GoProFor
LIFE17 GIE/IT/000561

Necessità ed esperienze di monitorraggio degli effetti del clima sulle foreste italiane

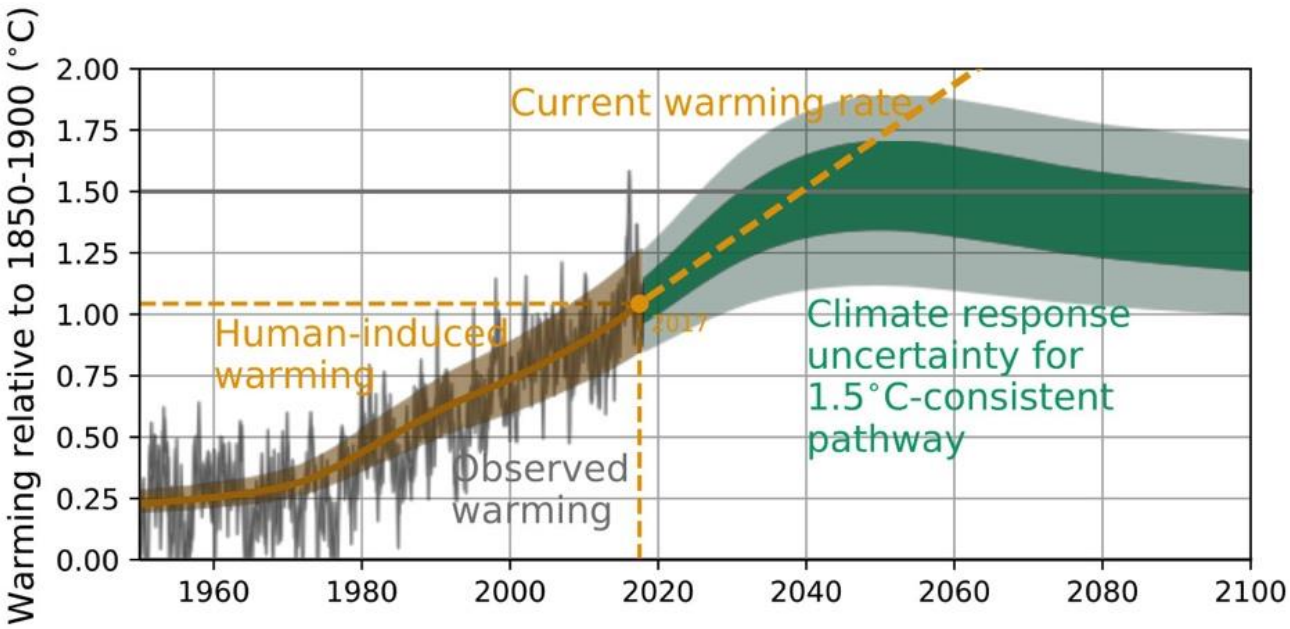
Monitoring on the effects of climate on Italian forests: needs and experiments

Renzo Motta (DISAFA)

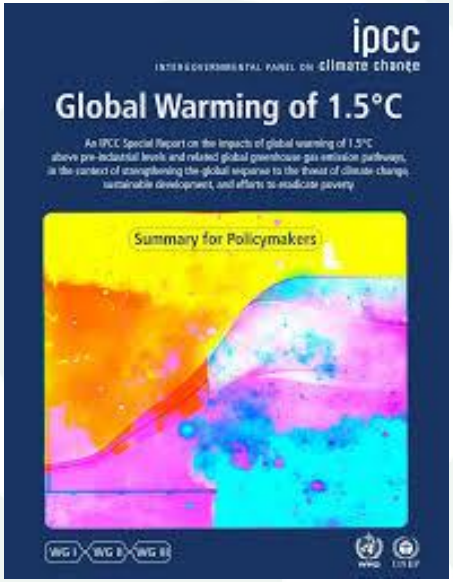
PALERMO | 11 NOVEMBRE 2019
LIFE E RETE NATURA 2000
Dall'esperienza dei Progetti verso un modello condiviso per la Gestione Forestale

LIFE AND NATURA 2000 NETWORK
From Projects experience to a shared model for Forest Management

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level



Source: IPCC Special Report on Global Warming of 1.5°C, Chapter 1 – Technical Annex 1.A, Fig. 12

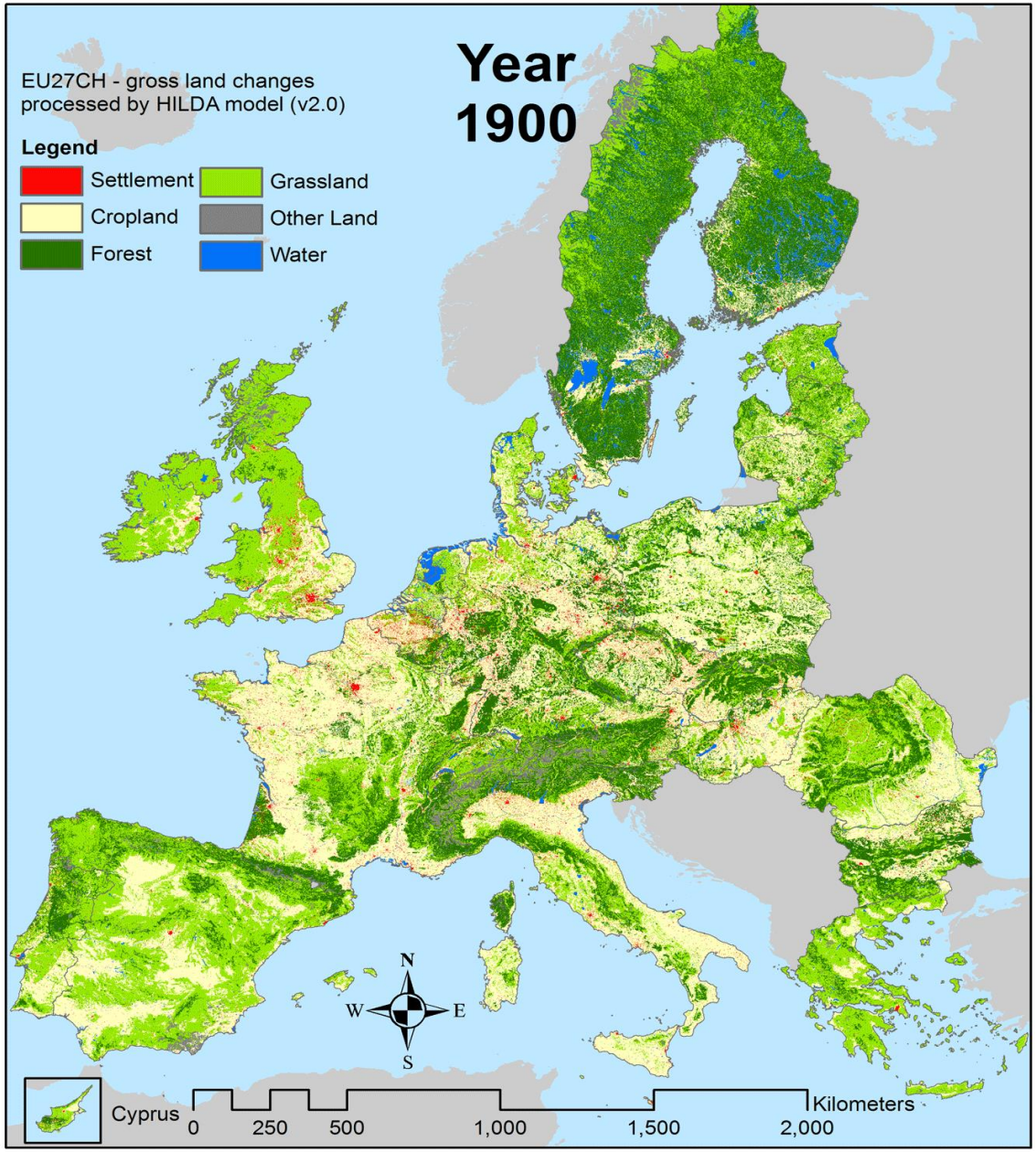


Forest Cover (Italy)

1900 about 18%
2005 INFC 34,3%
2015 INFC 36,4%
2019 IUTI 38,0%

>100% in one century
+ 2,1% in the last decade

Forest increment + 25% in the last century (climate, land use change, nitrogen ecc.)



Global Change Biology

Global Change Biology (2015) **21**, 299–313, doi: 10.1111/gcb.12714

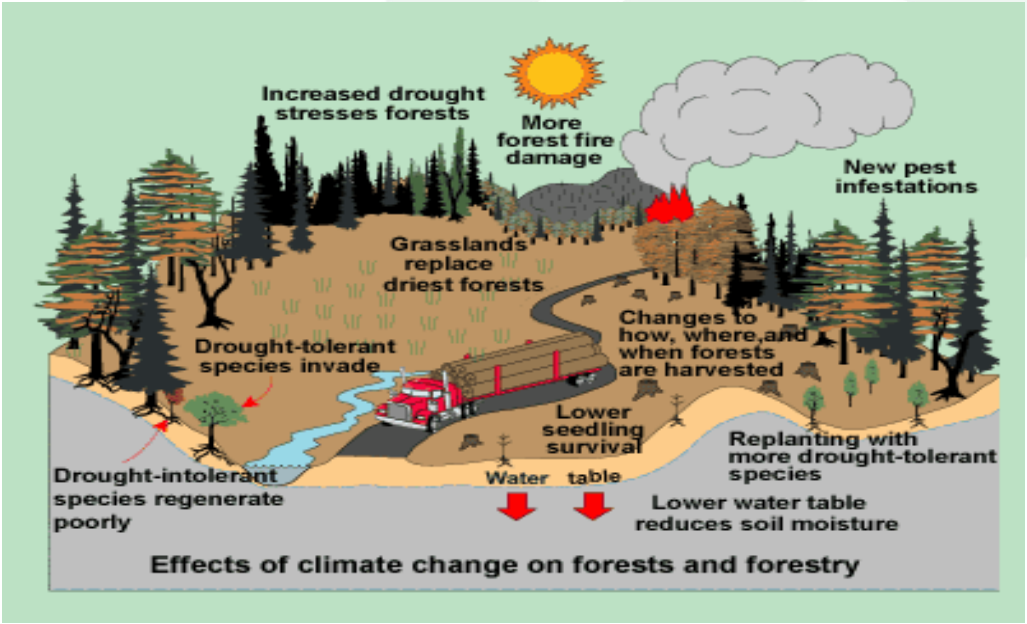
Gross changes in reconstructions of historic land cover/ use for Europe between 1900 and 2010

RICHARD FUCHS[1], MARTIN HEROLD[1], PETER H.VERBURG[2], JAN G.P.W.CLEVERS[1] and JONAS EBERLE[3]

[1]*Laboratory of Geoinformation Science and Remote Sensing, Wageningen University, Wageningen, The Netherlands,* [2]*Institute for Environmental Studies, VU University Amsterdam, Amsterdam, The Netherlands,* [3]*Institute for Geography, Friedrich Schiller University Jena, Jena, Germany*

Climate crisis impact on forests

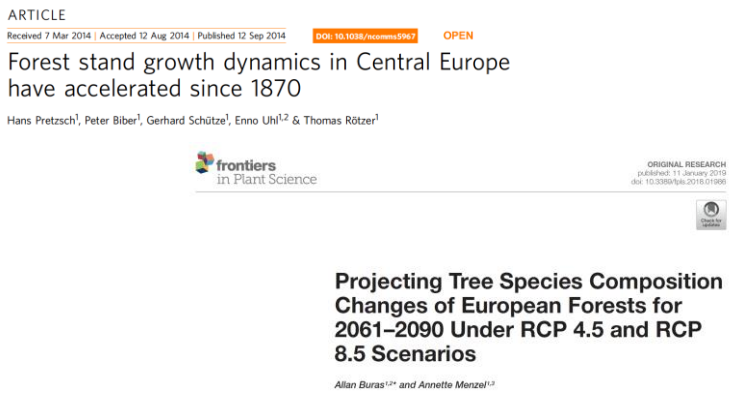
1) Long-term change (species ecological traits)
2) Short term change (natural disturbances regime)



Climate crisis impact on forests

1) **Long-term change (species ecological traits)**
2) Short term change (natural disturbances regime)

- Latitudinal range
- Elevation range
- Individuals or populations that currently live at the ecological border
- New species (alien or not)



ARTICLE

Received 7 Mar 2014 | Accepted 12 Aug 2014 | Published 12 Sep 2014 DOI: 10.1038/ncomms5967 OPEN

Forest stand growth dynamics in Central Europe have accelerated since 1870

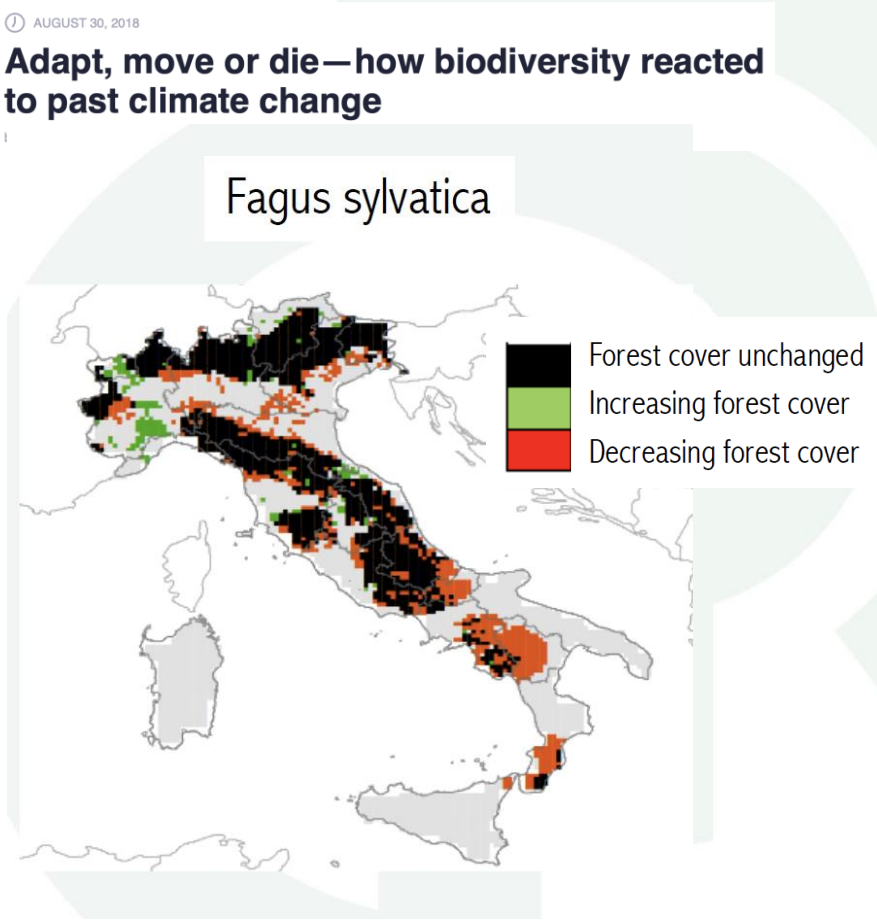
Hans Pretzsch[1], Peter Biber[1], Gerhard Schütze[1], Enno Uhl[1,2] & Thomas Rötzer[1]

frontiers in Plant Science

ORIGINAL RESEARCH published: 11 January 2019 doi: 10.3389/fpls.2018.01986

Projecting Tree Species Composition Changes of European Forests for 2061–2090 Under RCP 4.5 and RCP 8.5 Scenarios

Allan Buras[1,2] and Annette Menzel[1,3]*

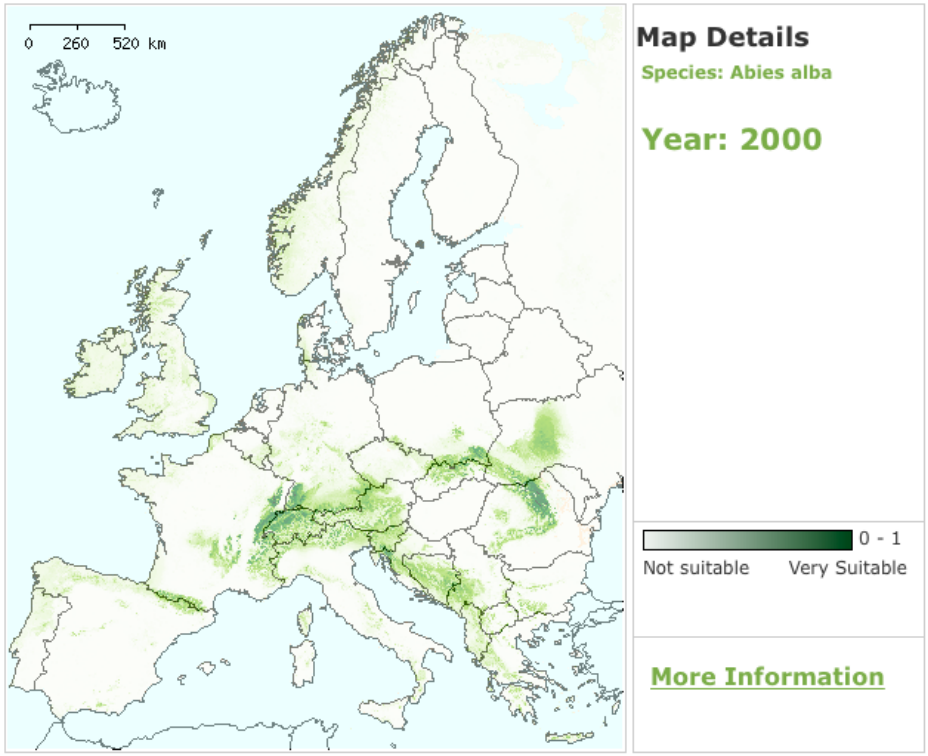


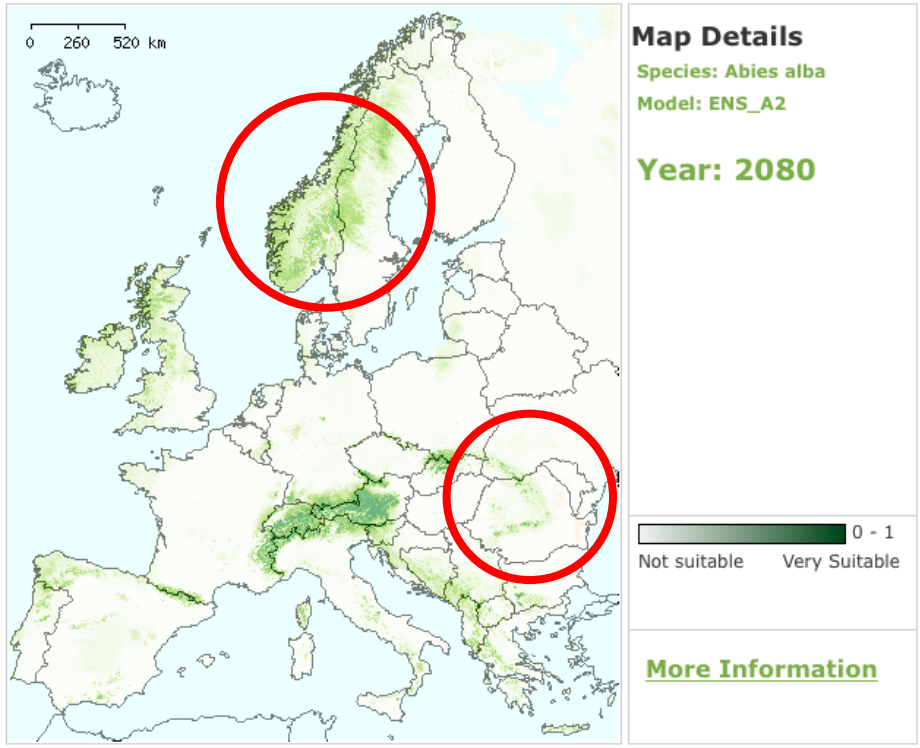
AUGUST 30, 2018

Adapt, move or die—how biodiversity reacted to past climate change

Fagus sylvatica

Forest cover unchanged
Increasing forest cover
Decreasing forest cover





Do we really know the ecological traits? The silver fir case

REVIEWS

Ecological Monographs, 83(4), 2013, pp. 419–439

The past ecology of *Abies alba* provides new perspectives on future responses of silver fir forests to global warming

Willy Tinner,[1,2,3,11] Daniele Colombaroli,[1,2] Oliver Heiri,[1,2] Paul D. Henne,[1,2,3] Marco Steinacher,[2,4] Johanna Untenecker,[5] Elisa Vescovi,[1,2] Judy R. M. Allen,[6] Gabriele Carraro,[7] Marco Conedera,[8] Fortunat Joos,[2,4] André F. Lotter,[9] Jürg Luterbacher,[5] Stéphanie Samartin,[1,2] and Verushka Valsecchi[10]

European Journal of Forest Research
https://doi.org/10.1007/s10342-019-01192-4

ASSMANN REVIEW

What is the potential of silver fir to thrive under warmer and drier climate?

Yann Vitasse[1,2] · Alessandra Bottero[1,2] · Martine Rebetez[3,4] · Marco Conedera[5] · Sabine Augustin[6] · Peter Brang[7] · Willy Tinner[8,9]

Forest Ecology and Management 388 (2017) 100–112

Contents lists available at ScienceDirect

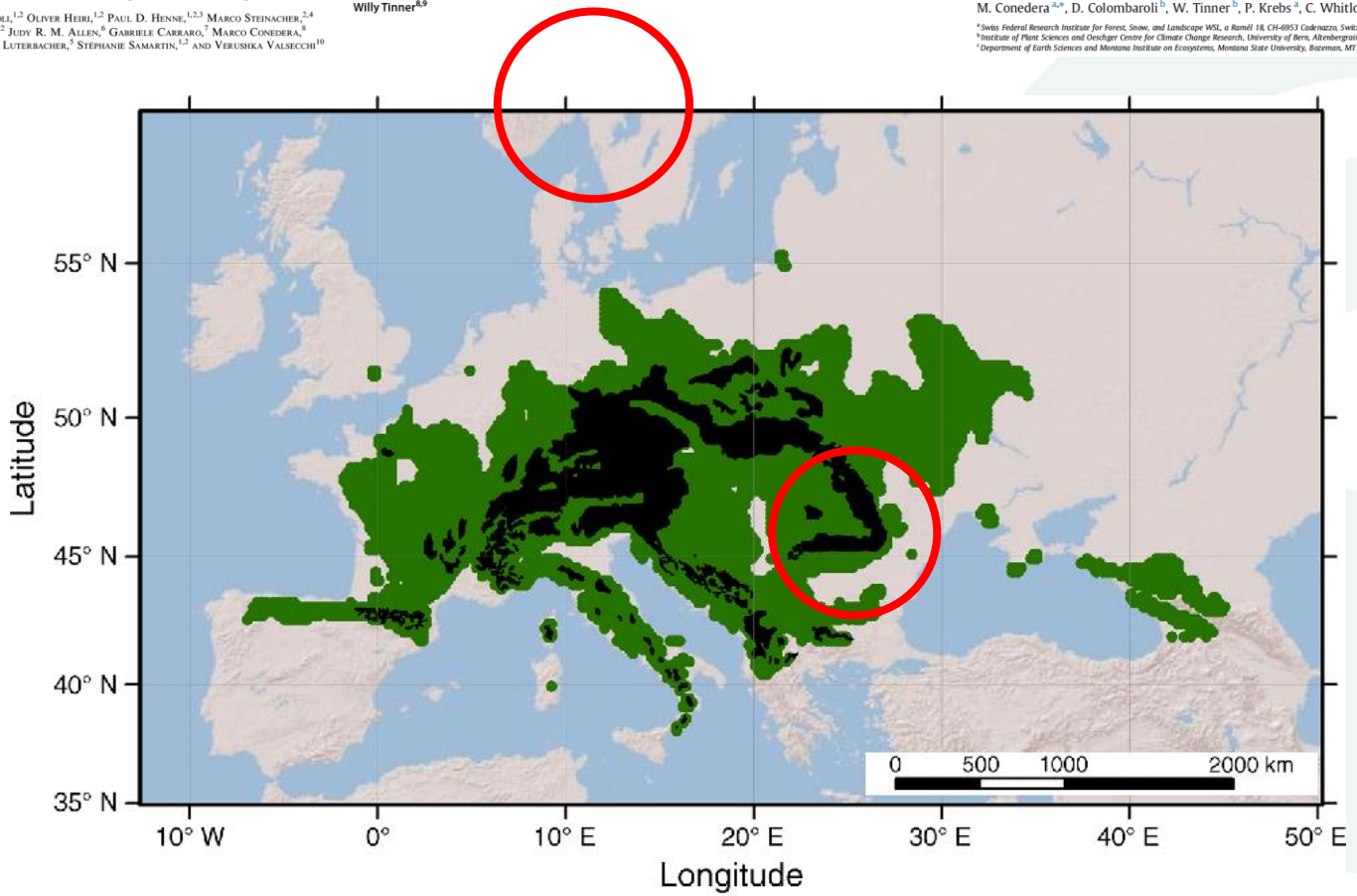
Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Insights about past forest dynamics as a tool for present and future forest management in Switzerland ☆

M. Conedera [a,*], D. Colombaroli [b], W. Tinner [b], P. Krebs [a], C. Whitlock [a,b,c]

[a] Swiss Federal Research Institute for Forest, Snow, and Landscape WSL, a Ramél 18, CH-6953 Cadenazzo, Switzerland
[b] Institute of Plant Sciences and Oeschger Centre for Climate Change Research, University of Bern, Altenbergrain 21, CH-3013 Bern, Switzerland
[c] Department of Earth Sciences and Montana Institute on Ecosystems, Montana State University, Bozeman, MT 59717, USA



nature COMMUNICATIONS

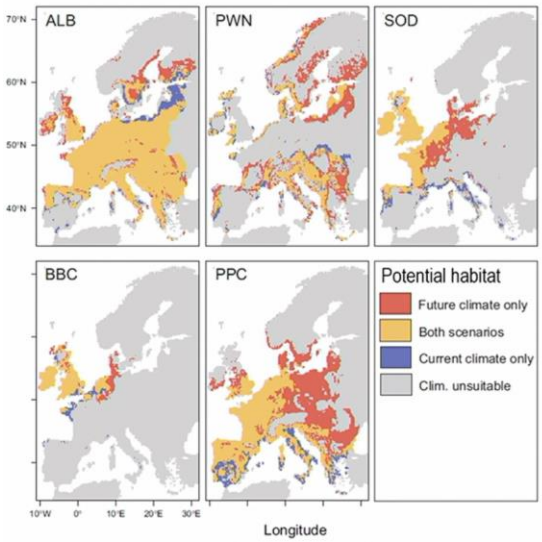
ARTICLE

DOI: 10.1038/s41467-018-04096-w OPEN

Invasive alien pests threaten the carbon stored in Europe's forests

Rupert Seidl[1], Günther Klonner[2], Werner Rammer[1], Franz Essl[2], Adam Moreno[1,3], Mathias Neumann[1] & Stefan Dullinger[2]

Potential spread of invasive alien pests



Asian long-horned beetle (ALB), pinewood nematode (PWN) and pitch pine canker (PPC) could establish on > 1 Mill. km² already under current climate

Climate change until 2050 will increase the potential range of pine pests (PWN and PPC) by ~50%

nature COMMUNICATIONS

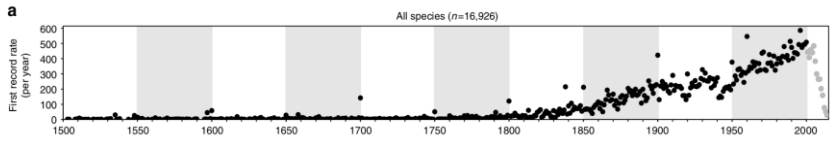
ARTICLE

Received 16 Feb 2016 | Accepted 28 Dec 2016 | Published 15 Feb 2017 DOI: 10.1038/ncomms14435 OPEN

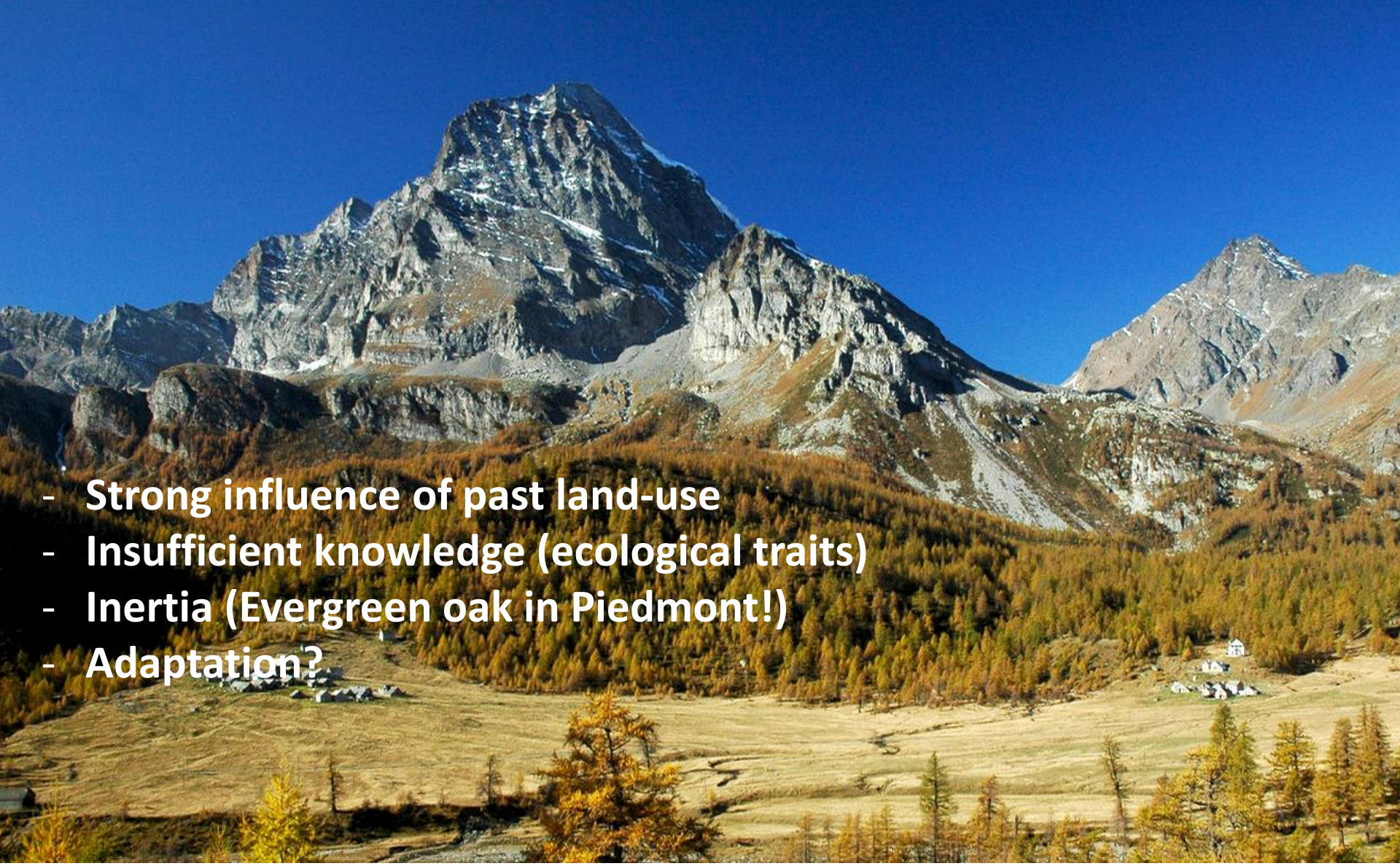
No saturation in the accumulation of alien species worldwide

Hanno Seebens *et al.*#

ARTICLE NATURE COMMUNICATIONS | DOI: 10.1038/ncomms14435



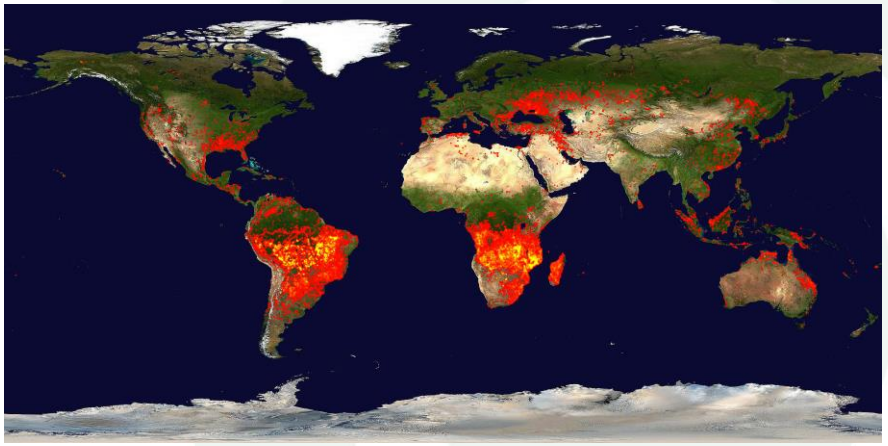
Alien species and climate change

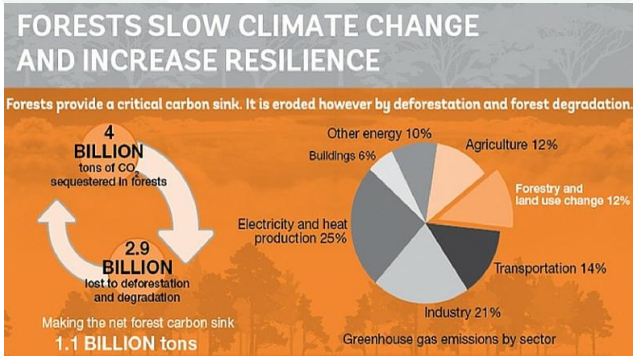

- Strong influence of past land-use
- Insufficient knowledge (ecological traits)
- Inertia (Evergreen oak in Piedmont!)
- Adaptation?

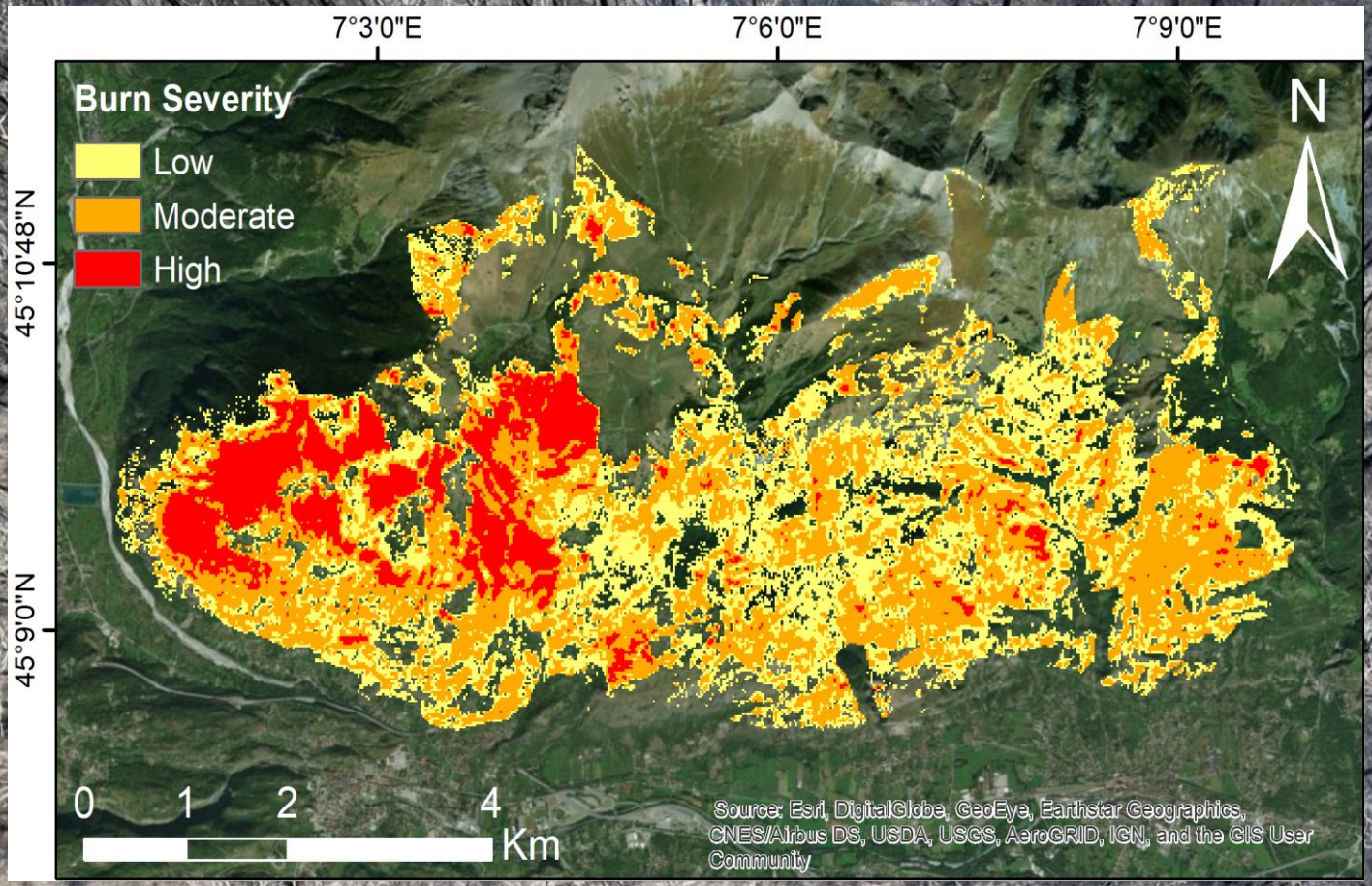
Climate crisis impact on forests

1) Long-term change (species ecological traits)
2) **Short term change (natural disturbances regime)**

-Forest fires
-Storms
-Insect outbreaks
-Drought







26/03/2019

Piano straordinario di interventi di ripristino del territorio percorso dagli incendi boschivi dell'autunno 2017

REGIONE PIEMONTE

ai sensi dell'art. 17 della L.R. 4/2009

Susa Valley 2017:
3.974 of which 2.609 ha forest.
The largest forest fire in the Alps

Luca Lucarelli, Monpantero

Storm Vaia: 42.000 ha forest

Forest@
Rivista di Selvicoltura ed Ecologia Forestale
Commenti e Prospettive
doi: 10.3832/efor2990-015
vol. 15, pp. 94-98

Selvicoltura e schianti da vento. Il caso della "tempesta Vaia"

Renzo Motta [1], Davide Ascoli [2], Piermaria Corona [3], Marco Marchetti [4], Giorgio Vacchiano [5]

Silviculture and wind damages. The storm "Vaia"

On October 29th, 2018, storm Vaia hit forests in north-eastern Italy, causing the loss of 8 million cubic meters of standing trees and, more importantly, the sudden reduction of forest-related ecosystem services. Such event is not unprecedented: a similar storm had occurred in the same regions in 1966.

Forest@
Rivista di Selvicoltura ed Ecologia Forestale
Rapporti Tecnici
doi: 10.3832/efor3070-016
vol. 16, pp. 3-9

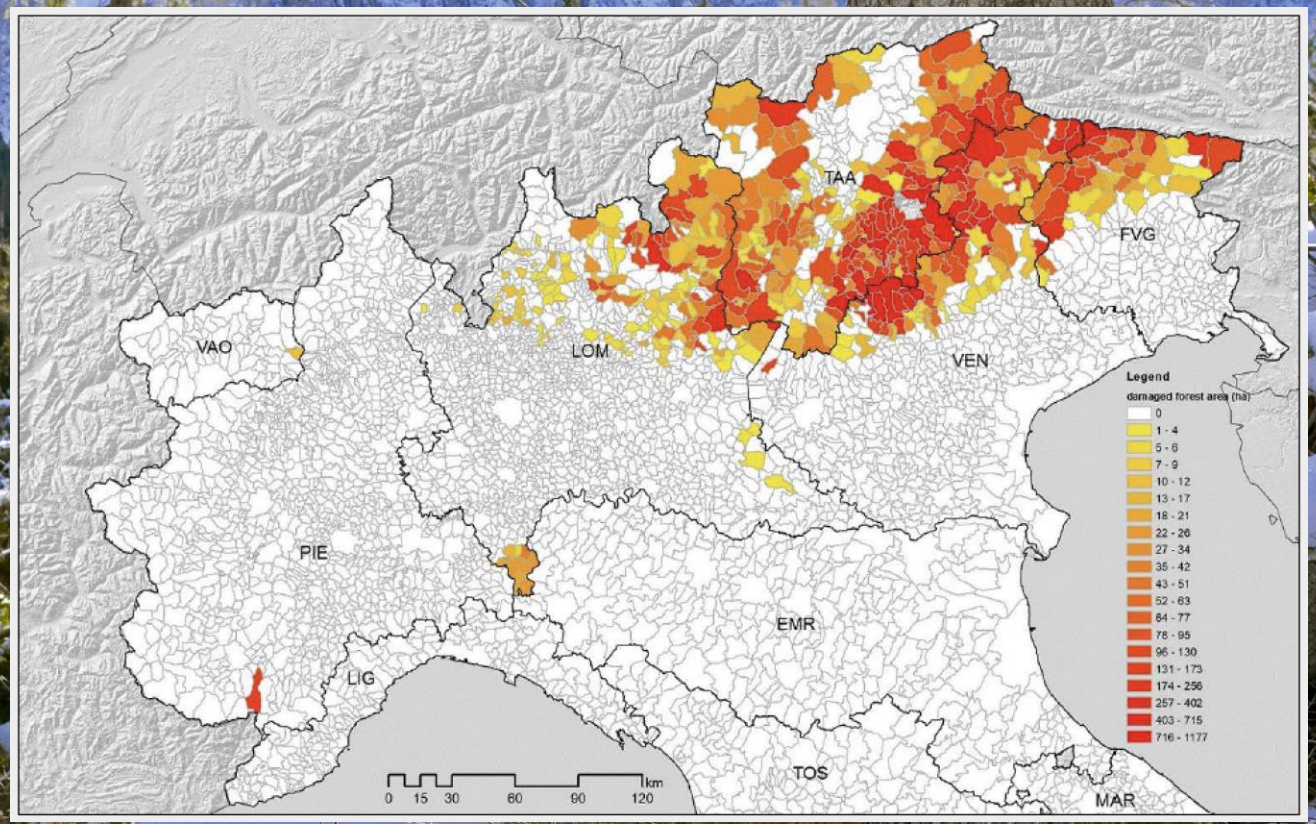
Stima dei danni della tempesta "Vaia" alle foreste in Italia

G Chirici [1], F Giannetti [1], D Travaglini [1], S Nocentini [1], S Francini [1], G D'Amico [1], E Calvo [2], D Fasolini [2], M Broll [2], F Maistrelli [2], J Tonner [2], M Pietrogiovanna [2], K Oberlechner [2], A Andriolo [2], R Comino [4], A Faidiga [4], I Pasutto [5], G Carraro [5], S Zen [5], F Contarin [5], L Alfonsi [5], A Wolynski [6], M Zanin [6], C Gagliano [6], S Tonolli [6], R Zoanetti [6], R Tonetti [7], R Cavalli [8], E Lingua [8], F Pirotti [8], S Grigolato [8], D Bellingeri [9], E Zini [9], D Gianelle [10], M Dalponte [10], E Pompei [11], A Stefani [11], R Motta [12], D Morresi [12], M Garbarino [12], G Alberti [13], F Valdevit [13], E Tomelleri [14], M Torresani [14], G Tonon [14], M Marchi [15], P Corona [15], M Marchetti [16]

Forest damage inventory after the "Vaia" storm in Italy

On October 29, 2019, the Vaia storm hits the North-Eastern regions of Italy by wind gusts exceeding 200 km h^{-1}. The forests in these regions have been seriously damaged. This contribution illustrates the methodology adopted in the emergency phase to estimate forest damages caused by Vaia storm, both in terms of damaged forest areas and growing stock volume of fallen trees. 494 Municipalities registered forest damages caused by Vaia, destroyed or intensely damaged forest stands amounted to about 42,500 ha, spread in Trentino Alto Adige, Veneto, Friuli Venezia Giulia, Lombardy and, only marginally, Piedmont and Valle d'Aosta. The growing stock volume of fallen trees was about 8.5 millions m^3.

Keywords: Windstorms, North-Eastern Italy, Wind Damages, Forest Damage Inventory



Renzo Motta, Carezza

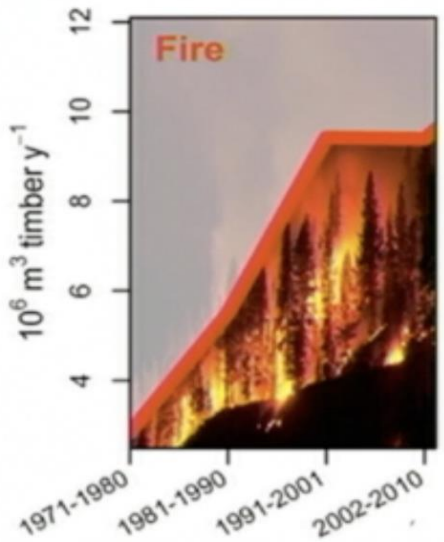
Global Change Biology (2003) 9, 1620–1633, doi: 10.1046/j.1529-8817.2003.00684.x

Natural disturbances in the European forests in the 19th and 20th centuries

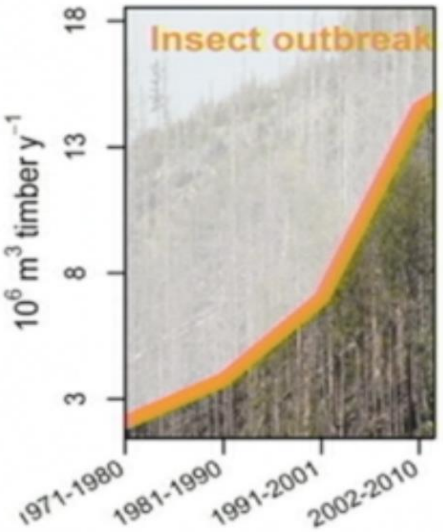
MART-JAN SCHELHAAS*†, GERT-JAN NABUURS*† and ANDREAS SCHUCK†
*Alterra, Green World Research, PO Box 47, NL-6700 AA Wageningen, The Netherlands, †European Forest Institute, Torikatu 34, FIN-80100, Joensuu, Finland

Increasing forest disturbances in Europe and their impact on carbon storage

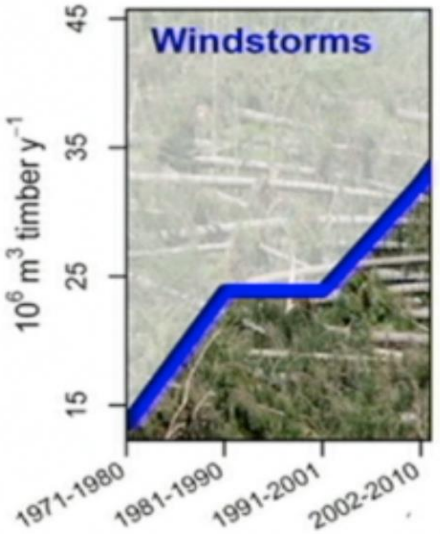
Rupert Seidl,[1,*] Mart-Jan Schelhaas,[2] Werner Rammer,[1] and Pieter Johannes Verkerk[3]



+231%



+602%



+139%

percent change relative to 1971 – 1980

In the last 40 years the forest area damaged by natural disturbances has significantly increased. Climate change?=

Biogeosciences, 15, 5699–5713, 2018
https://doi.org/10.5194/bg-15-5699-2018

Biogeosciences

Legacies of past land use have a stronger effect on forest carbon exchange than future climate change in a temperate forest landscape

Dominik Thom[1,2], Werner Rammer[1], Rita Garstenauer[3], and Rupert Seidl[1]

Anthropocene 6 (2014) 63–74

Contents lists available at ScienceDirect

Anthropocene

journal homepage: www.elsevier.com/locate/ancene

Fire, humans and landscape in the European Alpine region during the Holocene

E. Valese[a,*], M. Conedera[b], A.C. Held[c], D. Ascoli[d]

Global Change Biology (2006) 12, 1435–1450, doi: 10.1111/j.1365-2486.2006.01188.x

The relative importance of climatic effects, wildfires and management for future forest landscape dynamics in the Swiss Alps

SABINE SCHUMACHER and HARALD BUGMANN
Swiss Federal Institute of Technology Zurich, Department Environmental Sciences, Forest Ecology, CH-8092 Zurich, Switzerland

Ann. For. Sci. 67 (2010) 701
© INRA, EDP Sciences, 2010
DOI: 10.1051/forest/2010026

Available online at:
www.afs-journal.org

Original article

Land-use and climate change effects in forest compositional trajectories in a dry Central-Alpine valley

Urs GIMMI*, Thomas WOHLGEMUTH, Andreas RIGLING, Christian W. HOFFMANN, Matthias BÜRGI

Forest@
Rivista di Selvicoltura ed Ecologia Forestale
Editoriale
doi: 10.3832/efor0072-015
vol. 15, pp. 71-74

Territorio, bioeconomia e gestione degli incendi: una sfida da raccogliere al più presto

Marco Marchetti [1],
Davide Ascoli [2]

Landscape, bioeconomy and wildfire management: a challenge to face very soon

Forest fires are increasing in all developed temperate countries and especially in Southern Europe. An unprecedented forest transition is more and more due to land abandonment on one side and, on the other side, to the lack of awareness in urban culture about ecological processes and dynamics. Wildland Urban Interfaces are growing and could represent potential traps in terms of security for people especially where fuel is not managed, urban areas are not planned at all and landscape is not properly planned in an integrated way. We need integrated and transversal measures by converging fire prevention programs with the RDP measures for the agro-forestry-pastoral sector and the nature conservation agenda; that is, encouraging agricultural, pastoral and forestry activities, and nature conservation interventions in areas at high fire risk, favouring the bioeconomy where forest planning has identified strategic areas for fire prevention.

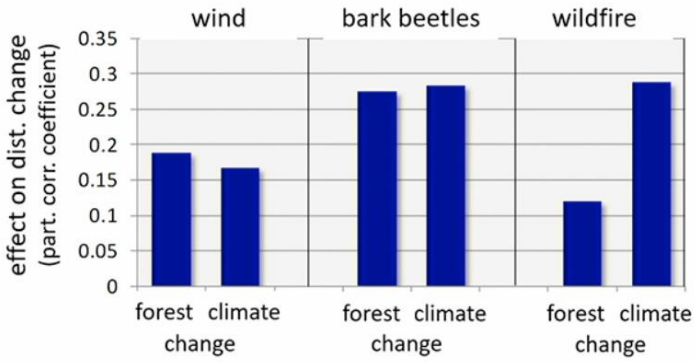
Keywords: Fire Planning and Forest Policies, Megafires, Deep Causes and Increase of Fire Passage Severity, Territorial Factors and Socioeconomics

Drivers of disturbance change in Europe

Climate change is an important driver of increasing disturbances

…but…

also management contributed (via changes in forest structure and composition)



Seidl et al. (2011, Glob. Change Biol.)

Most important “driver” of current natural disturbance regime is the land-use change (more for fire than for wind and bark beetles)

GoProFor
LIFE17 GIE/IT/000561

SISEF

PALERMO | 11 NOVEMBRE 2019
LIFE E RETE NATURA 2000
Dall'esperienza dei Progetti verso un modello condiviso per la Gestione Forestale

LIFE AND NATURA 2000 NETWORK
From Projects experience to a shared model for Forest Management

NATURA 2000

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-018-06788-9 OPEN

Patterns and drivers of recent disturbances across the temperate forest biome

Andreas Sommerfeld[1], Cornelius Senf[1,2], Brian Buma[3], Anthony W. D'Amato[4], Tiphaine Després[5,6], Ignacio Díaz-Hormazábal[7], Shawn Fraver[8], Lee E. Frelich[9], Álvaro G. Gutiérrez[7], Sarah J. Hart[10], Brian J. Harvey[11], Hong S. He[12], Tomáš Hlásny[13], Andrés Holz[13], Thomas Kitzberger[14], Dominik Kulakowski[15], David Lindenmayer[16], Akira S. Mori[17], Jörg Müller[18,19], Juan Paritsis[14], George L. W. Perry[20], Scott L. Stephens[21], Miroslav Svoboda[3], Monica G. Turner[22], Thomas T. Veblen[23] & Rupert Seidl[1]

nature climate change

REVIEW ARTICLE

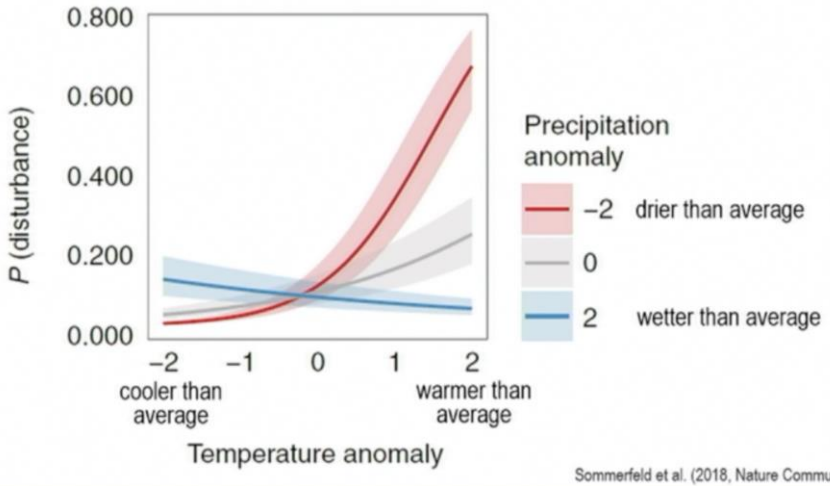
PUBLISHED ONLINE: 31 MAY 2017 | DOI: 10.1038/NCLIMATE3303

Forest disturbances under climate change

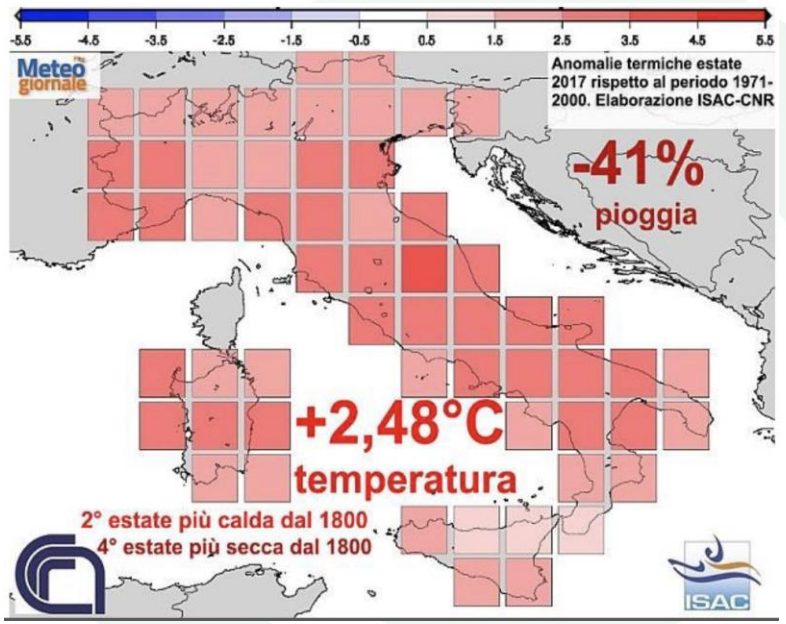
Rupert Seidl[1*], Dominik Thom[1], Markus Kautz[2], Dario Martin-Benito[3,4], Mikko Peltoniemi[5], Giorgio Vacchiano[6], Jan Wild[7,8], Davide Ascoli[9], Michal Petr[10], Juha Honkaniemi[5], Manfred J. Lexer[1], Volodymyr Trotsiuk[11], Paola Mairota[12], Miroslav Svoboda[13], Marek Fabrika[13], Thomas A. Nagel[11,14] and Christopher P. O. Reyer[15]

Analysis of 50 forest landscapes throughout the temperate biome

Large-scale, severe disturbances are consistently linked to warm and dry years



Sommerfeld et al. (2018, Nature Communications)



Institute of Atmospheric Sciences and Climate

We expect an increment of frequency and intensity of natural disturbances due to climate change!

- Current strong influence of past land-use and land-use change
- Anthropogenic influence (direct)
- Interactions among disturbances

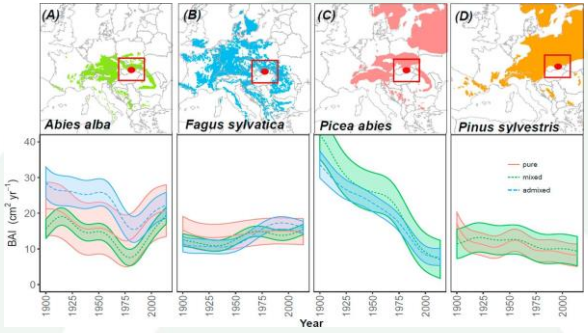
What we need to monitor? What are the correct indicators?

- Forest growth?
- Forest regeneration/structure?
- Dieback/mortality?
- Forest resistance?
- Forest resilience?
- Exotic/alien species?

Forest Ecology and Management
Volume 446, 15 August 2019, Pages 293-303

Long-term effects of environmental change and species diversity on tree radial growth in a mixed European forest

Michal Bosela [a], Ladislav Kulla [b], Joerg Roessiger [b], Vladimír Šebeň [b], Laura Dobor [c], Ulf Büntgen [d, e, f], Martin Lukac [c, g]



AGU100 ADVANCING EARTH AND SPACE SCIENCE
Journal of Advances in Modeling Earth Systems

RESEARCH ARTICLE
10.1029/2018MS001275

Thinning Can Reduce Losses in Carbon Use Efficiency and Carbon Stocks in Managed Forests Under Warmer Climate

Key Points:
- How will C-fluxes, CUE, and C-stocks of the major European forest types may respond to elevated atmospheric CO_2, warming, and management in the future?
- Results show that managed forests

Alessio Collalti[1,2], Carlo Trotta[3], Trevor F. Keenan[4,5], Andreas Ibrom[6], Ben Bond-Lamberty[7], Ruediger Grote[8], Sara Vicca[9], Christopher P. O. Reyer[10], Mirco Migliavacca[11], Frank Veroustraete[12], Alessandro Anav[13], Matteo Campioli[6], Enrico Scoccimarro[14], Ladislav Šigut[15], Elisa Grieco[1], Alessandro Cescatti[16], and Giorgio Matteucci[2]

nature Vol 447|14 June 2007|doi:10.1038/nature05847

LETTERS

The human footprint in the carbon cycle of temperate and boreal forests

Federico Magnani[1], Maurizio Mencuccini[2], Marco Borghetti[3], Paul Berbigier[4], Frank Berninger[5], Sylvain Delzon[4], Achim Grelle[6], Pertti Hari[7], Paul G. Jarvis[2], Pasi Kolari[7], Andrew S. Kowalski[8], Harry Lankreijer[9], Beverly E. Law[3], Anders Lindroth[6], Denis Loustau[4], Giovanni Manca[10†], John B. Moncrieff[2], Mark Rayment[2], Vanessa Tedeschi[2], Riccardo Valentini[10] & John Grace[2]

SPECIAL SECTION FOREST HEALTH

REVIEW

Forest health and global change

S. Trumbore,[1,2*] P. Brando,[3,4] H. Hartmann[1]

Humans rely on healthy forests to supply energy, building materials, and food and to provide services such as storing carbon, hosting biodiversity, and regulating climate. Defining forest health integrates utilitarian and ecosystem measures of forest condition and function, implemented across a range of spatial scales. Although native forests are adapted to some level of disturbance, all forests now face novel stresses in the form of climate change, air pollution, and invasive pests. Detecting how intensification of these stresses will affect the trajectory of forests is a major scientific challenge that requires developing systems to assess the health of global forests. It is particularly critical to identify thresholds for rapid forest decline, because it can take many decades for forests to restore the services that they provide.

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Long-term response of forest productivity to climate change is mostly driven by change in tree species composition

Xavier Morin, Lorenz Fahse, Hervé Jactel, Michael Scherer-Lorenzen, Raúl García-Valdés & Harald Bugmann

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LIFE E RETE NATURA 2000
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LIFE AND NATURA 2000 NETWORK
From Projects experience to a shared model for Forest Management

Life
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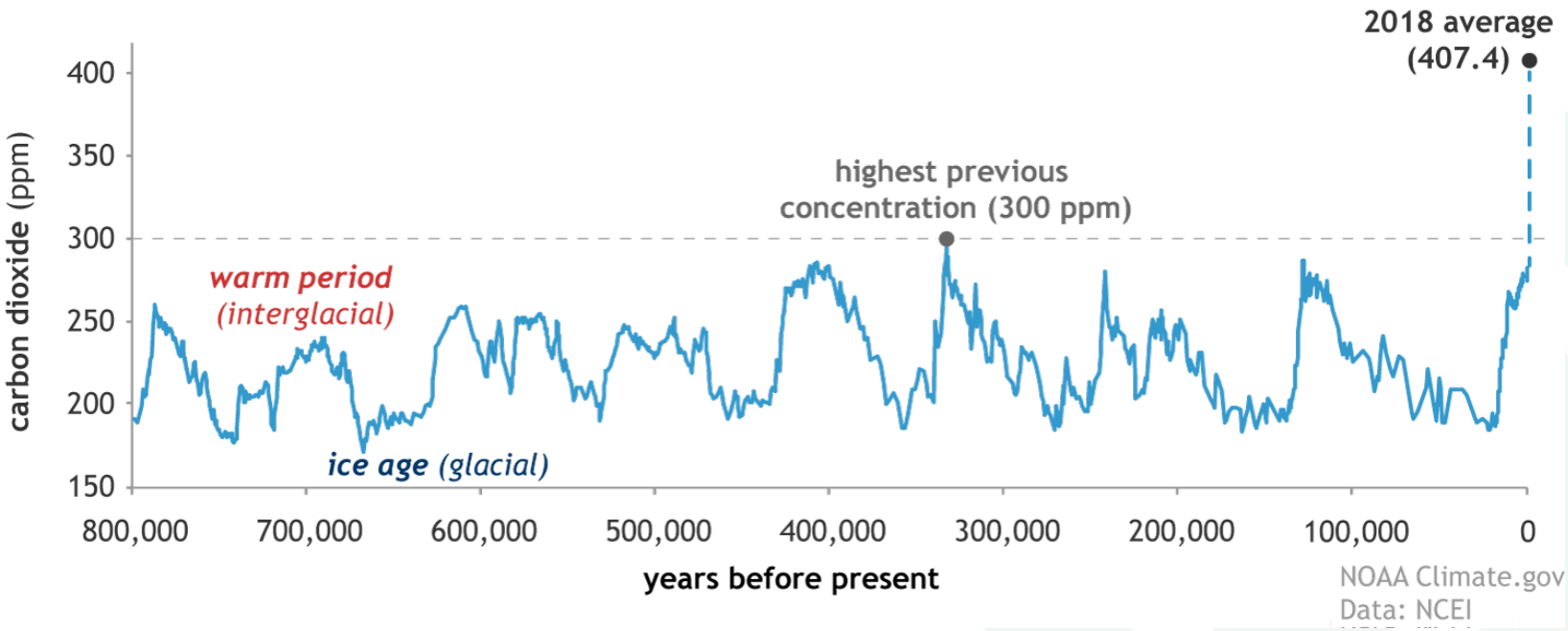

The current situation (carbon dioxide concentration) has never been experienced by our planet in the last 800.000 years. So we can build scenarios but **we cannot validate them** because we don't have a reference

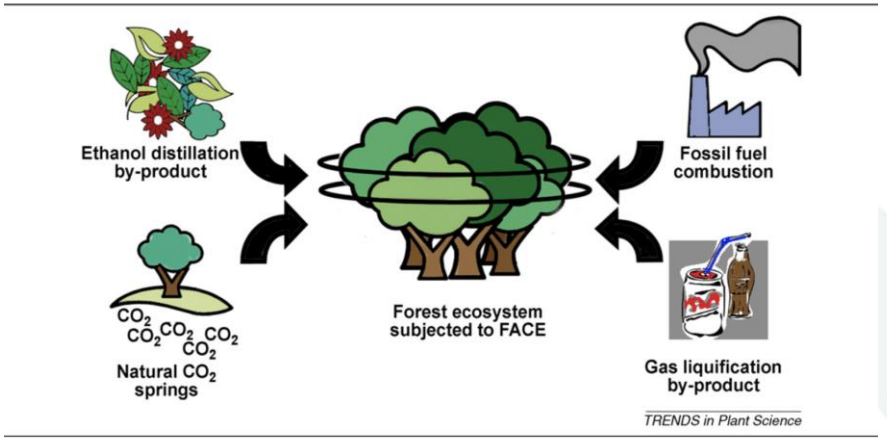

Figure 2. Natural versus artificial CO_2 sources to be considered for future experiments on forests to contain CO_2 costs.

Opinion

Cell PRESS

Challenges in elevated CO_2 experiments on forests

ESF-Forest FACE Group
Carlo Calfapietra[1], Elizabeth A. Ainsworth[2,3], Claus Beier[4], Paolo De Angelis[5], David S. Ellsworth[6], Douglas L. Godbold[7], George R. Hendrey[8], Thomas Hickler[9], Marcel R. Hoosbeek[10], David F. Karnosky[11], John King[12], Christian Körner[13], Andrew D.B. Leakey[3], Keith F. Lewin[14], Marion Liberloo[15], Stephen P. Long[3], Martin Lukac[16], Rainer Matyssek[17], Franco Miglietta[18], John Nagy[14], Richard J. Norby[19], Ram Oren[20], Kevin E. Percy[21], Alistair Rogers[14,3], Giuseppe Scarascia Mugnozza[22], Mark Stitt[23], Gail Taylor[24] and Reinhart Ceulemans[15]

CLIMATE CHANGE

Swiss university prepares for twenty-year forest experiment

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- Permanent plots (Forest reserves, LTER, long-term silvicultural experiments…)
- Adaptation (genetic, ecological traits…)
- New tools (satellite sensors, ecophysiological experiments, field manipulations…)
- “Prudential” indicators (number of species, new aliens, crown transparency, dieback or mortality…)

Ecology, 93(2), 2012, pp. 389–401

Factors driving mortality and growth at treeline: a 30-year experiment of 92 000 conifers

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- Importance of long-term experiments and long-term monitoring
- **LONG term!**

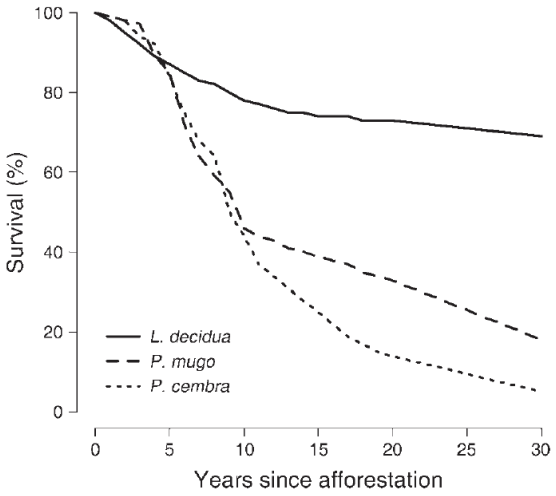

FIG. 2. Survival curves for three high-elevation conifers (*Larix decidua*, *Pinus mugo* ssp. *uncinata*, and *Pinus cembra*) for the period 1975–2005. For each species, survival is expressed as a percentage of the ~30 000 trees per species planted as seedlings.

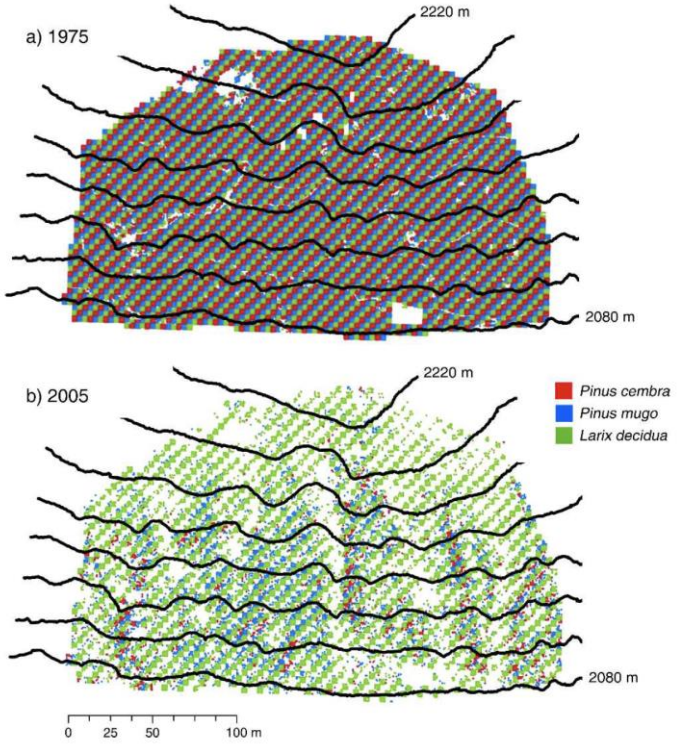

FIG. 1. Tree species distribution map of Stillberg, Central Alps, Switzerland, in: (a) 1975 and (b) 2005.

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