PEPR | FORESTT

Building Social-Ecological Resilience of Multi-Value Forests in Canada

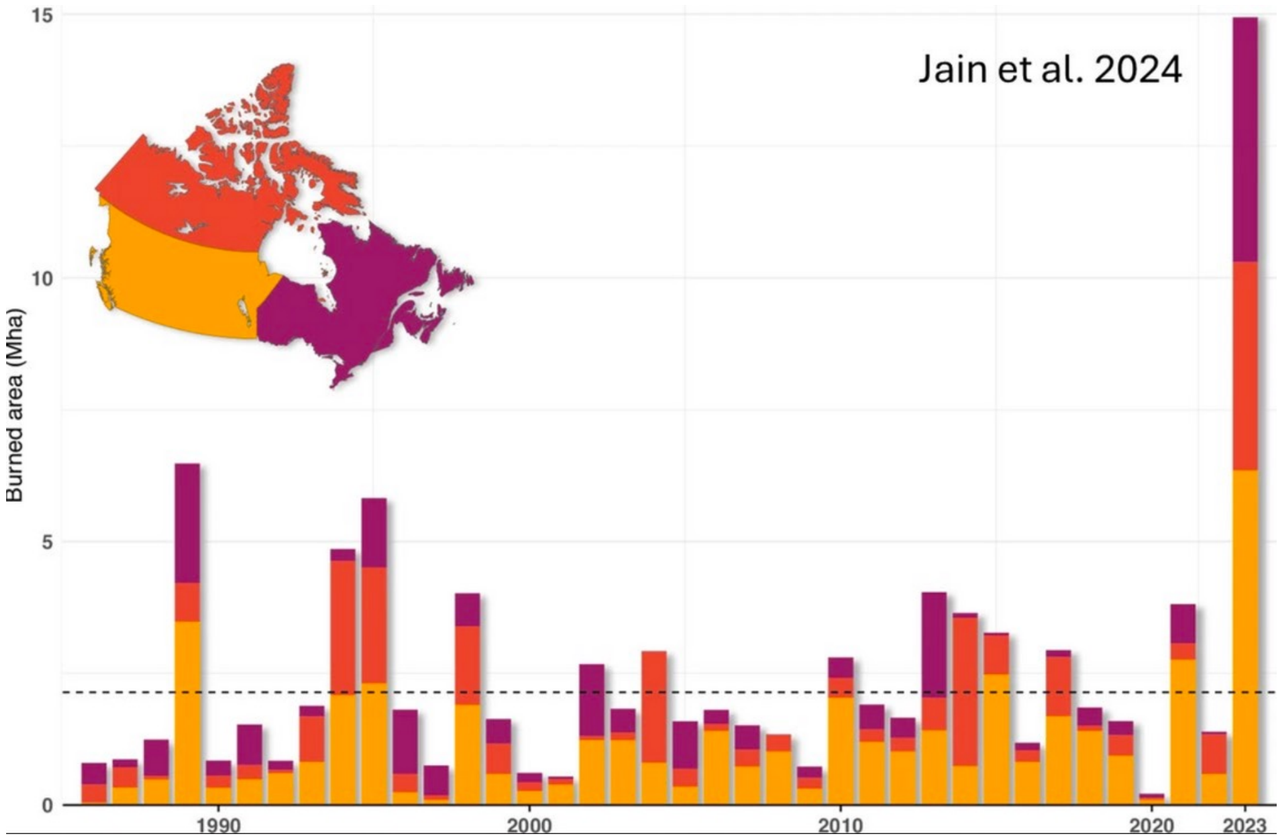
Tahia Devisscher, PhD
UBC, Faculty of Forestry

Oct 1 | 2025


Image | Natucate

Forest Fires

Canada's 2025 wildfire season is the second-worst on record. Scientists link the surge in fires to climate change, which is extending fire seasons and drying landscapes.

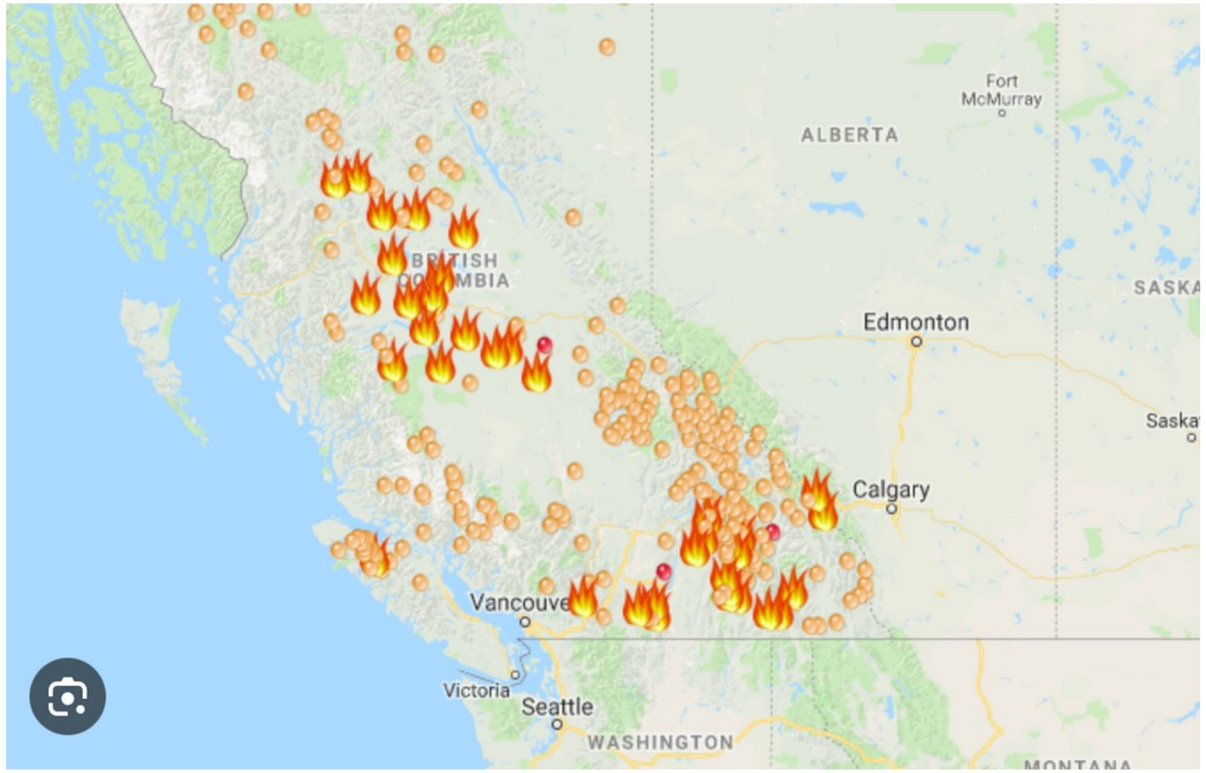


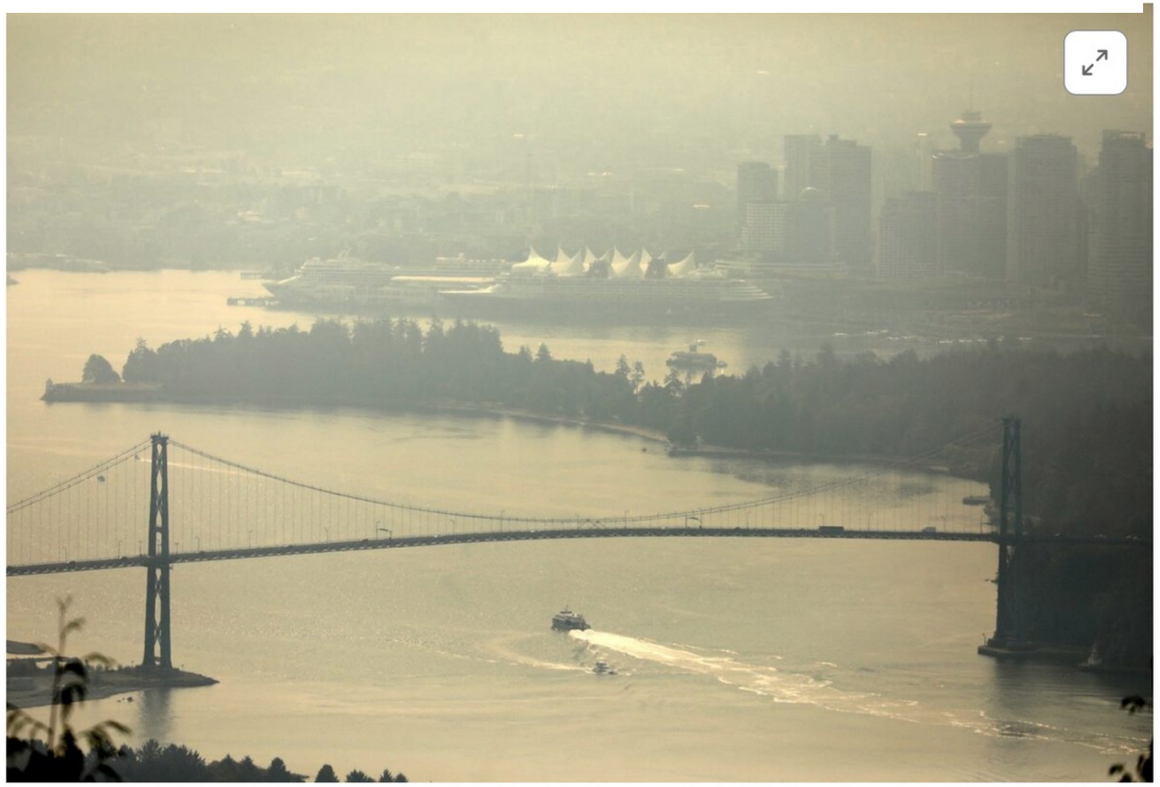
Canadian wildfire emissions double previous record as flames rage on

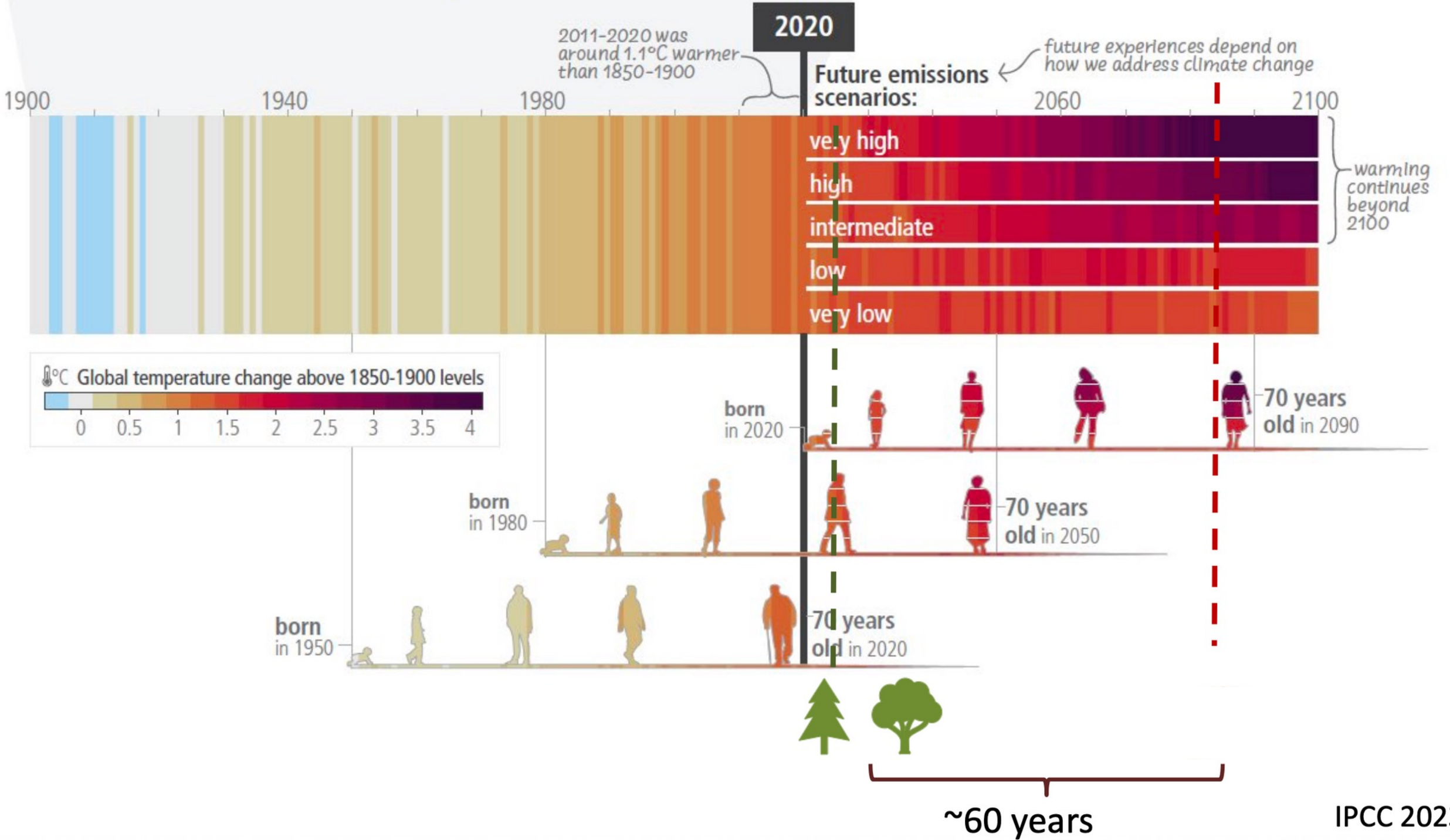
By **Reuters**

August 3, 2023 9:38 AM PDT · Updated August 3, 2023

Wildfire-hit British Columbia blanketed with hazardous smoke pollution






2020
2011-2020 was around 1.1°C warmer than 1850-1900
future experiences depend on how we address climate change
Future emissions scenarios:
1900
1940
1980
2060
2100
very high
high
intermediate
low
very low
warming continues beyond 2100
°C Global temperature change above 1850-1900 levels
0 0.5 1 1.5 2 2.5 3 3.5 4
born in 2020
70 years old in 2090
born in 1980
70 years old in 2050
born in 1950
70 years old in 2020
~60 years

IPCC 2023

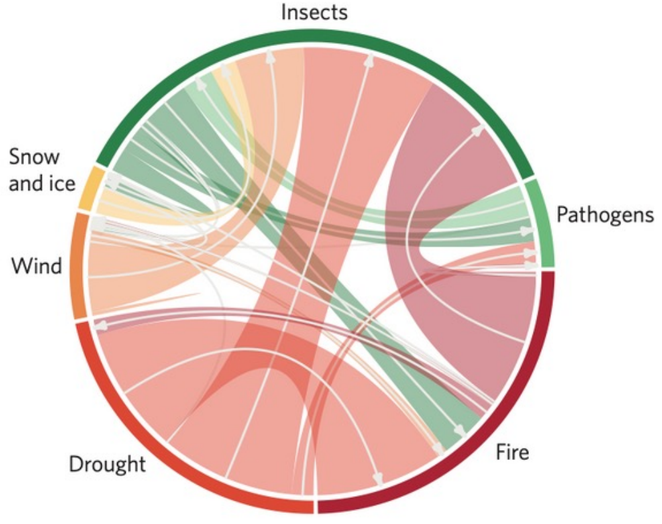
nature climate change

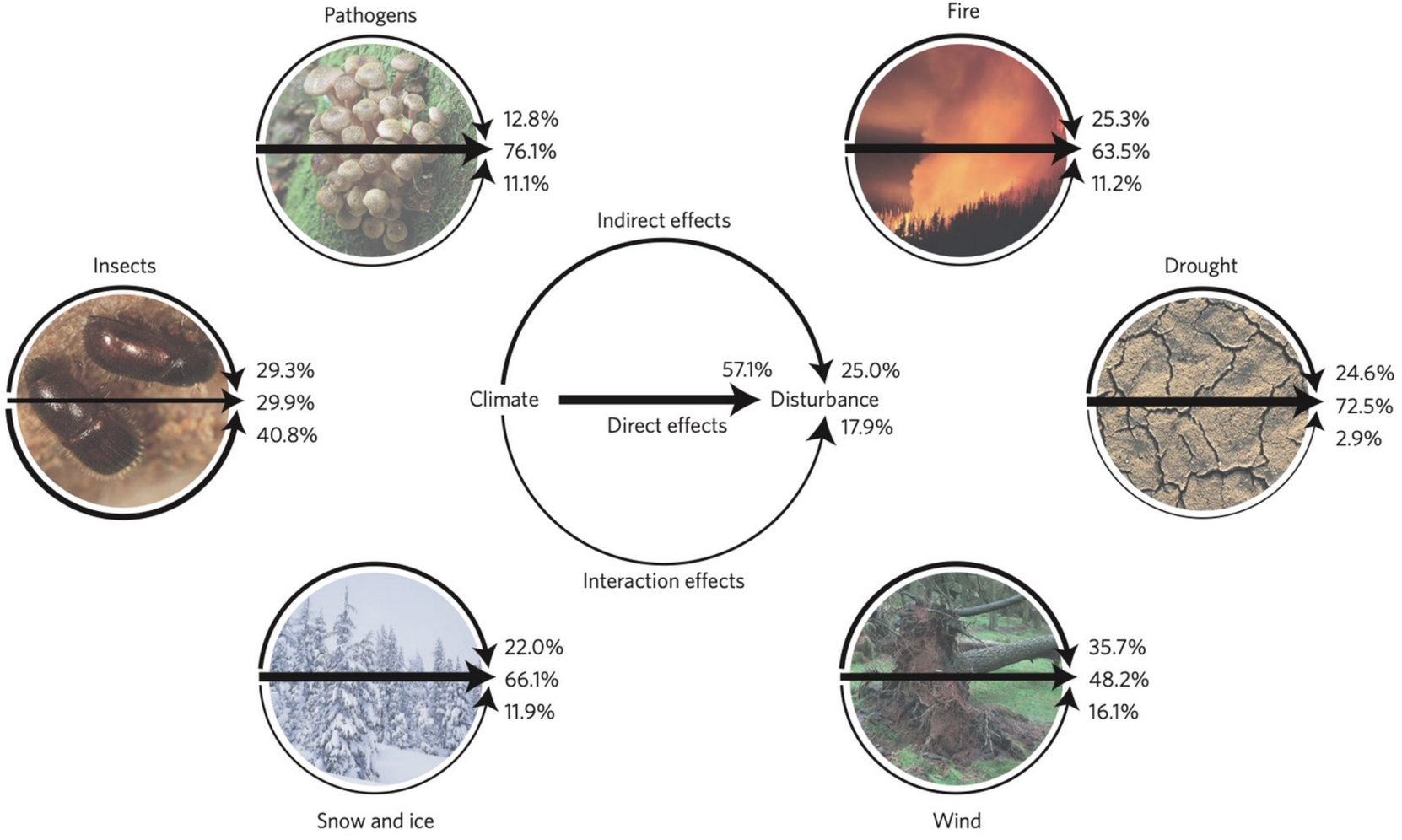
REVIEW ARTICLE

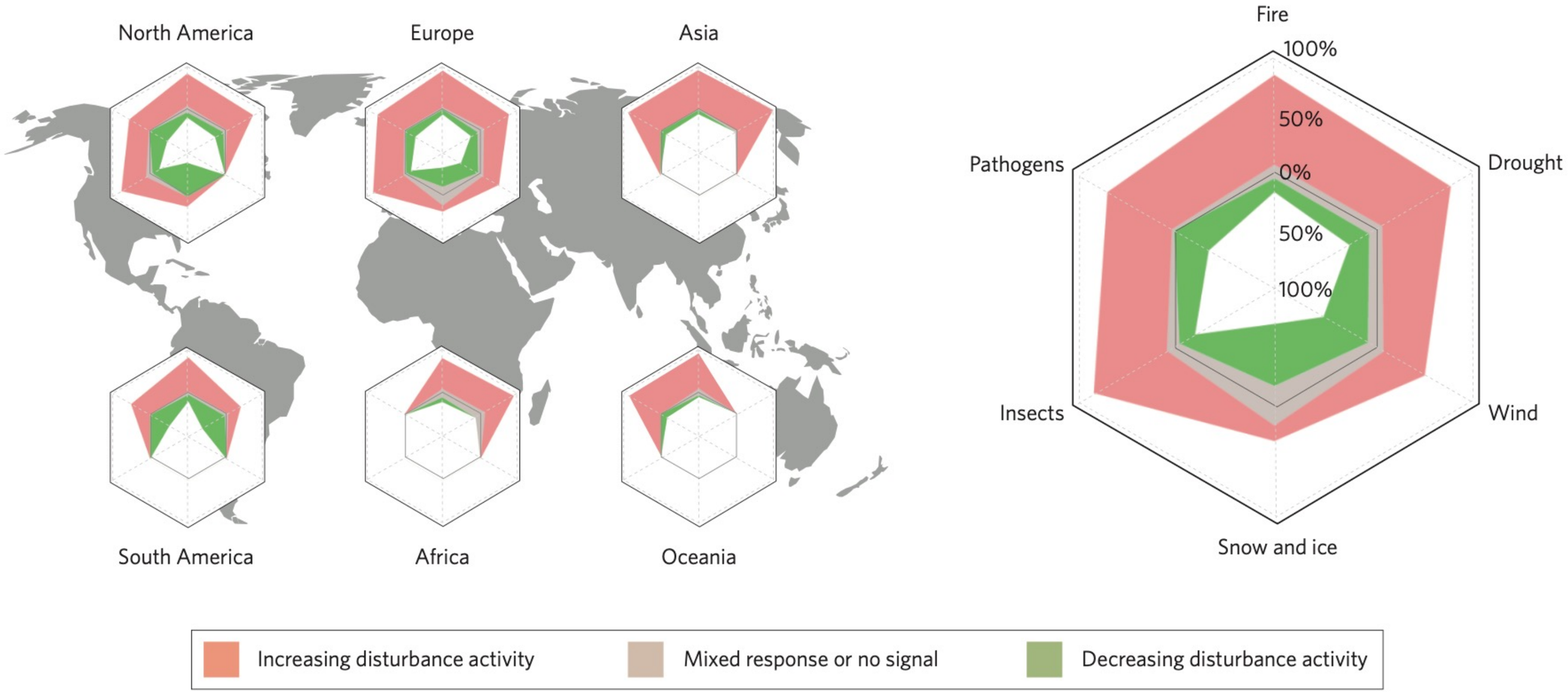
PUBLISHED ONLINE: 31 MAY 2017 | DOI: 10.1038/NCLIMATE3303

Forest disturbances under climate change

Rupert Seidl[1*], Dominik Thom[1], Markus Kautz[2], Giorgio Vacchiano[6], Jan Wild[7,8], Davide Ascoli[9], Volodymyr Trotsiuk[11], Paola Mairota[12], Miroslav and Christopher P. O. Reyer[15]







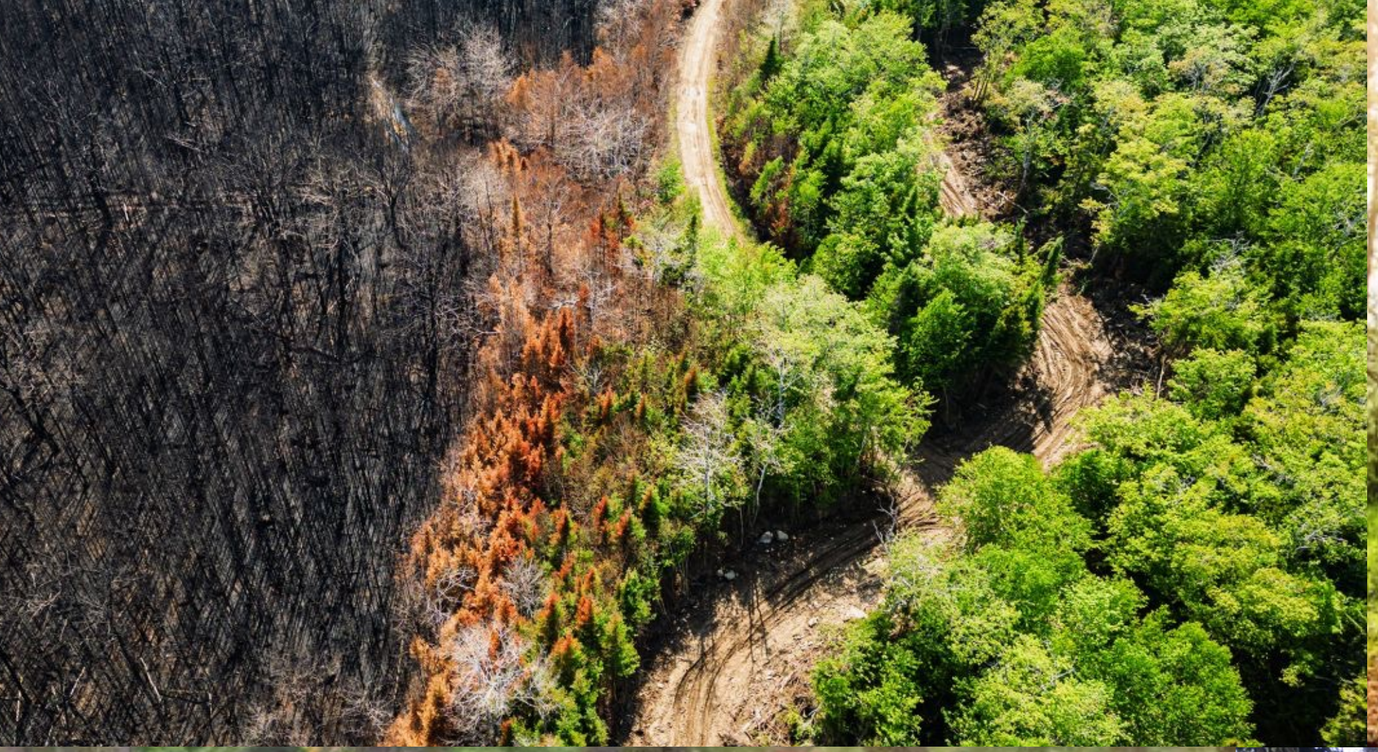
We conclude that ecosystems and society must be prepared for an INCREASINGLY DISRUPTED future of forests

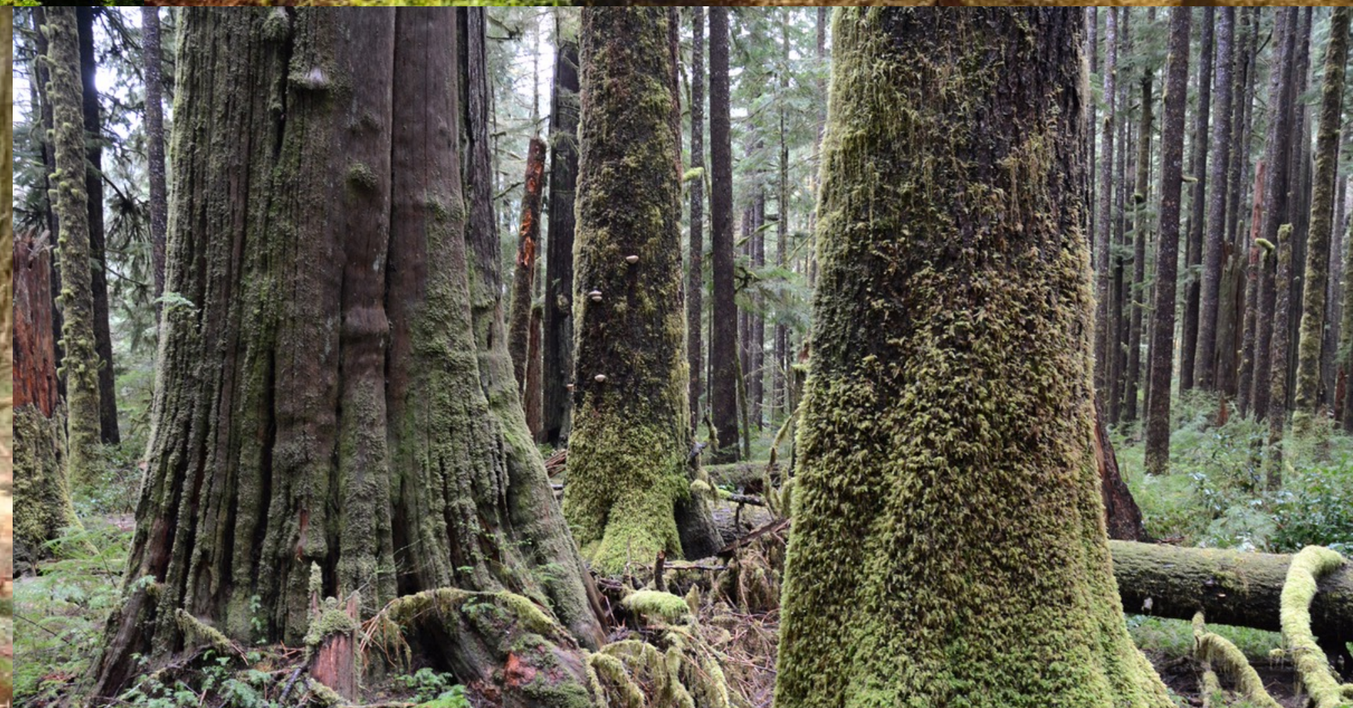

Global
NEWS

Climate Grief and Solastalgia

Sense of loss or mourning related to environmental destruction, climate change, or a sense of lost connection to the natural world


Image | AI Solarik





LIMITATIONS

Silo approach to timber harvest:
volume oriented disincentivizes diverse strategies

Myopic, short-term tendency in the stewardship:
tenure system

Missing long-term monitoring:
linking stand-level with landscape-level planning

Forest management and legislation are witnessing the need to adopt a new paradigm that embraces dealing with uncertainty and increasing resilience

Approaches

Community Forestry

Conceptualized as an area-based license to provide long-term opportunities for a range of community objectives, values and priorities.

Functional Complex Networks

Managing forests as complex adaptive systems to integrate functional diversity and connectivity in a multi-scale approach.

Triad Forestry

Forest zoning approach for intensive plantation management, ecological reserves, and a matrix for multiple uses to help reduce trade-offs.

SES Resilience

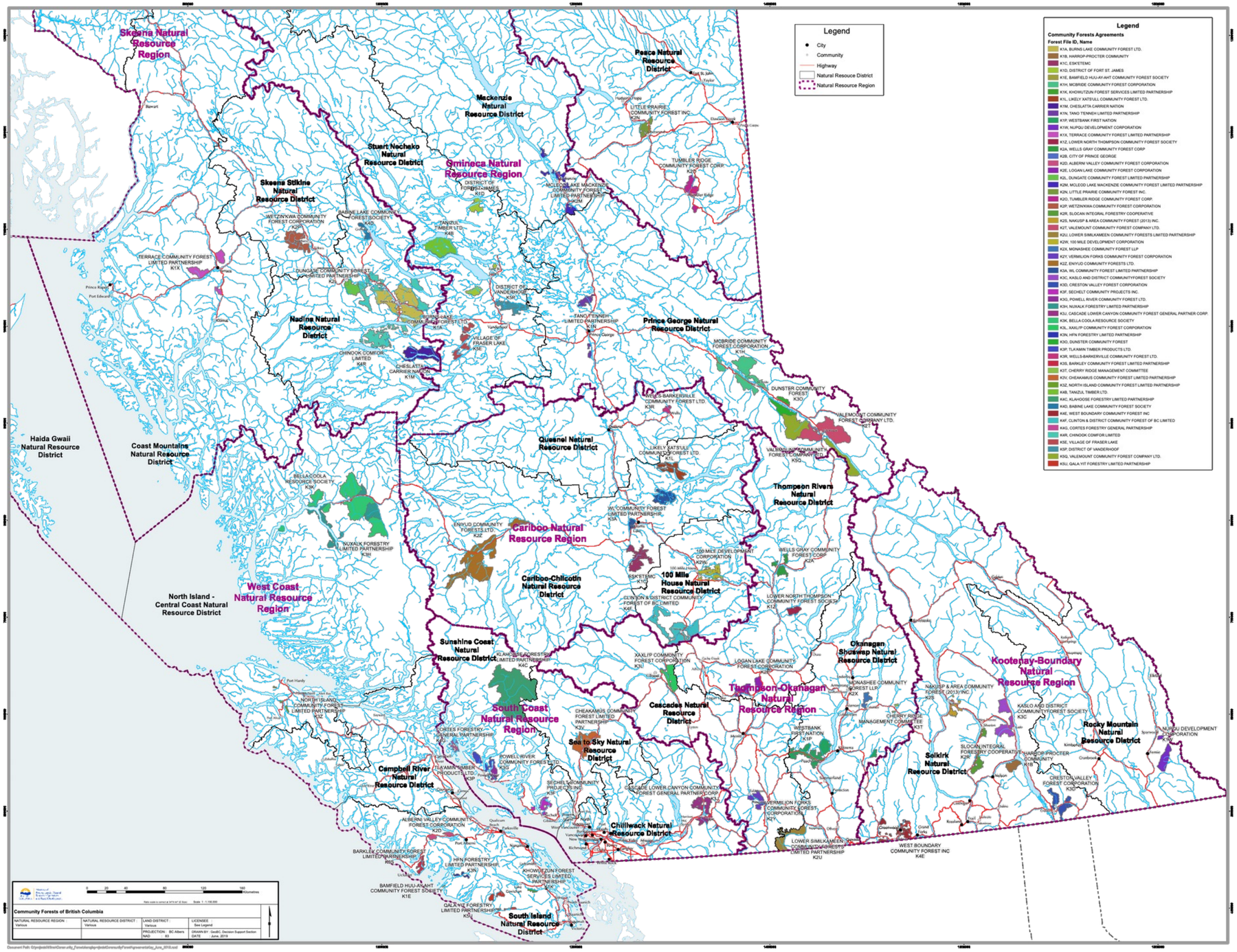
Approaches

Community Forestry

Conceptualized as an area-based license to provide long-term opportunities for a range of community objectives, values and priorities

SES Resilience

BC COMMUNITY FOREST ASSOCIATION



Land Use Policy 103 (2021) 105317

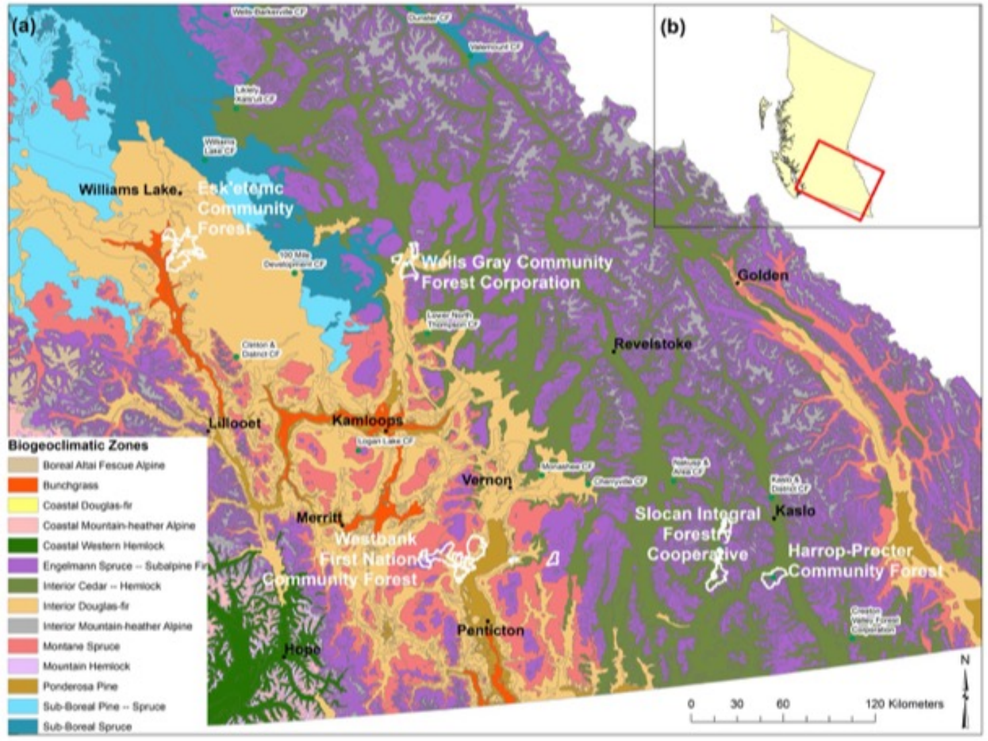
Contents lists available at ScienceDirect

Land Use Policy

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

Time for change: Learning from community forests to enhance the resilience of multi-value forestry in British Columbia, Canada

Tahia Devisscher [a,*], Jillian Spies [b], Verena C. Griess [a,c]



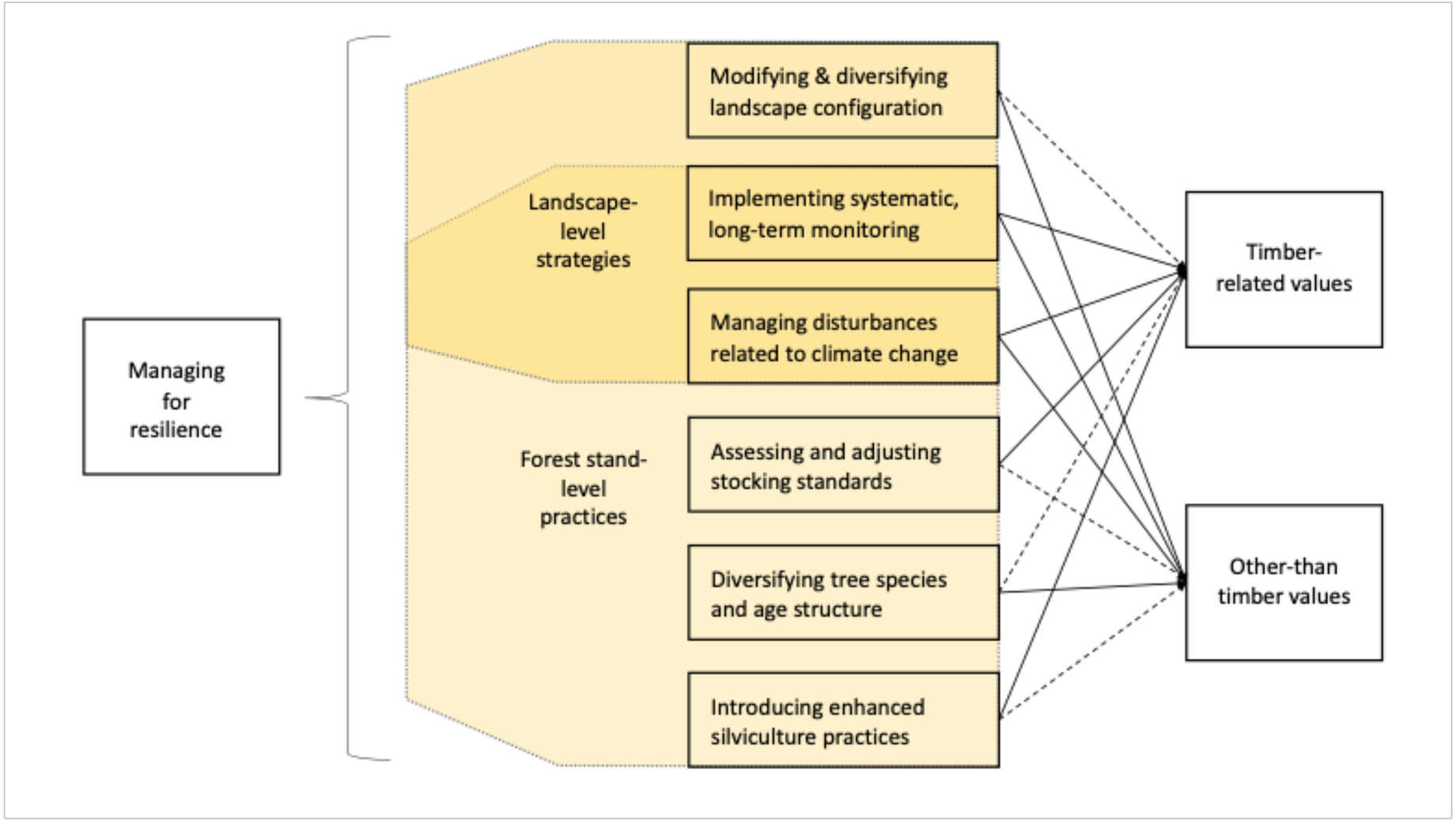
Community forests (CFs) selected as case studies, British Columbia, Canada.

	Total area (ha)	Direct Population 2018	Larger population 2018	Start year of license α
Esk'etemc Community Forest (E-CF)	31,000	450	10,832	2006
Westbank First Nation Community Forest (W-CF)	46,626	850	34,000	2009
Harrop-Procter Community Cooperative (HP-CF)	11,300	800	800	1999
Wells Gray Community Forest Corporation (WG-CF)	13,146	2400	2,600	2006
Slocan Integral Forestry Cooperative (S-CF)	16,000	2,000	6,500	2007

Shift in Mindset

Building bridges between extraction and conservation views.
Growing trust around a common vision.
Sense of ownership and shared responsability by local community.

Social license



Manage for resilience of multi-value forests through piloting novel practices and linking stand-level and landscape-level planning

Core lessons

- More nuanced, multi-functional and dynamic view of the forest
- Long-term investment requires a place-based approach that motivates learning
- Social license, trust and awareness strengthened adaptive capacity
- Integration of different forms of knowledge in planning

Approaches

Functional Complex Networks

Managing forests as complex adaptive systems to integrate functional diversity and connectivity in a multi-scale approach.

SES Resilience

BIOLOGICAL REVIEWS

Cambridge Philosophical Society

Biol. Rev. (2013), **88**, pp. 349–364.
doi: 10.1111/brv.12004

Response diversity determines the resilience of ecosystems to environmental change

Akira S. Mori[1,*], Takuya Furukawa[1] and Takehiro Sasaki[2]

[1] ... Information Sciences, Yokohama National University, 79-7 Tokiwadai, Hodogaya, Yokohama, 240-8501, ...

... The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, 277-8563, Japan

Received: 28 January 2021 | Revised: 20 June 2021 | Accepted: 5 July 2021

DOI: 10.1111/conl.12829

Conservation Letters
A journal of the Society for Conservation Biology
Open Access

WILEY

PERSPECTIVE

For the sake of resilience and multifunctionality, let's diversify planted forests!

Christian Messier[1,2] | Jürgen Bauhus[3] | Rita Sousa-Silva[2] | Harald Auge[4,5] | Lander Baeten[6] | Nadia Barsoum[7] | Helge Bruelheide[5,8] | Benjamin Caldwell[9] | Jeannine Cavender-Bares[10] | Els Dhiedt[6] | Nico Eisenhauer[5,11] | Gislene Ganade[12] | Dominique Gravel[13] | Joannès Guillemot[14,15] | Jefferson S. Hall[16] | Andrew Hector[17] | Bruno Hérault[18] | Hervé Jactel[19] | Julia Koricheva[20] | Holger Kreft[21,22] | Simone Mereu[23,24] | Bart Muys[25] | Charles A. Nock[26] | Alain Paquette[2] | John D. Parker[27] | Michael P. Perring[6,28,29] | Quentin Ponette[30] | Catherine Potvin[31] | Peter B. Reich[32,33] | Michael Scherer-Lorenzen[34] | Florian Schnabel[3,5] | Kris Verheyen[6] | Martin Weih[35] | Meike Wollni[36] | Delphine Clara Zemp[20,21,37]

Ecology Letters, (2007) **10**: 835–848 doi: 10.1111/j.1461-0248.2007.01073.x

LETTER

Tree diversity reduces herbivory by forest insects

Hervé Jactel[1]* and Eckehard G. Brockerhoff[2]

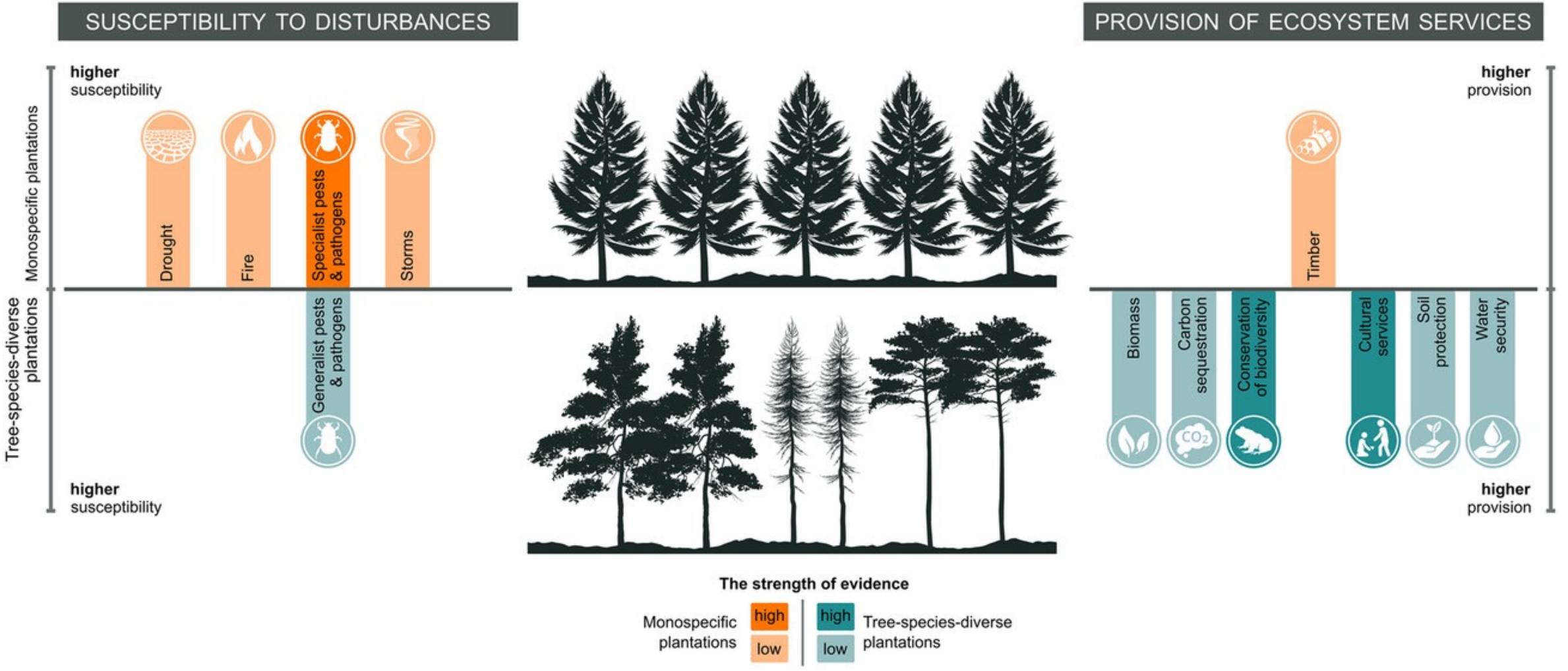
[1]*INRA, UMR1202 Biodiversity, Genes & Communities, Laboratory of Forest Entomology and Biodiversity, 69 Route d'Arcachon, 33612 Cestas Cedex, France*

[2]*Ensis[a], PO Box 29237, Christchurch 850, New Zealand*

**Correspondence: E-mail: herve.jactel@pierroton.inra.fr*

Abstract

Biodiversity loss from plant communities is often acknowledged to affect primary production but little is known about effects on herbivores. We conducted a meta-analysis of a worldwide data set of 119 studies to compare herbivory in single-species and mixed forests. This showed a significant reduction of herbivory in more diverse forests but this varied with the host specificity of insects. In diverse forests, herbivory by oligophagous species was virtually always reduced, whereas the response of polyphagous species was variable. Further analyses revealed that the composition of tree mixtures may be more important than species richness *per se* because diversity effects on herbivory were greater when mixed forests comprised taxonomically more distant tree species, and when the proportion of non-host trees was greater than that of host trees. These findings provide new support for the role of biodiversity in ecosystem functioning across trophic levels.



Conservation Letters, Volume: 15, Issue: 1, First published: 16 July 2021, DOI: (10.1111/conl.12829)

Messier *et al. Forest Ecosystems* (2019) 6:21
https://doi.org/10.1186/s40663-019-0166-2

DISCUSSION Open Access

The functional complex network approach to foster forest resilience to global changes

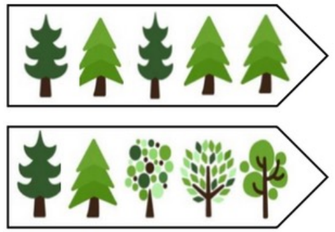
Christian Messier[1,2*], Jürgen Bauhus[3], Frederik Doyon[1], Fanny Maure[2], Rita Sousa-Silva[1], Philippe Nolet[1], Marco Mina[2,4], Núria Aquilué[2], Marie-Josée Fortin[5] and Klaus Puettmann[6]

A Resilient Forest Landscape

Functional Traits

(1) Functional Response Diversity

(2) Functional Redundancy



2 species
FDiv: **Low**
FRed: Medium

5 species
FDiv: **High**
FRed: **High**

STAND / OWNERSHIP

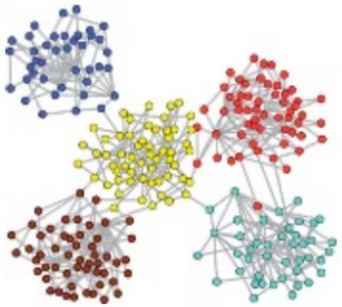
Mori *et al.* 2013 *Biol Rev*

Network Theory

(3) Connectivity: to *facilitate mvt*

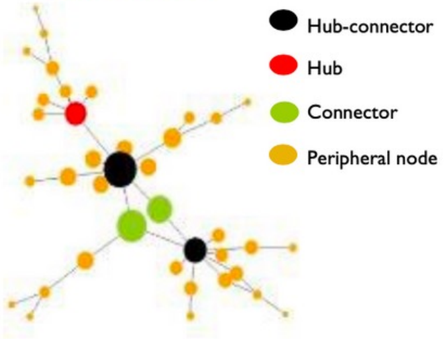
Bunn *et al.* 2000

(4) Modularity: to *decrease vulnerability*

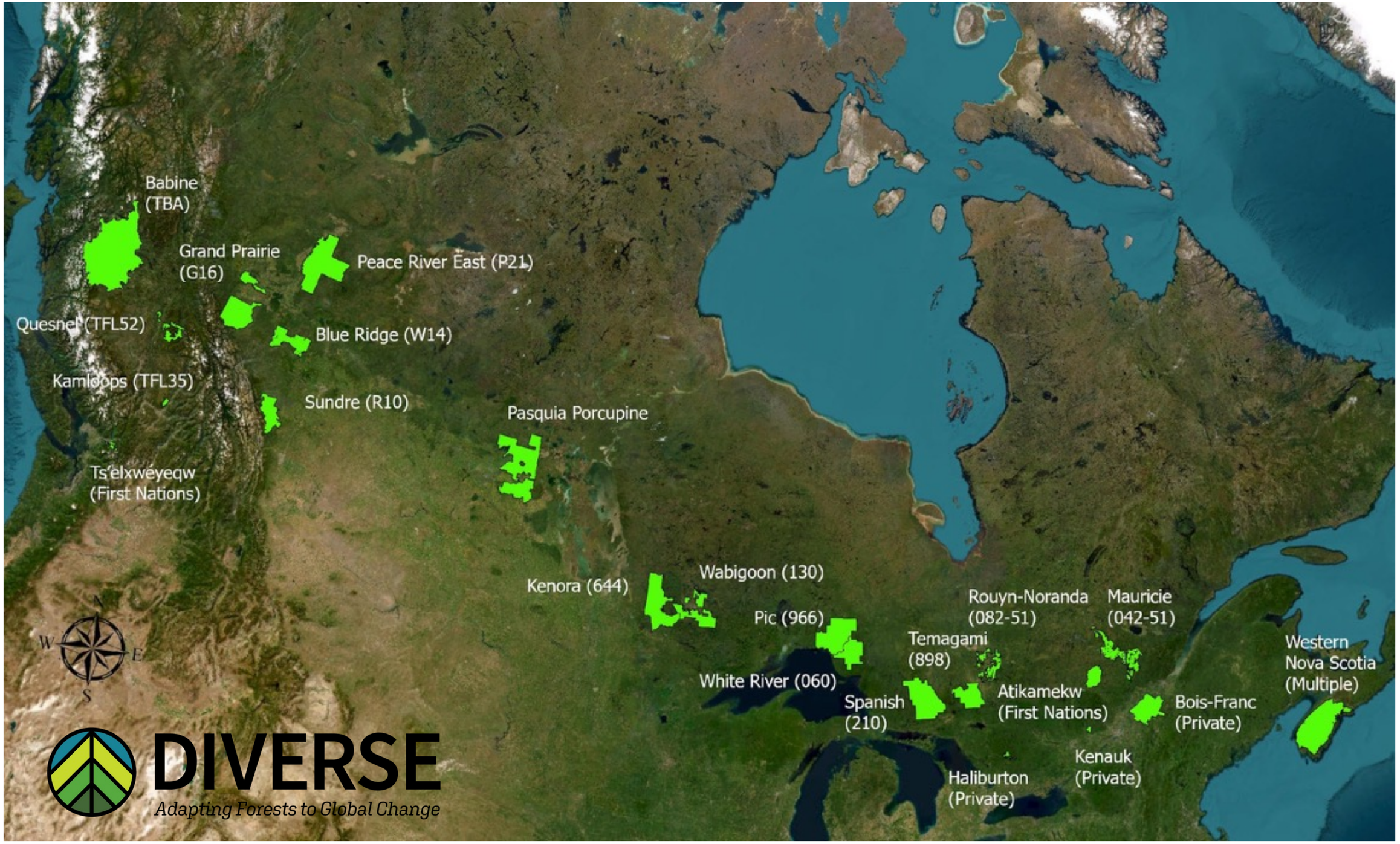


Müller-Linow *et al.* 2008

(5) Centrality: to *find where to intervene*

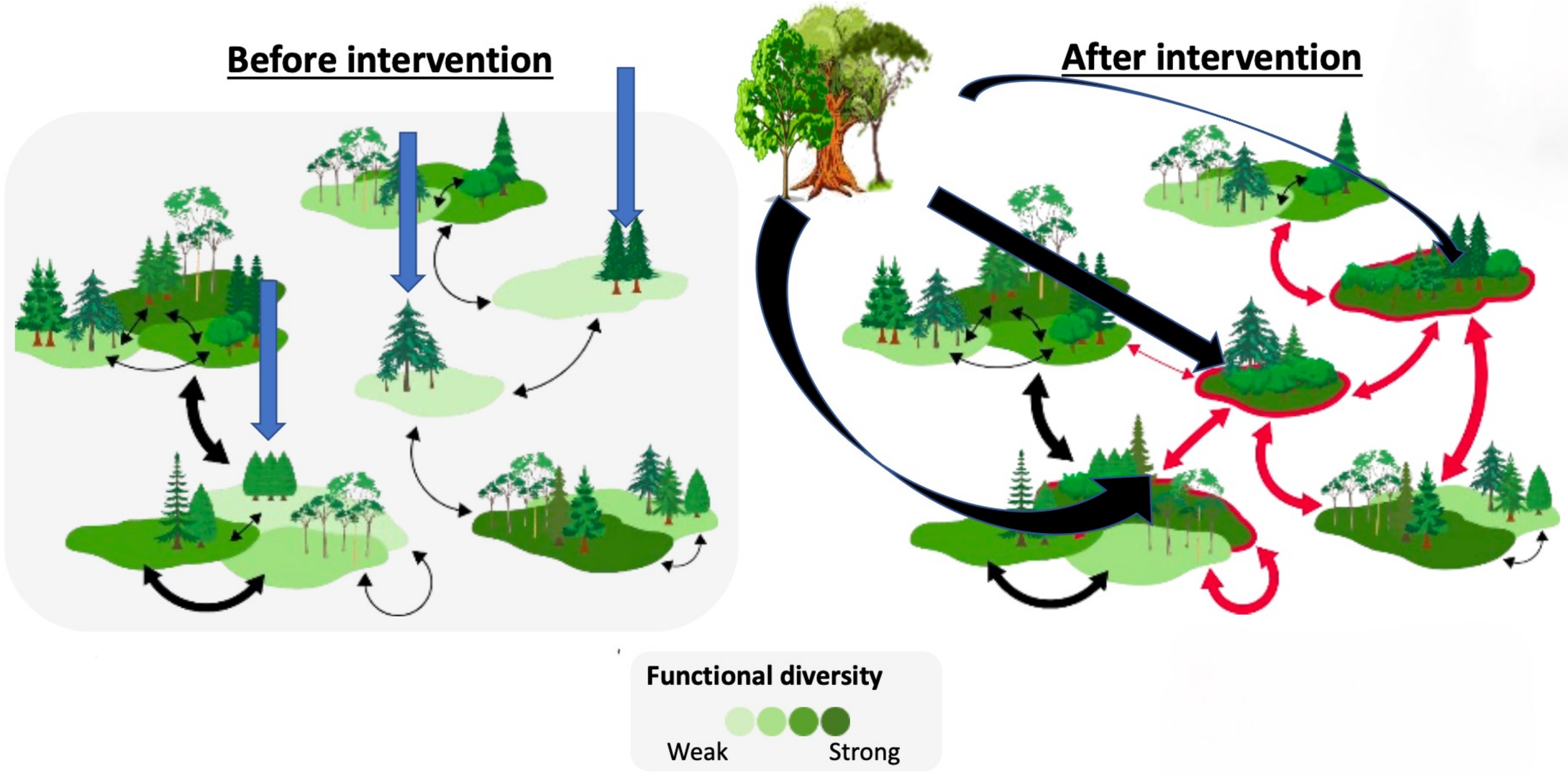


LANDSCAPE / REGION


Babine
(TBA)
Grand Prairie
(G16)
Peace River East (P21)
Quesnel (TFL52)
Blue Ridge (W14)
Kamloops (TFL35)
Sundre (R10)
Pasquia Porcupine
Ts'elxwéyeqw
(First Nations)
Kenora (644)
Wabigoon (130)
Pic (966)
Rouyn-Noranda
(082-51)
Mauricie
(042-51)
Temagami
(898)
White River (060)
Spanish
(210)
Atikamekw
(First Nations)
Bois-Franc
(Private)
Western
Nova Scotia
(Multiple)
Haliburton
(Private)
Kenauk
(Private)
N
W
E
S
DIVERSE
Adapting Forests to Global Change

DIVERSE

Adapting Forests to Global Change



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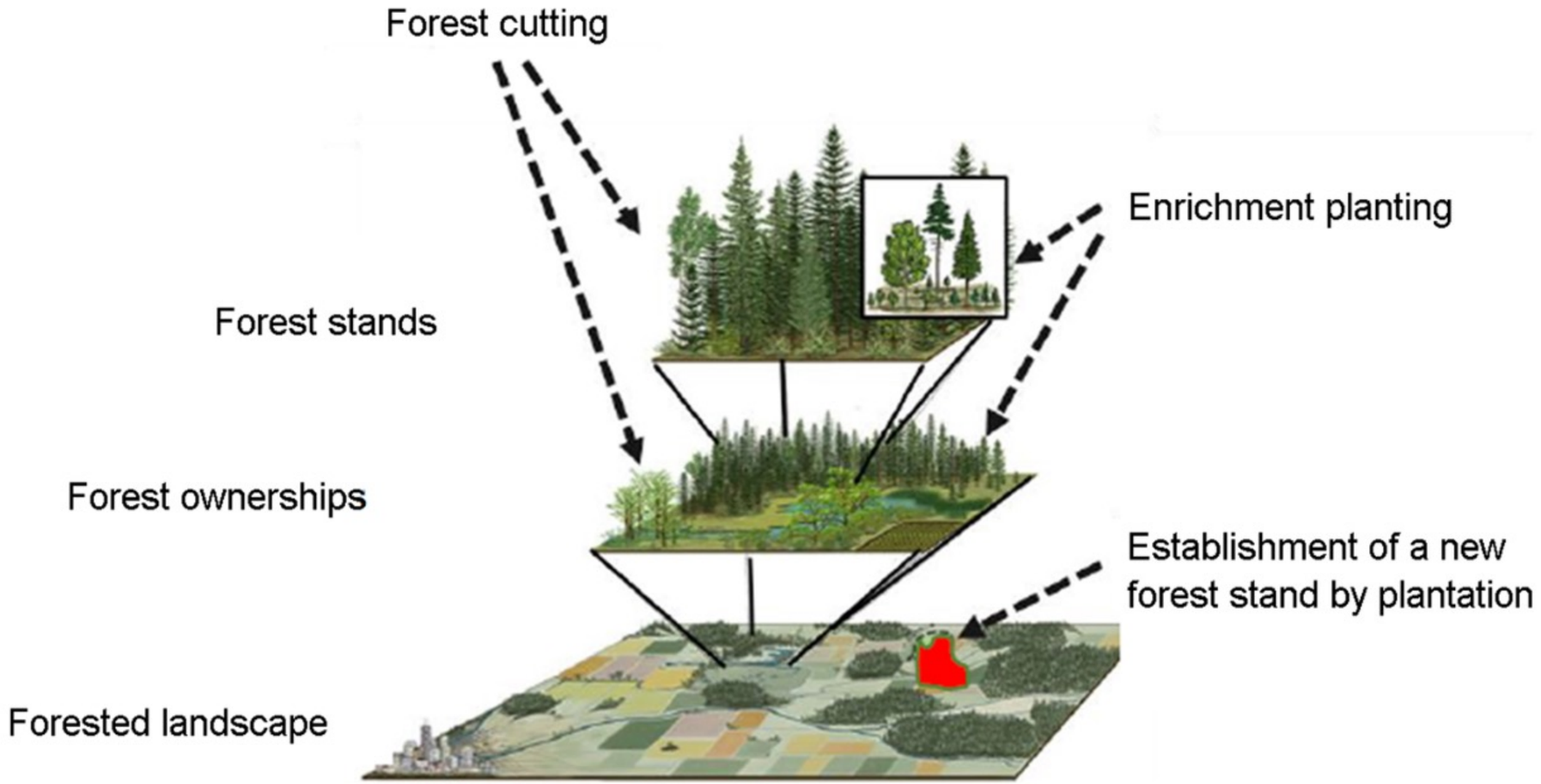


Messier *et al. Forest Ecosystems* (2019) 6:21

Approaches

Triad Forestry

Forest zoning approach for intensive plantation management, ecological reserves, and a matrix for multiple uses to help reduce trade-offs.

SES Resilience

Forest Ecology and Management 510 (2022) 120103

Contents lists available at ScienceDirect

Forest Ecology and Management

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

Perspectives: Thirty years of triad forestry, a critical clarification of theory and recommendations for implementation and testing

Austin Himes [a,*], Matthew Betts [b], Christian Messier [c,d], Robert Seymour [e]

New Forestry in Eastern Spruce-Fir Forests: Principles and Applications to Maine

Article published in 1992 by Robert S. Seymour
et Malcolm J. Hunter

Define 3 zones for diferent priorities:

Conservation

Intensive production

Extensive management (matrix)

The silvicultural work in intensive zones has to allow for a significant increase in productivity (3-6 times):

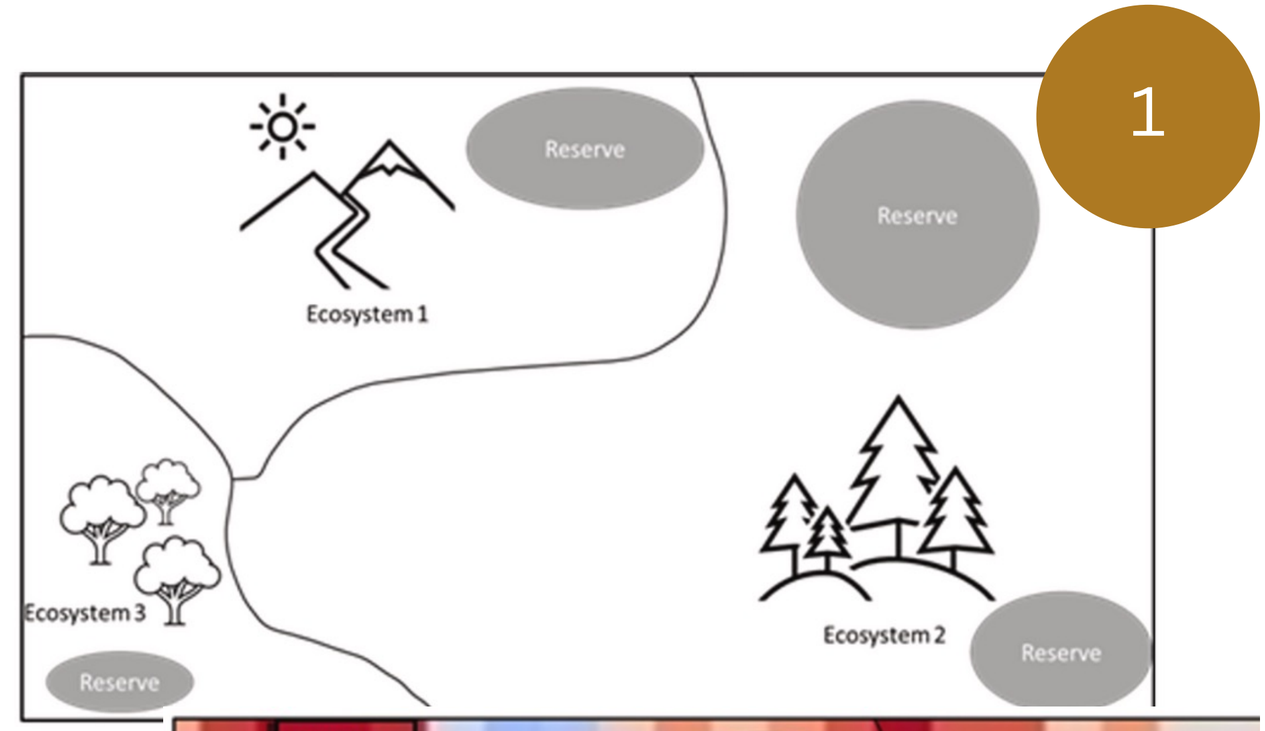
1.5 m3/ha/year

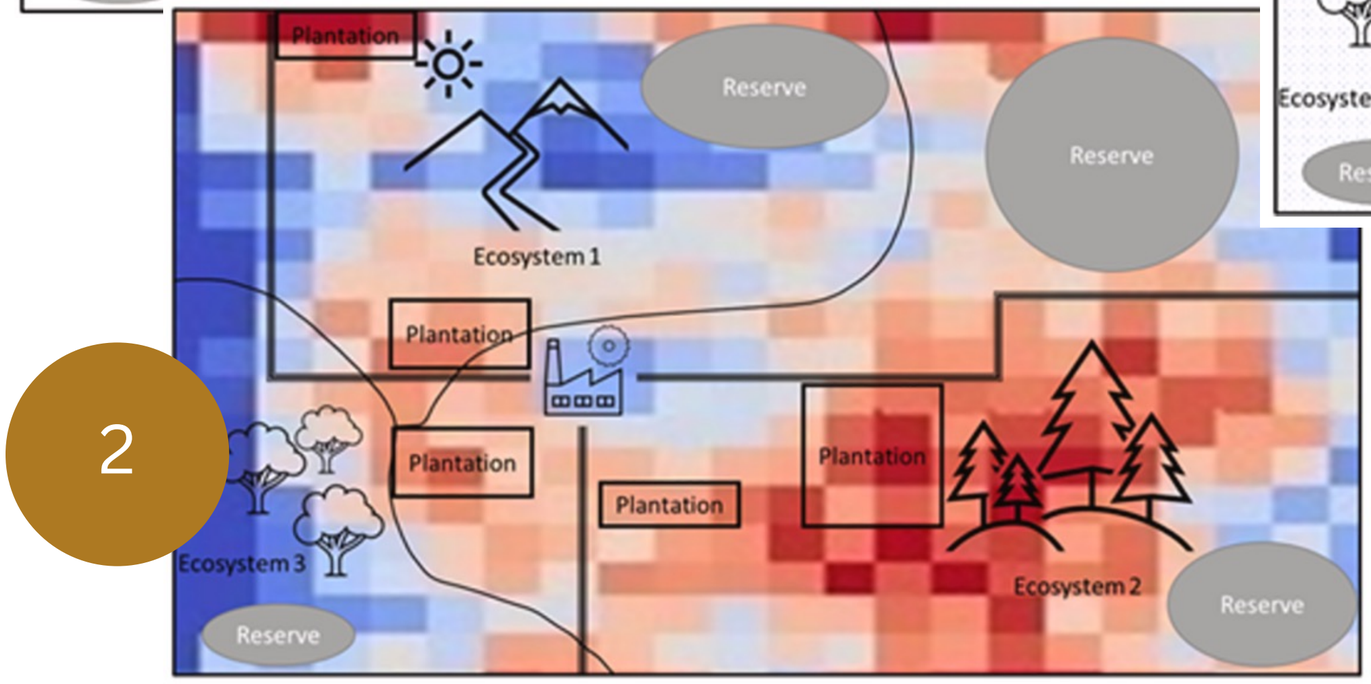
↓

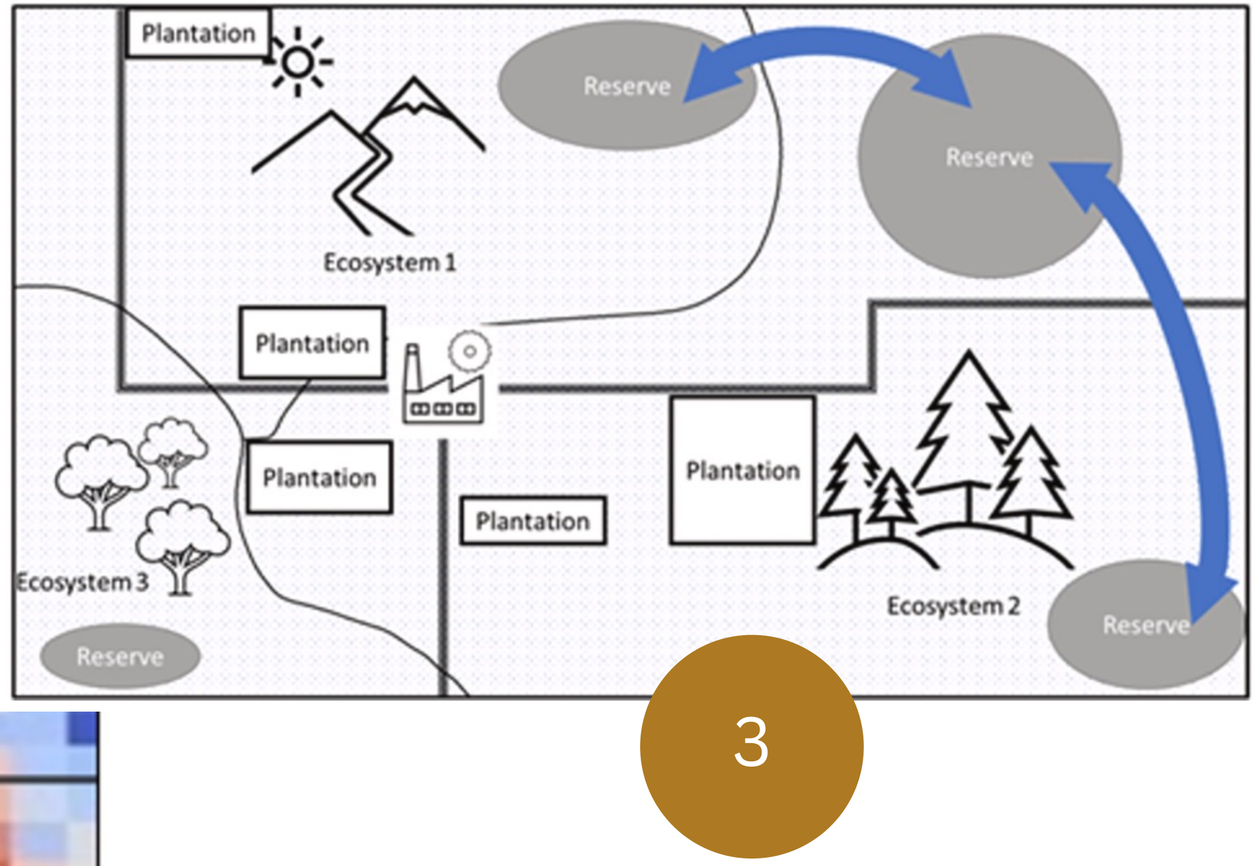
5 - 11.5 m3/ha/year

Reduce area of intensive zones and enable more area for conservation and other values

- Strategic positioning
- Investment to increase yield and diversity production

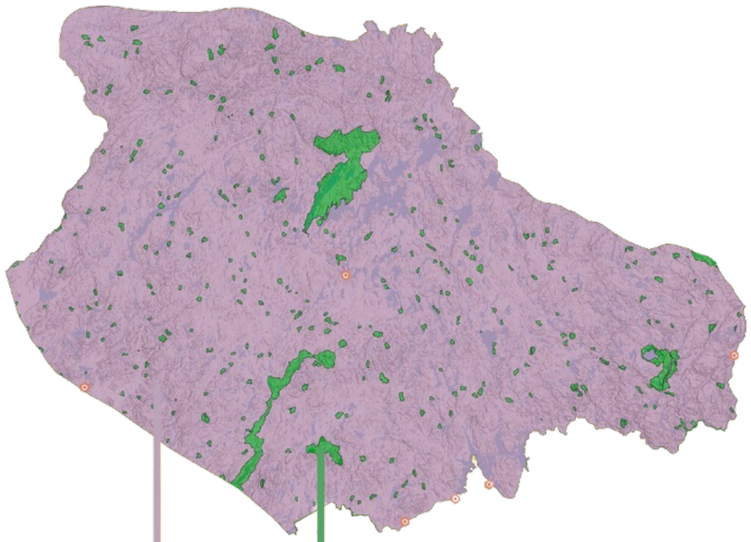






Forest Ecology and Management 510 (2022) 120103

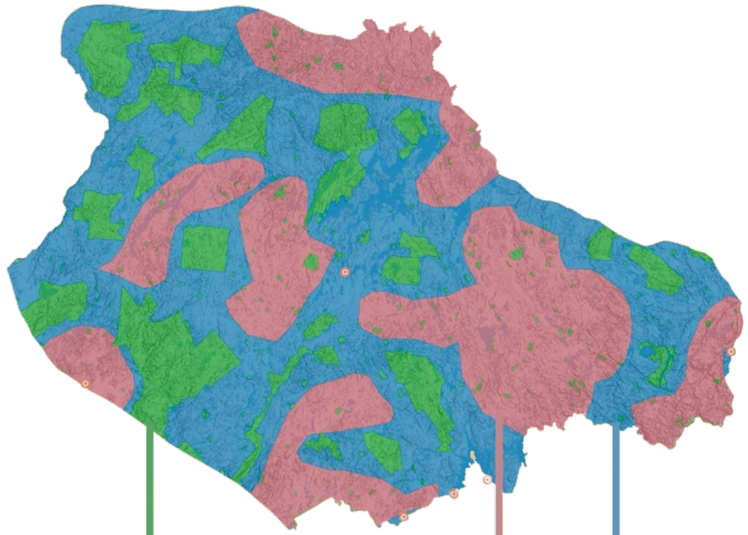
Current situation
Business as usual



Aires protégées existantes (14% du territoire) : Pas d'aménagement.

Reste du territoire : multi-usage et intensif mélangé.

Proposition in Quebec
('fake triad')

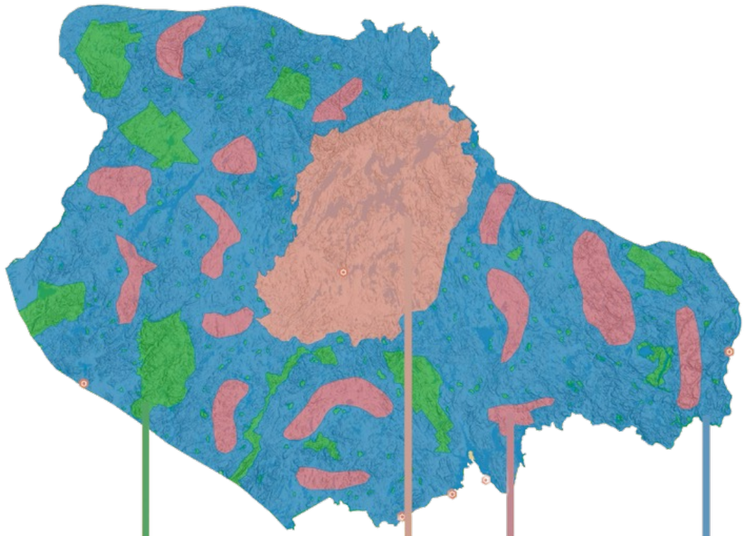


Aires protégées (30% du territoire) déterminées par qui?: Un petit peu d'aménagement.

ZAFPs (30% du territoire) déterminés en priorité : Coupes à blanc, foresterie intensive, priorité a l'industrie.

Multi-usage (40% du territoire) : Pas vraiment différent d'aujourd'hui.

Example with IPCA Manawan
('real triad')



Aires protégées : Un petit peu d'aménagement. + APIA de Manawan : Foresterie autochtone et conservation. = 30%

Intensives (16% du territoire) : Plantations mixtes avec espèces hybrides, éclaircies commerciales et coupes à blanc

Extensives (54% du territoire) : Diversité de coupes, mais intensité réduite et plus de coupes partielles.

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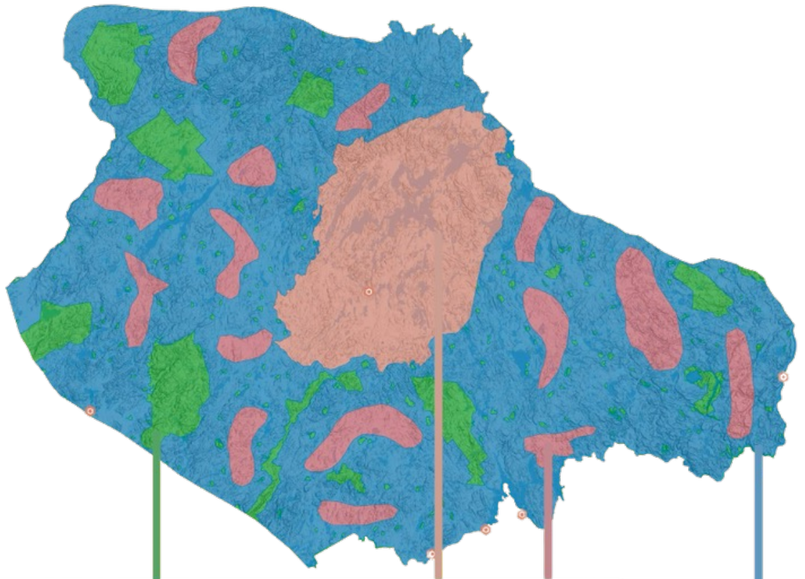
Adapting Forests to Global Change

Example with IPCA Manawan ('real triad')

Less clearcuts, more retention and partial cuts and corridors



Aires protégées : Un petit peu d'aménagement.

APIA de Manawan : Foresterie autochtone et conservation.

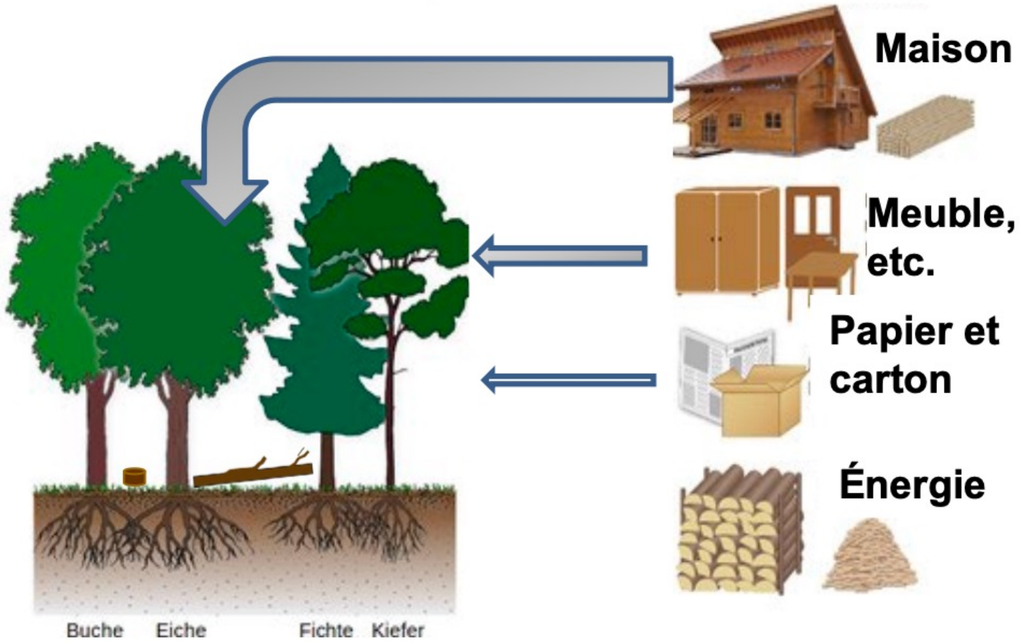
= 30%

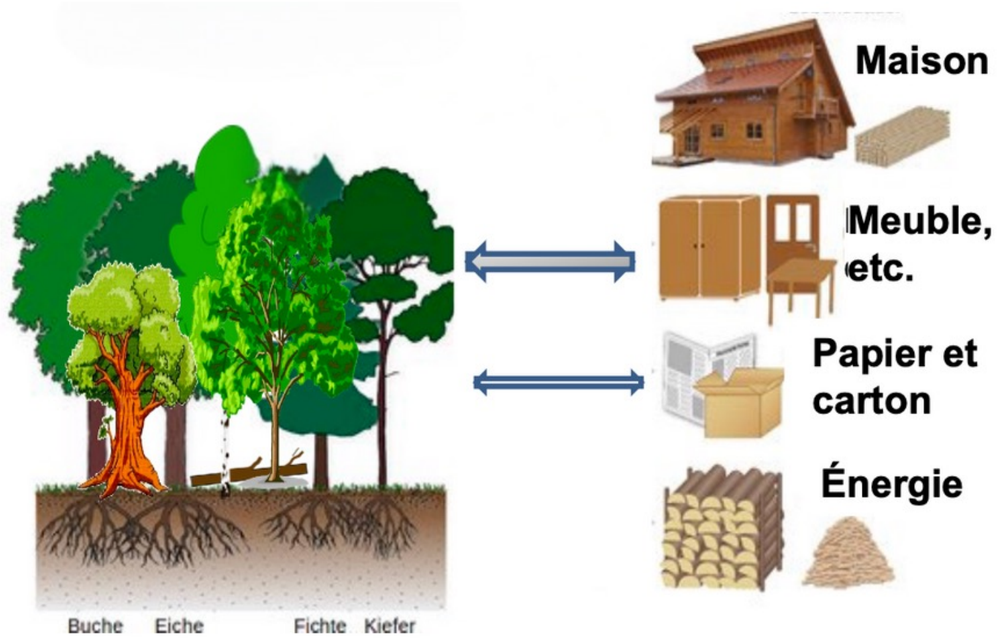
Intensives (16% du territoire) : Plantations mixtes avec espèces hybrides, éclaircies commerciales et coupes à blanc

Extensives (54% du territoire) : Diversité de coupes, mais intensité réduite et surtout coupes partielles.

PRESENT:

Industry conditions the simplification of the forest (top-down)

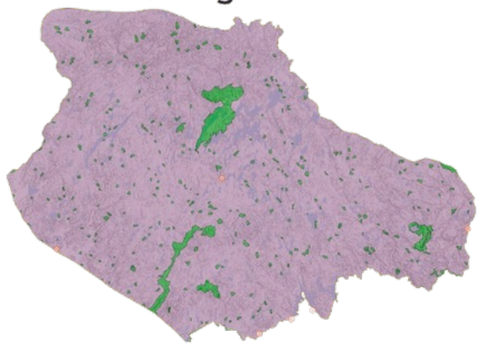




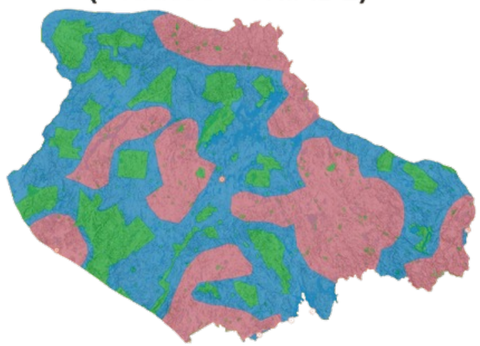
FUTURE:

Resilient forest more diversified conditions the industry (bottom-up)

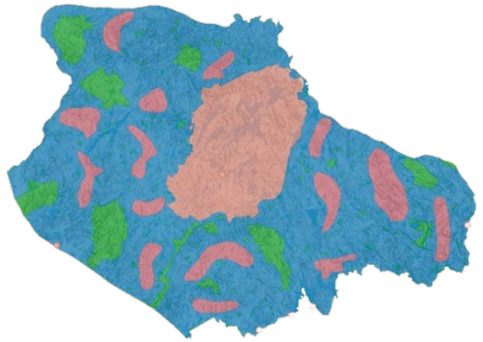
Habituel/Pas de changements



Proposition du Ministère (« fausse » TRIADE)

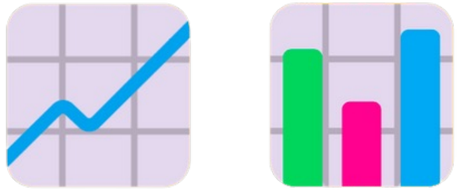


<u>Vraie</u> TRIADE avec APIA de Manawan



Clément Hardy

Modèles informatiques



DIVERSE

Adapting Forests to Global Change

Catherine Turner

Work with Manawan in co-creating the IPCA and social acceptability of the triad

Thank you

Email: tahia.devisscher@ubc.ca

THE UNIVERSITY OF BRITISH COLUMBIA

Faculty of Forestry

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