter Long



Kathy Willis



David Benz



Alistair Yeomans



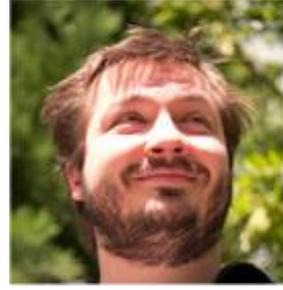
Andrew Martin



Beccy Wilebore



Gill Petrokofsky



Rich Piggott



Alex Teytelboym

European Commission  
Oxford Martin School  
Statoil  
NERC