

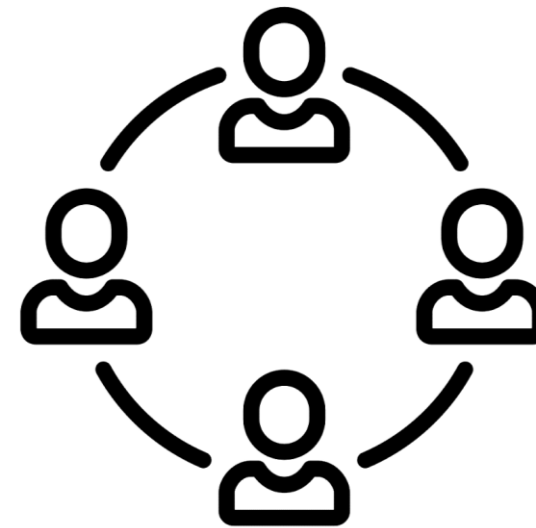
**Berkeley**  
UNIVERSITY OF CALIFORNIA

**University of California**  
Agriculture and Natural Resources



# *Tree Mortality Data Collection Network* **2021 Workshop**

**March 10-11<sup>th</sup> - 2021**



**Welcome!**

## Housekeeping Items (1/3)

- The meeting is being recorded, and some individual presentations will be available shortly after the meeting in our project's website;
- UC ANR Program Support is assisting with many of the Zoom logistics for the meeting so if you have any issues, please send a direct message through the chat to Kellie McFarland (Support) or email [ANRProgramSupport@ucanr.edu](mailto:ANRProgramSupport@ucanr.edu)
- All participants are muted by default. We request that questions be added to the chat we can keep track of all questions and comments.
- You will notice polls being launched at specific moments throughout each day of the meeting. We would appreciate if you all take a few seconds to answer these, and keep your "Menti" tab open on your browser.



# Housekeeping Items (2/3)

The image shows a Zoom meeting interface with several annotations and a toolbar. The toolbar at the bottom includes icons for Mute, Start Video, Invite, Manage Participants, Polls, Share Screen, Chat, Record, Closed Caption, Breakout Rooms, Reactions, and an End Meeting button. Annotations include: 'Please keep yourself muted' with an arrow pointing to the Mute icon; 'If connection is slow, please turn off your camera for better bandwidth' with an arrow pointing to the Start Video icon; 'Use the chat for questions or for messaging the organizers' with an arrow pointing to the Chat icon; and 'Sample' in large text with an arrow pointing to the Chat icon. A list of 'Other Suggestions' is on the right, and a 'Full Screen' button is in the top right corner.

Enter Full Screen

If connection is slow, please turn off your camera for better bandwidth

Please keep yourself muted

**Sample**

Use the chat for **questions** or for messaging the organizers

*Other Suggestions:*

- Close other windows/apps, especially mail programs for better connection;
- Please be respectful when commenting during Q&A and polls

Mute Start Video Invite Manage Participants Polls Share Screen Chat Record Closed Caption Breakout Rooms Reactions End Meeting

# Housekeeping Items (3/3)

## Mentimeter polls during the workshop



Please enter the code

Submit

The code is found on the screen in front of you

- We will be putting poll question as link in the **chat** box of the zoom interface
- If the link doesn't work go to [menti.com](https://www.menti.com) and use the meeting code (also provided in the chat)
- Keep menti tab **open** in your browser as we will ask multiple poll questions



DAY 2- MAR  
8:30-9:00 EA  
9:00-9:15 WE



(c) Jodi Axelson

Poll 4



# Poll 1



# *Tree Mortality Data Collection Network*

## **2021 Workshop**



## **Day 2 - Reforestation**

**Dr. Emilio Vilanova**  
**University of California - Berkeley**

# The California Tree Mortality Data Collection Network



2010-2019: ~ 163 million dead trees;



2017: **paradigm shift necessary:** translate our science into dialogue and action → *How?*



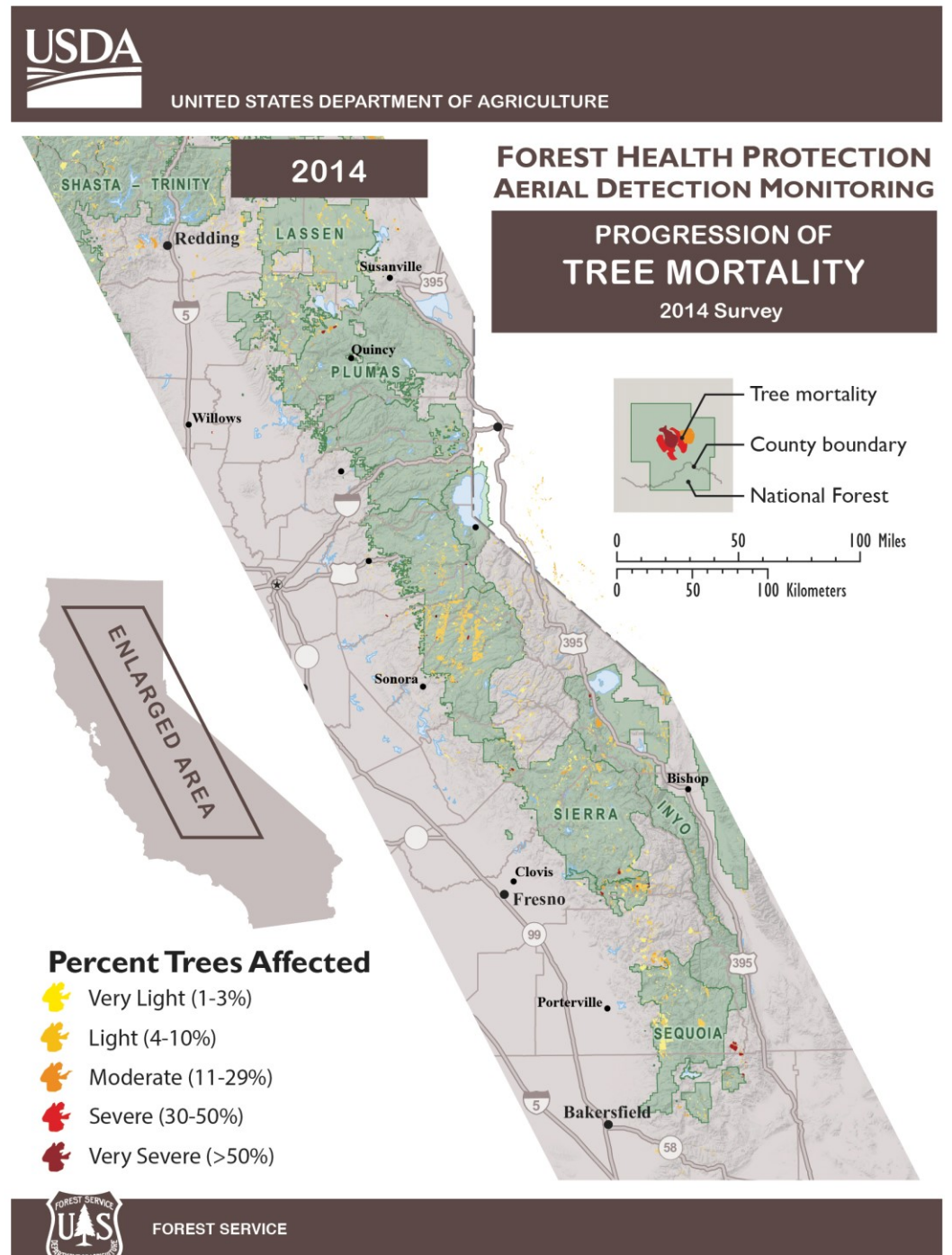
Annual workshops (2018, 2019, **2020**, **2021**);



Put results quickly into the hands of forest decision makers and planners;



Continue sharing work with land managers and decision-makers to feed research findings into action for resilient future forests





# The California Tree Mortality Data Collection Network

## OUTLOOK

## The California Tree Mortality Data Collection Network — Enhanced communication and collaboration among scientists and stakeholders

Critical research and dialogue are underway to understand the consequences of the massive wave of tree mortality in the Sierra Nevada.

Jodi Axelson, John Battles, Beverly Bulaon, Danny Cluck, Stella Cousins, Lauren Cox, Becky Estes, Chris Fettig, Andrea Hefty, Stacy Hishinuma, Sharon Hood, Susie Kocher, Devin McMahon, Leif Mortenson, Alexander Koltunov, Elliot Kuskulis, Adrian Poloni, Carlos Ramirez, Christina Restaino, Hugh Safford, Michèle Slaton, Sheri Smith, Carmen Tubbesing, Rebecca Wayman and Derek Young

Over 147 million dead trees were detected in California by the U.S. Forest Service Aerial Detection Survey (USFS ADS) from 2010 to 2018 (USDA 2019). The massive tree mortality, mostly in the Sierra Nevada and evident in swaths of conifers with red needles, resulted from the 2012–2016 drought and subsequent explosions in native bark beetle populations. While levels of mortality have declined in the last 2 years, the consequences will last for decades to come. Trees that died will fall over and surface fuel loads will increase — already the accumulation of millions of tons of dead material on forest floors is vastly outpacing the resources of local, state and federal jurisdictions to remove it. Urgent dialogue has started among UC scientists, forest managers, and public agencies to manage the consequences of the unprecedented tree die-off and increase the resiliency of forests to future droughts.

To accomplish these goals, we need data on the rates of ongoing tree mortality and dead tree fall, surface fuel build-up, wildfire hazard, forest renewal patterns, and the course of bark beetle outbreaks. Data are also needed to understand the long-term impacts of the wave of tree mortality on ecological services such as carbon storage and water quality.

Dead needles on tree in the Sierra National Forest.

In 2017, we set up the Tree Mortality Data Collection Network, led by academics at UC Berkeley and UC Agriculture and Natural Resources, to bring together scientists and agencies who are conducting field and remote-sensing studies across the Sierra Nevada. Then, rather than waiting for the results to be published in academic journals, we decided a paradigm shift was necessary — we would translate our science into dialogue by hosting in-person events and putting the results quickly into the hands of forest decision-makers and planners, and counties needing grants to remove accumulating surface fuels.

The dialogue began in March 2018 at the first Tree Mortality Data Collection Network workshop held at the USFS Wildland Fire Training Center in McClellan Park, Sacramento, and continued at a second workshop there in March 2019. Along with other researchers, we presented newly collected data to state and federal agencies, local governments, nongovernmental organizations, landowners and community representatives (see next pages).

Online: <https://doi.org/10.3733/ca.2019a0001>  
Published online March 11, 2019

## U.S. Forest Service Region 5 thinning study

Becky Estes, Derek Young and Christina Restaino

Effects of thinning on tree mortality along a latitudinal gradient in forests on National Forest, National Park and Bureau of Land Management lands.

- Thinning effectiveness decreased along the latitudinal gradient to the southern Sierra, where water stress was so high that stand density was less important (fig. 2A).
- Thinning substantially reduced mortality in central Sierra.
- In 2017, even in thinned, high-mortality plots, the density of surviving canopy trees (> 3-inch diameter) was 18 per acre; regeneration (< 3-inch diameter) was 76 per acre, suggesting that most stands will recover reasonable densities naturally.
- Drought mortality (concentrated in pines) has led to species shift. Among surviving canopy trees and regeneration, there was an unnaturally high relative abundance of shade-tolerant conifer species; pre-drought thinning reduced this effect (fig. 2B).

Researchers will document changes in stand resilience by evaluating residual structure and composition.

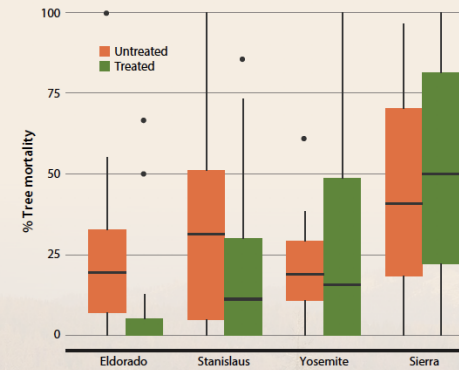


FIG. 2A. The effectiveness of thinning treatments decreased from the central to southern Sierra Nevada (Restaino et al., in press).

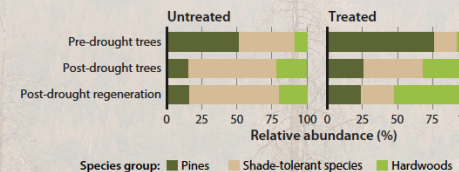


FIG. 2B. Drought has increased the dominance of shade-tolerant species, especially in unthinned stands. Thinned stands include more pines and hardwoods (Young et al., in review).

## U.S. Forest Service Pacific Southwest Research Station mortality study

Chris Fettig, Leif Mortenson and Beverly Bulaon

Study in high-mortality areas, at three elevational bands, in the Eldorado, Stanislaus and Sequoia National Forests.

- Mortality most severe in 2016 (fig. 3) and concentrated in larger-diameter conifer trees — in 3 years only one oak (*Quercus*) died.
- Between 2014 and 2017, 48.9% of trees died (fig. 3), and there were higher levels of mortality at low elevations (60.4%) than at high elevations (46.1%).
- Mortality mostly attributed to western pine beetle (*Dendroctonus brevicornis*; WPB).
- Ponderosa pine (*Pinus ponderosa*), the only host of WPB in the area, suffered highest levels of tree mortality, from 18.2% to 100% per plot.
- 39% of plots lost all ponderosa pine.
- Sugar pine (*Pinus lambertiana*) experienced 48% mortality, concentrated in mid-diameter trees, most due to mountain pine beetle (*Dendroctonus ponderosae*).
- White fir mortality at 26%, most due to fir engraver.
- Mortality positively correlated with tree density (Fettig et al. 2019).

As funding allows, researchers will remeasure plots on a regular basis.

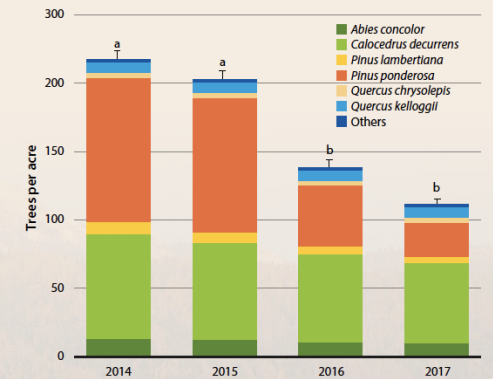
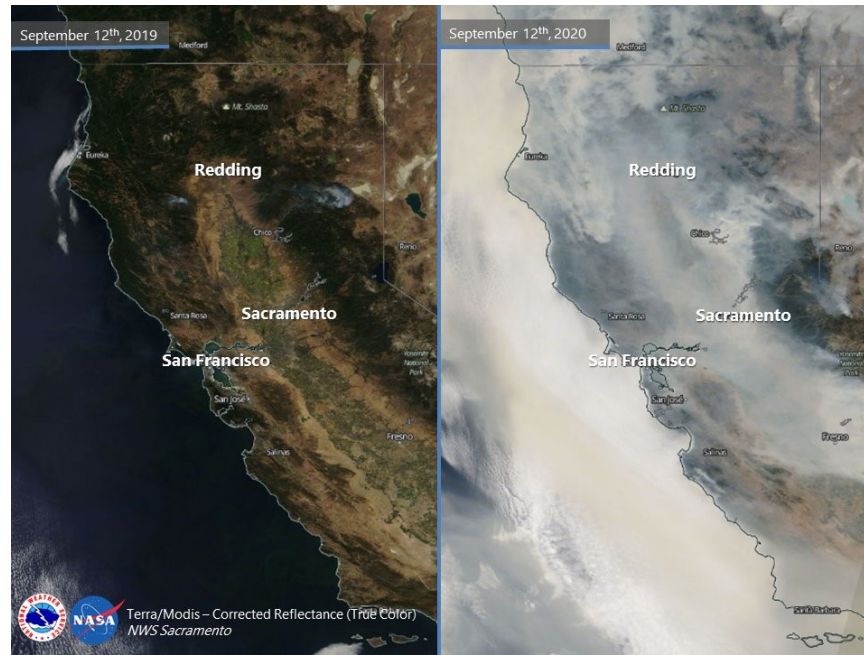


FIG. 3. Mean number of trees per acre by species (+ standard error of the mean, SEM), 2014–2017. Ponderosa pine (*Pinus ponderosa*) has suffered the highest levels of mortality. Means (+ SEM) followed by the same letter are not significantly different ( $P > 0.05$ ). Adapted from Fettig et al. (2019).





© Chris Fettig



© Carina Bilodeau



Creek Fire – Photo LA Times



© Leif Mortenson



## A quick summary of Day 1 – Fuels and wildfires



Stress on trees and forests due to climate change moving forward is profound



Fuel loading is a huge concern and is hard to measure



Wildfires effects are heterogenous but can do a lot of good sometimes



Treating and monitoring forests before disturbance is important



High uncertainty, we are learning but not enough.



Managers need more flexibility to change plans after unplanned disturbance



Collaboration and communication is vital

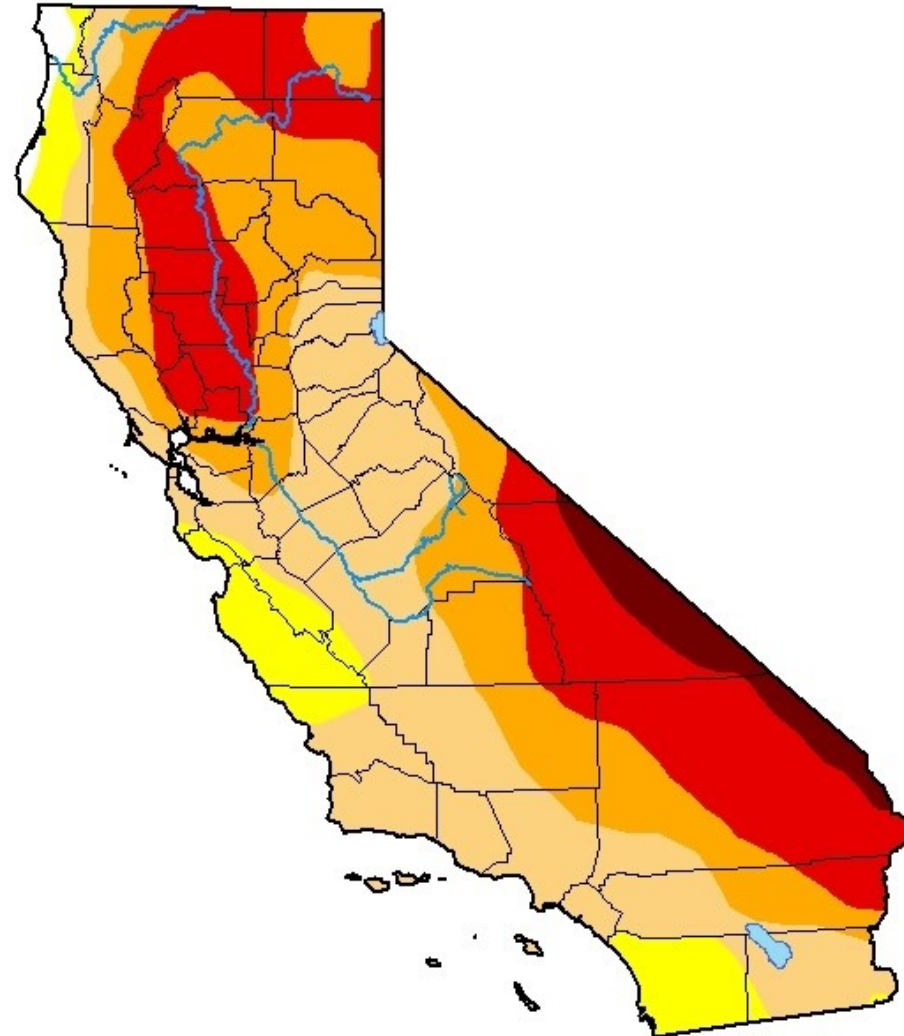
# What now?

## U.S. Drought Monitor California

March 2, 2021  
(Released Thursday, Mar. 4, 2021)  
Valid 7 a.m. EST



Berkeley Forests - Blodgett Research Forest  
© Emilio Vilanova



### Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>*

### Author:

Brian Fuchs  
National Drought Mitigation Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)



# What now?

University of California  
Agriculture and Natural Resources



## THE CALIFORNIA TREE MORTALITY DATA COLLECTION NETWORK

### 2021 WORKSHOP



MARCH 10-11, 2021  
9 AM - 12:30 PM (BOTH DAYS)  
ONLINE MEETING VIA ZOOM

More info in our [website](#)

(c) Jodi Axelson

## 2021 Workshop

### GOALS:

- Share latest results on live and dead trees, tree fall rates, fuels, regeneration, and post-mortality management;
- Discuss frameworks for incorporating data into forest management planning and policy;

\*\*\* Two main topics:



**Fuels and wildfires:** estimations, dynamics, management;



**Reforestation:** genetics, adaptation, challenges

THE CALIFORNIA TREE MORTALITY DATA COLLECTION NETWORK - 2021 WORKSHOP  
MARCH 10-11, 2021

AGENDA

(c) Jodi Axelson

DAY 2- MARCH 11: POST-MORTALITY MANAGEMENT – REFORESTATION

8:30-9:00 EARLY ACCES TO THE MEETING

Poll 4

9:00-9:15 WELCOME TO NEW PARTICIPANTS, QUICK SUMMARY DAY 1

Emilio Vilanova / Jodi Axelson UC Berkeley

9:15-9:45 PLENARY TALK: THE COLLECTIVE PIPELINE TO CLIMATE-SMART REFORESTATION

Britta Dyer - American Forests

9:45-10:00 Q & A

10:00-10:05 BREAK

10:05-10:20 USING ASSISTED GENE FLOW DURING REFORESTATION TO ESTABLISH CLIMATE-ADAPTED FORESTS

Derek Young - UC Davis

10:20-10:35 THE CALIFORNIA SEED ZONE MAP AND POST-FIRE REFORESTATION IN A WARMING FUTURE

Jessica Wright - US Forest Service

10:35-10:45 Q & A

Poll 5

10:45-11:00 REFORESTATION FOR RESILIENCE: THE CLIMATE-WISE REFORESTATION TOOLKIT

Amarina Wuenschel - US Forest Service

11:00-11:15 REPLANTING STRATEGIES UNDER CHANGING WILDFIRE, CLIMATE, AND BUDGET CONDITIONS

Malcolm North - US Forest Service

11:15-11:25 Q & A

11:25-11:30 BREAK

11:30-12:30 INTERACTIVE PANEL DISCUSSION Moderator: John Battles - UC Berkeley

Poll 6

# 2021 Workshop



Two half-day workshop



2 plenary talks (1 each day)  
8 short talks



2 Panel discussions (1 each day)  
Day 1: Fuels

**Day 2: Reforestation**



187 participants registered  
(as of March 8<sup>th</sup> )



# What now?

## High interest in massive tree planting efforts worldwide

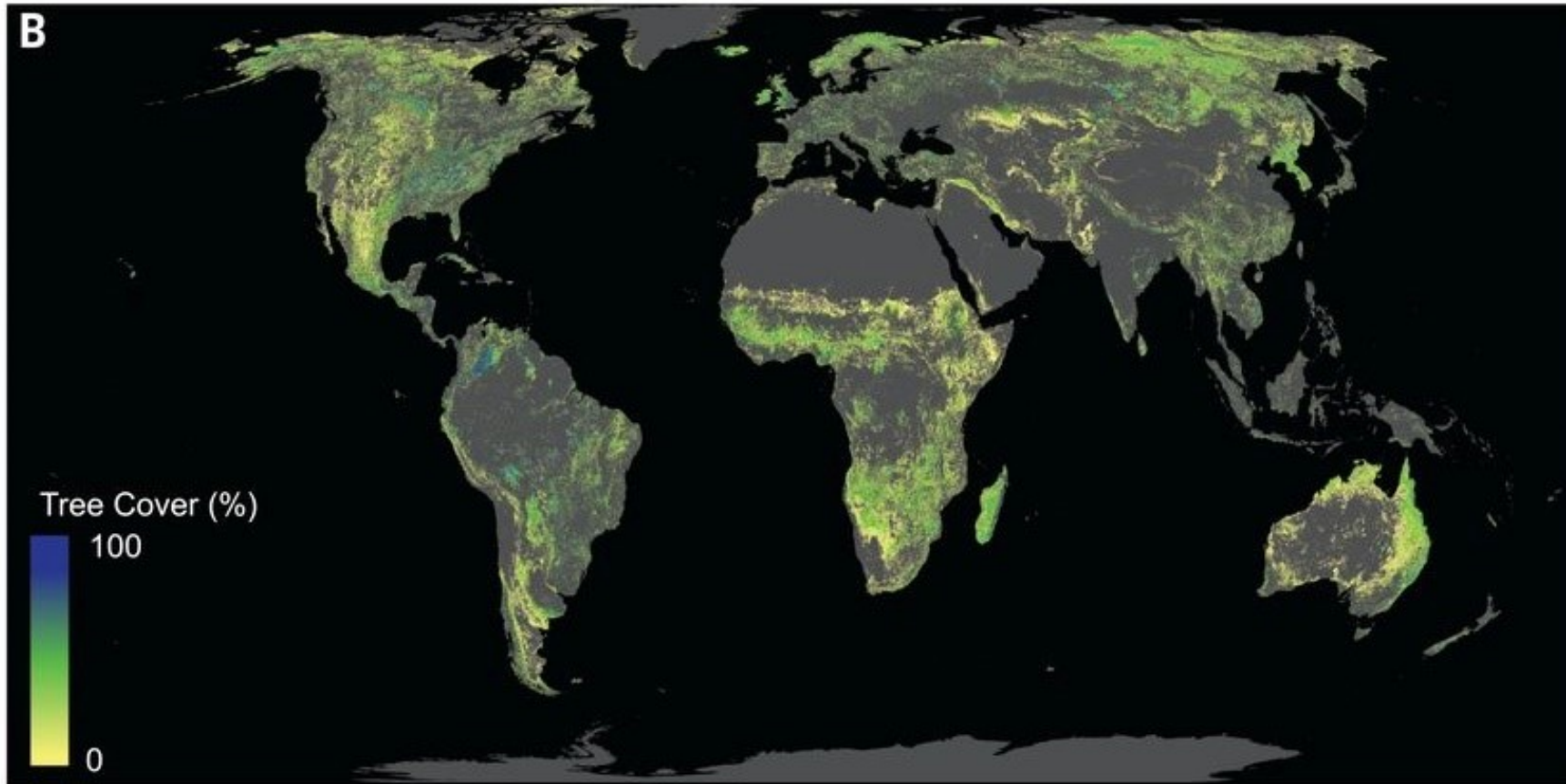
RESEARCH

RESTORATION ECOLOGY

### The global tree restoration potential

Jean-Francois Bastin<sup>1\*</sup>, Yelena Finegold<sup>2</sup>, Claude Garcia<sup>3,4</sup>, Danilo Mollicone<sup>2</sup>, Marcelo Rezende<sup>2</sup>, Devin Routh<sup>1</sup>, Constantin M. Zohner<sup>1</sup>, Thomas W. Crowther<sup>1</sup>

Global tree restoration potential represents an area of 0.9 billion ha of canopy cover





# What now?

## Tree planting efforts are complicated

© MARK ANDERSON

WWW.ANDERSTOONS.COM



"Hold on, where's the forest again?"

## Missing the forest for the trillion trees?

**H** The Hill

### US officially joins global trillion tree planting initiative | TheHill

The U.S. chapter of the One Trillion Trees program, launched Thursday, aims to plant at least 855 million trees by 2030. The goal of the initiative ...  
Aug 27, 2020



**H** HuffPost

### Planting Trees Sounds Like A Simple Climate Fix. It's Anything But.

The Trillion Trees campaign — which made headlines last year when President Donald Trump committed the U.S. to the initiative despite also ...  
4 weeks ago



**G** The Guardian

### Backing the trillion tree campaign to combat climate crisis

The recent explosion of interest in tree restoration has transformed the climate change conversation. Although the trillion tree campaign ...  
Feb 21, 2020



**V** The Verge

### Planting 1 trillion trees might not actually be a good idea

Tree-planting campaigns have taken off, with everyone from ... But the science behind the campaign, a study that claims 1 trillion trees can ...  
Jan 31, 2020



**F** Forbes

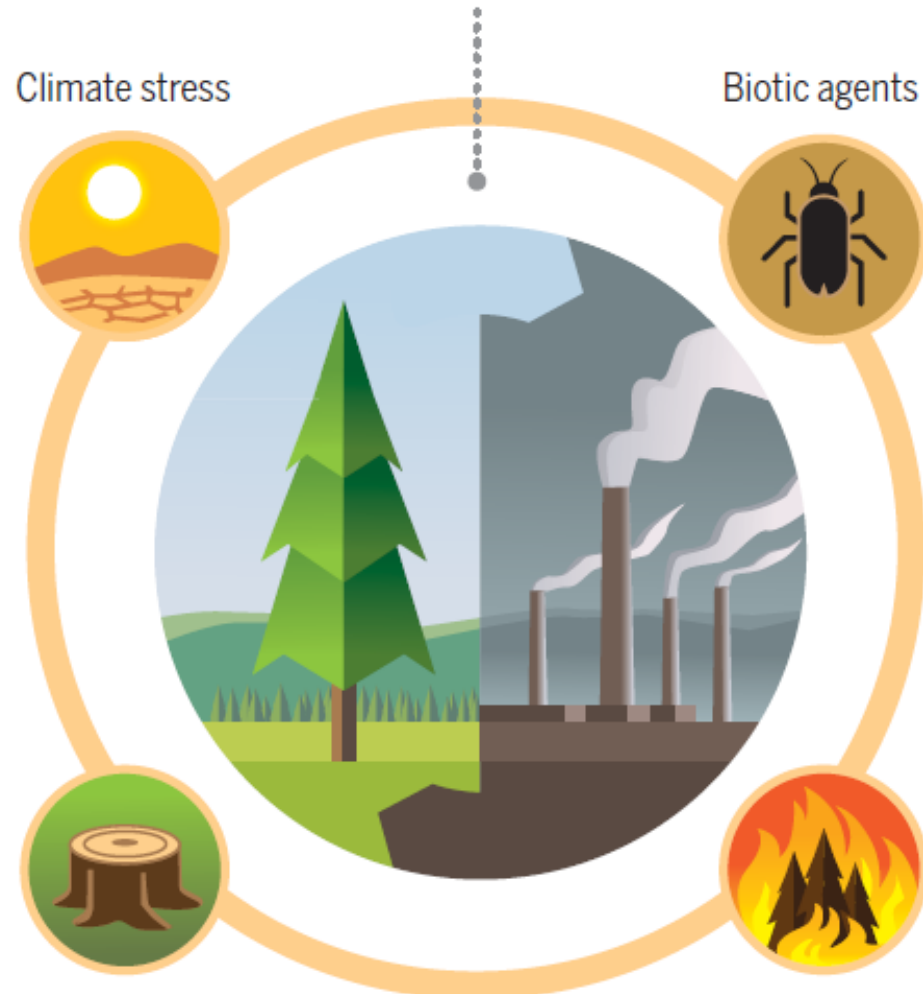
### One Trillion Trees Is Not Enough

Planning a large-scale tree planting campaign would allow Ireland to



# Reforestation for what? Timber? Resilience? Carbon? Biodiversity?

Forests as natural climate solutions face fundamental limits and underappreciated risks



Drought – beetle mortality – CA © Chris Fettig



Timber harvest – WA © Emilio Vilanova



Windblow event – WA © Emilio Vilanova



SQF Fire complex – California, 2020  
Photo: <https://inciweb.nwcg.gov/incident/7048/>

Figure from Anderegg et al. (2020)

*California Tree Mortality Data Collection Network*  
**2021 Workshop**

**Welcome!**

Got questions or comments?  
[evilanova@berkeley.edu](mailto:evilanova@berkeley.edu)