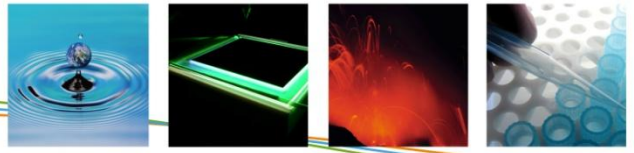


10/09/2012

HeathReCover - Remote sensing support to assist ecological restoration management after heathland fires

Birgen Haest, *Jeroen Vanden Borre,Toon Spanhove, Sander Veraverbeke, Luc Bertels, Stefaan Lhermitte, Marc Dufrêne, Martine Waterinckx and Geert De Blust*

http://heathrecover.vgt.vito.be

HeathReCover – Administrative details

- Project Period: Feb 2012 – Dec 2013
- Belspo co-funding project
- Partners:

vito

inbo

Agentschap voor Natuur en Bos

DGO 3

Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

NASA

vito
vision on technology

Belgian Science Policy Office
belspo

inbo

Agentschap voor Natuur en Bos

DGO 3

Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

NASA

HeathReCover – Project background

- Heathlands and peat bogs ecosystems
  - Highly valued landscapes of common European heritage
  - Large investment of effort and resources to conserve and manage them
  - Yet … *under threat:*
    - Anthropogenic activities
    - But also: (natural) phenomenon of uncontrolled fire

- RS has been shown to be useful to study fire – ecosystem interaction, but..
  - Mainly forest ecosystems
  - Limited research with hyperspectral and/or very high spatial data
  - Limited research on long-term analysis

vito vision on technology
belspo Belgian Science Policy Office
inbo
Agentschap voor Natuur en Bos
DGO 3
Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu
NASA

HeathReCover – Recent fire events in Belgium

→ Maybe a tragedy, but definitely an opportunity..

- The *Kalmthoutse Heide*
  - May 25-26, 2011: +- 450 ha of heathland
    (i.e. half of the core area)
  - 21 April 1996: +/- 330 ha of heathland and forest

- The *Kalmthoutse Heide*
  - Study area for RS projects over the past years
  - Short-term and long-term possibilities
  - Large amount of data
    (field and image)

→ Ideal Study Site

- The *Hautes Fagnes*
  - April 25, 2011
  - > 1300 ha
    (i.e. biggest fire ever in HF)

- The *Hautes Fagnes*
  - Less abundant data

→ Suitable Test Site

vito vision on technology
belspo
inbo
Agentschap voor Natuur en Bos
DGO 3
Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu
NASA

HeathReCover – Project objectives

- *"…to use RS as a tool to spatially and temporally investigate the complex interactions between fires and heathland and peat bog ecosystems"*

  - **More Specific:**
    - Delineate the **burn scars** in **detail using VHSR airborne digital VNIR** UltraCam data
    - Develop **new methods** to assess **heathland and peat bog fire severity** using **hyperspectral** data
    - **Map the abiotic conditions** (e.g. soil typology and hydrology) just after a fire to enable the investigation of their relationship to fire and vegetation re-growth patterns
    - Spatially explicit assess (**ecological loss in and restoration of**) **heathland and peat bog vegetation and habitats in the short-term**, **using hyperspectral** data
    - Investigate the potential **of time-series analysis** of historical **Landsat** datasets to characterize **long-term** post-fire heathland **vegetation re-growth patterns**

HeathReCover – Project approach – Study areas

- The *Kalmthoutse Heide*

Before...

During...

After..

vito
vision on technology

Belgian Science Policy Office
belspo

inbo

Agentschap voor
Natuur en Bos

DGO 3

Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

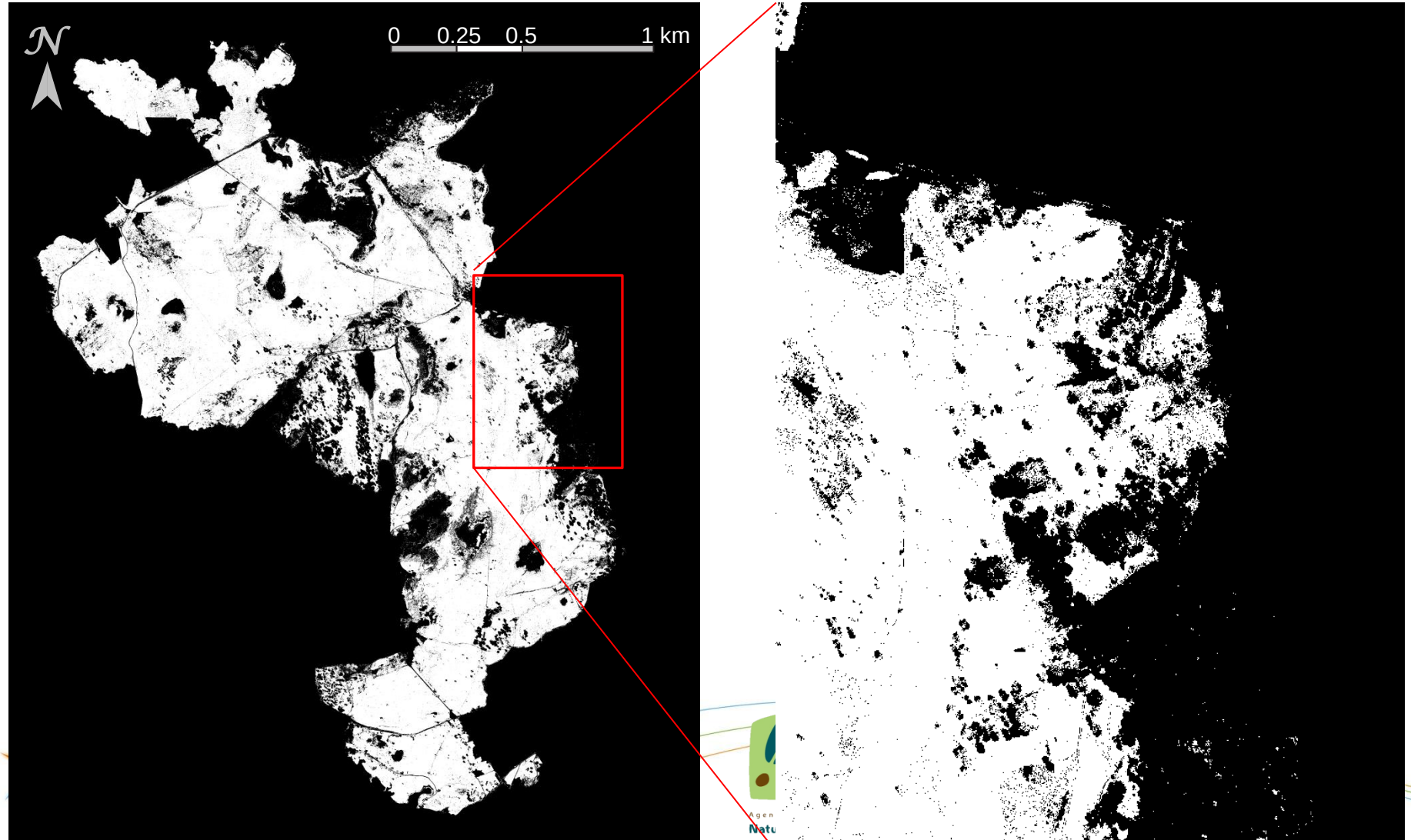
NASA

HeathReCover – Project approach – WP breakdown

WP 1: Project management and Dissemination				
Data	Short-Term Analysis			Long-Term Analysis
WP 2: Data collection and pre-processing	WP 3: Burn and Fire severity assessment of heathland fires	WP 4: Analysis of vegetation re-growth patterns	WP 5: Short-term assessment of ecological loss	WP 6: Long-term assessment using historical time-series
	WP 3.1: Burn Scar Delineation			
	WP 3.2: Fire Severity Assessment			

HeathReCover – Current activities, first results

- Burn scar delineation - new method based on RGBNir VHSR digital camera images



HeathReCover – Current activities, first results

- Fire/Burn severity analysis
  - Modification and insights of GeoCBI usability in heathland ecosystems
  - Correlation of GeoCBI to several spectral indices is strongly dependent of vegetation type..

HeathReCover – Current activities, first results

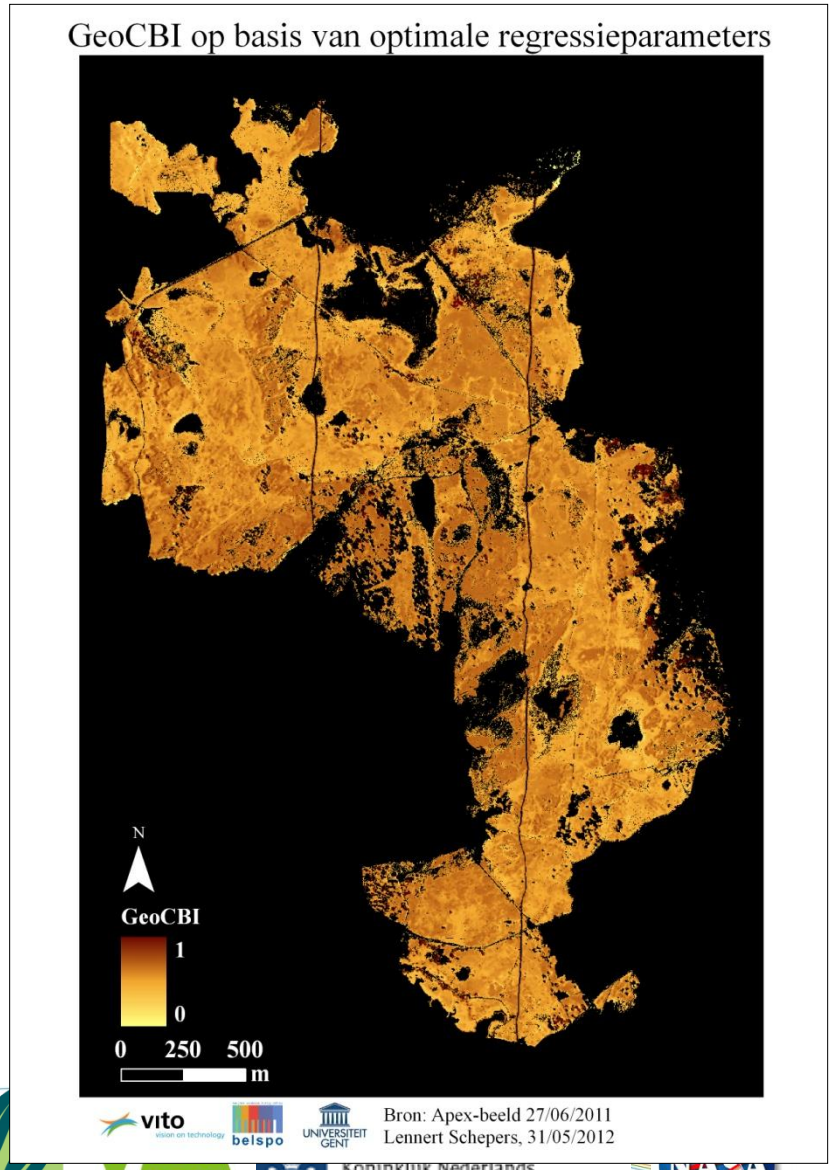
- Fire/Burn severity analysis

Index	Acroniem	Formule	Referentie
Normalized Difference Vegetation Index	NDVI	$NDVI = \frac{NIR-R}{NIR+R}$	Tucker (1979)
Global Environmental Monitoring Index	GEMI	$GEMI = \gamma(1-0{,}25\,\gamma) - \frac{R-0{,}125}{1-R}$ met $\gamma = \frac{2(NIR^2-R^2)+1{,}5\,NIR+0{,}5\,R}{NIR+R+0{,}5}$	Pereira (1999)
Enhanced Vegetation Index	EVI	$EVI = 2{,}5\,\frac{NIR-R}{NIR-6\,R-7{,}5\,B+1}$	Huete *et al.* (2002)
Soil Adjusted Vegetation Index	SAVI	$SAVI = (1+L)\frac{NIR-R}{NIR+R+L}$ met $L = 0{,}5$	Huete (1988)
Modified Soil Adjusted Vegetation Index	MSAVI	$MSAVI = \frac{2\,NIR+1-\sqrt{(2\,NIR+1)^2-8\,(NIR-R)}}{2}$	Qi *et al.* (1994)
Burned Area Index	BAI	$BAI = \frac{1}{(0{,}1+R)^2+(0{,}06+NIR)^2}$	Chuvieco *et al.* (2002)
Normalized Burn Ratio	NBR	$NBR = \frac{NIR-LSWIR}{NIR+LSWIR}$	Key en Benson (2005)
Char Soil Index	CSI	$CSI = \frac{NIR}{LSWIR}$	Smith *et al.* (2007)
Mid-Infrared Burn Index	MIRBI	$MIRBI = 10\,LSWIR - 9{,}8\,SSWIR + 2$	Trigg en Flasse (2001)

HeathReCover – Current activities, first results

» Fire/Burn severity analysis

Regressieparameters		GeoCBI = a * index + b	
Vegetatietype	optimale index	a	b
Struikhei	CSI	-0,2168	0,7640
Dophei	MIRBI	0,1686	0,2815
Pijpenstrootje	MIRBI	0,2716	0,1977
Grove den	NDVI	-1,7498	1,3697
andere klassen	MSAVI	-1,9697	0,7492



Schepers, L., Haest, B., Veraverbeke, S., & Others (in prep.). *Heathland fire severity assessment using APEX hyperspectral imagery*.

vito vision on technology
Belgian Science Policy Office belspo
inbo
Agentschap voor Natuur en Bos
DGO 3
Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu
NASA

Time for Questions..

http://heathrecover.vgt.vito.be