



The CALINVASIVES Project

Calinvasives is a new database management system, fully interfaced with Calflora, providing basic and important information on the biology, ecology, epidemiology, and impacts of emergent pathogens or emergent pathogens associated with insects threatening native California ecosystems. Calinvasives is an ideal single source in which it is possible to:

- Access basic information on the reproductive biology and spread strategy of emergent organisms
- Learn about the types of symptoms caused by the pathogen or by the pathogen and vectoring insect
- Identify further resources for a more in depth understanding of the emergent threat and of how to control it
- Learn about the hosts affected and on the current distribution of the emergent pathogen or of insects vectoring emergent pathogens
- Print out easy-to-read maps about pathogen or insect distribution with the option of choosing different scales of resolution, and different time periods

For pathogens or insects vectoring pathogens with a narrow host range, all of the information will be contained in a single page. For generalist pathogens, information may be contained both in the main "pathogen" page and in additional "pathogen x host species" pages. To start exploring Calinvasives go to: **Calinvasives Search**.

To generate a page about an emergent threat not yet included in the database management system, please create a Calflora contributor account and go to the **Calinvasives Pest / Pathogen Editor**.

Calinvasives Search

From the [search page](#), enter any criteria such as **Type of Pest**, **Name of Disease**, **Name of Affected Plant**, etc. and press . The matching results appear on the next page. Click on the name of a pest to see details about it.

Viewing a Pest/Pathogen Page

Here is an example of a Pest/Pathogen page: [Phytophthora ramorum](#).

Adding a Pest or Pathogen



Notholithocarpus densiflorus (Hook. & Arn.) Manos et al.

Tanoak

Notholithocarpus densiflorus, a dicot, is a **tree or shrub** that is **native** to California and is also found outside of California, but is confined to western North America.



Plant Characteristics and Associations



Bloom Period

Notholithocarpus densiflorus
© 2008 Kim Cabrera

Click on a photo to see it bigger
CalPhotos

Notholithocarpus densiflorus
© 2008 Kair Morse

Notholithocarpus densiflorus
© 2004 Kim Cabrera

Notholithocarpus densiflorus
© 2008 Kair Morse

Family: **FAGACEAE**
Genus: ***Notholithocarpus***

Subspecies and Varieties:

Notholithocarpus densiflorus var. *densiflorus*
Notholithocarpus densiflorus var. *echinoides*

Communities: Redwood Forest, Mixed Evergreen Forest, Yellow Pine Forest, Red Fir Forest

Habitat: slopes

Distribution by County

Add an Observation of *Notholithocarpus densiflorus*

Name Status:

Accepted by TJM2 + PLANTS

Accepted by PLANTS

Alternate Names:

(according to)

TJM2 + PLANTS: *Lithocarpus densiflorus*

More information about *Notholithocarpus densiflorus*

Location Suitability

Jepson eFlora

Search efloras.org (Flora of North America)

Nursery / seed vendor availability from CNPLX
This plant is available commercially.

Records from the Consortium of California Herbaria

website references from **Google**

Landscaping information from CalScape

Photos on CalPhotos / Google Images

Search for pests and pathogens (CalInvasives)

Photos and ID tips from PlantID.net

ACCESS THROUGH CALFLORA

Suggested Citation

Calflora: Information on California plants for education, research and conservation, with data contributed by public and private institutions and individuals, including the Consortium of California Herbaria. [web application]. 2017. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <http://www.calflora.org/> (Accessed: Nov 13, 2017).

The information on this page comes from diverse sources. None of the links are sponsored.

► Search Again

Searching for Affected plant = **Notholithocarpus densiflorus**

1 result

Phytophthora ramorum, a Fungus-like Oomycete.

contributed by Matteo Garbelotto Ph.D.

Diseases: Ramorum blight, Sudden Oak Death, Sudden larch death



Phytophthora ramorum, a fungus-like oomycete.

Kingdom: Straminopila Order: Pythiales Family: Phythiaceae

STATUS: Not native to California

ORIGIN: Unknown, hypothesized Eastern or Southern Asia.

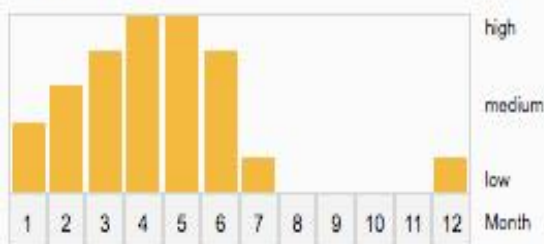
CURRENT DISTRIBUTION IN THE WILD: California, Oregon, Washington, United Kingdom, Republic of Ireland, the Netherlands. Common in the nursery industry in Europe and North America (USA and Canada)

Note: as of 2015 geographic range is expanding

GENETICALLY RELEVANT GROUPS BELOW THE SPECIES LEVEL: Yes. Four lineages named NA1, NA2,

EU1, and EU2 differing in many traits including growth rate, virulence, temperature optima, and mating alleles.

SPORULATION: Linked to presence of rainfall, so transmission period variable depending on location. In Central California as follows



HOST RANGE: Broad generalist, tens of plant families. For a confirmed host list see http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/usdaprlst.pdf

Note: as of 2015 the host list is still expanding.

Quercus agrifolia coast live oak

Notholithocarpus densiflorus tanoak

Umbellularia californica California bay

Arbutus menziesii madrone

Heteromeles arbutifolia Toyon

Quercus chrysolepis Canyon oak

Sequoia sempervirens Coast redwood

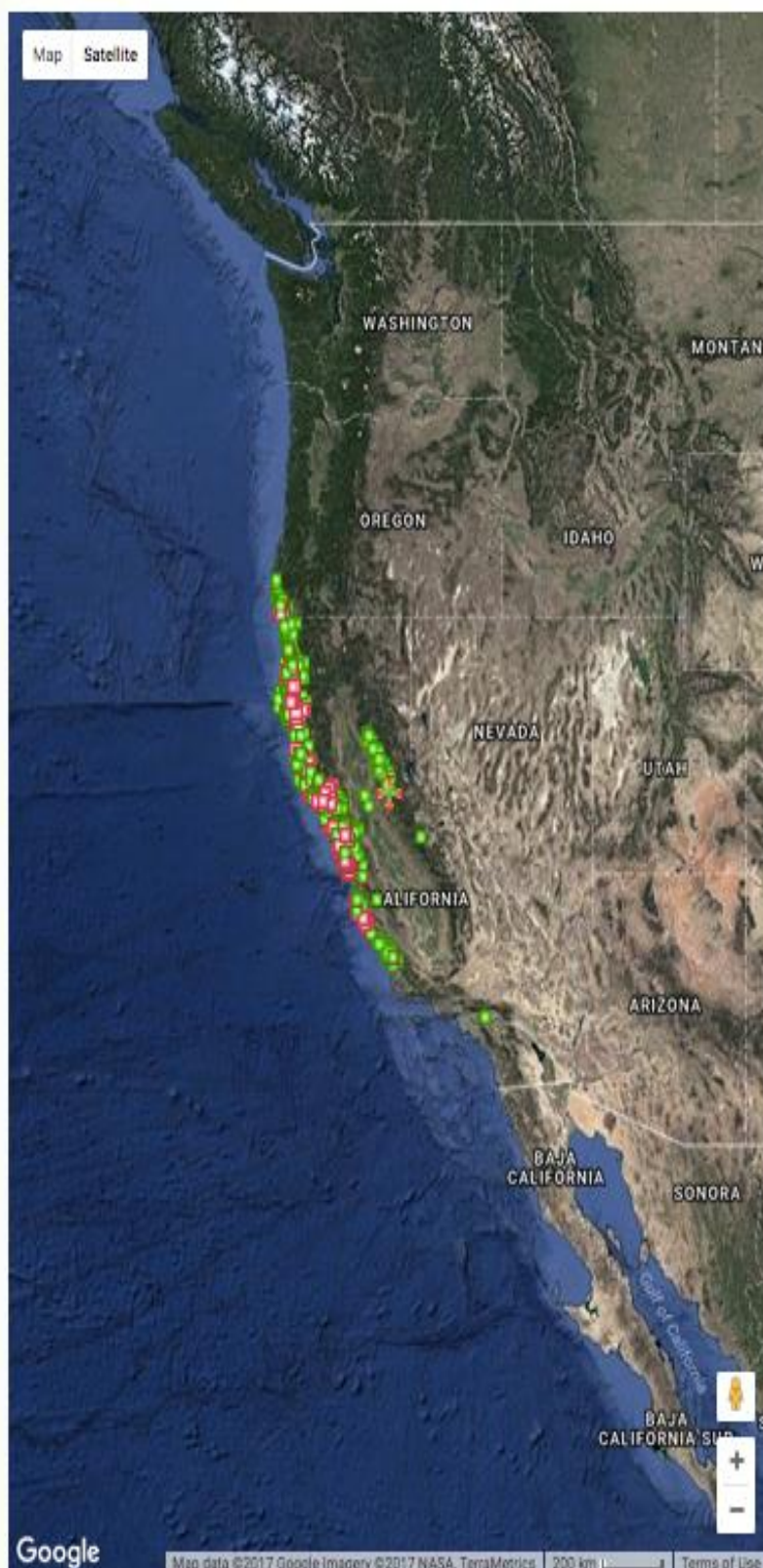
Vaccinium ovatum Evergreen huckleberry

COUNTIES:

Alameda	Humboldt	Mendocino	Placer
Contra Costa	Lake	Monterey	Plumas
Del Norte	Marin	Napa	Santa Clara
			San Francisco

☒ 200 m cells

Map Layers



Google

Map data ©2017 Google Imagery ©2017 NASA, TerraMetrics 200 km Terms of Use

***Phytophthora ramorum* on *Quercus agrifolia* (coast live oak)**

TRANSMISSIBILITY: not infectious

HOW COMMON? occasional

PLANT PART AFFECTED Branches

WHEN DO SYMPTOMS APPEAR? All year long

DAMAGE: Sudden Oak Death (SOD)

DESCRIPTION: The pathogen infects during the rainy season via motile zoospores (spores with two lateral flagella) reaching the host in airborne sporangia (asexual spores), mostly produced on California Bay Laurel leaves within 10-20 m from the oak. Infection occurs without the need of wounds, but can be favored by fresh wounds. Most infections occur on the main stem on the buttress near the root collar. However, if infected California bay laurel leaves are near large branches or upper portions of stems, localized branch or upper stem infection can occur.

SYMPTOMS: Note: symptoms are generic and lab tests are necessary to confirm SOD infections.

The disease progresses under the bark of infected trees by creating lesions killing the phloem (cambium) (Fig. 3) and blocking the outer rings of the xylem (wood). Lesions will grow both around the tree and upwards towards the canopy. They often affect the entire circumference of the tree, thus girdling it. Most oaks respond with a symptom also known as "gummosis" in orchard trees. It can be described as the oozing of amber to black sap from apparently healthy bark (Fig. 1). Sap is thick, of pleasant odor and once dry generates an orange to dark brown crust on top of the bark (Fig. 2). If bark is covered by moss or thick lichens, the sap will result in patches of dead or stained moss or lichens. Once the tree health is severely compromised, often when the canopy is still green, secondary organisms will become visible, in particular the charcoal like fruiting bodies of the sapwood decay fungus *Anulohypoxylon thursonianum* (Fig. 4) and colonization by bark and Ambrosia beetles, often visible on the outside thanks to the accumulation of sawdust generated on the bark by the tunneling of insects into the wood (Fig. 5). The entire canopy generally dries up at once 1-5 years after infection, given an appearance of sudden mortality, hence the name of Sudden Oak Death.

SEVERITY: Extremely severe. Percentage of infected oaks depends on abundance of California bay laurels in the stand. In absence of bay laurels infection is extremely rare. In presence of large numbers of California Bay laurels, infection levels over 70%. Once infected, it appears that over 90% of trees die within 5 years from infection, with most trees dying 1 to 2 years after being infected.

RANGE: Inadvertently introduced in multiple locations it is now present in stands where California coast live oaks and California bay laurels coexist. Present in the following counties: Mendocino, Sonoma, Napa, Lake, Marin, Solano, Contra Costa, Alameda, San Francisco, San Mateo, Santa Clara, Santa Cruz and Monterey.

COUNTIES:

INFECTION PERIOD: Linked to abundant rainfall, they occur mostly only in years when rainfall in the Spring is above average. Infections assumed to occur between mid March and mid June.

CONTROL: Only preventive, i.e. for trees yet to be infected but in areas at high or moderate risk for infection. To determine risk use the App SODmap mobile. Major approaches: 1- Selective California bay laurel thinning. 2- Oak injections with phosphonates and bark applications of phosphonates amended with Pentabark.

PHOTOS: click to see the full size image



Fig. 1 Fresh gummosis on oak bark



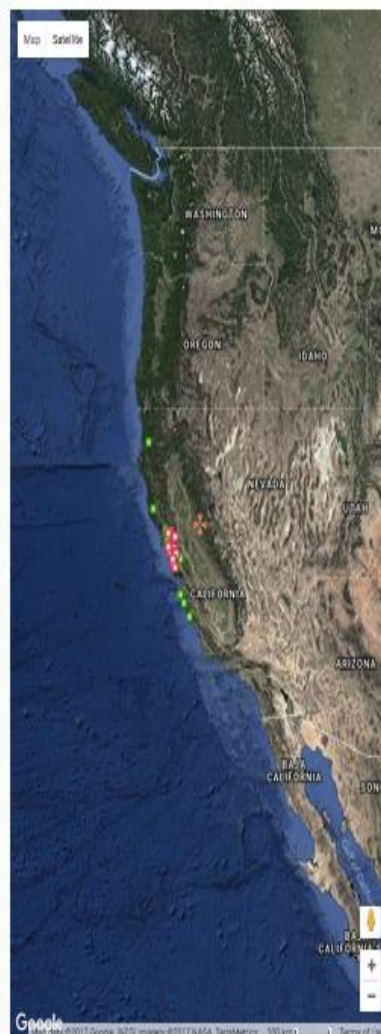
Fig. 2 Gummosis drying up on oak bark



Fig 3 Underbark lesion

200 m cells

Map Layers



38.6000, -120.7500



Phytophthora ramorum, a fungus-like oomycete.

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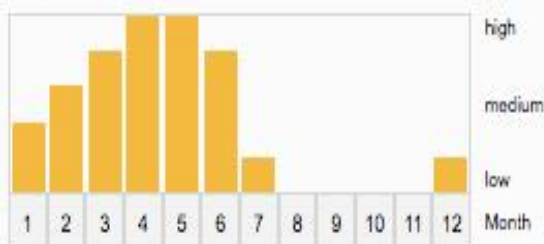
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Sequoia sempervirens Coast redwood

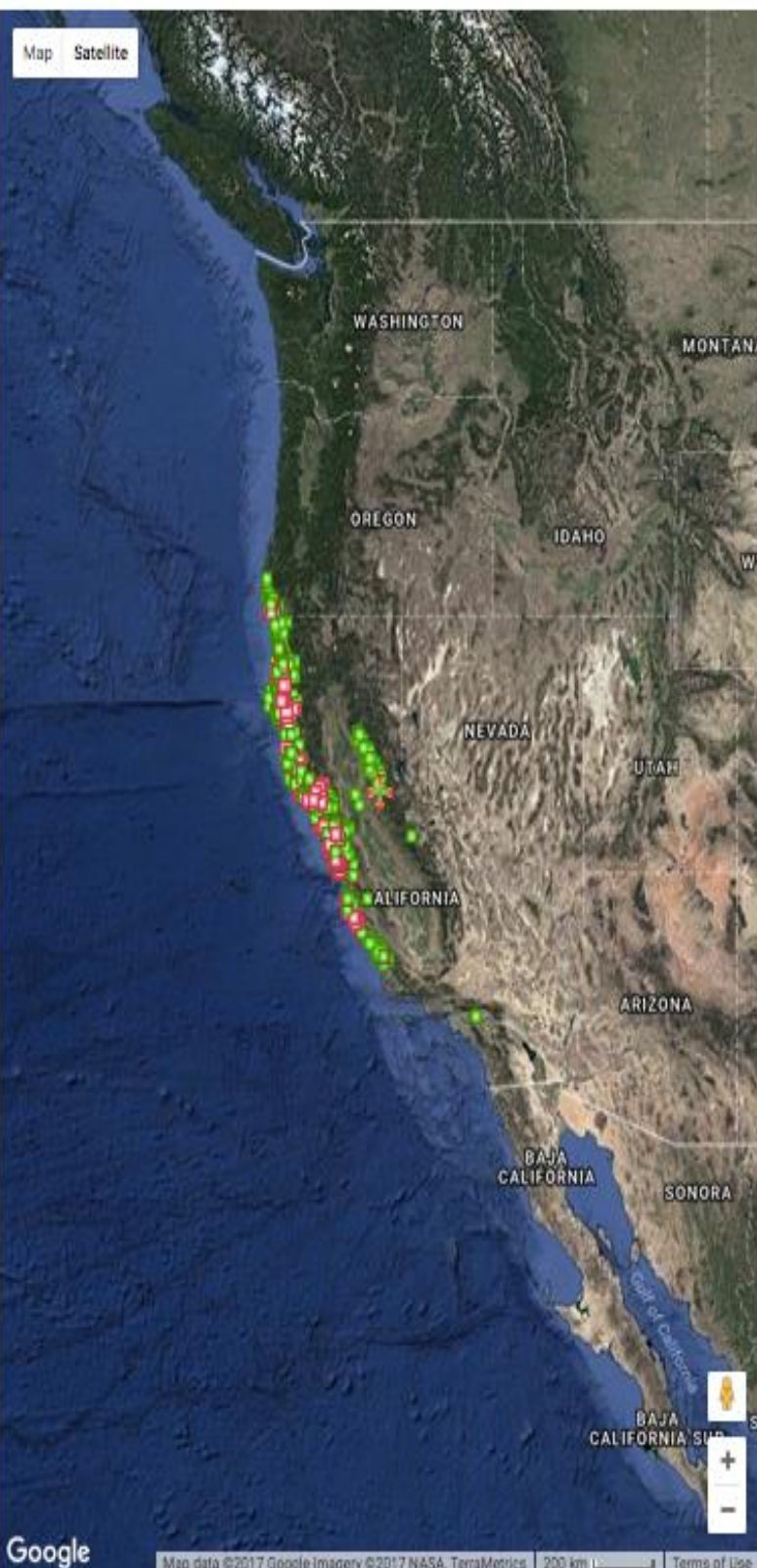
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			San Francisco

☒ 200 m cells

Map Layers





Calinvasives

California Plant Pest: *Phytophthora ramorum*

malteo g

EDIT - L

Start Year

End Year

Host

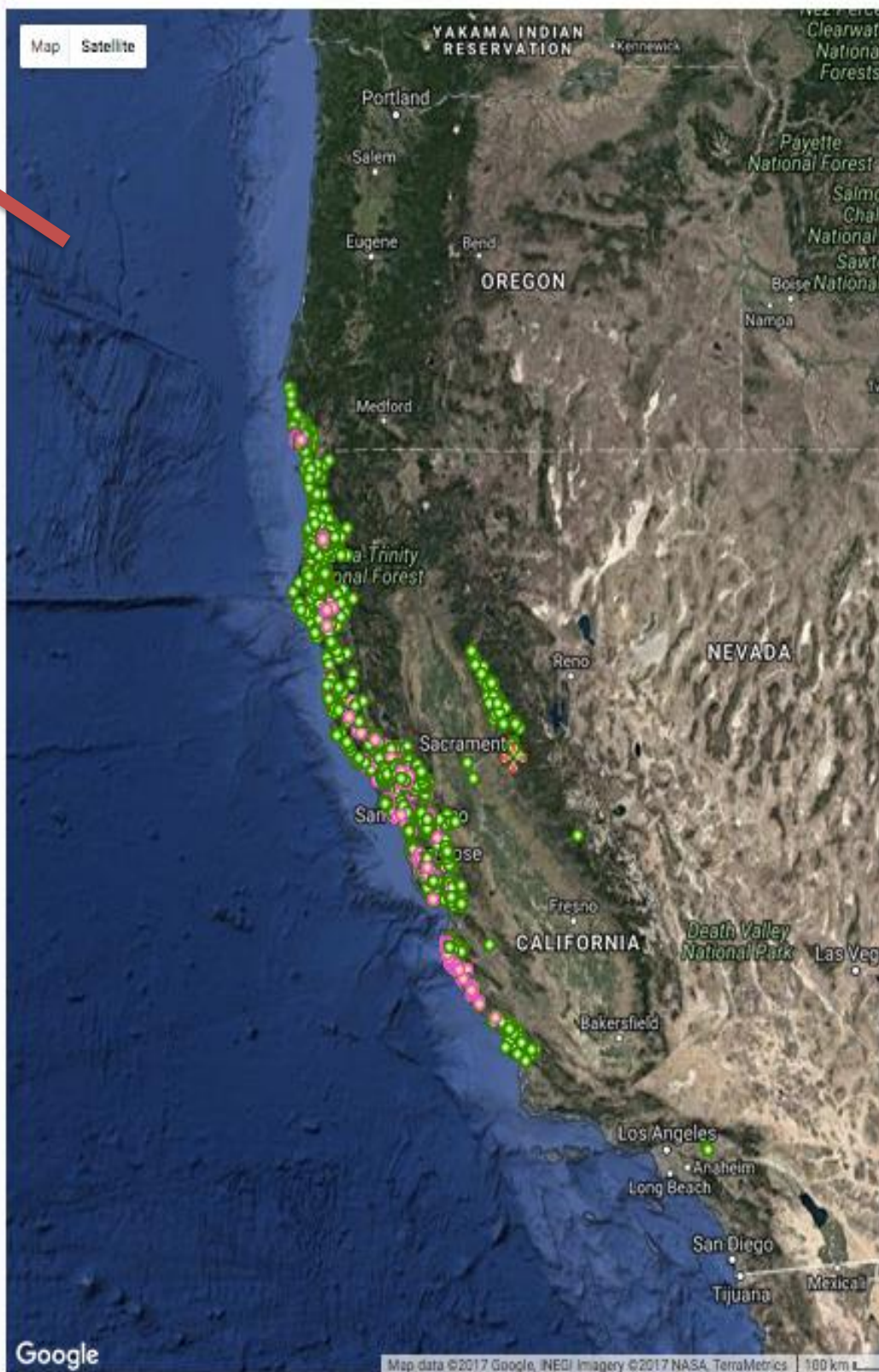
all hosts

☐ only positives

☐ Show cells ☒ Show points

DISPLAY

PRINT



Google

Map data ©2017 Google, INEGI Imagery ©2017 NASA, TerraMetrics

100 km

38.6000, -120.7500

Start Year

End Year

Host

☐ only positives

200 M

1 KM

2 KM

5 KM

✓ 10 KM

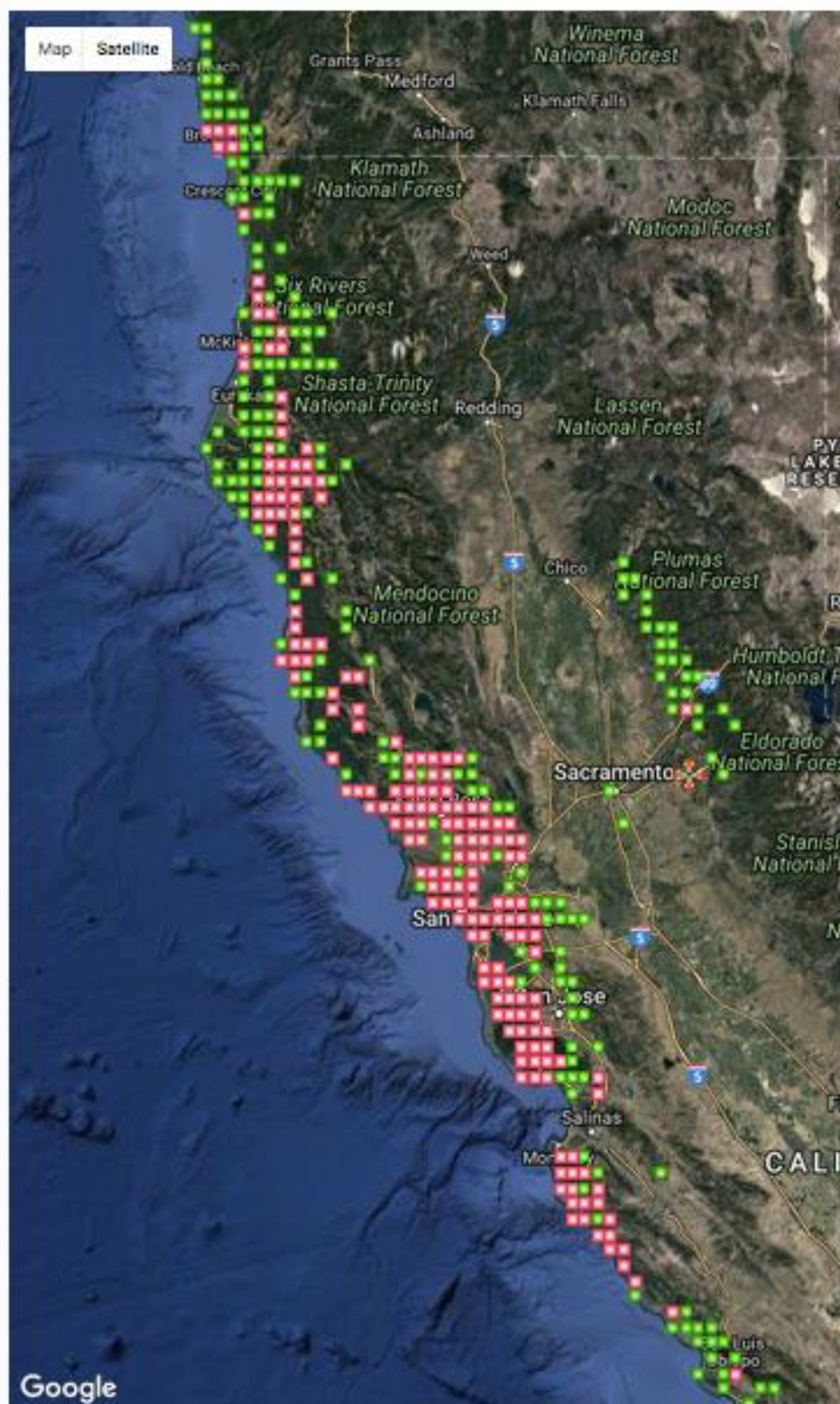
20 KM

☐ Show points

DISPLAY

PRINT

Cell size





Calinvasives

California Plant Pest: **Phytophthora ramorum**

Start Year

End Year

Host

all hosts

☒ only positives

☒ Show cells ☐ Show points

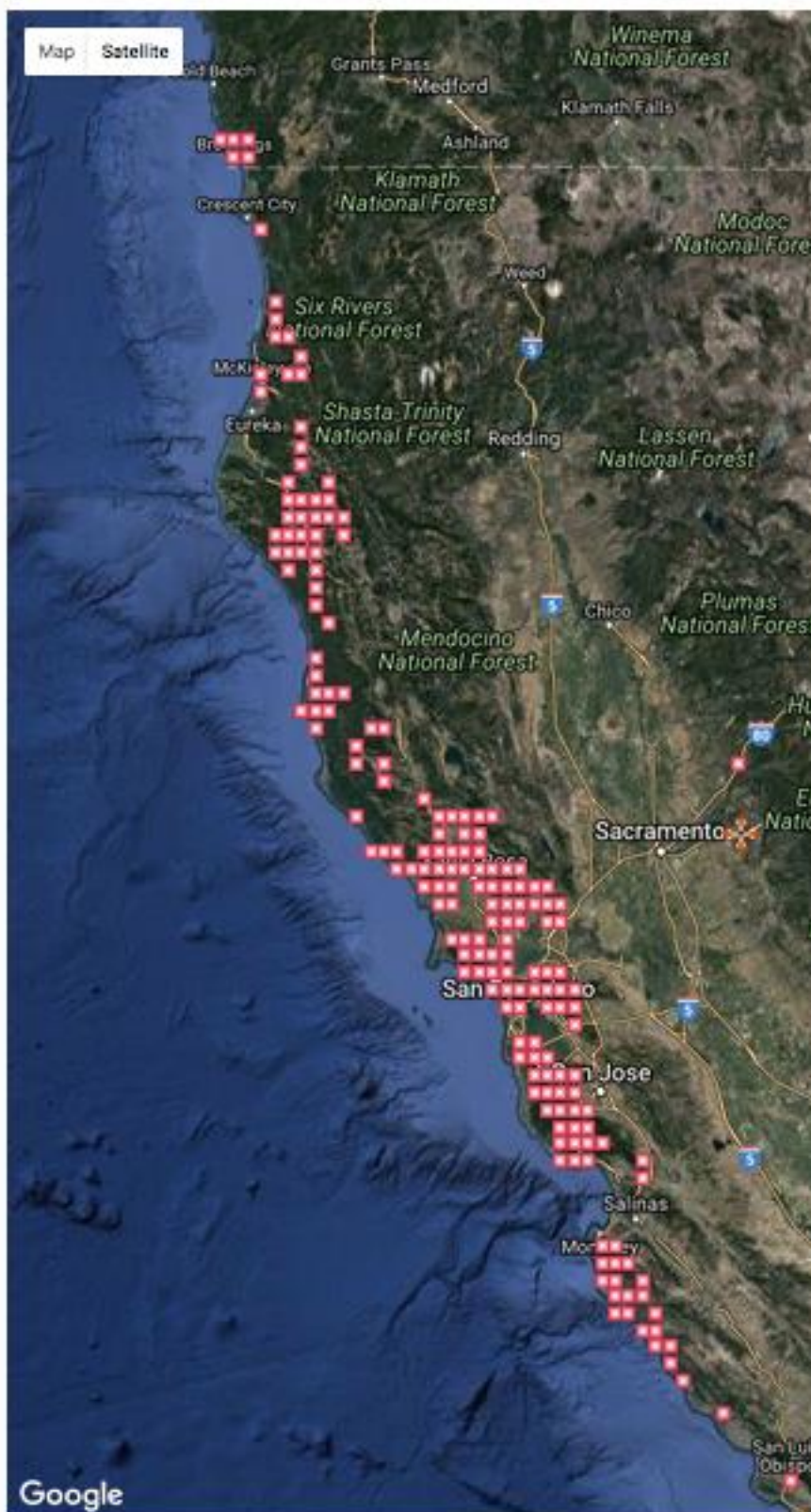
Cell Size

10 KM

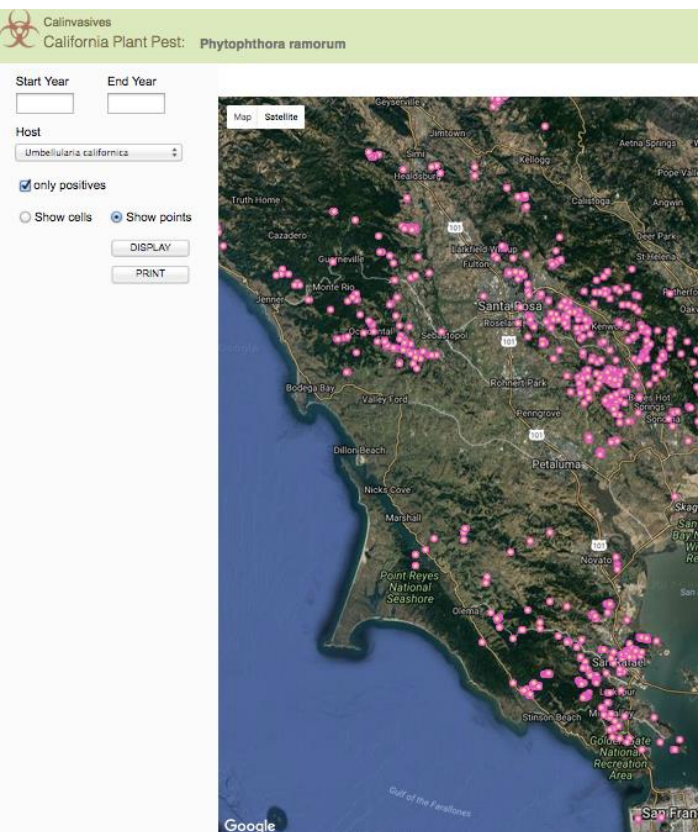
DISPLAY

☐ outline

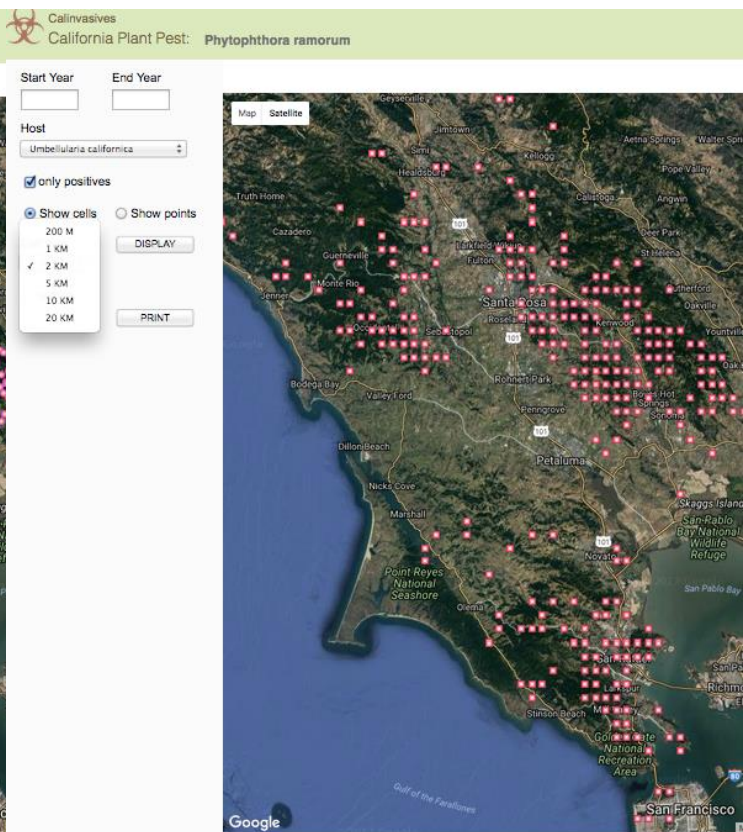
PRINT



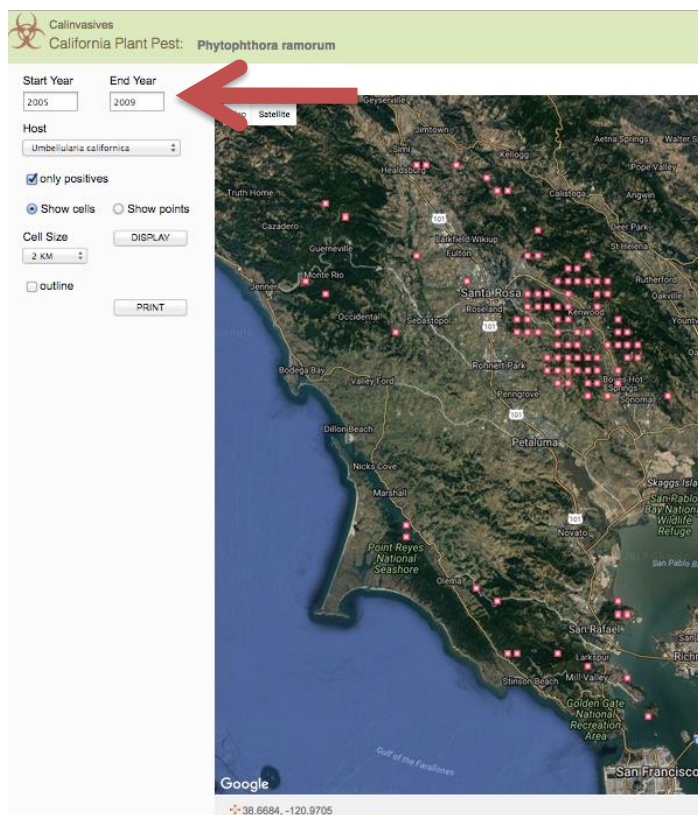
38.6684, -120.9705



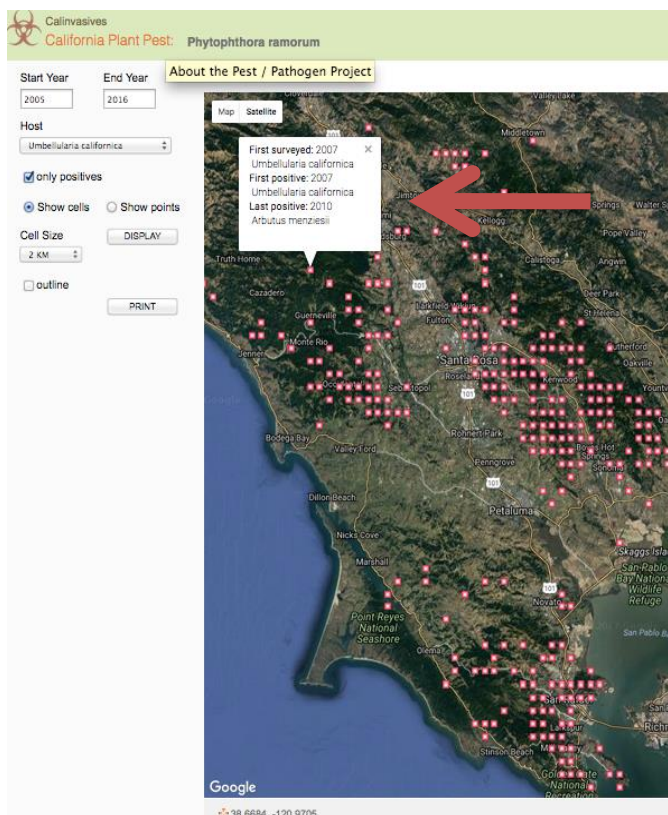
All observations (points), All years
Umbellularia



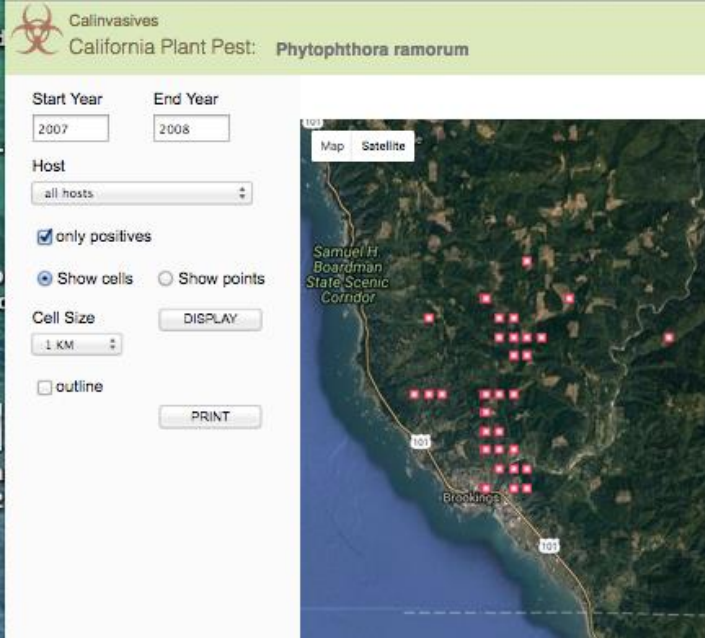
2 Km cell size, All years
Umbellularia



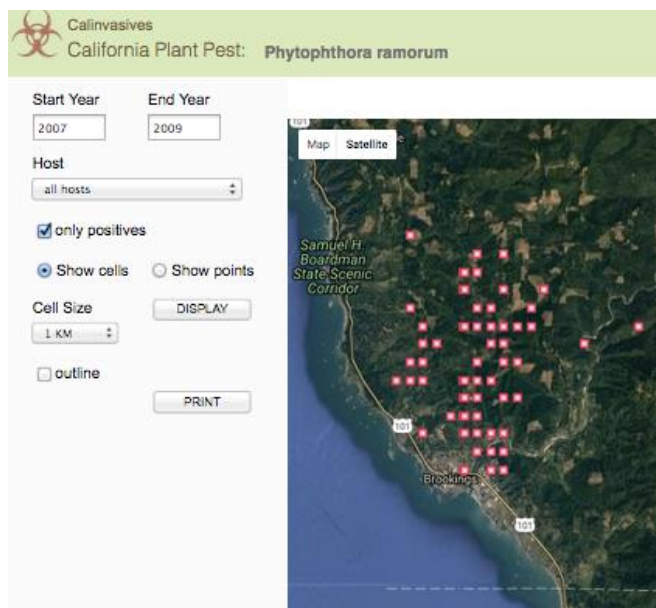
2 km cell size until 2009



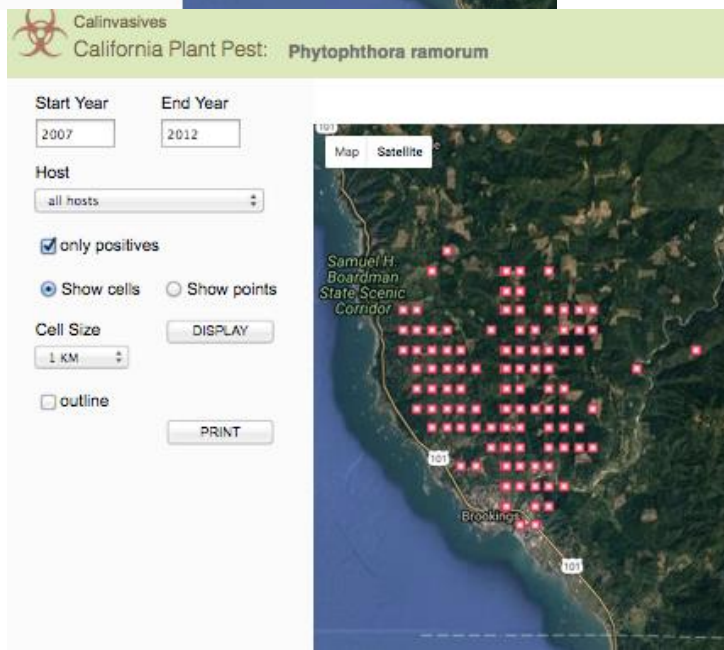
2 km cell size until 2016



OR, 1 km Cell size,
All hosts, until 2008



OR, 1 km Cell size,
All hosts, until 2009

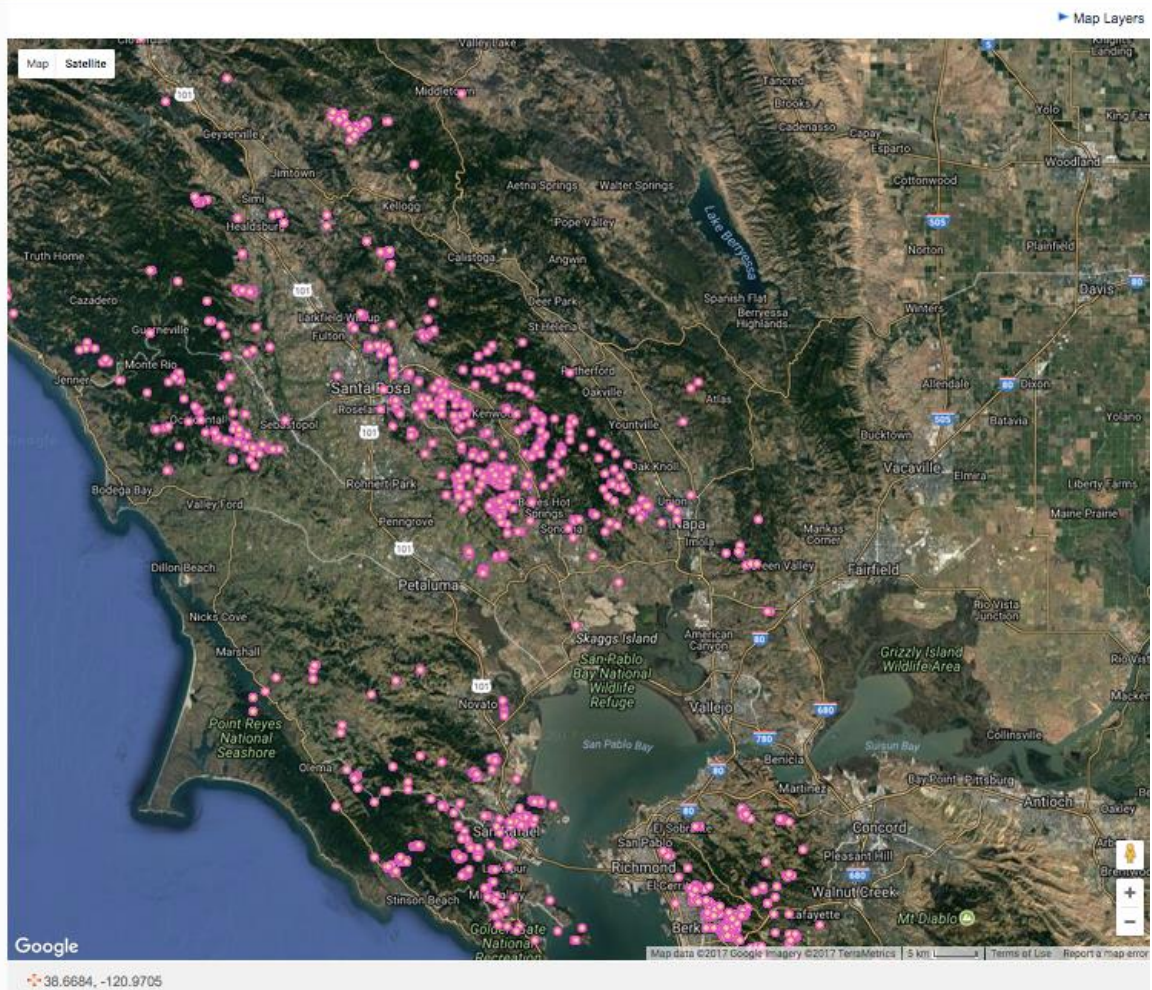


OR, 1 km Cell size,
All hosts, until 2012

Start Year End Year

Host

☒ only positives
☐ Show cells ☒ Show points

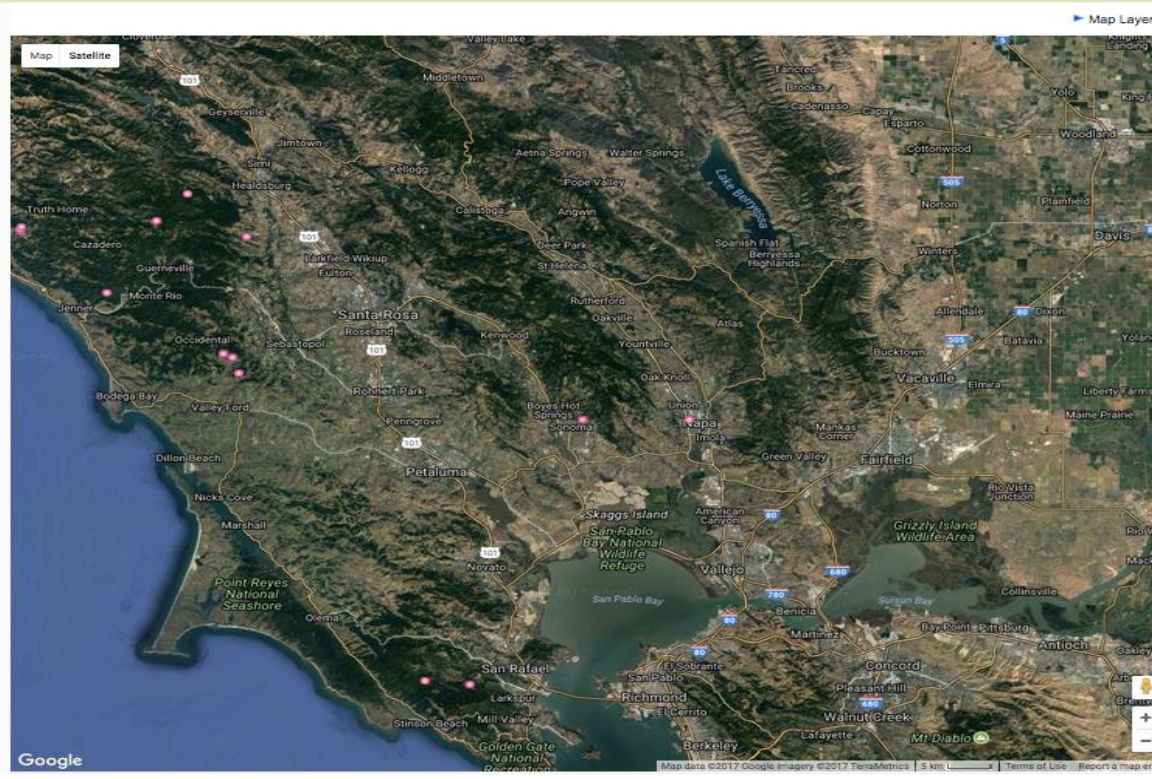


Same time,
and area
but
different
hosts

Start Year End Year

Host

☒ only positives
☐ Show cells ☒ Show points



HELP

Name of pest

Phytophthora

Type of pest

any
Fungus
Fungus-like Oomycete
Bacterium
Virus
Mycoplasma
Insect
Complex

County

any
Alameda
Alpine
Amador
Butte
Calaveras
Contra Costa
Colusa
Del Norte
El Dorado
Fresno
Glenn
Humboldt
Imperial
Inyo
Kings
Kern
Lake
Lassen
Los Angeles
Madera
Marin
Mariposa
Mendocino
Merced
Mono
Monterey

Origin / Status

any
Not native to California
Native but emergent
Unknown

Name of disease

Name of affected plant

Plant Community

any
Alkali Sink
Alpine Fell-fields
Bristle-cone Pine Forest
Chaparral
Closed-cone Pine Forest
Coastal Prairie
Coastal Sage Scrub
Coastal Strand

When are symptoms visible?
(When is the organism visible?)

any

Plant part affected

any

SEARCH

You can also access Calinvasives through a search portal identical to the Calflora one