# Citizen science in action: The 2020 SOD blitzes

**M. Garbelotto and D. Schmidt, U.C. Berkeley**
**50+ local blitz organizers**

**&**

**3000-plus volunteers**
**www.sodblitz.org**

# *Citizen Science and Covid-19 (I)*

- We have switched to online training and NO in person meetings will be organized. Everything you need to know is posted on www.sodblitz.org

- You still have to run your SOD survey on the weekend assigned to your community (see the BLITZES schedule online)

- Collection packets with all necessary materials are available in the **left bin** at the pick up/drop off **Blitz station**. Pick one or two packets, each one allows you to sample ten trees

- **Blitz stations** are at the venue published on the schedule. Their exact location will be posted on the doors of the venue

# *Citizen Science and Covid-19 (II)*

- Stay 6 feet away from other volunteers while picking up packets. Only 9 people can be in line at any given time

- If bin is closed, wear glove or plastic bag before opening  and closing lid. Dispose of glove/bag in disposal box

- All materials inside left bin are fully sterile and 100% safe

- Drop off packets with samples in the **right bin** before 10 am on the Tuesday following the Blitz date. Again use gloves or plastic bags to open and close bin lids, if bin is closed. Dispose of glove/bag in disposal box

- Make sure you have  registered on line as a volunteer before starting your Sudden Oak Death survey

# *Phytophthora ramorum* the SOD pathogen was moved from Asia to California via infected ornamental plants

- 4+ strains of pathogen worldwide

- Origin: Vietnam/China?

- Ornamental trade, worldwide

- Hundreds of host species

- Different severity of disease based on species



**Origin unknown, 4 distinct lineages: nursery-mediated global spread**



EU2

| NA1 | Migration A: source: ? sink: California | NA2 | Migration B: source: ? sink: Washington, USA; British Columbia, Canada | EU1 | Migration C: source: ? sink: Europe | | Migration D: source: Europe sink: Washington, USA; British Columbia, Canada |

Grunwald et al.    *TRENDS in Microbiology*

# *Phytophthora ramorum: SOD*

- Ramorum Blight
- 4 lineages
- Origin unknown
- Ornamental trade, worldwide
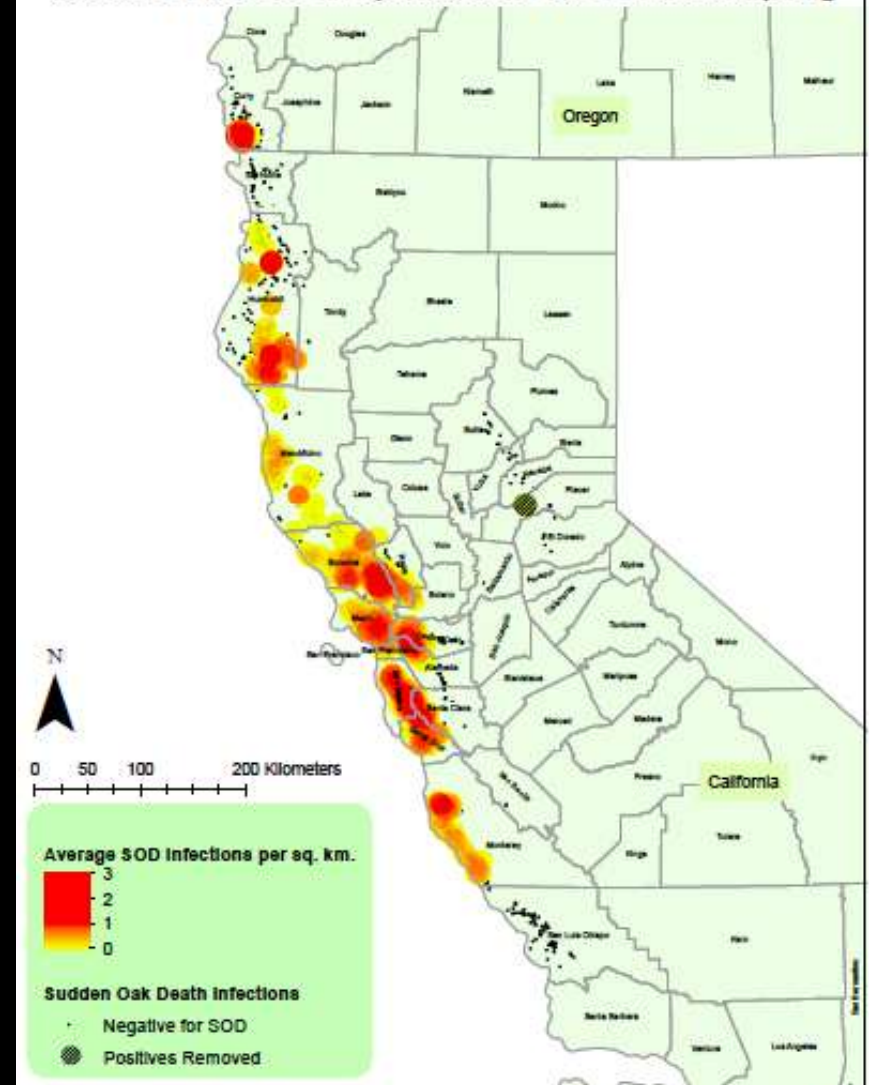- Hundreds of species
- Progressive dieback



- Sudden oak death (West Coast)
- 1 strain only (NA1) in CA forests
- Tens of native species infected
- Mortality of *Fagaceae* and *Ericaceae*
- Lethal girdling lesions and dieback
- Introduced via infected ornamentals

# Croucher et al. Biol Invasions 2013



Repeated introductions and not "natural" long-distance spread are responsible for extensive SOD distribution. This was determined by presence of identical genotypes at long distance and by coalescent analysis
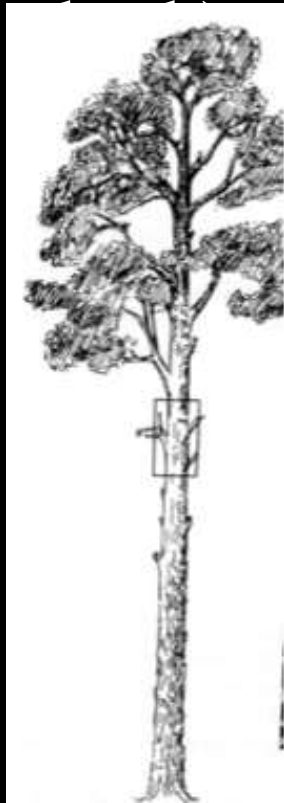


Density map of trees affected by Sudden Oak Death based on the SODmap available at www.sodmap.org

**Average SOD infections per sq. km.**
- 3
- 2
- 1
- 0

**Sudden Oak Death Infections**
- · Negative for SOD
- ⊛ Positives Removed

= up to 100% mortality adult tanoaks
up to 70% mortality adult oaks

# Bay- oak relationship in CA forests

- CA Bay Laurel :

Transmissive host



Oak trunks

Only leaves,
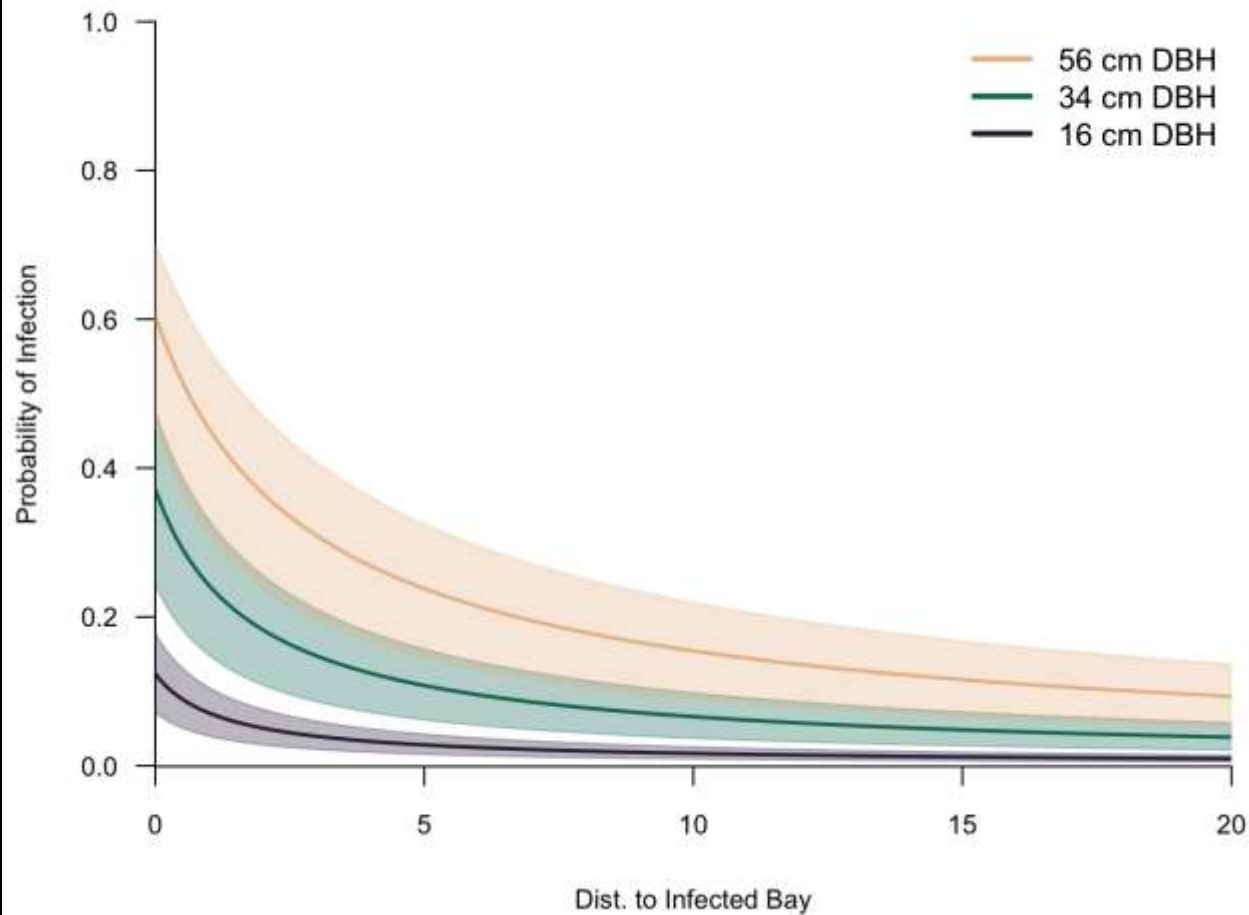highly infectious

- Oak:

Dead-end host
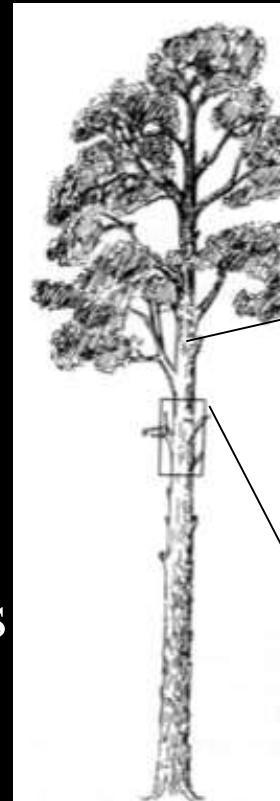


Only trunks lesion,
Lesions girdle tree but
are not infectious

# Oak are infected by bays less than 20 m away



3000 trees in 70 transects

Legend:
- 56 cm DBH
- 34 cm DBH
- 16 cm DBH

Y-axis: Probability of Infection

X-axis: Dist. to Infected Bay

# MAJOR SURVEYING PROBLEMS

- Zone of infestation is about 700 Km in length, yet less than 30% of available habitat has been colonized so far

- Outbreaks are not contiguous but occur in discrete patches, so there is no  a clear and unique advancing front

- To predict risk of infection for oaks, the scale needs to be in the tens of meters, i.e. extremely fine scale

# SOD Blitzes

- Yearly volunteer-based survey to: a)- identify new outbreaks, and b)- track expansion and contraction of the pathogen's range by sampling infectious host (bay laurel leaves) identifying hotspots that are crucial for disease spread

- Volunteers have to take training online and then collect over a weekend during wet spring

- Local environmentalists or UC Master Gardeners organize meetings. UC Berkeley tests all samples

# SOD Blitzes: unique features

- **All necessary sampling materials are provided to attendants** free of charge, we do not use high tech platforms on purpose (no I Naturalist)

- SOD Blitz trainings are locally organized: **each may have a different angle.** Volunteers can sample any location they want to

- Data are confirmed by UC Lab and made public **in real time** over the  web (SODmap.org) and using the App Sodmap mobile

# 2020 SOD blitzes

- We will be testing for new dangerous strain (EU1) already present in Oregon forests, but sill absent in California Forests
  - EU1 more virulent
  - EU1 resistant to Agrifos
  - EU1 A1 mating type (NA1 is A2) means EU1 can mate with NA1 and generate genetically different strains

- In 2019 SOD discovered in Del Norte County and at the very border of San Luis Obispo County

# SOD Blitz Collection Materials
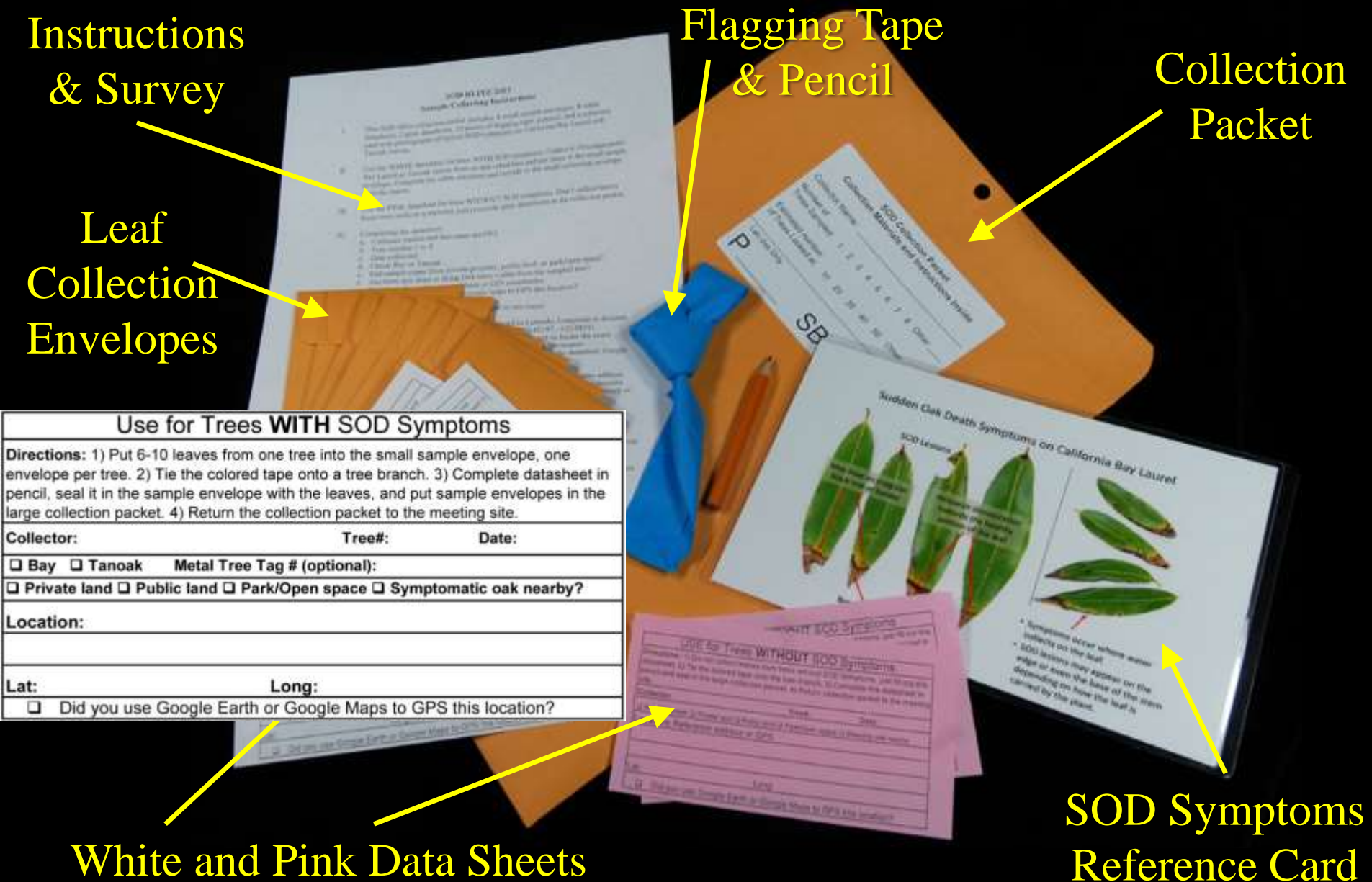
Instructions & Survey

Flagging Tape & Pencil

Collection Packet

Leaf Collection Envelopes

## Use for Trees **WITH** SOD Symptoms

**Directions:** 1) Put 6-10 leaves from one tree into the small sample envelope, one envelope per tree. 2) Tie the colored tape onto a tree branch. 3) Complete datasheet in pencil, seal it in the sample envelope with the leaves, and put sample envelopes in the large collection packet. 4) Return the collection packet to the meeting site.

| Collector: | Tree#: | Date: |
|---|---|---|

☐ Bay  ☐ Tanoak     Metal Tree Tag # (optional):

☐ Private land ☐ Public land ☐ Park/Open space ☐ Symptomatic oak nearby?

Location:

| Lat: | Long: |
|---|---|

☐     Did you use Google Earth or Google Maps to GPS this location?

White and Pink Data Sheets

SOD Symptoms Reference Card

# Trainings: personally taught, now video has helped standardize them

# Web-based SOD map



# App Sodmap mobile
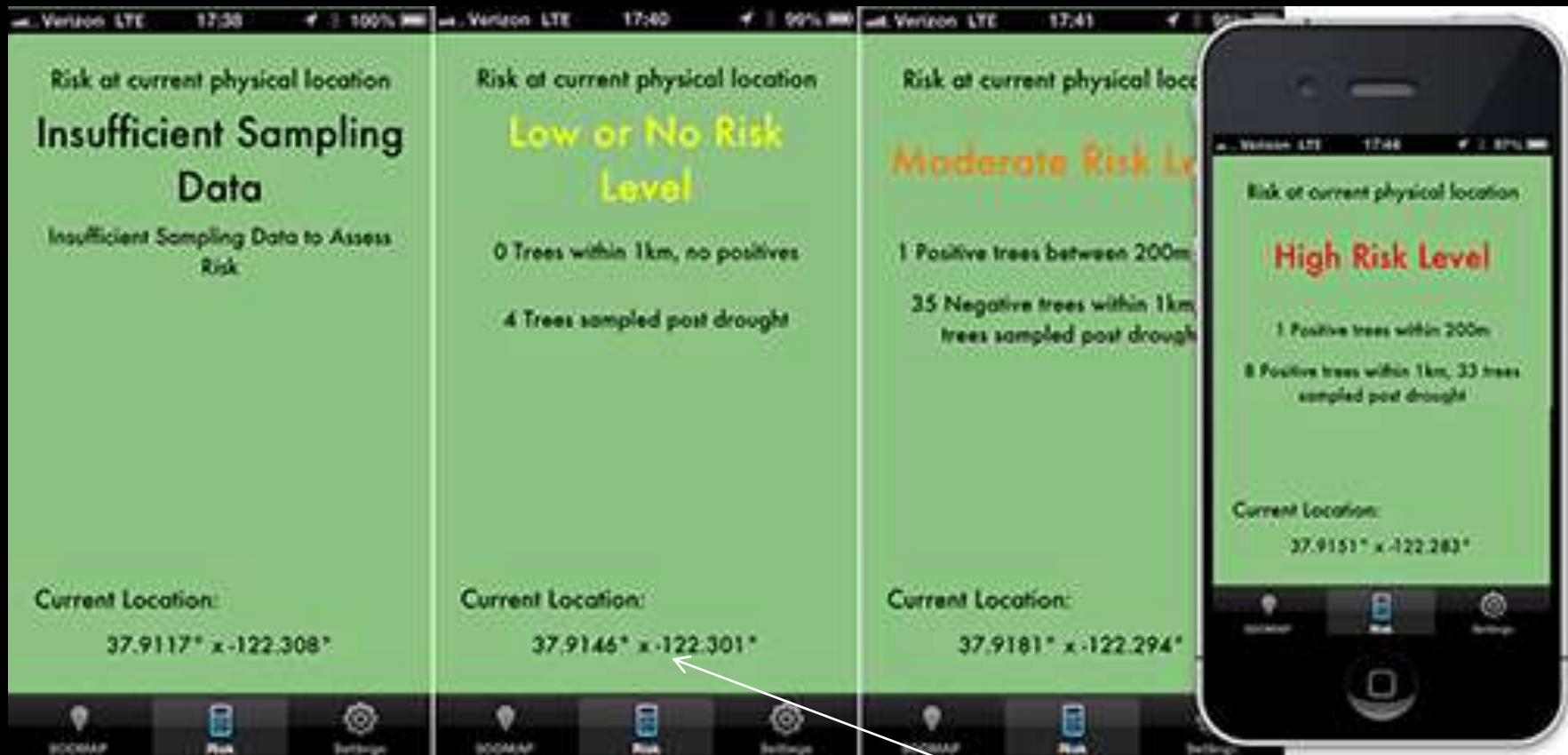


170.000 observations
RESULTS ARE PUBLIC
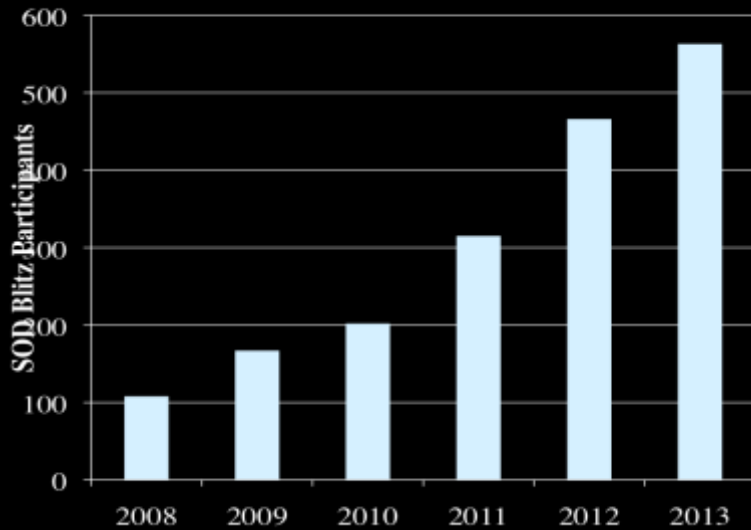Red icons= SOD positive
Green = SOD negative

# App also calculates risk of oak infection at physical location of user, based on proximity to outbreaks
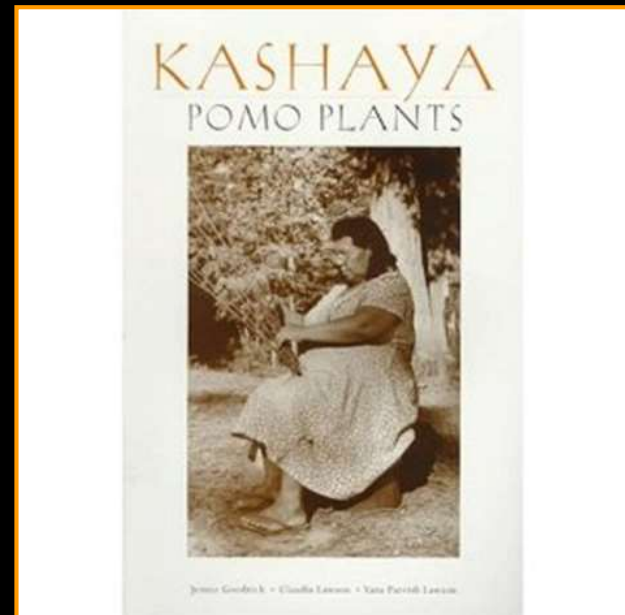


Use the "Risk" function to determine location (Lat. and Long. of tree you are sampling

# Why do citizen-scientists remain involved?


SOD Blitz Participants 2008-2013

**Property value reduced 3–6% to 8–15%**





KASHAYA POMO PLANTS

- Taken together, our data suggest that :
  - Locally organized SOD Blitz informational sessions and training efforts were highly effective  and attractive to stakeholders (program is 10 years old with high rate of return participants)

  - Citizen science produces useful data for understanding disease epidemiology: two "hard science" papers published

  - Working with citizen scientists as peers we have created the largest database in the world for a forest disease

**Forest Phytophthoras**

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Home > Vol 4, No 1 (2014) > Garbelotto

Garbelotto, M., Maddison, E.R., Schmidt, D. 2014. SODmap and SODmap Mobile: Two Tools to Monitor the Spread of Sudden Oak Death. Forest Phytophthores 4(1). doi: 10.5399/osu /fp.4.1.3560

**SODmap and SODmap Mobile: Two Tools to Monitor the Spread of Sudden Oak Death**

**RESEARCH COMMUNICATIONS**  **RESEARCH COMMUNICATIONS**

## Citizen science helps predict risk of emerging infectious disease

Ross K Meentemeyer[1,2*], Monica A Dorning[2], John B Vogler[2], Douglas Schmidt[3], and Matteo Garbelotto[3,4]

Engaging citizen scientists is becoming an increasingly popular technique for collecting large amounts of ... ical data while also creating an avenue for outreach and public support f... study, in which citizen scientists played a key role in the spatial prediction... yearly citizen-science program called "Sudden Oak Death (SOD) Blitz" eng... ing the causal pathogen during peak windows of seasonal disease expr... which were collected from under-sampled urban ecosystems – to develop... inform stakeholders on where they should prioritize management effor... Blitz program over 6 consecutive years improved our understanding of di... racy of our predictive models. We also found that self-identified non-prof... ing the disease as were professionals. Our results indicate that using long... risk of emerging infectious plant diseases in urban ecosystems holds subst...

*Front Ecol Environ* 2015; 13(4): 189–194, doi:10.1890/140299

*forests*    MDPI

Article

## Environmental Factors Driving the Recovery of Bay Laurels from *Phytophthora ramorum* Infections: An Application of Numerical Ecology to Citizen Science

Guglielmo Lione[1,2], Paolo Gonthier[1] and Matteo Garbelotto[2,*]

# SOD Blitzes

- One of the oldest citizen science programs in the world focused on tree health
- The goal is to detect infected bay leaves: it is methodologically simple, and important because bay leaf infection predates oak infection
- Knowledge of bay infection is key to implement disease management options on to model spread SOD

# Oakstep.org

- Oakstep program was started because

- Confirmation of SOD on one oak is important:

    - SOD infected oaks burn very hot
    - SOD infected oaks are likely to fail
    - Confirmation of SOD on one oak is the most pressing signal the landowner needs to protect other neighboring oaks

# Oakstep.org

-Program description

-Instructional video on how to sample oaks

-How to get all necessary materials

-Written instructions

-All forms needed to enroll and request materials

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## OakSTeP Project

What is OakSTeP? **Oak SOD Testing Program** is a new program aimed at making a step in the right direction towards the detection and control of Sudden Oak Death (SOD). The other major program aimed at empowering communities in the fight against SOD is called "SOD Blitzes" and allows lay people to identify and confirm the presence of SOD on California Bay Laurel and Tanoak leaves, the two major vectors for the disease in California forests. OakSTeP is a new program launched by the U.C. Berkeley Forest Pathology Laboratory aimed at filling the gap of knowledge on SOD in oaks. Currently, oak testing for SOD is prohibitively expensive and too complex to perform, even for tree care specialists. OakSTeP facilitates the cooperation between professional tree care specialists, oak owners who are their clients, and U.C. scientists to provide a rapid and inexpensive diagnostic service on SOD infection on oaks. Although "SOD blitzes" remain key in protecting oaks from SOD, by identifying the disease in its major vectors (Bay Laurels and Tanoaks) before oaks are infected, early detection of SOD on an oak in any given property, may allow a tree care specialist to save that oak, or more realistically, it may allow her or him to save uninfected oaks that grow nearby.

### How Does OakSTeP Work?

OakSTeP stands for "**Oak SOD Testing Program**" It is a program directed at licensed tree care workers to provide them with all that is needed to sample symptomatic oaks at a fraction of the cost. By enrolling in the program, a licensed tree care worker will have access to the following:

1. Sets of Petri dishes and associated data forms directly delivered to them and to be used when sampling oaks
2. Instructional Video and written instructions describing step by step all tools needed to sample oaks: when, where and how to sample oaks; where and how to send samples.
3. Analysis by the U.C. Berkeley state-of-the-art Diagnostic Lab.
4. Easy to read diagnostic reports that may be shared with clients.

Matteo's Instructional Video

OakSTeP

Special Event: An Evening to Support California Wild Lands and Native Forests

MATTEO GARBELOTTO
University of California Berkeley

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# However: (II)

- Diagnosing SOD is the  first step, but what about **treatments** to prevent disease spread? Only treatments will make a difference

- SOD treatment has a cost but is easy, all treatment to de done in the Fall: 1)- Identify high risk areas using SODmap mobile; 2)- Remove bay laurels 15 -30 feet around oaks you want to protect; 3)- Treat oaks that have very high value with phosphites

**-Fill in the extended Treatment form record included in your collection packet. THIS WILL CREATE A DATABASE OF HOW MUCH CALIFORNIANS ARE WILLING TO INVEST TO STOP SODAND TO GET  POLICY MAKERS TO INVEST MORE ON SOD**

Fill in form inside packet or go to www.sodquest.org

## Sudden Oak Death (SOD) TREATMENT SURVEY

**Date:**                                   **Full Name:**

**Zip code:**                              **Email:**

**Your position, circle one:**

    Owner            Manager            Renter            Arborist or similar

**Year when SOD was first officially diagnosed in property:**

**How was it diagnosed, circle all that applies:**

    SOD Blitz results

    Ag commissioner/CDFA

    Professional Arborist/private lab

**Circle all tree species present in property:**

    Coast live oak            Shreve's oak                    Black oak

    Canyon live oak          Tanoak                          California bay laurel

**What actions have you taken to control SOD, circle all the apply:**

    Removed bay laurels around oaks

your contribution will remain anonymous

# However: (III)

WE NEED TO KEEP AN OPEN COMMUNICATION CHANNEL.

USE THE PORTAL AT TREEFAQS.ORG

EARLY DETECTION: SOD BLITZES

SOD on oak CONFIRMATION OakSTeP.org

Two-way Communication: Treefaqs.org

SOD Treatments: Do and report them In SOD treatment survey

# EARLY DETECTION:SOD BLITZES

www.sodblitz.org
www.sodmap.org
www.sodmapmobile.org

# SOD CONFIRMATION ON OAKS

www.sodblitz.org
www.oakstep.org

# Reporting and questions

www.sodblitz.org
www.sodquest.org
www.treefaqs.org

# Learn SOD Treatments

www.sodblitz.org
www.matteolab.org
www.suddenoakdeath.org

# This is the "whole enchilada" to protect our oaks